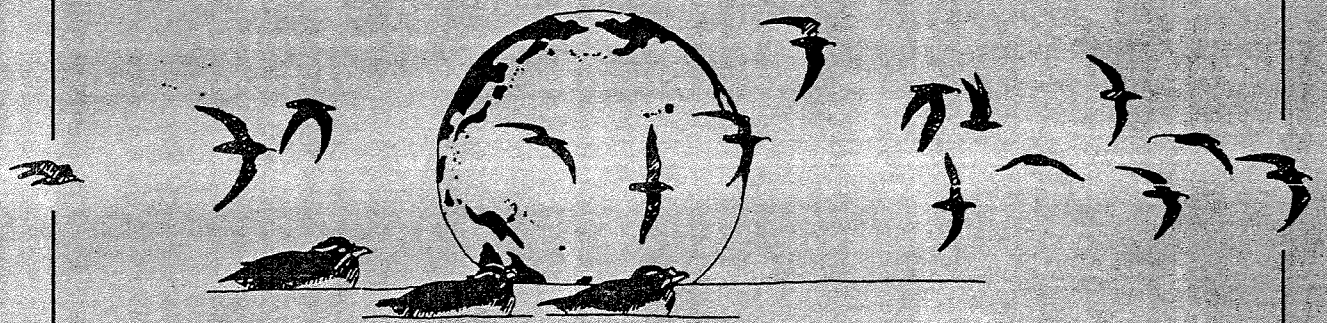


Pacific Seabirds



A Publication of the Pacific Seabird Group

Volume 22 Number 1

1995

Dedicated To The Study And Conservation Of Pacific Seabirds And Their Environment

The Pacific Seabird Group (PSG) was formed in 1972 out of a need for better communication among Pacific seabird researchers. The Group coordinates and stimulates the field activities of members involved in research and informs its members and the general public of conservation issues relating to Pacific seabirds and the marine environment. Group meetings are held annually and the PSG publication, *Pacific Seabirds* (formerly the *PSG Bulletin*), is issued biannually. Current activities include involvement in seabird sanctuaries, coastal surveys, seabird/fisheries interactions, and legislation. Policy statements are issued on conservation issues of critical importance. Although PSG's primary area of interest is the west coast of North America and adjacent areas of the Pacific Ocean, it is hoped that seabird enthusiasts in other parts of the world will join and participate in PSG. PSG is a member of the U. S. Section of the International Council for Bird Preservation. Annual dues for membership are \$20 (individual and family); \$13 (student, undergraduate and graduate); and \$600 (Life Membership, payable in six \$100 installments). Dues are payable to the Treasurer, whose address is on the back cover.

Pacific Seabirds

Pacific Seabirds (ISSN 0740-3371) is published twice a year, in the spring and fall, and contains news of interest to PSG members, including regional seabird research, conservation news, and abstracts of papers presented at the annual meeting. *Pacific Seabirds* is an outlet for the results of scientific research, as well as articles and shorter items on seabird conservation, seabird research activities, and other topics related to the objectives of PSG. All technical materials and book reviews should be submitted to the Publication Committee Coordinator, conservation-related material to the Vice-Chair for Conservation, and all other material to the Editor. Back issues of the *Bulletin* or *Pacific Seabirds* may be ordered from the Treasurer: please remit \$2.50 each for issues of Vols. 1-8 (1974-1981) and \$5.00 each for issues of Vol. 9 and later.

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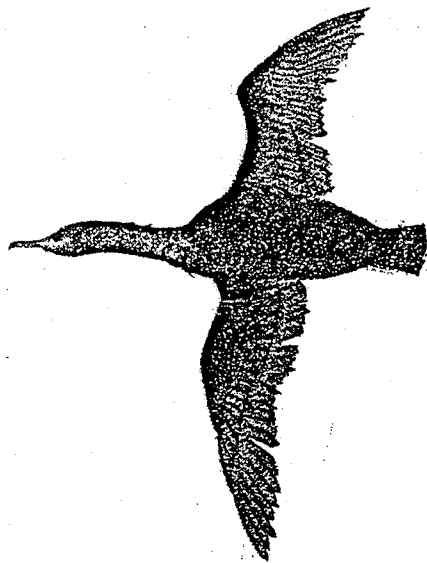


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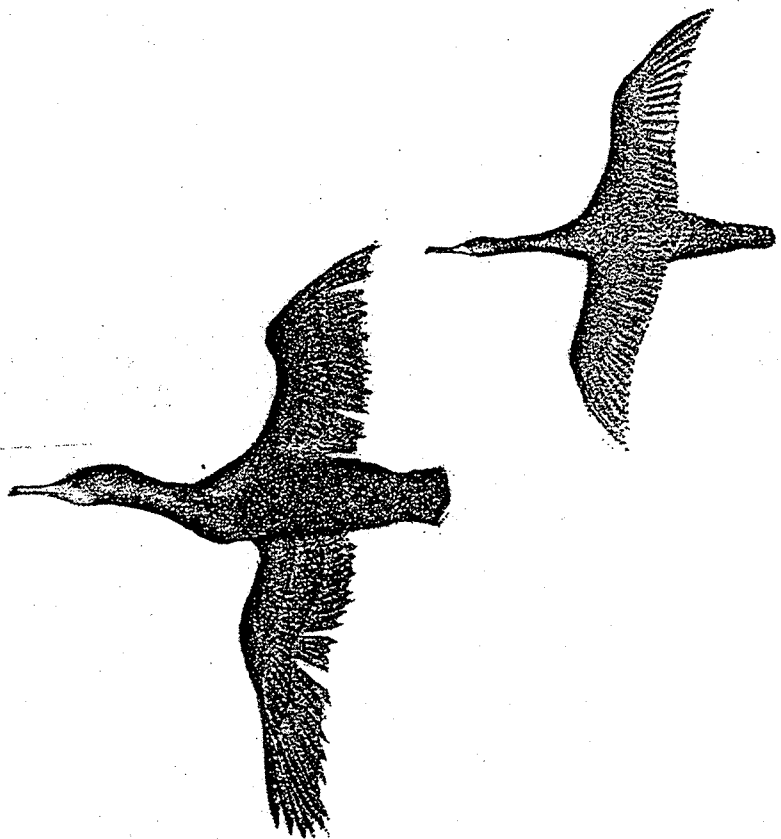


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Forum

Chronic Overfishing

Mark J. Rauzon, chair

A most significant demonstration of the vulnerability of seabirds occurred as we were concluding our conference. The Galapagos Islands, a marine reserve, was the scene of a fishing conflict. Local fishermen who were recently exploiting sea cucumber stocks for the Asian market were angered by restrictions imposed on their virtual unlimited take of marine organisms. (The legal quota on sea cucumbers was exceeded by 1000% in just three months.) Some fishermen stormed the Charles Darwin Research Station and held biologists and their families hostage, and willfully slaughtered giant tortoises and sea lions, the latter for penis sales in the Asian markets. The presence of fishermen on or near the island inhabited by the flightless cormorant poses great potential for introducing predators to this vulnerable island. This outrageous scenerio is similar, albeit on a less alarming scale, to what is occurring on many Mexican Islands.

On the other side of the globe, Newfoundland fisherman are idle as the St. Georges Bank is depleted and the Canadian government has gone to the extraordinary step of seizing Spanish fishing vessels violating Canada's 200 mile limit. European and Canadian ships are arming themselves for a sea battle. These episodes speak volumes about the state of our oceans and the threats to marine life, including seabirds. When I began studying seabirds for the USFWS in the Bering Sea in 1975, the pollack fisheries was untapped and the crab fisheries thriving. Today, the king crab fisheries is defunct and the pollack waning. What seemed unlimited is now destroyed. In 20 years, where will be fisheries be? Where will PSG be?

In my view, the state of PSG is in a vigorous change period as is the rest of the world, especially the marine environment. I believe the Pacific Seabird Group is evolving a more professional conservation involvement based upon long-term research. It's clear this approach is controversial. Some of us see the direction into conservation as away from science. I believe PSG must assume responsibility for speaking out

on issues we are informed about and capable of contributing to. As human population and political pressures bear down on the resources, PSG will find itself in an increasing unique position to "do something". But let us debate this openly so we can move in a unified direction. Please give

it some thought and share your views in letters to the editor or with your regional representative, or officers of PSG. We are a volunteer organization facing many challenges and we need as many people involved as are interested.

NOW AVAILABLE — A NEW PACIFIC SEABIRD GROUP SYMPOSIUM
BIOLOGY OF MARBLED MURRELETS – INLAND AND AT SEA
 S.K. NELSON AND S.G. SEALY (editors)

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Viewpoint: Persian/Arabian gulf wars and the environment

W.R.P. Bourne, Department of Zoology, Aberdeen University, Tillydrone Avenue, Aberdeen AB9 2TN, Scotland

Two days journey from Babylon at a place called Ait, in a field near unto it, is a strange thing to see: a mouth that doth continually throw forth against the air boiling pitch with a filthy smoke: which pitch doth run forth into a great field which is always full thereof. The Moors say that it is the mouth of hell.

