Caspian Tern Nesting Ecology and Diet in San Francisco Bay

2005 Final Annual Report

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This report summarizes preliminary data collected during the first half of the 2005 breeding season on Caspian terns (*Sterna caspia*) nesting at six current or former colony sites in the San Francisco Bay Area, California (Brooks Island, Knight Island, Baumberg Ponds [B10], Alviso Ponds [A7], Agua Vista Park, and Coyote Hills [N2A-N3A]). The purpose of this mid-season report is to present preliminary results to the funding agencies, resource management agencies, and other stakeholders on colony size, nesting success, diet composition, and factors limiting colony size and nesting success at these Caspian tern nesting sites. These results are preliminary because they may change as the breeding season progresses and with further analysis; this report has not undergone peer-review. Consequently, these preliminary results are not for citation or publication without prior permission from the authors.

Tables 1 – 6 present data on the chronology of Caspian tern nesting activities at the six colony sites under study. Table 7 presents data on the numbers of Caspian terns counted at each of the study colonies each week. Tables 8 - 9 present the currently available data on diet composition at Brooks Island and Knight Island in the San Francisco Bay Area.

CASPIAN TERN COLONIES IN THE SAN FRANCISCO BAY AREA

Brooks Island

Background: Brooks Island is in Central San Francisco Bay near the city of Richmond, and is owned and managed by the East Bay Regional Parks District. Brooks Island has been the site of the largest nesting colony of Caspian terns in the Bay area in the last decade. The tern colony is located on a sandy, low-lying spit that extends to the northwest of the main part of the island, and was estimated at over 1,000 breeding pairs in 2004. Caspian terns nest on the upper part of the beach on the leeward (northeast) shore of the spit. The terns nest in close proximity to gull colonies that also use the spit; a colony of western gulls (*Larus occidentalis*) that has traditionally used Brooks Island, and a recently formed colony of California gulls (*L. californicus*) that is still expanding. Brooks Island is a popular destination for recreational boaters, and is located beneath the flight path of recreational and commercial aircraft. Rats are known to have been inadvertently introduced to Brooks Island, and mammalian predators such as raccoons and a red fox have resided on the island in the past.

Colony Size and Nesting Success: Brooks Island was the first site in the San Francisco Bay area where Caspian tern nesting activity was recorded in 2005. The first Caspian tern egg was observed on the Brooks Island colony on April 13 (two days earlier than in 2004), and chicks began hatching on May 11 (19 days earlier than in 2004). In 2004, early nesting attempts by Caspian terns at Brooks Island failed, apparently because of the activities of mammalian predators on the colony. No mammalian predators have been detected on the Brooks Island colony so far in 2005.

The nesting habitat near the observation blind was occupied first (Main Colony), and later a separate satellite colony was formed further down the beach to the northwest (NW Satellite), as was the case in 2004.

Most of the Main Colony can be observed from the observation blind, allowing the majority of adults and chicks to be counted. Some nesting adults and chicks, however, are obscured by vegetation or topography. The NW Satellite Colony can not be observed from the observation blind, and numbers of adults and chicks on colony must be estimated by observers in a skiff on the water. To estimate the number of nesting pairs on Brooks Island, two sets of aerial photographs were taken, one by the East Bay Parks District and one by the USFWS, both on 31 May (more detailed methods for these surveys will be provided in the final report). Once the aerial photos are counted, we will be able to accurately estimate colony size and determine whether there has been a significant change in colony size since 2004. Currently, there are approximately as many breeding pairs of Caspian terns nesting on Brooks Island as in previous years (2003 and 2004) at this stage of the breeding season.

After 20 May the numbers of nesting terns counted on both the Main Colony and the NW Satellite increased significantly over previous weeks. It appears that failed nesters from the Knight Island tern colony (see below) may have re-nested on Brooks Island. In addition, a colony of about 100 nesting pairs at the Port of Los Angeles in southern California was reported to have failed in the preceding weeks (C. Collins and K.Keane, pers. comm.). The significant influx of Caspian terns to the Brooks Island colony in late May may have been a consequence of the failure of these two colonies and the failed nesters attempting to renest on Brooks Island.

