

SAN FRANCISCO BAY BIRD OBSERVATORY NEWSLETTER

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Avian Botulism Study In South San Francisco Bay

Part I

This is a two part series on the 5 year study of Avian Botulism done by SFBBO. Part II will follow in the October newsletter and we'll discuss more results of the study.

As our 16 foot inflatable boat moved through the warm fresh waters of the slough, we were relaxed, enjoying the beauty of the lush vegetation along Artesian Slough and the northern end of Coyote Creek. This was but one of many trips we had made down this slough and others as part of our study of avian botulism in south San Francisco Bay. Our study began in July 1982 and concluded in October 1986. For approximately four months during each of these five years, we patrolled the entire length of Artesian Slough and portions of Coyote Creek. During several years we also patrolled Guadalupe and Alviso Sloughs.

Patrol is an appropriate word, for as we monitored the birds, invertebrates and water quality in the study area, we began to feel a sense of stewardship of this land and its wildlife. As we travelled down the slough, we watched ducks and their ducklings swimming and feeding, swallows catching insects overhead, and thousands of red-winged blackbirds roosting in the tules.

For those who were not involved, the idea of going out in a boat to collect sick ducks and carcasses was repulsive. But collecting sick birds and carcasses was only a part of the work and, overall, most of us who were involved will

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remember this study because of the beauty of the area, the sense of accomplishment we felt when, after picking up the sick and dead vertebrates in the slough, an outbreak of avian botulism was controlled; or when, after treatment, a healthy duck was released back into the south bay.

Avian botulism is a disease caused by ingestion of the toxin of the anaerobic bacterium *Clostridium botulinum*. The earliest known report of large numbers of waterfowl dying from "western duck sickness" or "limberneck" as it was known, was in 1876 at Lake Owens, California.

Annual losses of waterfowl and shorebirds, often in the thousands have been reported in the western United States since 1910. In 1930, the causative agent of western duck sickness was identified as *Clostridium botulinum* type C toxin. Hunter (1970) reported that a minimum of a million and a half ducks died from avian botulism in California between 1934 and 1970. The table below shows both annual waterfowl populations and annual disease loss in California attributed to botulism from 1970 through 1986. The disease loss figures are based on birds found in the field and while they may reflect annual trends, they are only a small percentage of actual losses.

Annual Population and Botulism Disease loss of waterfowl in California 1976-1986

Year	Mid-winter Survey Total*	Botulism Pick-up**
1976-1977	6,682,200	23,516
1977-1978	5,722,850	2,530
1978-1979	5,896,390	31,891
1979-1980	7,102,715	19,625
1980-1981	5,192,160	20,469
1981-1982	4,802,255	13,132
1982-1983	2,942,410	14,060
1983-1984	6,053,645	22,294
1984-1985	2,724,026	13,287
1985-1986	3,281,066	4,622

* Surveyed the first week of January; ** Birds picked up April 1 - March 31.

Following ingestion of food contaminated with botulism, the bird will absorb the toxin through its small intestine. The toxin affects the bird's peripheral nervous system by blocking transmission of the nerve impulses to the voluntary muscles, resulting in a flaccid paralysis. In mild cases, the symptoms are loss of ability to sustain flight. In more advanced cases, the bird loses the use of its legs and uses its wings to move itself on land or through the water. Other symptoms include loss of muscle control of the nictating membrane, swelling of the eyelids, rapid dilation and contraction of the pupil, greenish diarrhea and staining of the vent, impairment of salt gland function and loss of control of the neck and pulmonary muscles. Birds may die from drowning, respiratory failure, lack of water, or exposure.

Clostridium botulinum type C is found naturally occurring in soils in many parts of the world. However, suitable environmental conditions are necessary for bacterial reproduction, growth, and toxin production. These conditions include a prolonged spell of warm weather, enlarged areas of shallow stagnant water, alkalinity, an abundance of aquatic invertebrates, and oxygen depletion associated with large amounts of rotting vegetation or other organic matter. Following an outbreak of avian botulism type C, *Clostridium botulinum* spores may be found in the soils for years. Late fall and winter outbreaks may occur as a

result of heavy contamination of an area during the earlier warmer months.