Ralph Fitch (1600)

Concern for the natural environment in the Middle East has evolved rather slowly, and its welfare provides an instructive subject for contemplation. When I first visited the area in the late 1950s as a reluctant conscript Royal Air Force Medical Officer during the Suez affair nobody appeared to care whether the bombardment of Egypt and the use of sunken ships to block the Suez Canal had environmental consequences, which apart from a minor addition to the litter of the ages were inconspicuous. Over the next quarter of a century correspondents in the area became increasingly concerned that it might be vulnerable to oil and toxic chemical pollution, but only found limited amounts. By the 1980s there were a growing number of reports on the subject (Oostdam 1980, 1984, Gupta and Kureishy 1981, Anderlini et al. 1981., Burns et al. 1982, Price et al. 1987, Coles and Gunay 1989), which did not usually indicate the occurrence of a serious problem. Few people said much yet about other developments.

The outbreak of the Iran–Iraq war in the 1980s caused a deterioration in the situation. The attack by Iraq on the Iranian Nowruz oilfield in the north–east Gulf in the spring of 1983 (Anon. 1983) resulted in a large oilspill, but little was published about the consequences. Although tankers were also attacked, their cargoes proved difficult to ignite, so rockets were fired into the accommodation instead. In consequence when I returned to the Gulf as the doctor on a support ship for the British Armilla Patrol in the 1987–88 winter the ports were full of damaged ships. Oil was also leaking from the Iranian Rostam oil platform in the lower Gulf after it had been set on fire, but causing

little damage (Bourne 1989). On 6th December the smoke from an 85,000 tonne naphtha carrier ablaze in the Straits of Hormuz could be seen for at least 100 km as it rose vertically for several kilometers to a sharp ceiling before moving east with the upper wind, as it did later at Kuwait (Hobbs and Racke 1992).

We rejoined the United Nations operation against Iraq following the invasion of Kuwait in November 1990, and I stayed until the war was over in mid March 1991. During the way out we carried out exercises against nuclear, chemical and biological warfare, but the other side, who were less well equipped, decided not to risk it. Instead they released between 0.25 (Anon. 1991) and 1.5 (Price and Robinson 1993) million tonnes of crude oil into the sea (Gordon Simpson, who was formerly in charge of the loading terminal, reports that it would have been possible to pump 15,000 tonnes of crude oil per hour through the 48-inch pipe into the sea, or discharge 4,000 tonnes per hour by gravity, so it might just have been possible to reach the higher totals reported, though it seems unlikely). Then they set fire to another 67 million tonnes of oil on the oilfields as they escaped (Readman et al. 1992).

We first encountered the smoke from the burning oil as it was blown SSE down the west shore of the Gulf by the prevailing NNW Shamal lower wind. In the upper Gulf the sun would disappear into a gray haze to the west after midday, and when the main plume periodically swirled over Bahrain 500 km from its source it became dark and misty with a stink of petroleum. Finally as we approached Kuwait on 12th March the visibility fell to a few dozen metres, and I had a recurrence of a cough developed in the foggy London of the 1950s, though my handkerchief did not become black in the way that it did during the rather similar Great Smog which killed 2,000 people there early in 1952. As we entered the smoke about two dozen small bird migrants settled on the ship and remained until it cleared (Bourne 1991).

A thin film of oil settled out of the denser smoke on to the sea, but we saw no major slicks until we met a series of parallel “windrows” when we visited the mine-sweepers about 50 km off Kuwait on 12th March. Although I watched birds for several hours a day throughout the war I only saw one badly oiled individual, a Great Crested Grebe (*Podiceps cristatus*) on this day. There were also two moderately oiled cock House Sparrows (*Passer domesticus*) and several lightly oiled migrants off Kuwait, about a dozen lightly oiled gulls in a total of 6,000–12,000 seen during the winter, and no other oiled animals. This is no more than would normally be expected during any voyage around western Europe, possibly because the oil was reduced to solid residues rather rapidly in the warm climate of the Gulf.

The previous literature on the ornithological situation ashore, and initial observations which received international publicity in 1990–91, are summarised by Haneman (1991), who reprints the more important contributions. The latter observations are reported in more detail by Green (1991), Dennis (1991a), Evans et al. (1991), van den Bergh et al. (1991), Keijl (1991) and Rands (1991), and in a series of reports to the International Council for Bird Preservation and the National Commission on Wildlife Conservation and Development of the Kingdom of Saudi Arabia dealing with bird mortality (Dennis 1991b), seabird breeding colonies (Symens 1991), and migratory shorebirds (Evans 1991, 1992, Habard and Wolstencroft 1992), which are summarised in Brooks and Evans (1993). Price and Robinson, eds. (1993) also summarize the background and other biological observations.

In general, the Shamal wind causes the water to move anticlockwise around the shallow upper Gulf (Foda and al Hashash 1983), so that both the Nowruz oilspill in the spring of 1983 and the Kuwait spill at the same time in 1991 came ashore on the fertile tidal flats along the coast of the Eastern Province of Saudi Arabia (Sheppard and Price 1991). Most of the Kuwait spill beached north of Abu Ali, but the poorly-reported Nowruz spill from further east may have spread further south. The total vertebrate mortality reported during the two spills (Heneman 1991) is summarised in Table 1.

There are some curious discrepancies.

Table 1. Animals reported killed in two similar oil spills.

	Nowruz, Spring 1983	Kuwait, Spring 1991
Dugongs	37	0
Cetaceans	33	0
Turtles	56	4
Sea-snakes	1500+	2
Birds	200+	20,000+

Thus while at least a hundred times more birds were reported to have been killed by the second spill, 271 times more other vertebrates were reported to have been killed by the first. Possibly the first spill spent longer at sea, where it killed more marine animals, and then congealed before coming ashore, whereas the second came ashore much sooner, while it was still liquid, so that it killed more birds along the coast (though some must surely have been missed there after the first spill?). The commonest species during the second spill, reaching totals of a few thousand, were the Great-crested and Black-necked (*Podiceps nigricollis*) grebes, Great and Socotra cormorants (*Phalacrocorax carbo* and *P. nigrogularis*), and Dunlin (*Calidris alpina*).

Since the Gulf is one of the main breeding-places, staging-posts on migration, and winter quarters for millions of birds, the mortality reported is not large. The grebes and Great cormorant are widespread to the north, the Socotra Cormorant to the south, and the Dunlin is the commonest shorebird. While about 65% of the cormorants brought to the Wildlife Rescue Centre at Jubayl were saved, it was only 5–10% of the grebes (Symens 1992). The shorebirds which winter in the area were already leaving when the oil was released, and it is difficult to assess the numbers of passing migrants. The following winter it was found that the number of wintering shorebirds in the oiled area had fallen from 250,000 to under 100,000 (Habard and Wolstencroft 1992). The first total presumably represents a substantial recovery from the similar spill eight years before, while it seems uncertain how many of the birds which disappeared simply moved elsewhere.

It is also difficult to assess the effect of the barrier of smoke hundreds of kilometers long and several kilometers high which lay for many months across the path of the vast

bird and insect migration between Asia and Africa. Several birds which came on board in the smoke in the norther Gulf were dirty and oily, but all except the House Sparrows left when the visibility improved. Symens (1992) also found the 10% of the landbird migrants caught on the coast at Tanajeeb 150 km south of the Kuwait border, and 5% of those caught at Jubayl, another 100 km further south, were sooty, and Ash (1992) saw several dark House Martins (*Delichon urbica*) over 7,500 km to the north-east of Siberia on 13–15 June 1991. Symens (1992) also saw various oiled water-birds gain inland at Riyadh in the autumn, and found that 8% of the Bank Swallows (*Riparia riparia*) caught there were oiled, and had lost a fifth of their normal weight, probably enough to make it difficult for them to complete their migration.

It seems likely that these were among the migrating birds and insects, notably dragonflies, which became oiled where they tried to feed, drink or rest, and often died, at the pools of oil and water that formed on the devastated oilfields of Kuwait (Evans et al. 1991, Mills 1991, Wolstencroft 1991). Apparently this is not a new phenomenon, but has also been noticed at some oily pools at Wafra west of Kafji in the neutral zone along the south-western border of Kuwait for over thirty years, though the numbers involved were not normally large (S. Howe, pers. com.). It also occurs at times elsewhere, and it seems time that responsible people took more care to avoid the creation of such traps for wildlife, or tried to keep it away from them.

Possibly the most serious immediate vertebrate wildlife conservation problem was caused by the pollution by oil of a series of islets off the east coast of Saudi Arabia which provide a breeding place for not only large colonies of terns which were

due to return soon after the war, but also the large Gulf population of Green Turtles (*Chelonia mydas*) (Benson et al. 1977, Ross and Barwani 1981). A helicopter survey showed not only much new oil on Karan Island, but also some old oil probably deposited in 1983 both there and on Jana island. The sandy part of Karan was cleaned, and some 78,450 pairs of terns bred, a 39% increase since 1986, though there was a change in the proportions of the species, and in the rocky areas that were not cleaned some young birds became oiled (Symens 1991). Apparently the turtles also escaped (Symens 1992), and fortunately the oil seems to have missed the large Dugong population to the south (Preen 1989).

