# Brown Pelicans and Fish Waste Handling Conflicts In Northern California Harbors Summer 2012

Final Report to the Kure/Stuyvesant Trustee Council

By D. Jaques
Pacific Eco Logic

April 2013

## Summary

This report documents findings from the first year of a California Brown Pelican (*Pelecanus occidentalis californicus)* injury reduction project targeted at northern California harbors. The primary goal of the project is to minimize anthropogenic harm such as plumage contamination with fish oils, gullet impaction due to carcass ingestion, and other physical injuries associated with scavenging. The project seeks to reduce injury to pelicans through modification of fish waste handling facilities, procedures, and human behaviors. Results demonstrated that contamination with fish oil was a significant source of injury for juvenile pelicans during the summer post-fledging dispersal period in northern California in 2012. The frequency of oiling amongst groups scavenging at a recreational fish cleaning station in the Crescent City Harbor was as high as 100% and pelican mortality within the sport basin was estimated at more than 60 pelicans over a 3 week time-period. A total 246 pelicans with fish-oil fouled plumage were captured and washed by wildlife rehabilitators in the project area, which spanned about 240 km of coastline from Shelter Cove to the Oregon border. Recreational fish cleaning stations with perched discharge pipes that drained directly onto pelicans scavenging from below were the most obvious and harmful sources of oiling in the Crescent City and Shelter Cove harbors. Bird movement from these two sites may have accounted for many oiled birds seen in Trinidad and Humboldt Bay. The 2012 event became a wildlife management crisis in northern California harbors. Harbor district personnel eventually took emergency action to eliminate and alter the infrastructure of the recreational stations, in accordance with specific recommendations made through this project. Significant reduction in future pelican mortality in the study area is expected to result from these actions. Public education and outreach were a project component, however, even complete public compliance would not have prevented the primary mechanism of severe oiling in this particular case. The fish oiling event in northern California was associated with a high incidence of juvenile pelican nutritional stress in south and central California. Follow up monitoring and additional investigation of potentially harmful fish waste handling systems in the region is recommended for 2013.

## Acknowledgements

This project was funded by the Kure/Stuyvesant Trustee Council. Special thanks to council members Jeff Dayton and Laird Henkel, CDFW, and Lynn Roberts and Carolyn Marn, USFWS, for their support and administration of the work. Thanks also the Crescent City Harbor District harbormaster R. Young and maintenance staff, for their cooperation and efforts to reduce pelican mortality in 2012. M. Merrick, Bird Ally–X, provided information on Crescent City rehabilitation capture chronology for this report. Dan Anderson and Laurie Harvey provided unpublished information on the 2012 pelican breeding season in the Gulf of Califonia, Mexico and Channel Islands National Park.

**Recommended Citation**. Jaques, D. 2013. Brown Pelicans and fish waste handling conflicts in northern California harbors, Summer 2012. Pacific Eco Logic report to the Kure/Stuyvesant Trustee Council. Unpubl. 20 pp plus appendices. djaques.pel@charter.net.

# Contents

Summary ..... i

Acknowledgements ..... i

Introduction ..... 1

Project Goal ..... 1

Project Approach ..... 1

Methods and Study Area ..... 2

Results ..... 4

Harbor Inventory: Fish Handling Facilities in Northern California ..... 4

Crescent City Harbor ..... 4

Trinidad ..... 6

Humboldt Bay ..... 7

Shelter Cove ..... 8

Distribution and Abundance of Pelicans and Human Fishing Activity in Northern California Harbors, Summer 2012 ..... 9

Pelicans and Fish Waste Handling ..... 10

Crescent City Harbor ..... 10

Humboldt Bay ..... 14

Trinidad ..... 14

Shelter Cove ..... 15

Public Outreach and Contacts with Harbor Staff ..... 15

Crescent City ..... 15

Humboldt Bay and Shelter Cove ..... 16

Harbor Infrastructure Summary and Recommendations ..... 17

Discussion ..... 18

Literature Cited ..... 20

Appendix A. Photographs. ..... A-1

Appendix B. Supporting Data ..... B-1

Appendix C. Correspondence between PEL and the CCHD ..... C-1

Appendix D. Plans for Crescent City Closed Fish Cleaning Station ..... D-1

# Introduction

The California Brown Pelican (*Pelecanus occidentalis californicus*) is a nearshore seabird that transits hundreds of miles of coastline annually tracking variable prey resources and commuting between terrestrial roosts, island breeding colonies, and foraging areas (Anderson and Anderson 1976, Shields 2002). Probability for interaction with the public is high compared to most seabirds, particularly when pelicans use artificial structures to roost or supplement their diet with offal. Some pelicans become regular "pier bums," seeking handouts from people or cuing in to scavenging opportunities at locations where such food sources are reliably available (Herbert and Schreiber 1975, Lincer et al. 1979). Environmental conditions, such as low food availability, unfavorable weather, oceanographic anomalies, or strenuous migrations can cause elevated stress and mortality. Pelicans may gravitate towards harbors in unusual numbers to seek shelter and/or scavenge when they are physiologically stressed.

There are many potential negative outcomes and sources of anthropogenic injury associated with pelican use of developed harbors, particularly in relation to scavenging. These include entanglement in fishing gear, gullet impaction, plumage contamination with petroleum and fish oils, and direct physical harm from humans. In Summer 2011, Pacific Eco Logic (PEL) and wildlife rehabilitators at Bird Ally-X (BAX) documented a high incidence of juvenile birds scavenging and becoming debilitated due to plumage fouling at northern California harbors from Shelter Cove to Crescent City. D. Jaques observed oiled pelicans and negative interactions with fishermen in the Crescent City Harbor on 21 August, 2011 and notified the California Dept. of Fish and Game (CDFG) and wildlife rehabilitators. BAX responded and eventually took in 50 affected juvenile pelicans from various harbors in Humboldt and Del Norte Counties, discovering acute problems in Shelter Cove. The 'Northern California Harbor Pelican Injury Reduction' project, initiated in 2012, was spurred by that event. The project seeks to reduce injury to pelicans at northern California harbors through modification of fish waste handling facilities, procedures, and human behaviors. The work was conceived as a coordinated joint effort between PEL and BAX but field work and outreach were ultimately performed separately in 2012.

## Project Goal

To minimize pelican injuries such as plumage contamination with fish oils, gullet impaction due to carcass ingestion, other physical injuries and public nuisance issues associated with scavenging.

## Project Approach

1) Assess and evaluate fishing waste management practices in coastal northern California harbors and work with harbor districts and other jurisdictions to correct problematic infrastructure or practices.

2) Conduct public outreach at marinas through fishermen contacts regarding proper handling of fish waste.

3) Develop durable informative signs for fish-cleaning facilities to encourage proper carcass disposal by recreational fishermen.

4) Develop and distribute informative pamphlets describing the impacts of fish oil on seabirds and ways contamination can be prevented.

5) Monitor the impacts of fish waste disposal on seabirds and effectiveness of the outreach and education efforts by conducting surveys to document seabird, especially pelican, condition and behavioral activities in harbors near fish waste facilities, during the period of greatest abundance of pelicans at harbors in northern California (July-October).

In 2012, PEL shared assessment and monitoring (tasks 1 and 5, above) with BAX, with an emphasis on the Crescent City Harbor, and BAX was responsible for public outreach (tasks 2-4). This report reflects the efforts of PEL and is a companion to a separate report from BAX.

## Methods and Study Area

The project area includes the coastal region from Shelter Cove to the Oregon Border, which includes the length of the Humboldt and Del Norte County coastlines and totals about 240 km of shore (Fig. 1). Four developed harbors occur within this region, Crescent City Harbor, Trinidad, the Port of Humboldt Bay, and Shelter Cove. The harbors at Crescent City and Humboldt Bay are the largest; both sites are heavily used by both commercial and recreational fishermen. The harbors at Trinidad and Shelter Cove are much smaller, primarily recreational fishing harbors.

Non-breeding migratory pelicans occur in the study area from about April through December, with peak use expected in July-September, the typical post-breeding dispersal period. High counts during late fall and winter sometimes occur (Jaques and Ford 2000). In the two county region, 57 pelican roost sites have been mapped and characterized (Jaques et al. 2008) Compared to Humboldt, Del Norte County has a smaller number of roosts, but pelican aggregations have historically been larger. Historic high counts of pelicans in the study harbors have totaled more than 500 in the Crescent City Harbor (11/1997) and greater than 400 at Shelter Cove (7/1986 and 9/1986).