The California Department of Fish and Game (CDFG) and U.S. Fish and Wildlife Service (USFWS) have identified outbreaks of avian botulism in south San Francisco Bay. Studies of the CDFG, USFWS and the San Francisco Bay Regional Water Quality Control Board (August - October 1977) have indicated that the disease has been prevalent in the Artesian Slough area near the town of Alviso. This slough receives a constant supply of treated wastewater from the San Jose/ Santa Clara Water Pollution Control Plant as well as seasonal freshwater from Coyote Creek.

To assess the effects of wastewater disposal from the San Jose/Santa Clara Water Pollution Control Plant (SJ/SC WPCP) on the occurrence of avian botulism in the Artesian Slough and Coyote Creek areas, the California Department of Fish and Game and the San Francisco Bay Bird Observatory were subcontracted by Larry Walker Associates, Inc. and Kinetics Laboratories, Inc. to take part in a five year biological monitoring program at the request of the South Bay Dischargers Authority. The study included monitoring water quality parameters throughout Artesian Slough and Coyote Creek, identifying and testing benthic invertebrates for botulism toxin and collecting sick and dead vertebrates to prevent or control

outbreaks of avian botulism.

A series of water quality and benthic sampling sites were established within the study area. During each survey trip, a wildlife census was conducted, water quality parameters were measured and benthic samples were collected at each sampling site, and all sick and dead vertebrates were collected. Two 16 foot boats and an airboat were used to permit access to the entire study area. The airboat permitted wider access of the areas for a more thorough collection of sick and dead animals during botulism outbreaks.

Over the course of the 5 year study, 1151 sick or dead vertebrates were collected in the study area. A total of 905 birds, 237 fish and 9 mammals were picked up. The highest number of vertebrates (440) was picked up in 1982, the first year of the study. In 1983, 363 vertebrates were collected, and in 1985, 230 vertebrates were collected. In two of the five years 1984 and 1986 very few vertebrates were picked up.

While not all of the birds collected in the area were suffering from avian botulism, most were. Laboratory tests by SFBBO, the California Dept. of Fish and Game, or the U.S. Fish and Wildlife Service were conducted to verify outbreaks of avian botulism.

Live birds collected in the study area included: Snowy Egret, Great Egret, Mallard, Gadwall, Green-winged Teal, Pintail, Northern Shoveler, Cinnamon Teal, Ruddy Duck, unidentified duck species, Coot, Avocet, Black-necked Stilt, Long-billed Dowitcher, Dowitcher species, Common Murre, American Northern Phalarope, California Gull, Ring-billed Gull, unidentified Gull species, and Northern Harrier.

Dead birds collected included: White Pelican Double-crested Cormorant, Snowy Egret, Great Egret, Great Blue Heron, Mallard, Gadwall, Green-winged Teal, Pintail, Northern Shoveler, Cinnamon Teal, Teal species, Ruddy Duck, unidentified duck species, Common Moorhen,

Totals of Sick and Dead Vertebrates Collected in Artesian Slough and Coyote Creek, 1982-1986

<u>YEAR</u>	<u>BIRDS</u>	<u>FISH</u>	<u>MAMMALS</u>	<u>TOTAL</u>
1982	409	29	2	440
1983	296	66	1	363
1984	26	10	2	38
1985	140	87	3	230
1986	34	45	1	80
TOTAL	905	237	9	1151

Over the course of the five year study, 1151 sick or dead vertebrates were collected in the study area.

Coot, American Avocet, Black-necked Stilt, Long-billed Dowitcher, Western Sandpiper, Least Sandpiper, Herring Gull, California Gull, Western Gull, gull species, and Black-shouldered Kite.

Dead fish collected included: Carp, Striped Bass, Sturgeon, Trout, Goldfish, Lamprey Eel and unidentified fish species.

Dead Mammals picked up included: Rats, Muskrates, and a domestic calf.