Diet Composition: A large number of Caspian tern bill loads have been successfully identified at the Brooks Island colony (N = 2,131). Based on the diet data collected so far this season, it is evident that the diet of Caspian terns nesting at Brooks Island consists primarily of schooling marine forage fishes, in particular surfperch (embiotocids), anchovies (engraulids), and silversides (atherinids), in that order. These three taxa combined made up > 80% of identified prey items. Additional fish taxa that represent more than 1% but less than 10% of the diet to date include gobies (gobiids), salmonids, herring (clupeids), sculpin (cottids), and unidentified non-salmonids. To date the salmonid portion of the diet has consisted mostly of juvenile fall-run Chinook salmon, not a listed ESU. Chinook salmon currently represents about 3% of the identified forage fish that have been delivered to the Brooks Island colony, compared to less than 1% and 3% by this date in 2003 and 2004, respectively.

Factors Limiting Colony Size and Nesting Success: A number of factors are apparently responsible for limiting the size and productivity of the Brooks Island Caspian tern colony in 2005; first and foremost among these appears to be the availability of suitable nesting habitat.

Nesting habitat for terns on Brooks Island is restricted to a narrow band of bare sand habitat between the vegetated areas that dominate the spit and the high tide line. This year, we noted that the area of suitable habitat for tern nesting had declined, as shoreline erosion had removed much of the nesting substrate from the northeast shore of the spit. Thus the current size of the Caspian tern colony on Brooks Island appears to be primarily limited by availability of suitable nesting habitat. Prior to the tern nesting season in 2005, vegetation and debris were removed from approximately 50 m^2 adjacent to the 2004 tern colony site. Approximately 20 nesting pairs of terns are now using this newly created nesting habitat, although this does not makeup for the loss of beach habitat since the 2004 nesting season due to erosion during winter storms.

In 2005, nesting success appears to be mostly limited by the recent expansion of the California gull colony on Brooks Island. Gull predation on Caspian tern eggs and chicks has been observed daily on the Main Colony and has increased considerably compare to last year, to the point where it is having a significant impact on tern productivity.

Knight Island

Background: Knight Island is in San Pablo Bay (northern San Francisco Bay area) near the mouth of the Napa River and the city of Vallejo. Knight Island is actually a low-lying island of inter-tidal marsh that was converted into a salt pond. The area is owned and managed by the California Department of Fish and Game. In recent years Caspian terns have nested on small islands in the Knight Island salt pond. In particular, two islands on the south side of the salt pond (South Colony) together supported over 200 nesting pairs of Caspian terns in 2004.

In September 2002, the levee surrounding the Knight Island salt pond was intentionally and illegally breached, converting the former salt pond into a tidal pond (I. Woo, pers. comm.). This change caused flooding of low-lying nests during extreme high tides and provided access for mammalian predators to nesting islands during extreme low tides. Foxes, raccoons, and other mammalian predators are known to frequent the levee surrounding the former salt pond on Knight Island. Expanding double-crested cormorant colonies on islands in the Knight Island salt pond also appear to limit the number of nesting Caspian terns.

Colony Size and Nesting Success: The first terns (38) were seen roosting on the South Colony at Knight Island on 29 March. The first egg was observed at the South Colony on 3 May, one day later than in 2004. During a high tide event on 25 May, the south island subcolony in the South Colony was almost completely inundated, resulting in failure of all active tern nests. Caspian terns began re-laying on the north island subcolony at the South Colony on 29 May. All re-nesting attempts failed due to predation pressure from

western gulls. Currently the South Colony appears to have been abandoned by Caspian terns. Terns did not nest on the Northeast Colony at Knight Island in 2004 because the site is lower in elevation than the South Colony site and was underwater during most high tides. No attempts by Caspian terns to nest at the former Northeast colony in 2005 have been detected. Due to the continuous depredation of tern nests by gulls at Knight Island, it is estimated that there were never more than 40 active tern nests at one time. Some of the terns that lost nests to gulls apparently re-nested until the colony failed completely around 31 May. The colony failure was exacerbated by the spring high tide event during the week of 25 May.

