

The Ardeid

Research & Resource Management at Cypress Grove Preserve

Audubon Canyon Ranch, Fall 1990

A Small Measure of Certainty

1989-90 Winter Waterbird Census on Tomales Bay

The lifting of the fog is often well-timed on cold winter mornings, unveiling a calm expanse of water that extends for miles under the first warming rays of sun -- perfect conditions for a census. On such days, the whirl of scoter wings seems to echo in the calm air near the Inverness dock. As the census boats cut their first wakes through the glass, team leaders test radio communications. Counters run through census strategies one more time. In the shallows near Millerton Point, the boats slow, turning into their starting positions. Waterbirds are everywhere.

The winter of 1989-90 was the pilot season for the ACR waterbird census on Tomales Bay. Field observers participated in a series of waterbird counts, testing and refining methods, and counting thousands of loons, grebes cormorants, scoters, scaup, Bufflehead, and other waterbirds -- an average total of 22,617 -- not including gulls! Totals for each species were recorded in each of four estuarine intervals, based on patterns of freshwater inflow and ocean water exchange that might affect composition, distribution, and abundance of food for waterbirds (see side bar).

The results raised an obvious question about the relationship between waterbirds and herring runs: Given that the eelgrass density, and presumably the availability of herring and roe, is greatest from Pelican Point north to Tom's Point, why were greater densities of waterbirds observed

south of Pelican Point (1017 per km²) than were observed north of Pelican Point (790 per km²)? Part of the answer may lie in the virtual failure of the 1989-90 herring spawn in Tomales Bay.

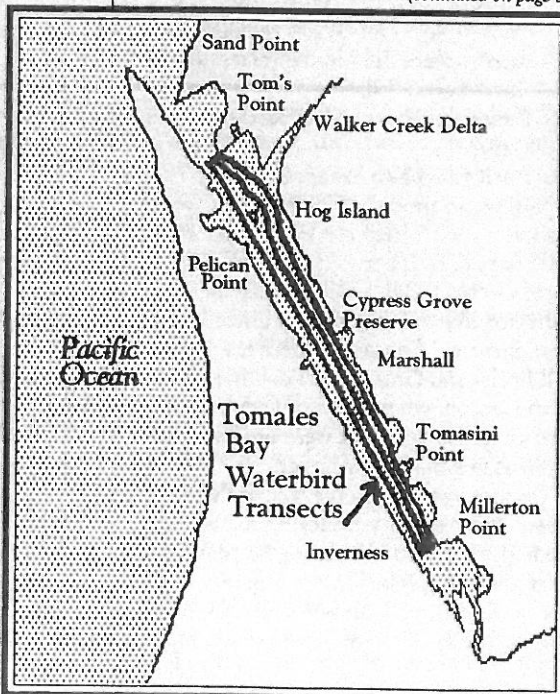
During an average winter, millions of Pacific herring (*Clupea harengus pallasii*: "army of river fish") launch repeated invasions of the estuary to spawn, each breeding event marked by a squall of waterbirds. California sealions float lazily, flippers up, fat and full of herring. It's no wonder that Tomales Bay is a haven for thousands of waterbirds. However, the biomass of Pacific herring that spawn in the bay has plummeted from a long-term average of over 6,000 tons per year to a meager 345 tons in 1989-90 (only 167 tons in 1988-89). Waterbirds seemed to spend most of the last two winters waiting.

One wonders how over 22,000 waterbirds -- with the abundances of most species comparable to numbers reported in Audubon Christmas Bird Counts during good herring spawning years -- could afford to wait for

(continued on page 3)