Field work for this project began in early summer, with preliminary harbor inspection and pelican surveys from the Oregon border to Crescent City during June 1-4. More intensive surveys from Oregon to Eureka took place in both July and August. In July, field work in Del Norte County was conducted over 7 partial days (July 16-22) and 1 day in northern Humboldt County (19 July). Follow up surveys took place 22-25 August in Del Norte County and on 26 August in northern Humboldt County. Areas south of Eureka in Humboldt County, including Shelter Cove, were not assessed or monitored by PEL due to BAX coverage of the region, and the need for focused effort in Crescent City.

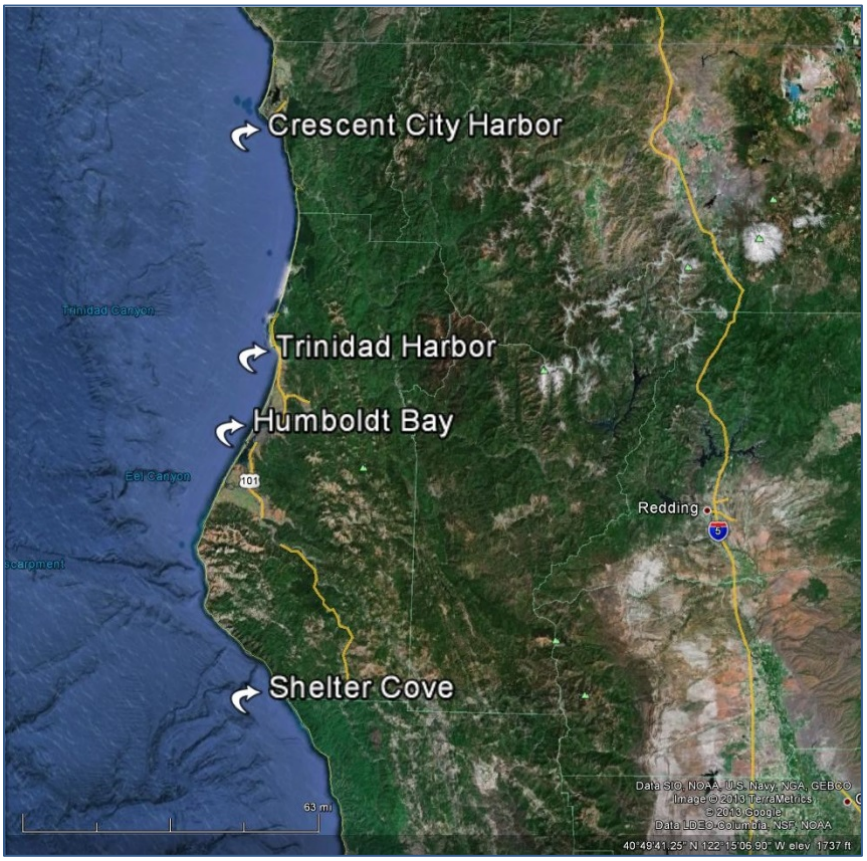
Brown pelican surveys within harbors were conducted from the ground with binoculars, and a spotting scope when necessary. Data were collected by region within the harbors so that bird relationship to potential and actual sources of fish oil was documented. Most observation time was focused on recreational cleaning stations where pelicans concentrated. Sampling time was recorded to account for observer effort, and was of greater duration when oiled birds were encountered. Total numbers of pelicans by age class, and numbers observed that were oiled, were recorded. Pelican age was divided

into two categories, adult (after second year and older) and juvenile (hatch-year and second year). General behaviors of pelicans and human activities at fish cleaning stations were noted. Photographs and video recordings were made to supplement the documentation.

Surveys also took place at surrounding traditional diurnal roost sites. All known roost sites in the immediate proximity of harbors, and a sample of easily accessed roosts between harbors, were censused and checked for oiled birds at least two times during the summer study period. Basic surveys of roosts were completed within 5-15 minutes of observation effort if no oiled birds were detected.

Communications between the Crescent City Harbor District and PEL took place through correspondence with the harbormaster as well as direct contact with staff. PEL did not contact the Humboldt Bay Harbor District during the field season due to BAX coverage of the area. Communication with CDFG was through Jeff Dayton, including a brief meeting at the Crescent City Harbor.

Fig 1. Northern California pelican injury reduction project area and major harbors in Del Norte and Humboldt County.



# Results

## Harbor Inventory: Fish Handling Facilities in Northern California

The facilities most relevant to this project are described below by harbor, and shown as photographs in Appendix A. An alpha numeric inventory system was developed to catalog and track specific facilities.

### Crescent City Harbor

The Crescent City Harbor is managed by the Crescent City Harbor District (CCHD) and includes a sport basin, commercial boat basin and central, less developed basin. The sport basin contains docks for small recreational vessels and charter boats, a boat ramp, and had three recreational fish cleaning stations in 2012 (Fig. 2). Commercial fish processors are located on piers at the end of Citizen Dock road and along the northeast side of the sport basin. Additional fish cleaning takes place off boats in the commercial basin. There is a recreational fishing pier near the western edge of the central basin, the "B Street Pier," used primarily for crabbing. Shore-based crabbing and fishing occur throughout the harbor.

Figure 2. Crescent City Harbor, showing locations of fish cleaning stations, commercial fish processing areas, and sport boat ramp. Photo from Google Earth. See text for location codes.

***Crescent City Fish Cleaning Station-Open-1 (CC-FCS-O-1).*** The most heavily used fish cleaning facility observed in summer 2012 was a recreational fishery open table station between a rip rapped shoreline and the primary parking lot of the sport basin (Fig 2) . The table was plumbed with water; oily waste water and flesh drained out to the harbor through a pipe perched about 10 feet above the rip rap shoreline (Fig. 3). Waste bins consisted of large plastic totes with hinged wooden lids, located on either side of the filet tables. The station was removed on July 20, 2012 due to wildlife conflicts.

***Crescent City Fish Cleaning Station-Open-2 (CC-FCS-O-2).*** A secondary fish cleaning station was located in the northwest corner of the sport basin, in the 'Citizen's Dock' area (Fig 2). This facility had three smaller open tables with plumbing, flanked by fish waste totes with hinged wooden lids. Oily waste and fish scraps drained down open chutes and pipes to the harbor water from each table. The station was removed on July 20, 2012 due to wildlife conflicts

***Crescent City Fish Cleaning Station-Closed-1 (CC-FCS-O-1).*** An enclosed fish cleaning station is located very near the boat ramp on Whaler Island and the open fish cleaning station in the sport basin parking lot (Fig 2). The station is solid construction with a chain link door and windows. Fish waste bins are located inside the structure and oily waste drains directly into the Crescent City sewage system (CCHD, pers. comm).

***Crescent City Commercial Fish Processing Area-1 (CC-CFPA-1).*** The primary commercial fish transfer and loading area is on a two part pier at the end of Citizen's Dock Road (Fig 2). Other commercial fishing activities take place in the commercial basin and north side of the sport basin.

Figure 3. Drain pipe at CC-FCS-O-1 and oiled pelicans below it.

## Trinidad

Trinidad Harbor is owned and managed by the Trinidad Rancheria. No fish cleaning or handling facilities were observed in this harbor during July and August 2012. The "Trinidad Pier Reconstruction" project was recently completed. This structure **(TR-RFP-1)** serves as a recreational fishing pier and temporary mooring; longer term mooring takes place in the associated sheltered waters (Fig. 4). All runoff from the new pier drains into inlets on the decking; this runoff is conveyed via PVC piping to a stormwater treatment vault. Runoff from the former pervious pier deck, which potentially contained trash, fish waste, and hydrocarbon pollutants, flowed directly into the Bay and was considered a problem (Baskin 2012). A fish cleaning station that was present on the old pier is no longer there. Fish cleaning is not allowed on the new pier, which was a coastal commission requirement to reduce potential pollutants from fish waste into the Trinidad Area of Special Biological Significance (ASBS).

Figure 4. Trinidad Harbor showing the recreational fishing pier and boat moorage.

## Humboldt Bay

Northern Humboldt Bay has at least two recreational marinas near Eureka; Woodley Island, operated by the Humboldt Bay Harbor, Recreation, and Conservation District (HBHRCD), and the Eureka Public Marina, operated by the City of Eureka. Several commercial fish processing facilities are located on the waterfront between the two marinas.

***Humboldt Bay Fish Cleaning Station Open-1 (HB-FCS-O-1).*** One small open fish cleaning station was located at the south end of the Woodley Island Marina at the end of a pier (Fig 5). The table is plumbed and has a discharge pipe that goes directly into the bay into the water column (J. Crider, HBHRCD, pers. comm).

***Humboldt Bay Commercial Fish Processing Area-1 (HB-CPFA-1).*** Fish processors are adjacent to the Eureka Public Marina (Fig. 5). Restricted access and limited shore based vantage points precluded views of waterfront activities in this area.

Figure 5. Northeastern Humboldt Bay, showing marinas and commercial fish processing areas near Eureka.