Diet Composition: A moderate number of Caspian tern bill loads were successfully identified at the South Colony on Knight Island prior to colony failure (N = 489). Based on the diet data collected so far this season, the diet of Caspian terns nesting at Knight Island was dominated by silversides (atherinids), herring (clupeids), salmonids, and gobies (gobiids), in that order. These four taxa combined made up > 85% of identified prey items. Additional fish taxa that represent more than 1% but less than 10% of the identified diet included sunfish and bass (centrarchids), striped bass (moronids), and unidentified non-salmonids. To date the salmonid portion of the diet has consisted primarily of fall-run juvenile Chinook salmon, not a listed ESU. Before colony failure, Chinook salmon represented about 21% of the identified forage fish that were delivered to the Knight Island colony. This compares to about 18% Chinook salmon in the diet of Knight Island terns by this time in 2004, and less than 2% in 2003

Factors Limiting Colony Size and Nesting Success: The primary factors limiting the size and productivity of the Knight Island Caspian tern colony in 2005 appear to be the availability of nesting habitat, flooding of tern nests during extreme high tide events, egg predation by gulls, and encroachment by other colonial waterbirds (i.e., double-crested cormorants). Increasing numbers of cormorants are using the small islands in the Knight Island salt pond for nesting sites, and this factor appears to be directly limiting the numbers of Caspian terns nesting there. Competition for nest sites with cormorants appears to cause terns to nest in low lying areas, areas that are susceptible to flooding during spring high tide events. Cormorant nesting colonies also attract avian predators, primarily western and California gulls, which had a significant impact on tern productivity by consuming tern eggs during disturbance events.

All the active Caspian tern nests that were initiated on the south island subcolony in the South Colony in 2005 were destroyed as a result of a high tide event on 25 May. Tern nesting effort shifted to the north island subcolony, where nests were subsequently heavily depredated by western gulls, causing complete failure of the South Colony by 31 May.

Baumberg Ponds (B10)

Background: Baumberg Ponds (B10) is a former salt pond in South San Francisco Bay near the east end of the San Mateo Bridge. Baumberg Ponds (B10) was created by building a levee around low-lying inter-tidal marsh, and is owned and managed by the

California Department of Fish and Game. In recent years several dozen pairs of Caspian terns have nested on a very small island in Baumberg Ponds near the west levee. In 2004, all of the active tern nests with eggs on the B-10 colony were depredated or abandoned early in the 2004 breeding season. Subsequent to the colony being depredated, a tide gate malfunction led to the draining of the salt pond, providing a land bridge to the surrounding levee. No terns have attempted to nest at the colony site since it was abandoned in 2004.

Colony Size and Nesting Success: Caspian terns have not attempted to nest on the island in Baumberg Ponds in 2005. Currently, the island that terns used for nesting is connected to the levee, and the whole area surrounding the island is now a mudflat.

Factors Limiting Colony Size and Nesting Success: All of the active tern nests with eggs on the Baumberg Ponds colony were depredated early in the 2004 breeding season; no terns have been observed nesting at the colony site since it was abandoned on 3 May, 2004. A malfunctioning tide gate has turned the former salt pond into a mudflat.

Alviso Ponds (A7)

Background: Alviso Ponds (A7) is a former salt pond in South San Francisco Bay near the southern tip of the Bay. Alviso Ponds was created by a levee surrounding low-lying inter-tidal marsh, and is owned and managed by the U.S. Fish and Wildlife Service as part of the Don Edwards San Francisco Bay National Wildlife Refuge. In recent years several dozen pairs of Caspian terns have nested on several very small islands near the middle of Alviso Ponds. Foxes, feral cats, raccoons, and other mammalian predators are known to frequent the levee surrounding Alviso Ponds. Human disturbance is evidently infrequent, and the area is closed to the public.