Tomales Bay

As you crest the western most ridge along Marshall-Petaluma Road, the view provides a dramatic perspective of this long (20 km), narrow (1.4 km), coastal embayment formed by a flooded rift valley along the San Andreas Fault. On a clear day, you can see across Tomales Bay, over the granite top of Inverness Ridge to the headlands at Point Reyes, and northward to the tip of Tomales Point and Bodega Head. However, coastal fog often covers the coast, spilling over Inverness Ridge into the bay, or cool low clouds block the view completely. As the tide drops, ripples spread across intertidal shoals along the east shore, while water masses move through deeper areas (up to 20 m) in the main channel along the west shore. Sediments in the bay grade from fine to coarse sand in the northern part to muddier substrates at the south end. During low tides, clouds of migrating and wintering shorebirds converge on large tidal flats at the deltas of Walker Creek near the mouth of the bay and Lagunitas Creek at the south end. Large subtidal meadows of eelgrass predominate in the northern half of the bay -- primarily north of Pelican Point, where salinities, temperatures, and tidal water exchange more closely reflect nearshore conditions in the Pacific Ocean. During an average winter, Tomales Bay eelgrass provides spawning habitat for over 6000 tons of Pacific herring, although this fishery has nearly collapsed in recent years. From December through early March, the herring and roe provide winter food for thousands of waterbirds.



Dueling for Gruel

Field observers who contribute to ACR's North Bay Counties Heron/Egret Project (HEP) may have witnessed a variety of aggressive behaviors among nestling herons and egrets. Some have asked if such apparently demanding chicks are evidence of a diminished food supply.

The adaptive value of sibling aggression was first described in 1954 by David Lack in *The Natural Regulation of Animal Numbers* (Oxford University Press). Lack explained how a "brood reduction strategy" enables birds to match their reproductive output to a variable food supply. Thus, ardeids can produce 4-5 offspring in good years, but feed only the larger more aggressive chicks in lean years. Younger chicks die quickly if food is scarce, and consequently, adequate food becomes available to fledge at least a partial brood. This is one reason why heron and egret breeding data can be used to monitor the health of wetlands -- brood size late in the season is related to food availability (productivity) in the ecosystem.

In a study at a Utah colony of 51 Great Blue Heron nests, Joseph Sullivan of Virginia Polytechnic Institute asked whether levels of sibling aggression (competition) were related to food availability, as evidenced by rates of food provisioning by adult birds (*Colonial Waterbirds* 11 (2):220-226). If sibling aggression and food supply are related, we might consider monitoring nestling behaviors as a clue into the productivity of local ecosystems. Now this sounds promising!

Sullivan observed nestling behaviors 24 hours per week through two breeding seasons. He classified his observations into the following categories:

1. **Bill Duel:** One nestling lunges toward a nestmate holding its bill closed while the nestmate avoids contact, often holding its bill open. The roles reverse producing a seesaw action. (This term is also used to describe similar behaviors in courting Great Blue Herons).
2. **Bill Grasp:** One nestling grasps another's bill in its own in a scissors-like manner.
3. **Bill Nibble:** One nestling contacts and "nibbles" only the tip of a nestmate's bill.
4. **Bill Peck:** One nestling forcefully

thrusts its bill toward another and contacts only its bill.

5. **Combination Bill Duel-Bill Nibble.**
6. **Combination Bill Duel-Bill Peck.**