By the time the last burning oil well was extinguished in early November 1991 (Garwin and Kendall 1991) the Gulf was cleaner than in the early 1980s, and indeed some European and North American waters (Readman et al. 1992). Despite predictions that the pall of smoke might reach the stratosphere, change the climate of the Middle East, and disrupt the Asiatic monsoons (Pearce 1991), satellite and airborne observations showed it was neither large enough nor high enough to have many distant effects (Johnson et al. 1991, Hobbs and Racke 1992), though this may have been avoided by a fairly narrow margin (Bakan et al. 1991). The problem which most impressed newcomers was the scale of local development, including infilling some of the best coastal sites such as Tarut Bay in Saudi Arabia, and the construction of oil terminals on the seabird breeding islands in the lower Gulf (Gallagher et al. 1984); also the amount of litter on the beaches (Bourne 1989, Rands 1991).

While all this was deplorable, the Director of the World Conservation Monitoring Unit at Cambridge, England, Dr. Robin Pallow, admitted in a BBC 2 Nature television programme (Anon. 1991) that "with the war over, we are in a position to make a more balanced judgement about the environmental repercussions. To talk about a catastrophe is simply rubbish. There may well have been political reasons for exaggerating it in order to mobilise world opinion against the Iraqis". Thus from the environmental point of view the Gulf War seems most remarkable as the first occasion when one side in a conflict used oil and smoke pollution, and the other then exaggerated the consequences, as political weapons.

Thus the most serious environmental casualty of the war may be the future credibility of environmentalists.

It may be useful to explain my own attitude to this, since it sometimes appears to be misinterpreted. Nearly thirty years ago I became alarmed by first the Torrey Canyon oil pollution in the English Channel (Bourne et al. 1967), and then a birdkill in the Irish Sea where some bodies proved to contain toxic chemicals (Bourne 1976). Fortunately following the bad publicity there was little further trouble, mainly due to undisciplined foreign ships, and it also soon became evident that such incidents usually have only a temporary local impact, which is dwarfed by some natural disasters such as those due to bad weather in high latitudes and "ENSOs" in the tropics, whereas more serious problems may be caused by damage to habitat. Since the situation appeared to be under control (Bourne and Vauk 1988), and grants often proved to have too many strings attached, I therefore returned the last and found independent means to investigate places such as the Gulf.

Meanwhile as the subject became a public issue other had also noticed that postulated threats to seabirds and proved a fruitful source of funds, and a large industry has now developed investigating, monitoring, and conserving them. While the better work clearly deserves every encouragement, it now seems increasingly liable to be discredited by ill-informed alarmist statements. Thus for example in due course some of the journalists who had been persuaded to publicise unlikely hypothetical effects of oil and smoke pollution during the Gulf War later also secured a second scoop on their own account by reporting how these effects had then failed to materialise (Anon. 1991). One particularly unfortunate consequence of crying "wolf" in this way has been a decline of popular interest in the area just as another threat to a more remarkable natural community has emerged with the current drainage of the magnificent but poorly-studied wetlands in southern Iraq.

Summarising the zoogeographical considerations involved, in the early Tertiary this whole region was submerged under the great Tethys Ocean, and oil formed in its marine sediments. Later, when Africa drifted north to collide with Eurasia, Arabia became raised and tilted and slightly displaced to form a valley to the east through

which the new mountain ranges to the north were able to drain into the Indian Ocean to the south through the Gulf, which has apparently fluctuated in its extent over the course of time. A rich fauna and flora started to develop here from the Miocene (Whybrow et al. 1991) until the whole area dried out and became smothered by moving sand when the sea-level fell during the Pleistocene (Glennis 1991, Kassler 1993).

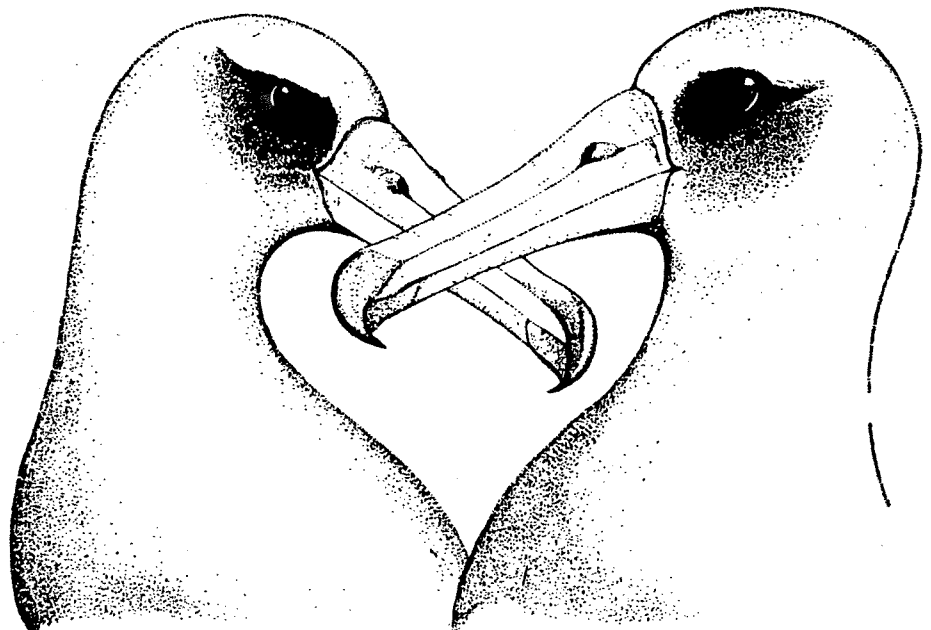
In consequence, while the area holds three presumably old endemic landbirds, the Gray Hypocolius (*Hypocolius ampelinus*), Iraq Babblar (*Turdoides altirostris*) and Basra Reed Warbler (*Acrocephalus grisoldis*), any of which, but especially the last (Pearson and Backhurst 1988), might be endangered by current developments in Iraq, the marine wildlife of the area cannot be very old, but presumably arrived from the Indian Ocean, where similar habitats occur all round the Arabian Sea from Somalia to India, since the sea-level rose and the Gulf flooded again within the last 10,000 years. Therefore although the Gulf now holds one of the most spectacular concentrations of seabirds in the world there are no endemic species, although they apparently include a large proportion of the still numerous Socotra Cormorants, and it also shares the Sooty Gull (*Larus heuglini*) and races of other species with the Arabian and Red Seas. Unfortunately any attempt to assess the impact of petroleum development on any of these birds is hampered by a lack of past information, and clearly the whole situation urgently requires further study.

I am grateful to Kenneth Warheit for helpful referee's comments.

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Pacific Seabird Group Annual Meeting & Post Conference Workshop in Mexico:

The Pacific Seabird Group held its 22nd annual meeting in San Diego, California during January 11-13, 1995. The scientific program featured a record setting 125 presentations including 80 papers. A symposium on seabird enhancement through animal and vegetation management was held with invited speakers from New Zealand, Mexico and other Pacific Rim countries. Dr. Thomas R. Howell was given the Lifetime Achievement Award for his contributions to seabird ecological studies (he discovered grey gulls nesting in the Peruvian desert). Mark J. Rauzon assumed the duties of Chair and William T. Everett is the chair-elect. Mauricio Cervantes Abrego is chairman of the newly established Mexico Committee.

During the three day conference, 28 invited seabird and wetland biologists from Mexico had opportunities to interact with other biologists from Canada, Puerto Rico, Hawaii, Japan as well as their colleagues from the USA (see Figure 1). Two invitees

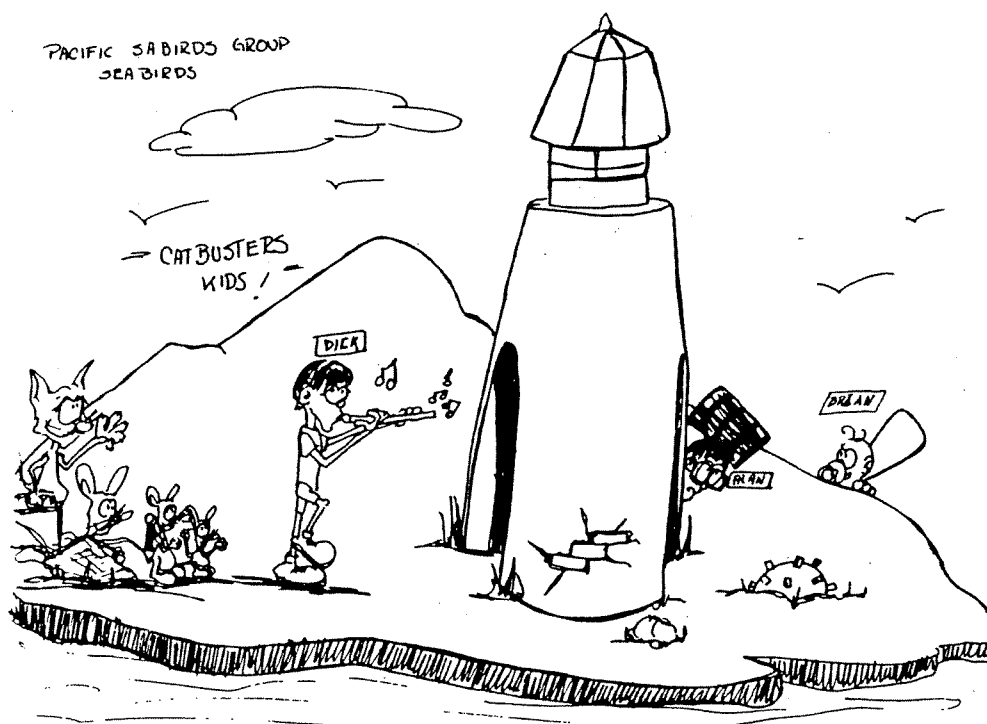
gave papers in Spanish and a poster was also presented (see enclosed abstracts). Dra. Enriqueta Velarde, deputy director of public education at SEDESOL attended. Dra. Velarde was a former student of PSG member Dr. Dan Anderson, and is a longtime PSG member. Her attendance was very inspiring to young biologists from Mexico. All participants are now PSG members for one year and will receive *Pacific Seabirds* biannually.