Colony Size and Nesting Success: Caspian terns were first observed on the nesting islands on 9 April in 2005. The first tern egg was observed at the Alviso Ponds (A7) colony on 1 May, eight days earlier than in 2004. Tern chicks began hatching at the Alviso Ponds colony on 1 June. There are currently about 14 active Caspian tern nests on two islands in Alviso Ponds, compared to 18 active nests on one island at this time last year.

Diet Composition: No diet data have been collected at the Alviso Ponds (A7) tern colony in 2005.

Factors Limiting Colony Size and Nesting Success: The primary factors limiting the size and productivity of the Alviso Ponds (A7) Caspian tern colony in 2003-2005 appear to be availability of suitable nesting habitat and the quality of nesting substrate. The islands in Alviso Ponds are very small and mostly consist of fine-grained material that turns mucky after a rain.

Agua Vista Park

Background: This small Caspian tern colony was first noted during the 2002 nesting season, and was estimated to consist of 38 nesting pairs in 2004. The colony was formed on two fragments of a wooden pier (Pier 63) on the San Francisco waterfront, just south of Pacific Bell Park (home of the SF Giants). The colony got its name from a very small park of that name on the shores of the Bay adjacent to the tern colony. The pier fragment nearest the shore has completely rotted away, leaving the outer sections unconnected to the mainland and thus free of mammalian predators. The Caspian terns are nesting on the decaying wooden pier, digging nest scrapes in the dirt and debris on the surface. Several pairs of western gulls nest in the vicinity, including on the pier where the terns are nesting. One of the two sections of pier that supported the tern colony in 2004 collapsed or was torn down prior to the 2005 breeding season. The remaining pier fragment appears to be in imminent danger of collapsing. The owner of the property is the San Francisco Port Authority.

Colony Size and Nesting Success: The first tern was seen roosting at the Agua Vista Park colony on 24 March. The first egg was observed on 24 April, eight days later than in 2004. Tern chicks began hatching at the Agua Vista Park colony on 20 May. There are currently about 18 active Caspian tern nests at the Agua Vista Park, compared to 24 active nests at this time last year.

Diet Composition: No diet data have been collected at the Agua Vista Park tern colony in 2005.

Factors Limiting Colony Size and Nesting Success: The primary factors limiting the size and productivity of the Agua Vista Caspian tern colony in 2003-2005 appear to be the quality of nesting substrate and the availability of suitable nesting habitat. Suitable nesting substrate is certainly the proximate factor limiting the size of the tern colony on the remaining pier fragment, but because terns are nesting at the site it is evident that availability of suitable nesting habitat for Caspian terns is limited in that part of San Francisco Bay.

Coyote Hills (N2A-N3A)

Background: These working salt ponds are part of the Don Edwards San Francisco National Wildlife Refuge on the west side of the Coyote Hills Regional Park (East Bay Parks). The colony is located on a levee separating two salt ponds (N2A and N3A) within the larger salt pond complex on the northeast side of the Dumbarton Bridge. These levees have been breeched at several spots such that they are no longer attached to the mainland. This site has been used by nesting Caspian terns intermittently over the last two decades (C. Strong pers. comm.), and was the first known location of Caspian tern nesting in the San Francisco Bay Area in 1922 (DeGroot 1931, Miller 1943, Chaniot 1970). The site was occupied by nesting Caspian terns continually from 1922 through the late 1960's.

Colony Size and Nesting Success: This colony was first noticed in 2005 by staff of San Francisco Bay Bird Observatory (SFBBO), when they counted 50 nests and 2 chicks. Subsequent counts confirm an estimated 50 nesting pairs. The first chicks were seen during the week of 28 May and the first egg-laying date is estimated to have been during the week of 25 April.

Diet Composition: No diet data have been collected at the Coyote hills (N2A-N3A) tern colony in 2005.