## Shelter Cove

Shelter Cove is a geographically remote location with an open-ocean boat launching facility. Public recreational boating and fish handling facilities are operated under the jurisdiction of the HBHRCD but are complicated by the fact that they are located on privately owned land, managed by the Shelter Cove Resort Improvement District (J. Crider, HBHRCD, pers. comm). There is a relatively large fish cleaning station within a chain link fenced area **(SC-FCS-O-1;** Fig. 6). The station formerly had an open top but in response to bird issues, a net top was recently installed. Fish waste from the cleaning table is temporarily stored in a container, then ground into a slurry and drained out to sea via a pipe. The pipe was perched many feet above the ocean's surface, until late July 2012, when it was extended to drain below the water level to eliminate showering scavenging seabirds with oil.

Like Trinidad, Shelter Cove is designated as an ASBS under the King Range unit. This designation specifically prohibits waste discharge into waters under the 2001 Ocean Plan. A compliance review in 2006 identified the discharge from the fish cleaning station at Shelter Cove as a problem (Gregorio et al. 2006). Division of Water Quality staff recommended that waste discharges from the fish cleaning stations at both Trinidad and Shelter Cove be eliminated. Staff recommended that all fish wastes be retained and hauled off-site for legal disposal or use, and all grey water be disposed to land under a waste discharge requirement (WDR) issued by the Regional Board. The State Board considered the Shelter Cove portion of the ASBS a high priority. The HBHRCD was notified to cease discharge from the fish cleaning station by August 2006, but discharge has continued to date. The pelican oiling issue in 2012 has finally set the process of eliminating the discharge in motion (described below).

Figure 6. Shelter Cove harbor, showing the fish cleaning station (SC-FCS-O-1) and long fish slurry drain pipe.

## Distribution and Abundance of Pelicans and Human Fishing Activity in Northern California Harbors, Summer 2012

Pelicans experienced near total breeding failure in U.S. waters in 2012, presumably due to low prey availability during the breeding season (L. Harvey, National Park Service, pers. comm., see Anderson et al. 1980). Many adult non-breeders and failed breeders from the Channel Islands colonies migrated early to the Pacific Northwest (D. Jaques, unpubl). Few pelicans were observed in Del Norte County, CA in early June 2012 (Table 2). Small numbers were observed flying or feeding, but none were found at traditional communal roosts. No pelicans were seen roosting or scavenging within the Crescent City Harbor in June 2012.

Numerous starving, young pelicans that could only have been from colonies in Mexico (D. W. Anderson, UCD, pers. comm.) began to swamp rehabilitation centers in southern and central California beginning around the first of July. Intakes were heavy through at least mid-July, according to media reports. By 10 July, northern California resource personnel became engaged in responding to public concern about unusual pelican behavior, and notified PEL of large numbers of pelicans dying on Redwood Coast beaches.

Communal roost site surveys in mid-July indicated relatively low pelican numbers in Del Norte County during the northern California mortality event. The maximum instantaneous count in the Crescent City harbor during 16-21 July was 40, nearly all juveniles (Table 1). Although the total numbers of birds in the harbor was not high, the numbers injured, stressed, and interacting with the public was unusual. Numbers of birds in the harbor were apparently greater just prior to the PEL surveys. A count conducted by C. Strong (CCR) on 11 July totaled 61 pelicans. Staff from the CCHD reported that they had been cleaning up dead pelicans since late June, BAX captured and removed 11 pelicans from 12-14 July, and another 11 pelicans were counted dead at the start of surveys on 16 July. Thus, documented capture and mortality of 22 birds more than accounted for the decline in numbers between 11-16 July.

The August pelican count in Del Norte County was similar to July, however distribution had shifted north and completely away from the Crescent City Harbor. Only one pelican was seen in the Crescent City Harbor and it was not associated with any fish handling area. In both months juvenile pelicans comprised roughly one third of the overall population in the county, however the harbor held a disproportionate amount of pelicans in July (Table 1).

In northern Humboldt County, nearly all pelicans seen at sampled roosts were within Humboldt Bay in both July and August (Table 2). The total count was higher in August, when increased numbers of adults were seen. The overall age ratio of pelicans in Humboldt County in July was similar to that of Del Norte. The largest aggregations in July were on artificial structures at a private mariculture facility in the northern Bay. In August the largest group was on a small breakwater just north of the bay mouth. This site was used as the primary release site for birds rehabilitated by BAX throughout August (L. Corsiglia, BAX, pers. comm).

Recreational fishermen occurred in the Crescent City Harbor each month, and cleaned their catch inside the closed fish cleaning station in June and August. During peak salmon fishing in July, the open stations were also used. Cleaning facilities appeared to be at or above capacity in July, and were used heavily from mid-morning to mid-afternoon by people cleaning salmon, bottom fish and crab. Documentation of fisheries activity in Humboldt Bay by PEL was limited to one observation of a fisherman cleaning albacore tuna at an open station on Woodley Island in July. Crabbing from the pier was the only type of fishing seen in Trinidad.

Table 1. Del Norte County Brown Pelican communal roost sites. High count and % of total that were immature (shown in parenthesis). Roost sites are mapped in Jaques et al. 2008.

| Roost No. | Roost Name | Habitat Type | June 1-4 | July 16-22 | August 22-26 |
|---|---|---|---|---|---|
| DN 2.0 | White Rock south | Offshore Rock | n.d. | 26 (0%) | n.d. |
| DN 3.0 | Klamath River Mouth | River Mouth | n.d. | 65 (15%) | 42 (57%) |
| DN 5.0 | False Klamath Rock | Offshore Rock | n.d. | 1 (100%) | 0 |
| DN 7.0 | Crescent City Harbor | Harbor | 0 | 40 (92%) | 1 (100%) |
| DN 8.0 | Elk Creek Mouth | Estuary | 0 | 0 | 0 |
| DN 12.0 | Steamboat Rock | Offshore Rock | 0 | 0 | 10 (20%) |
| DN 13.0 | White Rock north | Offshore Rock | 0 | 35 (29%) | 6 (33%) |
| DN 14.0 | Castle Rock | Offshore Rock | 0 | 17 (59%) | 0 |
| DN 17.0 | Lake Tolowa Mouth | Estuary | 0 | n.d. | 1 (100%) |
| DN 19.0 | Smith River Mouth | River Mouth | 0 | 36 (29%) | 77 (39%) |
| DN 21.0 | Hunter Rocks | Offshore Rock | 0 | 27 (11%) | 101 (25%) |
| | Total (Adult/Immature) % Immature | | 0 | 221 (136/80) 37% | 248 (163/85) 34% |

Table 2. Humboldt County Brown Pelican communal roost sites. High count and age composition (% immature).

| Roost No. | Roost Name | Habitat Type | July 19 | August 26 |
|---|---|---|---|---|
| | Eureka Waterfront south | Harbor | 11 (73%) | 2 (100%) |
| | Woodley Island Marina | Harbor | 30 (57%) | 3 (67%) |
| HU 8.0 | Coast Guard Jetty Samoa | Estuary | 3 (0%) | 135 (22%) |
| HU 9.0 | Manila Oyster Racks | Estuary | 97 (20%) | 66 (17%) |
| | Trinidad Harbor | Harbor | 5 (100%) | 0 |
| HU 10.0 | Arcata Bay mudflats | Estuary | 7 (43%) | 3 (0%) |
| HU 15.0 | Blank Rock | Offshore Rock | 0 | 0 |
| HU 16.0 | Flatiron Rock | Offshore Rock | 0 | 9 (0%) |
| HU 24.0 | Big Lagoon | Estuary | 0 | 0 |
| HU 25.0 | Stone Lagoon | Estuary | 0 | 0 |
| | Total (Adult/Immature) % Immature | | 153 (101/52) 34% | 219 (174/44) 20% |

## Pelicans and Fish Waste Handling

### Crescent City Harbor

Daily surveys of the Crescent City Harbor took place during 16-21 July when intense negative wildlife/fisherman conflicts and numerous oiled birds were observed. The open fish cleaning stations

were removed by the CCHD on 20 July. Most observation effort occurred during the time of day when fish cleaning was expected to be most active (1000-1600) and included 1-1.5 hours of direct observation each day except for 7/18. Additional surveys took place in the early morning, late afternoon, and after dark and totaled 3 hours observation time. When fish cleaning was most active, pelicans were aggressively scavenging, obstructing access to the waste bins, becoming oiled from the perched outflow, and choked by large fish scraps. Some fisherman attempted to deter pelicans by spraying water, kicking, and waving their hands while others threw scraps to the birds, continually drawing them in. Pelicans frequently surrounded the station, perching on the waste bins, pipes over the table, on the table, below the table, and on the rip rap below the outflow pipe. Pelicans landed on boats, stood around in the parking lot, and were reportedly run over by cars. While most fishermen cleaning their catch attempted to discard large fish remains in bins, other persons scavenging the carcasses from the bins were seen to leave the lids open or directly feed the birds. Small fish scraps were available to pelicans through the outflow pipes and larger pieces were lost by accident or stolen by birds. The primary source of oiling appeared to be the outflow pipe draining directly on top of pelicans standing on the rip rap below it. Many pelicans had wetted plumage that covered their entire bodies, while others were oiled in patches, on both dorsal and ventral surfaces.