A special workshop was held in Ensenada, Mexico immediately after the conference on Saturday, January 14, 1995 at the University of Ensenada, School of Languages (see Figure 2). Through a grant from the USFWS-NAFTA fund, and with logistical support from Pro-Esteros and Universidad de Baja California, 28 biologists from Mexico were transported to the University of Ensenada by bus to participate in a course designed by New Zealand predator control experts, Alan Saunders, Manager of the Threatened Species Unit,

Dick Veitch, cat expert and Brian Bell, rodent expert (see enclosed abstracts). The program contents were "customized" to meet the needs and interests of the Mexican Biologist during two discussion sessions held in San Diego concurrently with the PSG meetings. The objectives of the workshop were as follows:

1. Provide an opportunity for New Zealand (NZ) wildlife managers to discuss successful predator control projects with relevance to Mexican situations
2. Provide participants an opportunity to discuss predator control projects and island problems that may benefit from staff experience and peer input
3. Provide participants with an opportunity to obtain "hands-on" experience in implementing a predator control project under field supervision (see Figure 3)
4. Provide participants an opportunity to exchange information and experiences of their work in Mexico

These objectives were met. After an introduction by PSG member Leopoldo (Polo) Moreno-Martiella (University of California, Davis), Alan Saunders of New





Zealand stressed the need for strategic planning under the aegis of a national island coordinator.

The development of an operational plan that managers may implement is the next step. The integrated team approach with costs and benefits known is a key factor in the success of a predator management effort. Consultation with interested parties achieved agreement and "ownership" of the programs.

Dick Veitch presented a step-wise approach on how to rid islands of introduced pests, especially rats and cats. He briefly presented ways to: a) assess the situation and develop a feasibility plan; b) plan the Methods to use to eradicate pests; c) act - inform local health authority, inform the public and be prepared to act quickly if things go wrong; and d) protection to guarantee that animals are not released again is vital.



After the New Zealanders presented their papers, the Mexican groups presented 15 minutes presentations of on-going projects:

1) Human Activities in the Gulf of California by Luis Bourillon (University of Arizona, Tucson). The proliferation of seasonal fishing camps increases the risks of introducing rats and insects to vulnerable island ecosystems.

2) Education and Consciousness Raising on Socorro Island by Gustavo Arnaud (CIBNOR, La Paz). Sheep, cats, mice and insects impact vegeta-



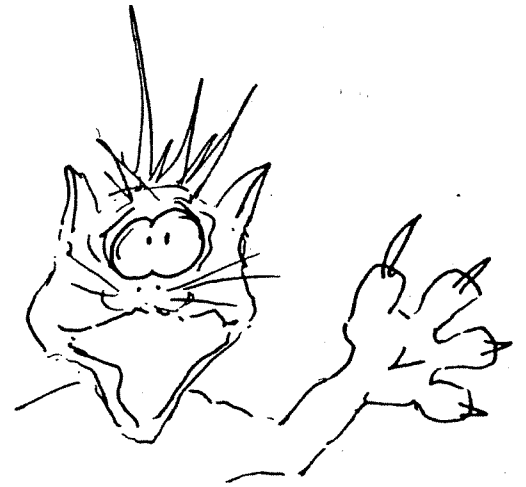
tion and endemic plants and fauna. An environmental education program for Mexican Navy personnel is on-going.

3) Cat Eradication on Isla Isabel by Cristina Rodriguez (UNAM, Mexico City). Eradication will commence this summer after current diagnostic studies are complete.

4) Introduced Fauna in the Gulf of Mexico by Jesus Ramirez (UNAM, Mexico City). Details the beginning of a rat eradication program on Rasa Island.

5) Rat/cat Eradication from Asuncion and San Roque Islands by Don Croll, Bernie Tershey, and Jose Angel Sanchez (SEDESOL). Rat eradication from Isla Natividad will follow

6) Cat Eradication on Isla Asuncion by Jesus Ramirez (UNAM, Mexico City).



7) Public Relations/Conservation Education on Isla Asuncion by Lourdes Flores and Raven Skydancer (University of Washington, Seattle). The use of a specially developed 30 minutes video on local cable station was shown to the local communities of Asuncion Island, was presented to the group.

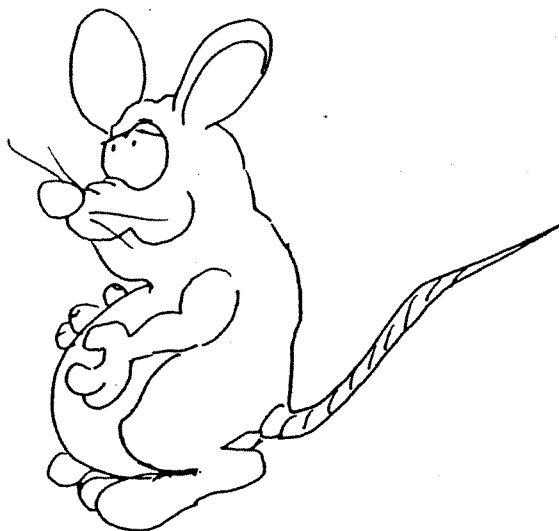
In addition to the information and experience transfer, other significant outcomes of the session was the group compilation of an atlas describing the Mexican islands with predators, the affected animal resources, current researchers and other contact people (Draft not yet available). During the open discussion phase of the workshop, many issues were discussed and recommendations made. One idea was to use the information contained in the draft of an





atlas to be used by a National Island Coordinator—an idea coming out of the group and being presented to Dra. Enriqueta Velarde. It seemed unlikely that a position could be funded internally, but outside funding may support a role such as this. See Figure 4 showing Drs. Velarde interviewed for the local newspaper. In addition, Velarde's participation at the training course allowed other participants to directly interact with her and gain insight into the workings and concerns of SEDESOL and inspiration of a possible career path.

After the discussion session, the attendees were shown the proper use of traps and poisons. Dick Veitch and Brian Bell demonstrated these technology transfer on how to set hidden traps and how to direct animals to traps. Special poison bait stations for rats were shown and several "tricks of the trade" were shared.



After the special session on January 16-18, the New Zealand consultants visited an newly initiated rodent control project on Isla Rasa with Dr. Velarde, Jesus Ramirez and Cristina Rodriguez to assess the techniques being used. Everything looks well developed and a successful eradication of rats is very possible here. In addition, the New Zealanders also consulted with biologist Cristina Rodriguez working on Isla Isabel about a cat/rat eradication program starting there. It is feasible to remove cats from Isla Isabel and Rodriguez will soon begin as she has already conducted preliminary studies and reported them to the group.

These two programs, finely tuned by the New Zealand specialists, can serve as educational models and when complete, will inspire others to take on similar projects, especially when the return of birds, lizards and vegetation is so impressive. In addition, U.S. Navy and Park Service biologists also received advice for managing predators on government lands from the New Zealanders.

In conclusion, the immediate positive benefit of this grant was to inform 28 biologists from Mexico about the problems of introduced feral animals on islands, and to provide solutions from the recognized world's experts in this field:

- 1) Provide a cook-book approach to developing plans to do something about these problems that biologists may face
- 2) Promote communication among various researchers in Mexico and inspire others to get involved
- 3) Establish of a Mexican Committee to begin to function as a coordinator for Mexican projects
- 4) Begin work on an atlas of Mexican islands, resources and problems
- 5) Contact government officials and share of concerns and interests in Mexico



In the future, we plan to build upon the momentum gained from this workshop by holding our annual meeting in Guaymas Mexico, in 1997 or 1998. PSG continues to assist seabird biologists in Mexico through informal participation by PSG members in projects like Bernie Tershey's work in the Gulf of California, Bill Everetts's work in the Baja Islands, Harry Carter's surveys for Xantus Murrelets in Mexico and possible seabird surveys for a colony catalog. Future funding needs might be to underwrite the National Island Coordinator position, facilitating the colony seabird catalog compilation, underwriting our annual meeting in Mexico to insure maximum Mexican participation and funding specific island restoration projects such as Socorro Island.