Factors Limiting Colony Size and Nesting Success: The primary factors limiting nesting success are the substrate (dredge spoil that gets extremely sticky when wet), high winds and large waves that occur almost daily in the South Bay, and the rapidly expanding California gull colony that surrounds the small tern colony. SFBBO (2005) estimates that there are over 2,800 gull nests on the levees separating the ponds. This is a significant increase over previous years (C. Morris pers. comm.). The narrow levee is approximately three to five meters wide and is elevated 1 to 1.5 meters above the water level. During the typically high afternoon winds in the summer, fetch from large waves inundates low lying nests. In addition, due to the poor substrate conditions, the high winds have been observed to blow unattended eggs into the adjacent salt ponds.

Summary

In summary, of the five Caspian tern colonies monitored in the San Francisco Bay area in 2003 and 2004, only the Brooks Island colony seems to be similar in size compared to this date in the previous two years. The Baumberg Ponds (B10) and Knight Island colonies have completely failed this season. Both the colony at Alviso Ponds (A7) and Agua Vista Park are smaller this year as compared to the previous two years. There is a new colony of Caspian terns in Don Edwards NWR near Coyote Hills, but this colony only numbers about 50 nesting pairs. Consequently, overall numbers of Caspian terns nesting in the San Francisco Bay Area in 2005 are apparently down. Tidal inundation of active nests and nest predation by California and western gulls, coupled with a lack of alternative suitable nesting sites, are the main factors behind this apparent decline. As in 2003 and 2004, Caspian tern diets in the San Francisco Bay area so far this season have consisted primarily of schooling marine forage fishes, especially anchovy, surfperch, silversides, and clupeids. The proportion of fall-run Chinook salmon in the diet of Caspian terns nesting at Brooks Island has remained small, but continues to be a significant proportion of the diet of terns nesting at Knight Island.

Table 1. Timeline for research activities and Caspian tern nesting chronology at Brooks Island, San Francisco Bay, California in 2005.

Date	Colony	Note
03/01/05	Brooks Is.	First adult tern observed near colony
03/23/05	Brooks Is.	First crew visit to colony site
03/23/05	Brooks Is.	First adult terns (83) observed on-colony
03/23/05	Brooks Is.	Diet data collection begins
04/13/05	Brooks Is.	First tern egg observed (main colony)
04/21/05	Brooks Is.	First tern egg observed (NW satellite)
05/11/05	Brooks Is.	First tern chick observed (main colony)
05/31/05	Brooks Is.	Aerial photo census of colony conducted (East Bay Parks and USFWS)

Table 2. Timeline for research activities and Caspian tern nesting chronology at Knight Island (South Colony), San Francisco Bay area, California in 2005.

Date	Colony	Note
03/20/05	Knight Is.	First adult terns (2) observed near colony
03/29/05	Knight Is.	First crew visit to colony site
03/29/05	Knight Is.	First adult terns (38) observed on-colony
04/06/05	Knight Is.	Diet data collection begins
05/03/05	Knight Is.	First tern egg observed
05/25/05	Knight Is.	South Island flooded; tern eggs lost
05/29/05	Knight Is.	Re-laying by terns begins
05/31/05	Knight Is.	Aerial photo census of colony conducted (USFWS)
05/31/05	Knight Is.	First observation of total colony failure (terns observed same day at Russ Island to the north)

Table 3. Timeline for research activities and Caspian tern nesting chronology at Baumberg Ponds (B10), San Francisco Bay, California in 2005.

Date	Colony	Note
03/30/05	Baumberg Ponds (B10)	First crew visit to colony site
03/30/05	Baumberg Ponds (B10)	No terns on colony due to broken flood gate that has left B10 a tide flat

Table 4. Timeline for research activities and Caspian tern nesting chronology at Alviso Ponds (A7), San Francisco Bay, California in 2005.