On 16-17 July, all of the pelicans observed scavenging at the open fish cleaning station (CC-FCS-O-1) were at least partially wet and presumably fouled by fish-oil (Table 3). Carcasses of others littered the rip rap shoreline from the boat ramp to the inner edge of the sport basin. The peak count of oiled pelicans at the station was 19. Pelicans that were still able to fly moved away from the site when no fish cleaning was taking place. Small numbers of pelicans remained at the station, even overnight. Some heavily oiled birds were observed to cease scavenging, preening, or responding to humans (Fig. 3). Several died overnight on the rip rap directly below the outflow pipe. Numbers at the station declined due to capture and mortality, but the incidence of oiling remained high until the facility was removed early in the morning on 20 July. By 21 July, there were no pelicans attending the station.

The second open format cleaning station (CC-FCS-O-2) was not discovered until 19 July, when 18 pelicans were observed scavenging there. A harbor maintenance worker was actively engaged in talking with fishermen, attempting to gain compliance with fish waste handling, and preventing aggressive actions toward pelicans at that time. This same worker had been threatened with a filet knife by a fisherman at FCS-O-1 earlier in the day, during a tense encounter over fish waste handling and the pelican issue. While pelicans were getting few scraps during observations, most (83%) had been oiled and were in poor condition. Pelicans prodded at fishermen and competed for scraps of tissue paper, indicating starvation. A banded bird (H98), rehabilitated and released by Bird Rescue in 2011, was present and scavenging. Two dead birds were recovered at the station that night. The open station was also removed early in the morning on 20 July. Four pelicans, including H98, attended the site during the morning. All had dispersed by the 21 July survey.

Following closure of the open cleaning stations, pelican activity shifted to the closed station, boat ramp, and the commercial fish processing area (Table 3). Pelicans roosting on the roof tops were vigilant to scavenging opportunities and gathered around the door of the closed station. No pelicans were ever

seen gaining access to the inside of closed station. Oiled birds seen at the closed facility throughout the week were likely previously contaminated from the open stations. On 21 January, 11 oiled pelicans were seen near the closed station and boat ramp. Some were actively scavenging on the remains of a freshly cleaned fish carcass, indicating continued problems with fisherman compliance with outreach efforts. No successful scavenging was observed at the commercial docks (CC-CFPA-1), which appeared to be a clean operation in July 2012.

Documentation of oiled birds was confounded by 2 primary factors, plumage status (wet or dry) and quality of observer's view of birds. Observations in Crescent City indicated that pelicans that were dry did not necessarily present as an oiled bird until they their plumage was re-wetted. For example, on July 18, observations occurred only in the morning, prior to fish-cleaning activity. The 2 birds that were attending FCS-O-1 were debilitated and based on behavior and location, probably oiled. Their plumage appeared dry, so they were not recorded as oiled. When the harbor was not active, pelicans tended to roost on a small natural rock in the harbor (Pelican Rock), including oiled birds that were flight capable. Pelican Rock was too distant to allow for adequate plumage status evaluation, however, dead pelicans were eventually observed on the rock with a spotting scope.

Table 3. Peak daily numbers of pelicans observed at fish cleaning stations and other areas within Crescent City Harbor during July 2012. Tot= total; Juv= number of juveniles, and Oil= total with visible plumage fouling (wet, fish-oiled plumage). Codes are as follows: Fish Cleaning Station (FCS)- Open (O) or Closed (C)-location number. Commercial Fish Processing Area (CFPA). Listed locations are mapped in Figure 2. The open fish cleaning facilities were removed early on June 20, prior to the survey.

| Day | **FCS-O-1** | | | **FCS-O-2** | | | **FCS-C-1** | | | **CFPA-1** | | | **Boat Ramp** | | | **Overall** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Jul* | *Tot* | *Juv* | *Oil* | *Tot* | *Juv* | *Oil* | *Tot* | *Juv* | *Oil* | *Tot* | *Juv* | *Oil* | *Tot* | *Juv* | *Oil* | *Total* | *% Juv* | *Oiled* | *% Oil* |
| 16 | 19 | 19 | 19 | | | | 6 | 6 | 4 | 1 | 1 | 0 | 1 | 1 | 0 | 27 | 100 | 25 | 93 |
| 17 | 12 | 12 | 12 | | | | 0 | 0 | 0 | | | | 1 | 1 | nd | 13 | 100 | 13 | 100 |
| 18* | 2 | 2 | 0 | | | | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 5 | 100 | 1 | 20 |
| 19 | 13 | 13 | 11 | 18 | 15 | 15 | | | | | | | 3 | 3 | 3 | 34 | 91 | 29 | 85 |
| 20 | 4 | 4 | 3 | 4 | 4 | 0 | 9 | 9 | 0 | 12 | 11 | 0 | 3 | 3 | 1 | 32 | 97 | 4 | 13 |
| 21 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 10 | 7 | 0 | 0 | 0 | 5 | 5 | 4 | 15 | 100 | 11 | 73 |
| | | | | | | | | | | | | | | | | 126 | | 83 | |

*limited observations on this date

### *Pelican Rehabilitation Removal from Crescent City*

Pelicans were captured and removed from the Crescent City Harbor by wildlife rehabilitation personnel over a one month period from 10 July to 10 August, with a total 51 birds collected (Table 4). Prior to PEL observations, 12 pelicans had been removed, 21 were collected during the observation period, and another 18 were caught after July observations. All of these birds were reportedly fouled with fish oil. Captures following the corrective actions (open station removal) represented 35% of all captures in Crescent City. These captures may have represented birds that were oiled in the harbor prior to July 20 or birds that flew from other locations. Once the open fish cleaning stations were removed from the

harbor, there was no longer a known source of oil contamination (this report) and the problems with pelicans and people reportedly ceased (Appendix C).

Table 4. Record of pelican intakes from the Crescent City Harbor before and after the closure of open fish cleaning stations. Data provided by M. Merrick, BAX. All birds were juveniles

| Before Closure | Total Number | After Closure | Total Number |
|---|---|---|---|
| 7/10/2012 | 1 | 7/23/2012 | 1 |
| 7/12/2012 | 10 | 7/24/2012 | 8 |
| 7/14/2012 | 1 | 7/25/2012 | 1 |
| 7/16/2012 | 12 | 8/4/2012 | 6 |
| 7/18/2012 | 9 | 8/7/2012 | 1 |
| | | 8/10/2012 | 1 |
| Totals | 33 | | 18 |

### *Pelican Mortality in Crescent City*

Brown Pelican mortality within the Crescent City Harbor was exceptionally high during July. CCHD maintenance staff reported that they had been cleaning up pelican carcasses since late June, and that numbers of dead birds had decreased by mid-July. Humboldt Wildlife Care began receiving emaciated pelicans in Humboldt Bay at the end of June (BAX website), which agrees with the mortality time frame noted in Crescent City. A carcass count conducted along the southern shoreline of the Crescent City sport basin on 16 July totaled 11 dead pelicans; these were removed by CCHD shortly thereafter. The CCHD and PEL removed 12 carcasses from the sport basin, 17-20 July, indicating a minimum mortality rate of 3/day. Six of these fresh carcasses were measured and weighed by D. Jaques. All six of the birds were severely emaciated and one stomach held the remains of a Common Murre (*Uria aalge*) chick. Another stomach contained toilet paper. Other stomachs were empty except for parasitic worms. No other injuries were noted. Presence of fish oil on dry carcasses was not readily apparent, so contribution of this factor to mortality was not confirmed in most cases. Feather samples were collected for potential future analysis.

Nighttime surveys revealed that small numbers of severely debilitated birds remained overnight near the 3 fish cleaning stations and at least one was generally recovered dead on-each site in the morning. Others died on "Pelican Rock," a communal roost site within the harbor. Four dead were seen through a spotting scope on the rock 7/18; the islet could not be accessed without a boat. The carcasses on Pelican Rock were not recovered or included in the daily mortality rate.

Using the observed mortality rate of about 3 pelicans per day and a reported mortality wave lasting about 3 weeks, a conservative estimate of pelican death at the Crescent City Harbor equates to roughly 60 pelicans. This is about twice as many pelicans as were estimated dead due to the M/V Kure oil spill in Humboldt Bay (CDFG and USFWS 2008). A higher estimate would be derived if the mortality rate was greater prior to mid-July, as indicated by CCHD staff. The addition of 51 pelicans captured by BAX indicates that mortality may have exceeded 100 birds in the Crescent City Harbor over a month, without intervention by wildlife rehabilitators.