Minutes of the 1995 Pacific Seabird Group Executive Council Meeting

The Executive Council met on 10 and 13 January in San Diego. A quorum was present for both meetings. All Council members attended at least one meeting except for Dave Irons and Mark Tasker. The minutes of the 1994 meeting were approved.

Meetings

Concurrent paper sessions were held at the 1995 meeting for the first time. This is not desirable but is inevitable because of the number of papers submitted. To minimize concurrent sessions, posters will be encouraged in the future, with clear instructions in the meeting announcement as to their preparation. Concurrent sessions of papers and committee meetings should be minimized, but the Council voted not to impose any rules regarding concurrent sessions.

The next meeting of PSG will be in November 1995 in Victoria, B.C., in conjunction with the Colonial Waterbird Group. A special symposium, "Marine and behavioral ecology of seaducks", will be held at the Victoria meeting. PSG has been invited to hold the following meeting in Guaymas, Mexico, but no decision was made.

At Kim Nelson's request, Marbled Murrelet papers will no longer be segregated into special sessions.

Publications

Steve Speich stated that the deadlines for the 1995 issues of Pacific Seabirds are April 5 and September 15. The latter deadline is earlier than usual so the issue can be mailed before the annual meeting in November. The editor wants people to respect these deadlines, so that the publication can be assembled and issued in a professional manner. No more major changes in its format are planned.

Back issues of Pacific Seabirds or special publications can be ordered from the Treasurer, except that those published by the Canadian Wildlife Service can be ordered from CWS.

A new PSG Technical Publication series is being initiated for peer-reviewed

papers that are too long to appear in Pacific Seabirds. The Council will approve manuscripts for appropriateness for the series. Expenses of publication will be paid by the authors. PSG symposia (special sessions held at annual meetings, with invited authors) will continue to be published in their own series, as before. Guidelines are being developed for editors of symposia.

Committees

Reports of several standing committees were presented at the Conservation Committee meeting. Scott Hatch reported that the Seabird Monitoring Committee has entered the first data in the monitoring database, mostly for Oregon. He has applied for funding from the National Biological Survey to develop the full database. A Japanese Seabird Conservation Committee was formed, and Piatt appointed Harry Carter as its chair. Carter and Piatt reported that PSG's moral support of research on the Japanese Murrelet has helped people who are raising issues of its conservation in Japan, and Japanese and American PSG members are proposing further work.

Ken Warheit was appointed chair of the Restoration Committee. A workshop will be held in Anchorage in September or October 1995 on all aspects of habitat and population restoration following oil spills. PSG has received a grant of \$77,000 from the Exxon Valdez Oil Spill Trustee Council to support the workshop.

It was discussed whether ad hoc committees (such as Publications and Baja California) should be officially created by the Council. It was agreed that this is not necessary, as long as the committee's duties are clearly prescribed in the Bylaws, or the committee's coordinator is officially appointed by the Chair.

Grants from PSG

PSG sometimes has small amounts of money (a few thousand dollars at most) to support research and other projects. Mechanisms for issuing grants were discussed. An application for a grant will consist of a brief

proposal, which should be submitted through an Executive Council member. The Council will consider all proposals; they will vote on proposals at regular Council meetings and may consider them at other times if necessary. Applicants are encouraged to obtain matching funds from other sources.

PSG provided a small grant last year to a research project in the Philippines.

Records of PSG policies

Several Council members felt that PSG's policies from past years, as expressed in Council decisions, resolutions, and decisions of committee coordinators, should be more easily available to future officers. At present they reside in a file box that passes from one Chair to the next. It was agreed that each Chair should summarize progress and commitments made during the year in a "Chair's notebook" and pass this on the next Chair. Other records will include the committee Chairs' reports to Pacific Seabirds.

Treasurer's report and financial matters

Ken Warheit reported on PSG's finances for 1994. For the first time, PSG has received considerable funding for specific projects: \$25,800 for the Restoration Workshop that was held at the current meeting in San Diego (\$15,000 from NAFTA funds through the U.S. Fish and Wildlife Service, the rest from private donors), and \$77,000 for the workshop in late 1995 (see "Committees"). Several Council members said it is important that expenditure of special funds be tracked closely, and that they be spent only on the purposes intended by the donors.

Warheit reported on the Endowment Fund. Investment of the Fund needs to be diversified; at present it is entirely invested in a single bond fund, whose value decreased recently along with the bond market in general.

PSG's institutional dues were raised from \$20 to \$25, and foreign dues were raised from \$25 to \$30. These increases are in line with last year's individual dues increase. Life memberships will be 30 times the current individual dues (although new life members were charged at the old rate during 1994—an unintentional bargain).

Fund-raising for PSG occupied considerable discussion, as usual. A prospectus is being developed so that potential

donors can easily get information on the projects they would be supporting and the way the organization is run.

Piatt reported that the policy that was instituted last year, under which various levels of expenditure require approval by the Chair, all officers, or the whole Council, has worked well.

Elections

Currently the entire burden of finding nominees for office each year and running the election seems to fall on the chair of the nominating committee. Doug Forsell suggested improving this system; a 2- to 3-member nominating committee will be sought. It was agreed that the Secretary would do mailings. An effort will be made to hold elections earlier than heretofore, preferably in spring.

Duties of the Treasurer

The Treasurer's job has become very time-consuming. The Council authorized spending \$700 for the Treasurer to hire an assistant (a student) who will handle the mailing list. The Secretary will take over some correspondence duties relating to memberships that the Treasurer has been performing.

Corresponding memberships

A new category of member was established, Corresponding Member. Up to 10 biologists in other countries will be invited to join PSG without paying dues; they will receive Pacific Seabirds, and they would write brief yearly reports on their work. The Council approved expenditure of up to \$200 per year to support Corresponding Memberships. Malcolm Coulter will coordinate.

Vivian Mendenhall, Secretary

Report of the Japanese Seabird Conservation Committee

At the January 1995 PSG meeting in San Diego, the Japanese Seabird Conservation Committee (JSCC) was officially formed to focus on the specific needs for seabird conservation and research in Japan. Despite strong economic ties between Japan and North America, barriers of geography, language, culture, and low funding for seabird work have limited development of seabird conservation and research in Japan and have limited international efforts in

Japan. Japanese biologists have not fully participated in Pacific-wide seabird conservation issues through involvement in PSG. The initial goals of the JSCC are

- 1) to help promote and otherwise assist seabird conservation and research efforts in Japan;
- 2) to encourage Japanese involvement in seabird issues throughout the Pacific Ocean through interaction, exchange and participation in PSG meetings and other PSG activities;
- 3) to help solicit funds for conservation and research efforts in Japan by Japanese and other members of PSG; and
- 4) to help solicit funds for attendance costs by Japanese biologists at PSG meetings.

Initial members of the JSCC are: Harry Carter (Acting Coordinator); Malcolm Coulter; Leah deForest; John Fries; Anthony Gaston; Craig Harrison; Hiroyoshi Higuchi; Jack Moyer; Yutaka Nakamura; Nancy Naslund; Leigh Ochikubo; Koji Ono; Kuniko Otsuki; John Piatt; Mark Raizon; Gus van Vliet; and Yutaka Watanuki.

Initial PSG efforts began in 1993 and 1994 and have involved joint research efforts in Japan (see PSG Bull. 20(2):14-17; PS 21(1): 17-21,25; and PS 21(2):13-17). Improved attendance of PSG meetings by Japanese biologists also has been an important achievement of initial PSG efforts in Japan which the JSCC continues to encourage. Dr. Yutaka Watanuki is currently playing an important role in the PSG Seabird Monitoring Committee. In January 1994, three Japanese biologists attended the Sacramento meeting and two papers were presented on Japanese seabirds. In January 1995, four Japanese biologists attended the San Diego meeting and four papers were presented on Japanese seabirds.

The JSCC will continue to identify prospective Japanese biologists to add to the membership of the JSCC and PSG and encourage attendance by Japanese biologists at the November 1995 meeting in Victoria, British Columbia, Canada, that will be held jointly by PSG and the Colonial Waterbird Society (CWBS). This meeting should be very interesting for Japanese PSG members who will have an opportu-

nity to interact with Canadian biologists as well as other PSG and CWBS biologists.

Immediate efforts of the JSCC will be focused on providing support for continued collaborative efforts by PSG and Japanese groups for conservation and research of the Japanese Murrelet (*Synthliboramphus wumizusume*). A report titled "Conservation of the Japanese Murrelet: Joint efforts by the Pacific Seabird Group and Japanese Research Groups in 1993-1994" has been prepared by PSG members Carter, Fries, Ochikubo, deForest and Piatt. This report is now undergoing final changes, based on reviews from Japanese collaborators. Once completed, it will be submitted to the PSG Publications Committee for further peer review, an assessment of publication costs, and consideration of publication funding options. The PSG Publications Committee has agreed to consider this report for possible publication. Future efforts of the JSCC should include many other issues in Japan.

At the January 1995 PSG banquet in San Diego, a total of \$440 was raised during the auction specifically for the "Japanese Initiative". Koji Ono donated several items for the auction. These funds were intended to assist joint efforts for the Japanese Murrelet and will be contributed to Fries and Ochikubo for their work in Japan with Japanese colleagues in 1995 (see below).