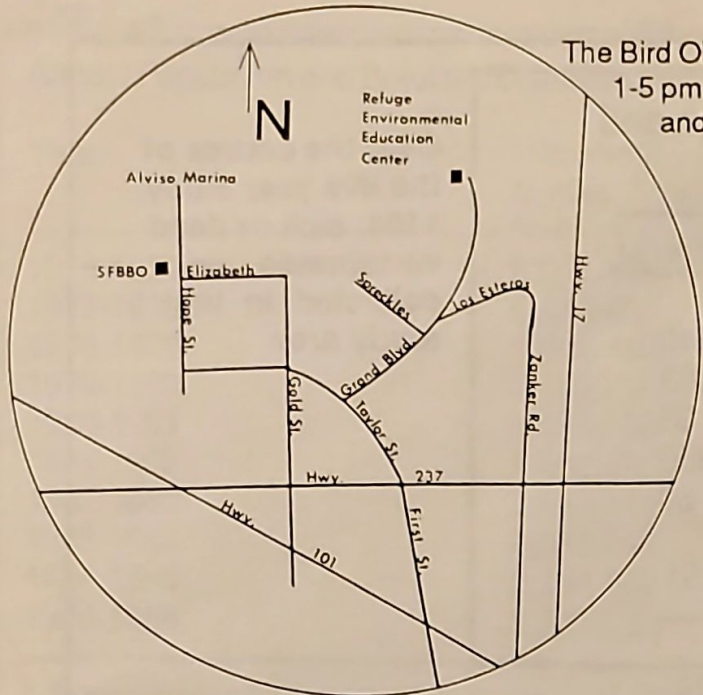
In addition, a live California Least Tern suffering with botulism-like symptoms was found in Mountin View in 1982. It recovered quickly with treatment, as did a Northern Harrier and many of the sick ducks and shorebirds picked up during the study.

Live birds collected in the study area were treated by personnel experienced in wildlife rehabilitation techniques. Those birds who exhibited physical signs indicative of botulism poisoning were treated by

standard methods including administration of fluids and foods via stomach tube. Following recovery from botulism, the birds were, whenever possible, banded with U.S. Fish and Wildlife Service bands prior to release. Most of the birds were released at the Palo Alto Flood Control Basin. Several of the birds were recovered by duck hunters and reported to the USFWS's Bird Banding Laboratory. None of the birds were recovered again in Artesian Slough or Coyote Creek. ■



The Bird Observatory office is located at 1290 Hope St. in Alviso. The office is open from 1-5 pm weekdays and some weekends. But before stopping in, call (408) 946-6548 and check the schedule.



The General Membership meetings are held on the first Thursday of the month at 7:30 pm at the San Francisco Bay National Wildlife Refuge Environmental Education Center in Alviso. (see map) The Board meetings are open to the membership and are held monthly. Call the Observatory for dates and times.

The newsletter deadline is the first Monday of the month. Send contributions to the editor: Susie Formenti, 16675 Buckskin Ct., Morgan Hill, CA 95037.

The San Francisco Bay Bird Observatory is a non-profit corporation under IRS statute 501(c)3. All memberships and contributions are tax deductible.

GENERAL MEMBERSHIP MEETING

Thursday, September 3, 1987

Refuge Environmental Education Center
in Alviso

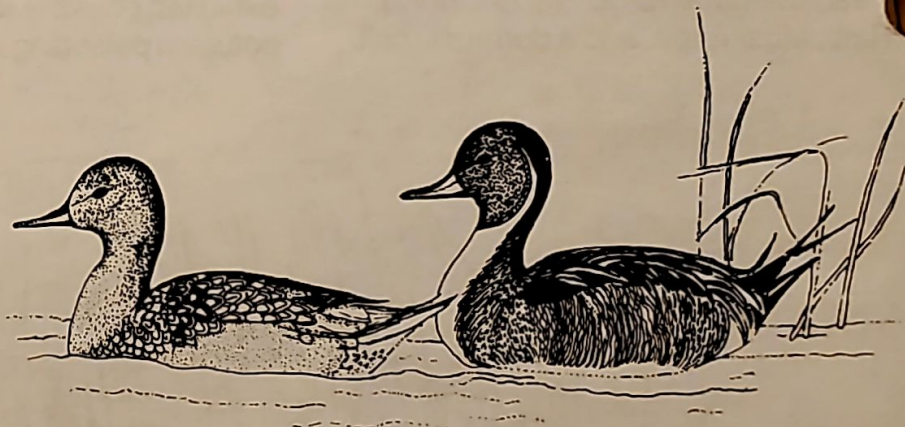
7:30 pm

FEATURED SPEAKER: Allen Fish,
Coordinator of the Golden Gate Raptor Migration
Observatory.

TOPIC: Allen's presentation will include a slide show on raptor migration through the Marin Headlands and he will also talk about raptor field identification.

October General Meeting

The featured speaker for the October General Membership Meeting will be Luis Baptista of the California Academy of Sciences. He will give a presentation on "Song Learning in Birds". Mark your calendar so you won't miss this fascinating topic.



Editor, Susie Formenti



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* Single payment becomes part of an endowment fund.