## Humboldt Bay

### *Woodley Island Marina*

Woodley Island Marina was surveyed on July 19 and August 26. In July, Brown Pelicans aggregated at the fish cleaning station, HB-FCS-O-1 (Table 5). Several birds were loafing on the pier prior to the arrival of a fisherman. The fisherman cleaned his tuna, throwing scraps out to the water, and eventually attracted about 30 pelicans. An estimated 50% of these birds were oiled and one had a large fish head stuck in its throat. Several of the pelicans on the pier were trembling, soaking wet, and soliciting food. Total observation time was 30 minutes in July and 15 minutes in August.

### *Eureka Waterfront*

The Eureka waterfront was inspected briefly (15 minutes) in the evening in July, when no fishing activity was observed . One wet and apparently dying pelican was located south of the public marina near a dilapidated wharf (Carvahlo Fisheries). Behind the locked gate of the wharf, a group of 10 pelicans were roosting, at least two of which appeared oiled. The view was obscured by distance, dull light and objects on the pier. There was no obvious source of contamination for these birds, however BAX reported problems associated with the commercial fish processing area just north of the city marina. Pelicans were observed foraging in open fish waste bins at Pacific Seafood Group and carcasses were also noted at the site (Bill et al. 2013).

Table 5. Numbers of pelicans present and oiled in northern Humboldt Bay fish processing and cleaning areas, Woodley Island and Eureka waterfront, during PEL surveys.

| | July 17, 2012 | | | | August 26, 2012 | | | |
|---|---|---|---|---|---|---|---|---|
| | Adult | Immature | Total | # Oiled | Adult | Immature | Total | Oiled |
| HB-FCS-O-1 | 13 | 17 | 30 | 15 | 1 | 2 | 3 | 1 |
| HB-CFPA-1 | 3 | 8 | 11 | 2 | 0 | 2 | 2 | 0 |

BAX captured 61 pelicans from the Eureka waterfront area, including Woodley Island, during July and August. The majority of these were reported to be oiled (Bill et al. 2013).

## Trinidad

Trinidad Harbor was surveyed on July 19 and August 26, 2012. Four juvenile pelicans were seen on the recreational fishing pier and associated floating platform (TR-RFP-1) during a 30 minute observation session in July. One bird appeared wet and the others appeared to be somewhat incapacitated, perhaps starving. The birds were in close proximity to people who were crabbing, but no scavenging activity was observed. A fifth bird was located in the parking lot that was severely debilitated and probably near death, oiled plumage was not apparent. No pelicans were seen at the harbor during the August survey. No sources of oil or food were noted on either visit. BAX reported 35-40 contaminated pelicans at Trinidad on 9 July, and eventually collected 81 birds from the site (Bill et al. 2013). Most of these birds were considered to be fish-oiled. BAX also reported that fish cleaning off Charter boats was seen to

injure pelicans in “a few incidences,” and deduced that most oiled birds had been contaminated from outside the harbor.

### Shelter Cove

Shelter Cove was not visited by PEL in 2012. Pelicans were reportedly contaminated with fish oil by scavenging within the fish cleaning station as well as from the outflow pipe. BAX began collecting oiled pelicans from Shelter Cove on 13 July and eventually collected 45 birds, the majority of which were oiled (Bill et al. 2013). The HBHRCD installed netting over the top of the facility and modified the pipe at the end of July, so that the drain emptied into the water column. This appeared to alleviate problems with new oiling of pelicans (J. Crider, HBHRCD, pers. comm).

## Public Outreach and Contacts with Harbor Staff

PEL field work and communications with resource agency and harbor district personnel were focused in Del Norte County, while BAX took the lead in Humboldt County. PEL communication with the HBHRCD took place after the field season. BAX was tasked with development of public outreach materials and did so independently during the 2012 fish oil episode (see Bill et al 2013).

### Crescent City

The pelican mortality event affecting the northern California project area was brought to the attention of PEL on 10 July, 2012 by an ecologist from the California Dept. of Parks and Recreation (A. Transou) seeking interpretation. On 11 July, local seabird biologist (C. Strong, CCR) performed a preliminary pelican survey at the Crescent City Harbor upon request, and relayed information that indicated a management crisis. On 13 July, Jaques placed a telephone call and a follow up e-mail message to the CCHD (Harbormaster R. Young) suggesting both short and long term solutions, specifically 1) temporary closure of the open fish cleaning station in the sport basin and 2) movement to secure funding for a properly designed closed structure for the future (Appendix C). This suggestion was based on direct observations of the similar problems in Crescent City in 2011 and evaluation of fish waste handling at other harbors on the west coast.

In response to the 2012 event, the CCHD re-posted numerous small signs on the fish cleaning stations. These signs were developed and used by the harbor district in 2011. Bins were outfitted with hinged wooden lids, a physical improvement initiated by BAX in 2011. Additional temporary signs were created and posted by BAX on 18 July. Field observations from 16-19 July and mounting pelican mortality demonstrated that the signs and bin modifications alone were not working to prevent injury and conflicts. CCHD harbor maintenance staff actively engaged in communications with fishermen in an effort to reduce conflicts and pelican abuse, but could not sustain the effort required to monitor all sites at all times and also faced significant resistance from some fisherman. On 17 July, the CCHD sought

additional ideas from PEL for alleviating the problem, short of removing the stations. PEL suggestions included a variety of hazing methods and structural alterations that might prevent pelicans from hanging around the stations and gaining access to scraps.

Additional direct outreach took place between PEL and sport fishermen, interested public, and the harbor maintenance crew at the fish cleaning station over 5 days in July. At times this included physically closing bins, flushing pelicans from the station, and suggesting fishermen be more careful and conscientious with their waste handling. It was noted that some of the people contributing to the problem were non-English speaking and were themselves scavenging for crab bait in the bins. A member of the public assisted in gently flushing pelicans from the station on one date, and stated he had previously taken on that task himself and had notified the local press about the pelican crisis.

Ultimately, the CCHD decided to remove the two open fish cleaning stations and did so on 20 July. This occurred one week after the initial PEL suggestion, and following increased escalation and awareness of the problem. Some fishermen complained strongly to the harbormaster about this inconvenience, however, R. Young verbally communicated that he did not intend to ever re-install such open facilities.

The CCHD followed up their actions by proposing and quickly securing funding for a new closed fish cleaning station (Appendix D). Project completion is anticipated by mid-summer 2013. The station is a multi-purpose building that ties into a larger promenade construction project. It will be located adjacent to the commercial basin. All oily fish waste will be drained through the public sewer system, rather than directly out to the harbor. Carcasses will be collected in bins that will be housed inside the station and hauled off and recycled into compost by "Eco Nutrients," a local company. Interpretive panels within a waterfront wind shelter are included in that project and may provide an opportunity for seabird conservation and injury prevention outreach.

### Humboldt Bay and Shelter Cove

Communication with HBHRCD Harbormaster, J. Crider, took place after the field season. Modification of fish waste handling at Shelter Cove is a clear priority for the District. The HBHRCD is actively engaged in a three step process to correct problems associated with fish waste at Shelter Cove (J. Crider, HBHRCD). The eventual goal is to separate bulky fish matter from the fish cleaning table water, so that liquid waste can drain into the Shelter Cove sewer system. This would completely eliminate the pipe discharge. Legal complications associated with the property owner and lease arrangements have slowed the process, so the pipe will not be eliminated by summer 2013. If problems with pelicans occur in 2013, the HBHRCD will alter discharge from the pipe so that it only occurs at night when pelicans would presumably be inactive or less active foraging.

There are no plans to change the fish cleaning station at Woodley Island at this time (J. Crider, pers. comm). There is a fish waste receptacle that will be maintained regularly and the cleaning table pipe drains into the water column. Signs are posted in many places to notify the public not to allow pelicans

access to scraps. Although there were wet, scavenging pelicans seen at Woodley Island in 2012, there was not a clear association between these birds and an oil source at that site.

## Harbor Infrastructure Summary and Recommendations

Existing known infrastructure for dealing with fish waste in four northern California harbors, including recommendations for avoiding future conflicts with brown pelicans and other seabirds, are summarized in Table 6. The planned addition of a closed station and associated fish waste handling procedures in Crescent City should minimize the probability for fish oiling and provide an ideal example for sound infrastructure-based solutions to a demonstrated fish oil problem. Questions still exist about the potential sources of plumage contaminated birds in Humboldt Bay and Trinidad. Investigation of how fish cleaning off boats may impact pelicans at those sites is warranted. There is no plan to amend the open fish cleaning station at Woodley Island, so it should be monitored to determine if it is a significant source of problems. Work is also still needed to address known sources of oiling at the commercial fish processors in Humboldt Bay, which will require interaction with private industry representatives not yet identified (Table 7). It is uncertain if the solutions devised by HBHRCD at Shelter Cove in 2012 will be sufficient to minimize future plumage contamination. Monitoring will be required to evaluate that situation until permanent removal of the discharge pipe.