John Fries and Leigh Ochikubo will form the North American PSG contingent to continue joint research efforts on Japanese Murrelets in Japan in 1995. Fries will continue studies with Koji Ono (Toho University) and Yutaka Nakamura (Miyazaki Medical College/Wild Bird Society of Japan) at Biro Island (the largest Japanese Murrelet colony in the world), as well as conduct additional work on seabird conservation in Tokyo. Ochikubo will continue surveys and research in the Izu Islands with Dr. Masami Hasegawa (Chiba Natural History Museum and Institute), Dr. Jack Moyer (Miyakejima Nature Center), and others. Most costs of joint work in 1995 will be covered by Japanese funding obtained by the Japan Alcid Society, the Chiba Natural History Museum and other sources. However, Fries and Ochikubo have submitted a proposal to PSG for \$3,000 as a contribution to these efforts (about 35% of North American PSG contingent costs). In 1993, PSG previously contributed \$2,000 to North American PSG contingent costs. In 1994,

costs were covered by individual PSG members of the North American contingent.

The JSCC will continue efforts to help raise funds for seabird research and conservation in Japan. To date, the JSCC has received promises for personal donations totalling \$325 to provide support for Fries and Ochikubo in Japan in 1995. If you would like to make a personal contribution to PSG efforts for the Japanese Murrelet, please make out a cheque payable to PSG (indicate Japanese Murrelet on the cheque) and send it to the PSG Treasurer (see inside back cover of PS for address). Your donation at this time would greatly help this important project during a crucial time in its development.

The JSCC also will obtain funds for Japanese Murrelet efforts by obtaining donations to PSG in exchange for seabird books also donated to PSG. In 1995, all proceeds will go to support Fries and Ochikubo's efforts in Japan with Japanese colleagues. The following classic reference books on seabirds have been donated for this purpose with suggested donation amounts as follow:

Murphy, R.C. 1925. Bird islands of Peru. G.P. Putnam Sons, New York. ... \$200.00

Taverner, P.A. 1926. Birds of Western Canada. Victoria Memorial Museum Bulletin No. 41 \$80.00

Murphy, R.C. 1936. Oceanic birds of South America. MacMillan, New York (2 volume set) \$350.00

Jewett, S.G., W.P. Taylor, W.T. Shaw, and J.W. Aldrich. 1953. Birds of Washington State. Univ. Wash. Press, Seattle.. \$150.00

Warham, J. 1990. The petrels, their ecology and breeding systems. Academic Press, New York \$100.00

All books are in good condition. Before sending a donation to PSG, please contact the JSCC Coordinator (see inside back cover of PS) to ensure that the book is still available. Shipping costs will be determined once an order is placed and are not included in the suggested donation amounts indicated above. You can arrange for pickup at the next PSG meeting or otherwise if desired. Once shipping costs have been determined, you must send a cheque

payable to PSG (and indicate it as a donation for Japanese Murrelet work) to the PSG Treasurer. Donations to PSG are tax deductible. If you have classic reference books on seabirds or other similar items (that could be offered for donations or auctioned) that you would like to donate to PSG to help support efforts for the Japanese Murrelet or for other efforts in Japan, also contact the JSCC Coordinator.

Harry Carter, Acting Coordinator

Report of the PSG Seabird Monitoring Committee

The primary mission of the Seabird Monitoring Committee is to create and maintain a comprehensive database on seabird monitoring for the North Pacific. This database will incorporate observations on populations, productivity, survival, breeding chronology, and other parameters for all locations and species north of about 20° north latitude. Its a daunting task, but one we feel is doable given adequate financial support (more on this below), moral support, and ultimately a bit of hands-on commitment from seabird professionals working throughout this vast yet cohesive region. The committees activity is spearheaded by a group of regional delegates—one from each of the five Pacific states and from Mexico, British Columbia, Russia, Korea, China, and Japan. Regional delegates were identified in an earlier issue of Pacific Seabirds (volume 19, number 2, 1992); recent additions include Polo Moreno, University of California, Davis (Mexico), Cho Sam-Rae, Konju National University (Korea), Yutaka Watanuki, Hokkaido University, Sapporo (Japan), and Lu Jianjian, East China Normal University, Shanghai (Peoples Republic of China). Beginning this year, Ken Warheit has agreed to function on behalf of Washington state, relieving David Nysewander. For information and advice on how each of us can contribute to the realization of a working database, readers are urged to contact one of those regional delegates.

Last year, we introduced the work of the Seabird Monitoring Committee—its philosophy, agenda, and early results—at the North American Wildlife and Natural Resources Conference, held in Anchorage in March, 1994. Reprints of the published article are available on request (S.A. Hatch,

G.W. Kaiser, A.Ya. Kondratyev, and G.V. Byrd, A Seabird Monitoring Program for the North Pacific, Trans. 59th No. Am. Wildl. & Natur. Resour. Conf., 1994, pages 121-131).

Currently, the Pacific Seabird Monitoring Database contains some 715 observations in 180 time series. Eleven species are represented from 79 colonies in Oregon, B.C., Alaska, and Japan. Important additions during the year were 248 observations on Common Murres in Oregon (from Roy Lowe), 83 observations on 5 species in B.C. (20 time series from 5 locations contributed by Tony Gaston), and 29 observations on 5 parameters of Rhinoceros Auklets from Teuri Island, Japan (furnished by Yutaka Watanuki). Our immediate strategy is to collate as much information as possible from one broadly distributed and well-studied species—we've chosen the Common Murre—as a demonstration of the utility of the overall approach.

In 1992-1993, the committee conducted an extensive, albeit incomplete, survey of seabird monitoring effort in the North Pacific. We established that over 5,000 observations on population parameters already exist for 50+ species of North Pacific Seabirds, and 400-500 new observations are accumulating annually. The complete inventory of existing information undoubtedly includes more than 10,000 observations. Clearly, we have a long way to go in capturing this information and making it readily available to the biological and conservation communities at large. At a well-attended session during the PSG annual meeting in San Diego (10-13 January 1995), the group discussed various strategies for funding the efforts of the PSG Seabird Monitoring Committee and its many cooperators. A proposal for the Design and Implementaion of a Seabird Monitoring Database for the North Pacific has since been funded by the central office of the National Biological Service, Washington D.C. In February we learned that \$150,000 (about \$130,000 after overhead) is available to the project in 1995, thanks to a competitive redirection process instituted this year by the NBS. It is hoped that this level of funding will continue over at least the next 3 years. Mechanisms are now being explored to establish a grant or cooperative agreement between the NBS and PSG, whereby PSG would manage the majority of the funds and disburse them in a measured fashion to various third-party

cooperators. The idea is to compensate contributors for their time and trouble in cleaning up historical data and getting them into formats suitable for inclusion in the database. An important function of the PSG Seabird Monitoring Committee will be to prioritize and schedule data entry into the system and to negotiate the financial side with potential contributors. Under one scenario, the PSG could also employ one full-time data management technician to help the process along.

One of the important issues surrounding this activity is the question of data ownership, or what are sometimes referred to as intellectual property rights. The Seabird Monitoring Committee discussed this matter in San Diego, and also in Sacramento a year previously. It is important to realize that the database we are generating is not one among the current trend of so-called meta databases—a mere description of the location and attributes of data known to be out there and potentially available to users. While our inventory of seabird monitoring effort essentially constitutes such a meta database, the Pacific Seabird Monitoring Database itself is intended to contain the actual numbers—the distilled results of seabird monitoring effort made available directly to users. We are aware, however, of the problems this creates for some participants, and our proposed solution is as follows. Each record in the database, consisting of one annual observation on a given population parameter for one species and location, includes a data release code. Specific language has not yet been worked out to support the different levels of proprietary control that contributors may desire, but essentially we will offer options ranging from prohibition against any sort of publication without consent to the opposite extreme in which availability for any purpose would be wide-open. Every copy of the database will display through its interface the committee's ethical guidelines governing use of the data. In the most common sensitive case, authors of published scientific papers will be advised to insert in their text a statement such as the following: The analysis and conclusions contained in this paper are based in part on information obtained from the Pacific Seabird Monitoring Database. The authors have fully complied with published ethical guidelines governing its use. In brief, those guidelines would require that in each instance where a con-

tributor has requested he or she be consulted before publication, such contacts have in fact been made and permission obtained. Another guideline might be that when published sources besides the Seabird Monitoring Database itself exist, those sources should be cited in publications—as opposed to simply mentioning the database as one monolithic and essentially anonymous source. We assume that people generally would prefer to see the original documentation of their work cited in a conventional manner.

Obviously, anyone could choose to ignore and fail to acknowledge in writing the existence of these guidelines. However, since we expect the database and its rules to become well known throughout our profession, to do so would be a breach of professional conduct that would not likely go undetected or uncensored. Compliance might seem at first to be an onerous task, but in fact the process would be made as easy as possible. All the information needed to make contacts—names, addresses, phone numbers, etc.—will be at the users' fingertips, as will lists of relevant documentation—published and unpublished sources of data that should be consulted or cited. Experience indicates that a system of protections and procedures such as this will be essential to getting the cooperation we need.