Date	Colony	Note
04/01/05	Alviso Ponds (A7)	First crew visit to colony site
04/07/05	Alviso Ponds (A7)	First adult terns observed near colony
04/09/05	Alviso Ponds (A7)	First adult terns (3) observed on-colony
05/01/05	Alviso Ponds (A7)	First tern egg observed
05/14/05	Alviso Ponds (A7)	Terns occupying three small islands in A7
06/01/05	Alviso Ponds (A7)	First tern chick observed

Note: Diet data not collected in 2005

Table 5. Timeline for research activities and Caspian tern nesting chronology at Agua Vista Park, San Francisco Bay, California in 2005.

Date	Colony	Note
03/24/05	Agua Vista	First crew visit to colony site
03/24/05	Agua Vista	First adult terns (1) observed on-colony
04/24/05	Agua Vista	First tern egg observed
05/20/05	Agua Vista	First tern chick observed

Note: Diet data not collected in 2005

Table 6. Timeline for research activities and Caspian tern nesting chronology at Coyote Hills Salt Ponds (N2A-N3A), San Francisco Bay, California in 2005.

Date	Colony	Note
05/28/05	Coyote Hills	Colony first discovered (SFBBO)
05/28/05	Coyote Hills	First adult terns (50) observed on-colony (SFBBO)
05/28/05	Coyote Hills	First tern egg observed (SFBBO)
05/28/05	Coyote Hills	First tern chick observed (SFBBO)
05/30/05	Coyote Hills	First crew visit to colony site

Note: Diet data not collected in 2005

Table 7. Average number of adult Caspian terns counted each week at five nesting colonies in San Francisco Bay (Brooks Island [main colony], Brooks Island [NW satellite colony], Knight Island [South Colony], Baumberg Ponds [B-10], Alviso Ponds [A-7], Agua Vista Park, and Coyote Hills [N2A-N3A]) in 2005.

	San Francisco Bay						
Week ending	Brooks Is. (main colony)	Brooks Is. (NW satelitte)	Knight Is. (South colony)	Baumberg Ponds (B-10)	Alviso Ponds (A-7)	Agua Vista Park	Coyote Hills (N2A-N3A)
27-Mar	63	0	no data	0	no data	1	no data
3-Apr	65	19	36	0	0	17	no data
10-Apr	176	27	29	0	no data	14	no data
17-Apr	134	64	93	no data	6	22	no data
24-Apr	182	84	97	no data	13	30	no data
1-May	374	128	127	no data	21	23	no data
8-May	403	168	105	no data	no data	20	no data
15-May	511	220	190	no data	44	18	no data
22-May	590	306	162	no data	42	42	no data
29-May	727	371	127	no data	33	43	50
5-Jun	673	324	0	no data	33	27	70
12-Jun							
19-Jun							
26-Jun							
3-Jul							
10-Jul							
17-Jul							
24-Jul							
31-Jul							

Table 8. Caspian tern diet composition at Brooks Island (Main Colony), San Francisco Bay, California, based on percent of identifiable prey items delivered as billoads to the colony in 2005. Year-to-date (YTD) percentages are averages of the weekly percentages.