Table 6. Summary of relevant infrastructure identified in Northern California harbors during 2012, and recommendations for reducing seabird scavenging opportunities and fish oil contamination.

| Harbor | Fishing Type | Infrastructure Problem Identified | Recommendations | Current Status |
|---|---|---|---|---|
| Crescent City Harbor | Sport | 2 open cleaning stations with direct perched drainage and vulnerable waste bins | Removal of open stations | Open stations were removed, new closed facility construction to be completed in 2013 |
| | Commercial | None identified | | |
| Humboldt Bay | Sport | Open fish cleaning station at Woodley Island and drainage direct to bay | Monitor open station | No plans for change |
| | Commercial | Waste bins open and accessible to pelicans | Cover waste bins and make scraps inaccessible | No plans known |
| Trinidad | Sport | Fish cleaning takes place off boats | Further evaluation needed | |
| | Commercial | Fish cleaning takes place off boats | Further evaluation needed | |
| Shelter Cove | Sport | Semi-open fish cleaning station with perched slurry pipe emitting direct to sea | Keep fish cleaning station inaccessible to pelicans and monitor impacts of submerged drain pipe until permanent fix is in place. Discontinue emissions in daylight hours if necessary. | Pipe altered to drain below the sea surface. Netting added to prevent pelicans from entering station from the top. |

Table 7. Summary of harbor jurisdictions and contact information.

| Harbor | Jurisdiction | Primary Contact | Phone and e-mail |
|---|---|---|---|
| Crescent City Harbor | Crescent City Harbor District | Harbormaster, Richard Young | (707) 464-6174<br>richard@ccharbor.com |
| Humboldt Bay<br>Woodley Island | Humboldt Bay Harbor, Recreation and Conservation District | Harbormaster, Jack Crider | (707) 443-0801 |
| Humboldt Bay<br>Commerical fishing area | Pacific Seafood and other private industries | To be determined | |
| Trinidad Bay | Trinidad<br>Rancheria | Joe Rollings | (707) 599-0125 |
| Shelter Cove | Humboldt Bay Harbor, Recreation and Conservation District | Harbormaster, Jack Crider | (707) 443-0801 |

## Discussion

The harbor pelican injury reduction project was instrumental in documenting that contamination with fish oil is a significant problem for Brown Pelicans in northern California under certain circumstances. In 2012, those circumstances included the overlap of 1) northern post-fledging dispersal of juvenile pelicans from Mexico, 2) apparently poor prey availability in portions of the California Current System at that time, and 3) a very active fishing season where availability of offal attracted hungry pelicans into northern California harbors to scavenge, holding many there until they died. The importance of recreational fish cleaning station design was highlighted through this project. The 2012 summer salmon season was unusually long and successful, and together with heavy rockfish and tuna fishing, attracted more anglers and created more fish waste and opportunity for conflicts than in other recent years. Fish handling practices in the study region had been consistent for decades, however, the combination of environmental and human factors described above had apparently never collided in the same way, with the exception of 2011, which was a similar but less extreme event (PEL unpubl, BAX website). While open cleaning stations may not cause elevated mortality in some years, in others, such as 2012, they may become a death trap for pelicans. Factors leading to high incidence of fish-oiling in northern California need further study. Fish oiling was also reported at other California harbors in 2012 and may be a chronic source of pelican injury at more southerly locations on the coast.

Nutritional stress, scavenging, and fish-oil plumage contamination in the California Brown Pelican appear to be closely linked. The 6 dead Crescent City pelicans that were evaluated by PEL were emaciated, however it was not possible to determine if starvation or fish-oiling was the primary or first cause of bird debilitation. Loss of plumage insulation from large doses of viscous oil can cause rapid hypothermia in seabirds exposed to cold water temperatures (Jennssen, B.M. & Ekker. 1991). Whether pelicans initially in good nutritional condition, then dosed with oil could have lived long enough to

exhaust all endogenous fat reserves and catabolize muscle to the extent that sample necropsies indicated is unknown. Cape Gannets with plumage thought to be contaminated by fish-oil, were dried, banded and released back into the wild to determine their fate (du Toit and Bartlett 2001). Band recoveries indicated that the birds tended to became resoaked and experienced high mortality. Only one of 92 banded gannets was seen in good condition at least one month later. While it is impossible to know how many of the pelicans enumerated in 2012 would have died of starvation without the oiling factor, it seems likely that pelicans that were heavily oiled were unlikely to survive without intervention.

While starvation is a natural factor affecting seabirds, when large numbers of pelicans begin scavenging harbors and becoming injured by secondary anthropogenic sources, a significant wildlife management issue arises. The issue also affects the quality of public recreation, as was clearly observed in Crescent City Harbor in 2012. The conflicts there not only pitted fishermen against pelicans attempting to gain access to food, but fishermen against fellow fisherman, bird advocates, and harbor district personnel. Long term data indicate unusually low anchovy and sardine abundance in central California from 2010-2012 (NOAA 2012). If these anomalous coastal pelagic prey conditions continue into 2013, it is likely that significant pelican management issues and unusual mortality will be repeated in harbors where infrastructure has not been adequately addressed.

Public outreach conducted by the CCHD and BAX (Bill et al. 2013) reached hundreds to thousands of people and elevated awareness of the pelican problems and proper fish waste handling in northern California. However, even perfect behavioral compliance by sport fishermen could not have prevented fish oil and flesh from flowing out of the drain pipes at Crescent City and Shelter Cove. Specific changes to the physical infrastructure of fish-waste handling facilities and actions by facility managers may be more critical to reducing problems with fish oiling than public education, although public education is clearly an important component of injury prevention. The basic key to infrastructure improvements will be to 1) minimize pelican access to all sources of offal in harbors and 2) eliminate direct input of fish oils into the waters where pelicans and other seabirds occur.

Continued monitoring will be required to determine if the fixes that resulted from the severe and unfortunate 2012 episode at Crescent City and Shelter Cove will be adequate to solve the problems observed at those sites. More thorough monitoring at Humboldt Bay and Trinidad may be needed to determine additional sources of plumage contamination. A combination of direct field observations and rehabilitation intake data can provide a good measure of fish waste handling problems at specific harbors. Use of both sources of data served to document the problem in northern California in 2012 and could provide a means to monitor the effectiveness of harbor infrastructure improvements over time and in other areas of the State.

## Literature Cited


Anderson, D.W. and I.T. Anderson. 1976. Distribution and status of Brown Pelicans in the California Current. Am. Birds 30:3-12.

Anderson, D.W., F. Gress, and K.F. Mais. 1982. Brown Pelicans: influence of food supply on reproduction. Oikos 39:23-31.

Baskin, Jim. 2012. Trinidad Pier Reconstruction Project, Trinidad Harbor, City of Trinidad. Coastal Development Permit 1-07-046. California Coastal Commission, North Coast District.

Bill, J., M. Merrick, and L. Corsiglia. 2013. Reducing Injury to Brown Pelicans in Northern California Harbors. Unpubl. Progress Report to the Kure/Stuyvesant Trustee Council. 14pp.

California Department of Fish and Game and United States Fish and Willdife Service. 2008. Kure/Humboldt Bay Oil Spill. Final Damage Assessment and Restoration Plan/Environmental Assessment. July 2008.

du Toit, M. and P.A. Bartlett. 2001. 'Soaked' Cape Gannets at Ichaboe Island, Namibia. Bird Numbers (10)2.

Gregorio, D.E., C.S. Anderson, and S. Azimi-Gaylon. 2006. Status Report. Areas of Biological Significance. Ocean Unit, Division of Water Quality report. 74 pp.

Herbert, N.G. and R.W. Schreiber. 1975. Diurnal activity of brown pelicans at a marina. Florida Field Nat. 3: 11-12

Jaques, D.L., and R.G. Ford. 2000. Brown Pelicans and the M/V Kure/Humboldt Bay oil spill. Final report to the California Department of Fish and Game Office of Spill Prevention and Response, Sacramento, CA.

Jaques, D.L., H.R. Carter, and P.J. Capitolo. 2008. A Brown Pelican roost site atlas for northern and central California. Unpublished report, Pacific Eco Logic, Astoria, Oregon; and Carter Biological Consulting, Victoria, British Columbia.