In time, we expect that any controversy or individual concerns over data ownership will be dispelled as contributors realize they have much to gain and little or nothing to lose through participation in the program. Many important uses of seabird monitoring data do not involve publication, and the kinds of publications that may result from users accessing the database are unlikely, in most instances, to preempt any plans that contributors may have for their own data.

The Seabird Monitoring Committee welcomes input and advice from all interested parties on the ethical issues just raised or any other matter regarding development of the Pacific Seabird Monitoring Database.

Scott A. Hatch, Coordinator

Cepphus Discussion Group

Interest in and discussion of guillemots is increasing for many reasons. The Pigeon Guillemot is a species judged to be

not recovering from the *Exxon Valdez* Oil Spill. Guillemots belong to a widespread genus and have potential as monitors of conditions in the nearshore. Additionally, a study being conducted through Queen's University is examining worldwide guillemot genetics and requires the cooperation of all those doing fieldwork on the genus. Approximately fifteen people conducting studies of or interested in Black, Pigeon and Spectacled guillemots met at the PSG meeting in San Diego to discuss their research. They agreed that establishing a discussion group to increase the exchange of information on field techniques, research initiatives, and results would be worthwhile. To clarify the purpose of the group it was decided to call it the *Cepphus* Discussion Group to avoid confusion with those who refer to members of the genus *Uria* as guillemots. People conducting research on Black Guillemots in the Atlantic or Arctic oceans, areas typically outside PSG's realm, are encouraged to participate. Unlike the technical committees formed by the PSG Executive Council to coordinate research and conservation on murrelets, this group is not currently an official part of PSG.

A list of those people who have conducted or are planning research on *Cepphus* is being compiled by Lindsey Hayes (U.S. Fish and Wildlife Service, 1011 E. Tudor Rd., Anchorage, AK 99501; Phone 907-786-3694; hayesd@mail.fws.gov). Anyone who would like to be included on the mailing list who has not already done so should contact Lindsey. When appropriate include a short synopsis of past or current research. The fall issue of *Pacific Seabirds* will include a synopsis of information on current *Cepphus* research.

Pacific Seabird Group and Colonial Waterbird Society Meeting 1995

The Pacific Seabird Group and the Colonial Waterbird Society will hold a Joint Annual Meeting in Victoria, British Columbia, Canada 8-12 November 1995. This will constitute the Twenty-third PSG Annual Meeting.

The scientific meetings will be held in the new Conference Centre in downtown Victoria. The theme will be "Behavioral mechanisms of population regulation". Invited plenary speakers, workshops, paper

and poster sessions are planned for three days. Victoria is one of the best locations for birds in Canada and November is one of the best months to see them. Seabirds, seabirds, and marine mammals abound along the shores of Vancouver island. Field trips to see wildlife and take in the scenery are planned. An announcement and call for papers containing all necessary information will be mailed to PSG members in early summer.

The Local Committee Chairpersons are Rob Butler, Pacific Wildlife Research Centre, Canadian Wildlife Service, PO Box 340, Delta, British Columbia V4K 3Y3 Canada (604) 946-8546, fax (604) 946-7022, e-mail BUTLERR@CWSVAN.DOTS.DOE.CA and Ron Ydenberg, Department of Biosciences, Simon Fraser University, Burnaby, British Columbia V5A 1S6 Canada, (604) 291-4282, e-mail: ydenberg@fraser.sfu.ca

Scientific Program Chairs are William T. Everett, Western Foundation of Vertebrate Zoology, 439 Calle San Pablo, Camarillo, California 93012, Phone (805) 388-9944, fax (805) 388-8663, e-mail wteverett@aol.com and James Kushlan, Department of Biology, University of Mississippi, MS 38677, Phone (601) 232-7203, fax (601) 232-5144, e-mail: byjak@cypress.mcsr.olemiss.edu

Report of the Marbled Murrelet Technical Committee

January 1995 Meeting

MMTC members and others took part in the MMTC meeting at Pacific Seabird Group's annual meeting held in San Diego. About 70 people participated, important information was shared, and much was accomplished within MMTC subcommittees. Thanks to all who made presentations or participated.

Inland Survey Protocol Changes

There are two additions to the 1994 survey protocol (Methods for surveying Marbled Murrelets in forests, Ralph et al.): improved training methods and guidelines for the number of site visits to determine murrelet presence or occupancy at survey sites. If you have not received these additions and would like to contact CJ Ralph, USFS, Redwood Sciences Laboratory, 1700 Bayview Drive, Arcata, CA 95521, 707-822-3691.

Marbled Murrelet Recovery Team—U.S.

A final internal review of the Marbled Murrelet Recovery Plan has been completed. The new version is expected to be out for public comment in the near future.

Marbled Murrelet Recovery Team—Canada

The Recovery Team submitted Marbled Murrelet habitat guidelines for coastal forests of British Columbia to be incorporated into the new BC Forest Practices Code last November. They are currently waiting for a response.

Publication and Report Updates

Biology of Marbled Murrelets: Inland and At Sea (S. Kim Nelson and Spencer G. Sealy, Eds.) is being published in *Northwestern Naturalist*. It is in press and is expected to be out within the next few months. Copies will be available for purchase from PSG.

Ecology and conservation of the Marbled Murrelet in North America: an inter-agency scientific evaluation (C.J. Ralph, G.L. Hunt, Jr., M.G. Raphael, and J.F. Piatt, Eds.) is expected to be out by early May. To obtain a copy contact: USFS Pacific Southwest Research Station, Publications Distribution, P.O. Box 245, Berkeley, CA 94301. Ask for PSW-GTR 152.

Nancy Naslund, Coordinator

PSG Corresponding Members

At the last Executive Council Meeting (January, 1995), it was approved to offer Corresponding Memberships to a limited number of people, particularly in developing countries and in areas where little is known of the status of seabirds, in order to increase cooperation with PSG. With acceptance of these memberships, the Corresponding Members agree to write articles for *Pacific Seabirds* at least every two years and we hope that will lead to increasing involvement. Mark Rauzon has asked me to manage this effort for PSG.

Five Corresponding Members have been proposed: one in Chile, two in the Philippines, one in the Democratic People's Republic of Korea and one in the People's Republic of China. We look forward to increased cooperation with these individu-

als and greater involvement of PSG in these countries. If you would like to nominate individuals, please send your suggestions to: Malcolm Coulter, P.O. Box 48, Chocorua, New Hampshire 03817 USA.

Nominations for the 1996 Pacific Seabird Group Lifetime Achievement Award or Special Achievement Award

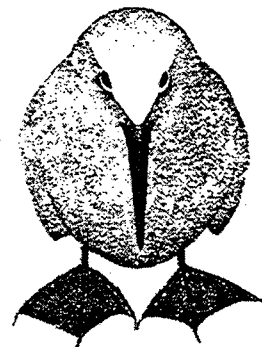
Please send your nomination for the 1996 PSG Lifetime Achievement Award or a Special Achievement Award to the PSG Chair (Mark Rauzon) by 30 May 1995. Please prepare a short 1-page description of the individual's contributions to the study and conservation of Pacific seabirds for review by the PSG Executive Council. If your nominee is selected, you must be prepared to conduct a short presentation at the November 1995 PSG/CWBS meeting in Victoria, British Columbia, and write a summary of the individual's achievements for *Pacific Seabirds*.

Submission Deadline for Pacific Seabirds

The submission deadline for the fall issue of *Pacific Seabirds* is September 15, 1995. This deadline is earlier than usual so that *Pacific Seabirds* can be circulated before the fall meeting. Please keep this in mind and get your reports, articles, and new items in early.

Call for Manuscripts

Pacific Seabirds is interested in articles, technical reports, and other notes of interest. Please submit manuscripts to Steve Speich, Publications Committee coordinator before the September 15 deadline.



DR. Miklos D.F. Udvardy Receives Lifetime Achievement Award

The Pacific Seabird Group presented the Lifetime Achievement Award to Miklos D.F. Udvardy at its Twenty-first Annual Meeting in Sacramento, California, January 1994. This was the second such presentation; the first was presented to Karl W. Kenyon. The award was presented to Dr. Udvardy during the banquet, after a presentation of his lifetime of achievements, and was followed by a short lecture by Dr. Udvardy.

Dr. Udvardy has always been a global traveler. He was born in 1919 in Hungary, where he remained until after the end of World War II (1948). He earned a Doctorate Degree for his study of the ecogeography of birds of Hungarian grasslands which launched him into his primary lifetime area of intellectual investigations, that of biogeography.

In 1948, he moved to Finland, where he began a two-year post doctorate program focusing on thermoregulation of birds and body temperature, and where he formed his continuing friendship with Lars von Haartman. This period was followed by two years in Sweden, where he worked on eco-physiology of birds at the University of Uppsala, and where he studied tunicates of the Swedish Antarctic Expedition of 1901/1902 at the National Museum. During this period, he met and married Maud, his wife, companion, friend, and supporter of 44 years, and mother of their three children.