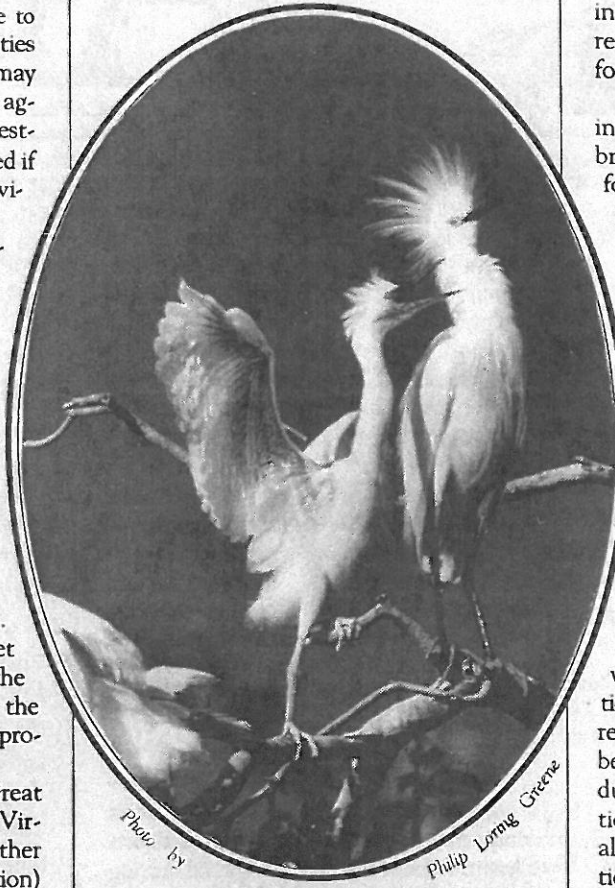


Photo by

Philip Long Greene

7. **Combination Bill Grasp-Bill Nibble.**
8. **Combination Bill Grasp-Bill Peck.**
9. **Incomplete Bill Grasp** (no contact).
10. **Incomplete Bill Nibble** (no contact).
11. **Incomplete Bill Peck** (no contact).
12. **Grasp** (feathers or any part except bill).
13. **Peck** (anyplace except bill).

Sullivan found that larger broods were associated with increased occurrences of Bill Nibbles, Bill Pecks, Grasps, and Incomplete Grasps. Bill Dueling was the only behavior that increased with lower provisioning rates. Contact maneuvers, such as Bill Pecks and Grasps were common early in the season, when parents were more attentive at the nest, but were observed less often as nestlings grew larger.

Intense aggression observed early in the season may allow parents to focus their feeding efforts on the strongest nestlings, increasing the probability of raising at least one young during lean years. As the nestlings at the Utah colony grew older, more

aggressive behaviors gave way to less hazardous, more ritualized behaviors, such as Bill Dueling. Such ritualized aggression may serve to safely intimidate a sibling when there is a danger of injury, thus ensuring that the more vigorous nestlings would receive adequate nourishment in case of a food shortage later in the season.

Interestingly, nestling aggression observed in Sullivan's study did not contribute to brood reduction. Temporary shortages in food supplies, sufficient to produce some nestling aggression without leading to brood reduction, might explain this outcome. Another possibility may be related to the large size of fish that were usually provided as the main course at the Utah colony: Douglas Mock of the University of Washington has suggested that regurgitated boluses consisting of many small fish are more likely to trigger nestling aggression (*Science* 225:731-733). Sullivan did find that broods fledging 4 or more nestlings were raised by adults that were able to provide food more frequently than most pairs.

Aggressive HEP field observers who would like to monitor nestling interactions or feeding bouts at their colony should remember to record the rate of all observed behaviors, i.e., the total number per nest during a predetermined period of observation. Dramatic changes in such data might alert us to changing local or regional conditions affecting wetland food supplies.

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the herring to spawn. Why didn't they fly to San Francisco Bay where herring spawned in far greater numbers? Rich Stallcup reported an estimated 50,000 Surf Scoters rafting in the Pacific Ocean outside of Tomales Bay. Were these birds waiting for schools of herring en route to estuarine spawning grounds? We hope that time, and additional waterbird research, will tell.

We do know that the waterbirds occurring south of Pelican Point included huge concentrations of Surf Scoters and Greater and Lesser Scaup. Scoters and scaup are well-adapted for feeding on molluscs and other invertebrates in the bottom substrate, although they certainly heavily exploit herring roe when it is available. Other species distributions also suggest feeding ecologies unrelated to herring runs, such as concentrations of Ruddy Ducks at the extreme south end of Tomales Bay, Horned Grebes and Eared Grebes in mid-bay, and Red-necked Grebes in the main channel near the mouth. One possibility is suggested by the herring's preference for reduced salinities for spawning: like the waterbirds, schools of herring may have concentrated in areas south of the largest eelgrass beds. One might suspect such a shift during years with little freshwater runoff.

Meanwhile, we were heartened to count greater numbers of Red-necked Grebes (67), Black Scoters (99), and Bufflehead (5144) than have been previously reported on Tomales Bay. Bufflehead showed an apparent decline through the winter; such changes are expected for species that move to ponds created by winter rains. Several rare or uncommon species were also sighted in the bay, including Fork-tailed Storm Petrel, Oldsquaw, Harlequin Duck, and Rhinoceros Auklet.