Jennssen, B.M. & Ekker. 1991. Dose dependent effects of plumage-oiling on thermoregulation of Common Eiders somateria mollissima residing in water. Pp. 579-584 in Sakshaug, E. Hopkins, C.C.E. & Oristland, N.A. (eds.): Proceedings of the Pro Marc Symposium on Polar Marine Ecology, Trondheim 12-16 May 1990. Polar Research 10(2).

Lincer, J.L., D.Krivit, and J.E. Shaw. 1979. People and pan-handling pelicans. Fla Field Nat 7(2)13-40.

NOAA. 2012. Climatic and Ecological Conditions in the California Current LME for April to June 2012. April-June 2012, Volume 5, Quarter 2.

Sheilds, M. 2002. Brown Pelican (Pelecanus occidentalis). In The Birds of North America, No 609 (A. Poole and F. Gill, eds.). The Birds of North America, INc., Philadelphia, PA.

## Appendix A. Photographs.

All below photographs were taken by D.Jaques, except P1. Please contact author for permission to use.

Photo 1. Crescent City Harbor, showing coastline and roost sites north to Castle Rock NWR. Photo: Rick Hiser 2006.

Photo 2. Crescent City Harbor fish cleaning station (CC-FCS-0-1), showing fishermen cleaning their catch at open tables, perched outflow, obstructed waste totes, advisory sign created and posted by the Crescent City Harbor District, and aggressive wet pelicans. Fishermen were annoyed by pelicans and tried to deter birds from perching on the table with water sprayed from hoses. 7/16/2012.

Photo 3. Crescent City Fish Cleaning Station-Open-2 (CC-FCS-O-2), showing open tables, drain system, fish waste bins, interpretive signs posted by the CCHD (on bins), scavenging human and pelicans. CCHD staff conveyed to this non-English speaker that pelicans should not be allowed access to bins and he complied. 7/19/2012.

Photo 4. Crescent City Fish Cleaning Station-Closed-1 (CC-FCS-C-1) near Whaler Island boat ramp, showing restrictions to access by pelicans. 7/20/2012.

Photo 5. Crescent City Commercial Fish Processing Area (CC-CFP-1), at the end of Citizen's Dock Road the morning the open fish cleaning stations were removed. Catch from fishing vessels is off-loaded into totes at this location. Pelicans were not observed to receive any scraps during observations and ceased attending the site by afternoon. 7/20/2012.

Photo 6. Crescent City Harbor fish cleaning station (CC-FCS-0-1), showing people scavenging for discarded fish, tote lid style, and boldly scavenging partially oiled pelicans. 7/16/2012.

Photo 7. Pelicans scavenging below the perched outflow pipe at CC-FCS-O-1.

Photo 8. Pelican wet to the skin below the CC-FCS-O-1, presumably contaminated with fish oil.

Photo 9. Juvenile pelicans dying on the rip rap in the sport fishing basin at Crescent City Harbor, bird on left is clearly contaminated, bird on right appears dry but may be contaminated. Bird on the right died in place overnight.

Photo 10. Pelicans attending Woodley Island Marina HB-FCS-O-1, showing a juvenile with a large fish part stuck in its pouch. Soon after the photo was taken, a fisherman arrived and provided birds with tuna carcasses thrown into the water, despite the presence of advisory signs. May of the pelicans had plumage that was not waterproof, presumably contaminated with fish oil. 7/19/2012.

Photo 11. Trinidad recreational fishing pier (TR-RFP-1) and debilitated pelicans. 7/19/2012.

Photo 12. A thoroughly wet pelican floating in the Crescent City Harbor sport basin, below CC-FCS-O-1.

Photo 13. A contaminated pelican attending a shoreline crab fishing area near the Crescent City Boat ramp at night.

Photo 14. Dying pelican at CC-FCS-O-2 July 19, 2012. Died overnight.

# Appendix B. Supporting Data

| Date | Time | Harbor | Area | Total Pelicans | Adult | Juvenile | # Visibly Oiled | Human Activity | Note |
|---|---|---|---|---|---|---|---|---|---|
| 7/16/12 | 1700 | Crescent City | Boat ramp | 1 | 0 | 1 | 0 | None | |
| 7/17/12 | 2130 | Crescent City | Boat ramp | 1 | 0 | 1 | nd | None | On jetty at dusk |
| 7/18/12 | 730 | Crescent City | Boat ramp | 1 | 0 | 1 | 0 | | 14 fly by north (1/13) |
| 7/19/12 | 2100 | Crescent City | Boat ramp | 3 | 0 | 3 | 3 | None | |
| 7/20/12 | 1130 | Crescent City | Boat ramp | 1 | 0 | 1 | 1 | | |
| 7/20/12 | 1530 | Crescent City | Boat ramp | 3 | 0 | 3 | 0 | | |
| 7/21/12 | 1730 | Crescent City | Boat ramp | 5 | 0 | 5 | 4 | Fish cleaning | 4 wet eating big fish carcass on rip rap, |
| 7/16/12 | 1700 | Crescent City | CC-CFPA-1 | 1 | 0 | 1 | 0 | None | |
| 7/18/12 | 730 | Crescent City | CC-CFPA-1 | 1 | 0 | 1 | 0 | Boat offloading shrimp? | |
| 7/20/12 | 1030 | Crescent City | CC-CFPA-1 | 12 | 1 | 11 | 0 | Loading | On roofs and totes |
| 7/21/12 | 1730 | Crescent City | CC-CFPA-1 | 0 | 0 | 0 | 0 | | |
| 7/16/12 | 1300 | Crescent City | CC-FCS-C-1 | 6 | 0 | 6 | 4 | Fish cleaning | BAX did round up of oiled pelicans |
| 7/16/12 | 1700 | Crescent City | CC-FCS-C-1 | 3 | 0 | 3 | 0 | None | |
| 7/17/12 | 1220 | Crescent City | CC-FCS-C-1 | 0 | 0 | 0 | 0 | None | |
| 7/18/12 | 730 | Crescent City | CC-FCS-C-1 | 1 | 0 | 1 | 1 | None | 1 dead on rocks nearby |
| 7/20/12 | 1130 | Crescent City | CC-FCS-C-1 | 8 | 0 | 8 | 0 | Fish cleaning | |
| 7/20/12 | 1530 | Crescent City | CC-FCS-C-1 | 9 | 0 | 9 | 0 | Fish cleaning | 9 people inside cleaning fish, keeping |
| 7/21/12 | 1730 | Crescent City | CC-FCS-C-1 | 10 | 0 | 10 | 7 | Fish cleaning | birds outside door, non aggressive |
| 7/16/12 | 1300 | Crescent City | CC-FCS-O-1 | 19 | 0 | 19 | 19 | Fish cleaning | plus 11 dead on rip rap in sportbasin |
| 7/16/12 | 1700 | Crescent City | CC-FCS-O-1 | 4 | 0 | 4 | 0 | None | Harbor district cleaned up carcasses |
| 7/17/12 | 1200 | Crescent City | CC-FCS-O-1 | 12 | 0 | 12 | 12 | Fish cleaning | 2 unreponsive, wet and shaking |
| 7/17/12 | 2130 | Crescent City | CC-FCS-O-1 | 3 | 0 | 3 | nd | None | Below outfall at dusk |
| 7/18/12 | 730 | Crescent City | CC-FCS-O-1 | 2 | 0 | 2 | 0 | None | 1 dead below outfall pipe |
| 7/19/12 | 1015 | Crescent City | CC-FCS-O-1 | 13 | 0 | 13 | 11 | Fish cleaning | 1 with fishing line/lure in wing |
| 7/19/12 | 2100 | Crescent City | CC-FCS-O-1 | 3 | 0 | 0 | 3 | None | below outfall at dusk; plus 1 dead |
| 7/20/12 | 1130 | Crescent City | CC-FCS-O-1 | 4 | 0 | 3 | 3 | None | Cleaning station removed; 3 wet on ri |
| 7/20/12 | 1530 | Crescent City | CC-FCS-O-1 | 2 | 0 | 2 | 0 | None | 1 in water |
| 7/21/12 | 1730 | Crescent City | CC-FCS-O-1 | 0 | 0 | 0 | 0 | None | 1 dead below former outfall pipe |
| 7/19/12 | 1015 | Crescent City | CC-FCS-O-2 | 18 | 3 | 15 | 15 | | including banded bird |
| 7/19/12 | 2100 | Crescent City | CC-FCS-O-2 | 0 | 0 | 0 | 0 | None | 1 dead |
| 7/20/12 | 1030 | Crescent City | CC-FCS-O-2 | 4 | 0 | 4 | 0 | None | Cleaning station removed; H98 presen |
| 7/20/12 | 1530 | Crescent City | CC-FCS-O-2 | 1 | 0 | 1 | 0 | None | |
| 7/21/12 | 1730 | Crescent City | CC-FCS-O-2 | 0 | 0 | 0 | 0 | None | |
| 7/16/12 | 1700 | Crescent City | Commercial boat basin | 1 | 0 | 1 | 0 | None | |
| 7/18/12 | 730 | Crescent City | Commercial boat basin | 0 | 0 | 0 | 0 | | |
| 7/20/12 | 1530 | Crescent City | Commercial boat basin | 1 | 0 | 1 | 0 | None | 1 swim in water |
| 7/16/12 | 1700 | Crescent City | Pelican Rock | 14 | 0 | 14 | nd | None | Too distant to determine status |
| 7/18/12 | 730 | Crescent City | Pelican Rock | 20 | 1 | 19 | nd | None | plus 4 dead on rock |
| 7/19/12 | 2100 | Crescent City | Pelican Rock | 30 | nd | nd | nd | None | Night roost |
| 7/20/12 | 1030 | Crescent City | Pelican Rock | 16 | 2 | 14 | na | None | |
| 7/20/12 | 1530 | Crescent City | Pelican Rock | 7 | 0 | 7 | na | None | minimum count |
| 7/21/12 | 1730 | Crescent City | Pelican Rock | 5 | 0 | 5 | na | | Minimum |
| 7/19/12 | 1015 | Crescent City | Sport boat basin | 12 | 0 | 12 | nd | Feeding pelicans | Feeding bait fish or scraps from boat |
| 7/20/12 | 1130 | Crescent City | Sport boat basin | 14 | 1 | 13 | na | Crabbing | Brief attraction due to bait scavenge |
| 7/20/12 | 1130 | Crescent City | Sportbasin-other areas- | 3 | 0 | 3 | 0 | | 2 dead collected by harbor |