Week ending	N	Anchovy	Butterfish	Centrarchid	Clupeid	Croaker	Flatfish	Goby	Moronid	Salmon	Sand lance	Sculpin	Silverside	Smooth-hound	Splittail	Surfperch	Toadfish	Tomcod	Trout	UNID
3-Apr	45	15.6	0.0	0.0	4.4	0.0	0.0	2.2	0.0	0.0	0.0	2.2	35.6	0.0	0.0	31.1	0.0	0.0	0.0	8.9
10-Apr	70	34.3	0.0	0.0	4.3	0.0	0.0	12.9	0.0	0.0	0.0	1.4	31.4	0.0	0.0	12.9	0.0	2.9	0.0	0.0
17-Apr	113	16.8	0.0	0.0	11.5	0.0	0.0	10.6	0.0	0.0	0.0	0.9	20.4	0.0	0.0	38.9	0.0	0.9	0.0	0.0
24-Apr	194	9.8	0.0	1.5	6.2	0.0	0.0	3.6	0.0	0.0	0.0	0.5	30.9	0.0	0.0	43.8	0.0	0.0	0.0	3.6
1-May	291	24.7	0.0	0.0	4.5	0.0	0.7	3.1	0.3	0.7	0.0	2.7	26.1	0.3	0.3	32.6	0.3	1.0	1.7	0.7
8-May	223	35.0	0.0	0.4	7.6	0.9	0.0	4.9	0.0	2.7	0.0	1.8	34.1	0.0	0.0	9.4	0.0	0.0	0.9	2.2
15-May	259	12.4	0.4	1.5	5.8	0.4	0.0	1.9	0.0	4.6	0.0	1.5	18.1	0.0	0.0	51.7	0.4	1.2	0.0	0.0
22-May	273	26.0	0.0	1.5	2.2	0.0	0.0	1.8	0.0	8.1	0.0	2.2	10.6	0.0	0.4	45.4	0.0	0.4	0.4	1.1
29-May	287	41.1	0.0	0.0	3.5	0.0	0.0	1.0	0.0	2.4	0.0	3.8	4.5	0.0	0.0	42.5	0.0	0.0	0.0	1.0
5-Jun	376	30.9	0.0	0.0	2.4	0.0	0.0	1.6	0.0	9.8	0.3	1.3	6.4	0.3	0.0	46.3	0.0	0.3	0.0	0.5
12-Jun																				
19-Jun																				
26-Jun																				
3-Jul																				
10-Jul																				
17-Jul																				
24-Jul																				
31-Jul																				
YTD	2131	24.6	0.0	0.5	5.2	0.1	0.1	4.4	0.0	2.8	0.0	1.8	21.8	0.1	0.1	35.5	0.1	0.7	0.3	1.8

NOTE: The "Salmon" category consisted primarily of juvenile chinook salmon.

NOTE: The "Trout" category consisted of stocked rainbow trout from nearby reservoirs.

NOTE: The "UNID" category consisted of unidentified non-salmonids.

Table 9. Caspian tern diet composition at Knight Island (South Colony), San Francisco Bay, California, based on percent of identifiable prey items delivered as billoads to the colony in 2005. Year-to-date (YTD) percentages are averages of the weekly percentages.

Week ending	N	Anchovy	Centrarchid	Clupeid	Croaker	Goby	Moronid	Non-salmonid	Salmon	Sculpin	Silverside	Splittail	Surfperch	Trout	UNID
3-Apr															
10-Apr	1	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17-Apr	12	0.0	0.0	0.0	0.0	41.7	0.0	8.3	0.0	0.0	50.0	0.0	0.0	0.0	0.0
24-Apr	2	0.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0
1-May	78	0.0	0.0	50.0	0.0	5.1	0.0	0.0	23.1	0.0	21.8	0.0	0.0	0.0	0.0
8-May	90	0.0	7.8	40.0	0.0	4.4	1.1	3.3	23.3	2.2	16.7	1.1	0.0	0.0	0.0
15-May	78	0.0	12.8	14.1	2.6	1.3	5.1	0.0	50.0	1.3	11.5	0.0	0.0	1.3	0.0
22-May	169	1.2	5.9	2.4	0.6	0.6	1.2	1.2	52.7	1.2	29.0	1.2	1.8	0.6	0.6
29-May	59	0.0	27.1	20.3	0.0	1.7	1.7	6.8	16.9	0.0	22.0	0.0	0.0	3.4	0.0
5-Jun															
12-Jun															
19-Jun															
26-Jun															
3-Jul															
10-Jul															
17-Jul															
24-Jul															
31-Jul															
YTD	489	0.1	6.7	22.1	0.4	19.4	1.1	2.5	20.8	0.6	25.1	0.3	0.2	0.7	0.1

NOTE: The "Salmon" category consisted primarily of juvenile chinook salmon.

NOTE: The "Trout" category consisted of stocked rainbow trout from nearby reservoirs.

NOTE: The "UNID" category consisted of unidentified non-salmonids.