The occurrence of relatively normal winter populations of waterbirds during an extremely poor year for herring runs suggests an important aspect of ecological adaptation -- that waiting is adaptive if it includes a measure of certainty. The ability to override a short-term loss of food supply is a common theme in adaptive behavior. One must consider that fisheries or other human activity may be responsible for the catastrophic decline of herring in Tomales Bay. However, the persistent numbers of winter waterbirds provides some encouragement: their patience may be evidence of nature's long history of hope fulfilled.

The Marin Islands Heronry Needs Your Help!!!

The 3-acre West Marin Island (off of San Rafael) is the largest breeding colony of herons and egrets in the San Francisco Bay Area, supporting several hundred pairs of 4 species. And it's for sale. Several public agencies and local conservation organizations are joining in the project to save the islands, including the State Lands Commission, State Coastal Conservancy, Marin County Open Space District, U. S. Fish and Wildlife Service, Trust for Public Land, Marin Audubon Society, and Audubon

Canyon Ranch. However, a huge amount of additional support must be raised from private donations -- in the neighborhood of \$500,000. Your help is crucially needed to make the project a success, and to establish a Marin Islands National Wildlife Refuge. Please send donations or requests for information to the California Coastal Conservancy/Marin Islands, attn: Terri Nevins, Project Manager, 1330 Broadway, Suite 1100, Oakland, CA 94612.

I N P R O G R E S S

SHOREBIRDS

A recent report on the Tomales Bay Shorebird Project (ACR Proj. Rept. 89-4-1) is completed and available at CGP. The report covers the 1989-90 winter and spring shorebird censuses, with notes on the movements of shorebirds among habitat areas within Tomales Bay. The fall 1990 census results were lower than we expected, totalling a mere shorebirds, although there are few other data for comparison. Several field observers reported count disturbances by Peregrine Falcons and Merlins. Incidentally, we are looking for a light-weight 2-person boat for crossing tide channels to census areas.

WATERBIRDS

Also available at CGP is a report on the 1989-90 Tomales Bay Winter Waterbird Census (ACR Proj. Rept. 89-12-1). After a very successful first-year effort (see the lead article in this issue), several improvements have been added to the plan for the 1990-91 census, including additional supplementary land-based count areas. ACR's research vessel, the Aurelia, was recently equipped with a new backup motor and several other repairs and minor improvements. Thanks to Elaine Senf for the (custom) boat cover. To become a waterbird censuser in 1990-91 call CGP soon. We are also looking for volunteer census boats and skippers.

CORDYLANTHUS

We are currently summarizing a survey of Point Reyes Bird's Beak (*Cordylanthus maritimus palustris*) conducted during the last two summers on Tomales Bay. The study includes an intensive investigation of the plant's co-occurrence with several other salt marsh species at ACR's Walker Creek Delta. *C. m. palustris* is considered rare (list 1B) by the California Native Plant Society

and is eligible for state listing as threatened or endangered, but the federal government lists it as C2: insufficient data.

AQUACULTURE

We have begun the second year of a five-year study by ACR on the possible effects of aquaculture, i.e. oyster culture, on winter shorebird populations in Tomales Bay. Preliminary results are equivocal, as expected, but this promises to be an interesting project. The study has also sparked some interest in shorebird-gull interactions. There'll be more about this later.

COASTAL PRAIRIE

Volunteers at CGP have transplanted six thousand native grass seedlings of seven species into plastic growing tubes called "stubbies." The seedlings will be reintroduced in December. We need more volunteers to help in monitoring active *Microtus* (meadow vole) runways in November. Re-vegetation, *Microtus* runway counts, and grassland vegetation analysis contribute to CGP's study of ecosystem effects of coastal prairie restoration. The project was recently described in *Ecological Restoration* published by Restoring the Earth, Berkeley.

NORTH BAY COUNTIES HERON/EGRET PROJECT

The report on the 1990 breeding season has been completed (ACR Proj. Rpt. 90-3-1). It includes a large base of information on colony sites and numbers of breeders, with some notes on brood sizes, nesting behaviors, timing, and disturbances, observed at 43 colonies throughout Marin, Sonoma, Napa, and Solano Counties. We plan to include Contra Costa County in 1991. There will be an organizational meeting for new and old NBHEP field observers in January or February. Please call CGP for more information.