# Appendix C. Correspondence between PEL and the CCHD

From: Deborah Jaques
Sent: July 13

Greetings Rich,

I sent you a phone message with an idea for reducing pelican/people conflicts in the short term. That is to temporarily close the open fish cleaning station. I will be in town next week and would like to discuss long term options with you. I heard that the funding came pouring in for the below project.

http://www.dfw.state.or.us/news/2012/June/062612b.asp

Thanks for your efforts and interest so far,
Deborah

Deborah Jaques
Pacific Eco Logic
Astoria, Oregon
(503) 298-0599

*July 19*
*From Rich Young fwd by Jeff Dayton*
*As of tomorrow morning, the uncovered Crescent City fish cleaning stations will be removed and placed in storage until further notice*.

*The covered fish cleaning station at the Launch Ramp bathroom will remain available to local fishermen to clean their catch.*

*Thanks, Rich*

Richard Young
CEO/Harbormaster
Crescent City Harbor District
101 Citizens Dock Road
Crescent City, CA 95531
(707) 464-6174 x24
fax: (707) 465-3535

**JULY 24**
-----Original Message-----
From: Richard Young [mailto:ryoung@ccharbor.com]
Sent: Tuesday, July 24, 2012 10:11 AM

To: djaques.pel@charter.net
Subject: RE: Crescent City

Deborah,

Thank you for your interest and help with this issue. Crescent City is a fishing harbor and we try hard to provide a pleasant experience for our fishing people. But, harming birds or other animals sharing the harbor is not part of a pleasant experience for our fishing people. At first we thought educational flyers and admonishment from our maintenance personnel would be sufficient for birds and fishermen to coexist. After all, it seemed to work last year.

But this year is different. There seem to be more, and more aggressive, pelicans in the harbor. There are also more fishermen due to the expanded, and very successful, salmon season. The combination of more birds and more people led to more problems. Although we had pretty good compliance with our educational efforts, there were still 5 or 10% of the people who wouldn't cooperate. Our staff took a lot of abuse from a few recreational fishermen...

When it became apparent that the educational efforts were not going to be successful, we decided to remove the open fish cleaning stations. This is enormously unpopular with much of the recreational fishing community, but it is the only way we have of reducing the amount of fish carcasses thrown in the water and the damage to birds. We don't have a good option to solve this problem, but closing the open fish cleaning stations is the "least bad" choice we have.

So thank you again for your concern. In the future, if you know of a problem here at the Crescent City Harbor District, please tell me about it. The pelican problem sort of caught us unawares...we didn't realize we had a problem until after numerous birds had died.

Thanks again, Rich

Richard Young
CEO/Harbormaster
Crescent City Harbor District
101 Citizens Dock Road
Crescent City, CA 95531
(707) 464-6174 x24
fax: (707) 465-3535
richard@ccharbor.com

**AUGUST 2**

-----Original Message-----
From: Deborah Jaques [mailto:djaques.pel@charter.net]
Sent: Thursday, August 02, 2012 11:06 AM
To: Richard Young
Subject: RE: Crescent City

Hi Rich,
Thanks for writing back. I appreciate the harbor's efforts to deal with the pelican problem, which was clearly worse this year than last. I understand that there were many other harbors in California where negative interactions between pelicans and fishermen/fish oil occurred. I am not sure if any of the other

harbors besides Shelter Cove took action, however. I am hoping that your closing the 2 open stations paid off in terms of alleviating the nuisance and oiling issue at least to some extent.

It has been almost 2 weeks since I left California now and have not been corresponding with anyone about the situation in Ccity. When you can get to it, I would appreciate if you can drop me a line with a bit of an update.

For example, did pelicans seem to disperse or were there as many as ever hanging around to try to scavenge? Did the rate of mortality change?

Were there reports of nuisance issues from fisherman? I'm sure that fisherman found being reduced to one station a nuisance, but it certainly seemed like the best solution in an emergency type situation.

I will be back in town in late August and hope to maybe catch you then
.
Take Care,
Deborah

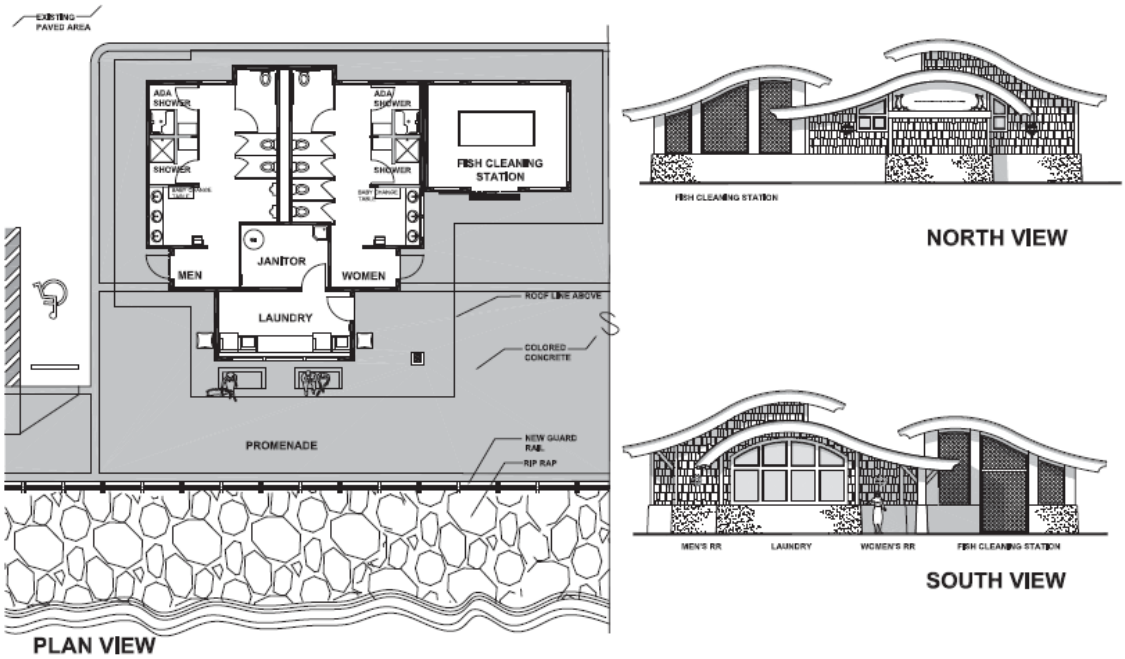
From: Rich Young
Sent: August 6, 2012

Hi Deborah,

The problem stopped when the open fish cleaning stations were removed.
I don't know whether the birds moved on because of lack of feeding opportunities or what, but we stopped having the problem between pelicans and people. This was an extremely unpopular solution among the recreational fishermen, but it was the "least bad" choice from a palette of bad choices.

Thanks, Rich

# Appendix D. Plans for Crescent City Closed Fish Cleaning Station




From:
http://scc.ca.gov/webmaster/ftp/pdf/sccbb/2012/1210/20121018Board05_Crescent_City_Harbor.pdf