T H E W A T C H

CGP Field Observers contributing to T.B. Shorebird Project (s), T. B. Winter Waterbird Census (w), Aquaculture/Shorebird Monitoring (a), North Bay Counties Heron/Egret Project (h), CGP Coastal Prairie Restoration Study (p), ACR Marsh Monitoring Project (m), and other activities (o) include:

Shirle Akers (h)
 Richard Allen (w)
 Sarah Allen (sw)
 Bob Baez (sw)
 Norah Bain (s)
 Larry Barnes (s)
 Tom Baty (w)
 Rosilyn Bazarro (w)
 Gay Bishop (sh)
 Patti Blumin (h)
 Janet Bosshard (hp)
 Maggie Brown (sp)
 Brian Bullick (swmo)
 Tom Byron (h)
 Robert Cardwell (w)
 Eric Davis (h)
 Rosamond Day (h)
 Linda DeVere (shpo)
 John Dillon (swp)
 Ted Elliot (h)
 Steve Engel (sw)
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 Binny Fischer (h)
 Virginia Fletcher (swhpo)
 Grant Fletcher (swhpmo)
 Sonya Force (mp)
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 Margaret Greene (h)
 Philip Greene (h)
 Peggy Gross (h)

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 Laree Holmes (wh)
 Jennifer Joell (h)
 Carol Kuelper (spo)
 Tamara Loring
 Rod MacDonald (sa)
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 Jo Maillard (h)
 Scott Mathieson (h)
 John McDonough (s)
 Ellen Mcknight (h)
 Jane Merriman (h)
 Milt Morgan (po)
 Pix Morgan (sp)
 Joe Mueller (s)
 Scott Noack (mp)
 Terry Nordbye (s)

Richard Plant (w)
 Karen Porteous (w)
 Myrlee Potosnak (h)
 Grace Pratt (h)
 Helen Pratt (h)
 Rhio Reigh (ho)
 David Reinking (a)
 Jeanie Rosager (h)
 Ellen Sabine (swhpmo)
 Fran Scarlet (h)
 Elaine Senf (h)
 John Shoemaker (h)
 Laurie Silver (h)
 Brian Simon (wmo)
 Dabne Smith (w)
 Anne Spencer (shwpmo)
 Rich Stallcup (sawm)
 Jean Starkweather (h)

Mary Anne Stewart (h)
 Edith Taylor (h)
 Judy Temko (spmo)
 Janet Thiessen (sw)
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 Tanis Walters (sw)
 Sophie Webb (w)
 Tom White (w)
 Diane Williams (s)
 David Wimpfheimer (wsa)

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 Susan Kelly
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 Editing & Design
 Linda DeVere
 Staff Writer
 John Kelly

I N T H E F I E L D

December	1-2	Field Trip to the Sacramento wildlife refuges for ACR Field Observers and Docents (call Linda DeVere at 415/927-7224)
	7	Tomales Bay Shorebird Census (10:30 AM)
	8	Native Grass Planting Day at Cypress Grove Preserve (9:30 AM) (call ACR office in Bolinas for information: 415-868-9244)
	15	Tomales Bay Waterbird Census (call CGP for information)
January	4	Backup count day for the Early Winter Shorebird Census
	21	Late Winter Tomales Bay Shorebird Census <i>To be announced:</i> Tomales Bay Waterbird Census (call 663-8203)
February	4	Late Winter Tomales Bay Shorebird Census
	19	Late Winter Tomales Bay Shorebird Census <i>To be announced:</i> North Bay Counties Heron/Egret Project 1991 planning meeting for new and returning Field Observers (call CGP for information: 415/663-8203) <i>To be announced:</i> Tomales Bay Waterbird Census (call 415/663-8203)
March	2	Backup count day for Late Winter Shorebird Census
<i>Every Tuesday:</i> Tuesday work group at Cypress Grove Preserve (please call in advance 415/663-8203)		



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