In 1951, the Udvardys left Europe for Toronto, Canada. He was soon successful, presenting ten lectures at the University of Toronto for the sum of \$200.00. He also found work with the Fisheries Research Board of Canada in Toronto and then again in Vancouver, British Columbia, at the University of British Columbia, where he remained for several years. In 1965, he, Maud, and their children became naturalised United States citizens.

Dr. Udvardy has been a visiting lecturer at several institutions, including the University of California Los Angeles (UCLA) and University of California Santa Barbara. While at UCLA, he met and became friends with George Bartholemew and Thomas Howell. In 1966, he accepted a faculty position at California State University Sacramento, where he remained until his retirement in 1992. During this time he held temporary faculty positions in Bonn, Germany and Honduras as a Fulbright Scholar.

There are two academic periods in Dr. Udvardy's career that stand out. The first was at the University of British Columbia, where he guided and influenced a group of students (J. Bedard, R.H. Drent, M.T. Myres, S.G. Sealy, G.F. Van Tets, and K. Vermeer), many of whom worked on marine bird projects, including studies on Mandarte Island and in the Queen Charlotte Islands, British Columbia, and St. Lawrence Island, Alaska. Other students included A.J. Erskin, P.R. Grant, O. Horvath, K.E. Kelleher, W.D. McLaren, L. Reffalvi, M.H.W. Skirrow, S.M. Smith, F.S. Tompa, and N.A.M. Verbeek, and, later on, R. W. Campbell, H. Carter, and D.N. Nettleship. Dr. Udvardy was also influential in the establishment of the British Columbia Nest Record Card Scheme, now a major source of information on the breeding distribution of British Columbian birds. The second significant period was while he was on the faculty of California State University Sacramento, where several stu-

dents (R.L. Knudsen; L.D. Krasnow; R.C. Lee; R.F. Pierotti; and S.M. Speich) worked with him on marine birds. In total, Dr. Udvardy guided 26 students to master's degrees and 6 to doctorate degrees.

Dr. Udvardy is one of those individuals whose domain is the literature of the world, an interest no doubt aided by his fluency in six languages and ability to read at least thirteen. He has traveled on all the continents and visited scores of countries where he has lectured and attended a multitude of meetings, conferences, and congresses. Dr. Udvardy has served on the boards of several scientific organizations and is a member of a variety of scientific societies. He has received numerous honors. In total, he has published nearly 200 works, including reviews, notes, papers, reports and four books, published in several languages. His main fields of interest are biogeography, ornithology, physiology, ecology and ethology, and he is especially interested in the ecobiogeography of the continents. Of particular interest to students of marine birds, and what can now be regarded as a classic paper of marine ornithology, is his 1963 publication, *Zoogeographical Study of the Pacific Alcidae*. *Dynamic Zoogeography*, published in 1969, demonstrates Udvardy's understanding of the world literature not only of birds, but also of insects, plants, and of all life forms and the evolutionary process. Dr. Udvardy is truly a scholar of the world's biological literature, the product of an era of discipline and circumstances perhaps forever vanished.

After a lifetime of lecturing and writing away from his native Hungary, Dr. Udvardy was able to resume visits to Hungary in 1974, when Hungary regained its freedom. His native country presented him an Honorary Doctorate in 1990, and in 1993 he was elected a member of the Hungarian Academy of Sciences.

Today Dr. Udvardy continues his intense intellectual activities and is now completing work on a revision of the biogeographic provinces and subdivisions of the world. When not traveling, he can usually be found at home in Sacramento or on his ranch in the foothills of the Sierra Nevada, accompanied by his charming and gracious wife, working on projects, reading, writing, and enjoying the visits of his friends, children, and grandchildren.

S.M. Speich

Conservation News

Seabird Conservation 1995

Craig S. Harrison, Vice-Chairman for Conservation

The Conservation Committee continues its efforts to implement programs to eliminate alien predators from colonies. The most time-consuming activity in 1994 was planning a Symposium and Workshop on Restoration of Island Biodiversity, Baja California and the Gulf of California and raising \$24,000 to allow Mexican biologists to attend. Mark Rauzon, Bill Everett and Polo Moreno-Matiella were instrumental in this work. The International Office of FWS granted PSG \$15,000 to support travel costs, and we raised an additional \$9,000 from individuals. In 1993 we began PSG's Mexican initiative by working with the American Ornithological Union and other organizations to ask FWS and SEDESOL (Mexico's wildlife agency) to establish a program to identify seabird colonies in Mexico whose populations are limited by alien predators and to remove the predators. The Mexico Committee formed at the San Diego meeting and will now take the lead in conservation activities in Mexico.

The Conservation Committee has remained active with regard to the *Exxon Valdez* Oil Spill (EVOS) restoration. We commented on the draft Restoration Plan and draft programmatic environmental impact statement in July 1994. Among other things, we (1) agreed with the trustee council's habitat and acquisition protection policies; (2) endorsed monitoring and research (while urging the trustee council to respect its own policy that agencies will be funded only for restoration work that they do not normally conduct); and (3) agreed that manipulation of the environment is a useful restoration activity if it involves removing rats, foxes and other alien creatures from colonies as compensatory restoration. At PSG's urging, the final restoration plan allows restoration outside the spill area with respect to seabirds "when the most effective restoration actions for an injured migratory population are in part of its range outside the spill area." Finally, we sug-

gested that the trustee council's focus on Common Murres, Harlequin Ducks, Marbled Murrelets and Pigeon Guillemots is too limited because many other species were injured. The final Restoration Plan allows restoration of any species that was injured by the oil spill.

PSG applied for a grant of \$77,000 from the EVOS Trustee Council to organize a Symposium on Seabird Restoration in autumn 1995 in Alaska to discuss the science of seabird restoration. We intend to (1) identify and evaluate the techniques that can be used to restore seabird populations injured by oil spills; and (2) gather knowledgeable scientists from throughout the world to attend and participate in discussions. The Trustee Council agreed to fund PSG's proposal in November 1994. The Executive Council established a Restoration Symposium Steering Committee to make all decisions that are necessary to fulfill PSG's agreements with the EVOS trustees, and is comprised of Craig S. Harrison (Project Co-leader), Kenneth Warheit (Project Co-leader), Mark Rauzon, William T. Everett and John Piatt.

We also commented on the draft restoration plan (March 1994) for the *Nestucca* oil spill and supported (1) improving habitat for seabirds on Destruction Island by removing alien rabbits; (2) educating boaters regarding disturbance to seabird colonies; (3) delineating seabird mortality from net fisheries; and (4) monitoring Common Murre attendance at Washington colonies to evaluate restoration actions. In December we collaborated with the Restoration Committee to comment on the draft restoration plan for the *Apex Houston* oil spill in central California.

At the request of the House Merchant Marine Committee, we advised Congress on seabird-fishery issues and commented on a draft bill entitled Migratory Bird and Habitat Conservation Act of 1994. This legislation was not enacted, but would have directed FWS to remove predators from refuge islands and would have asked FWS and the National Marine Fisheries Service to prepare a report to Congress concerning the take of seabirds in commercial fisheries in the U.S. Exclusive Economic Zone.

Other activities of the Conservation Committee include

- Coordinating with Bill Everett and the Xantus' Murrelet Technical Committee to

(1) provide advance notice to FWS and the State of California of PSG's intention to petition to list this species (March 1994) and (2) communicating PSG's recommendations on the interim management of this species to the superintendent of Channel Islands National Park (August 1994);

- Successfully working with the Old Harbor Native Corporation in asking the EVOS Trustee Council to purchase its seabird islands near Kodiak;
- Assisting the chief scientist of the EVOS Trustee Council by submitting names of biologists to serve as peer reviewers of seabird projects to ensure the trustees use the best available science in making restoration decisions;
- Commenting on the draft 1995 work plan for *Exxon Valdez* Oil Spill projects;
- Asking the FWS Regional Director in Alaska to prepare a plan that outlines a comprehensive approach to removing all exotic predators from seabird islands in Alaska;
- Unsuccessfully requesting funds from the *Exxon Valdez* Oil Spill Trustees to develop a predator plan;
- Writing the East Bay Conversion and Reinvestment Committee, mayor of Alameda and Congressman Ronald Dellums to ask that Least Terns, Caspian Terns, Snowy Plovers and Western Gulls at the Alameda Naval Air Station be protected and maintained after the base closes;
- Asking FWS, the Bureau of Indian Affairs and Washington Fish & Game Department for an opportunity to comment on protocols that estimate the incidental take of murres and Marbled Murrelets in fisheries off the coasts of Washington or Oregon;
- Asking Interior Secretary Babbitt to enforce the Migratory Bird Treaty Act in the 200-mile Exclusive Economic Zone;
- Persuading ICBP to testify again to the House Appropriations Committee in support of funds to remove alien predators from Isla Clarión and North Coronado Island, Mexico. This would allow Xantus' Murrelets, Townsend's Shearwaters and Ashy Storm-Petrels to resume normal breeding;
- Asking FWS and NOAA to support a multi-site and multi-resource sanctuary in Hawaii that would provide comprehensive and coordinated protection for a marine ecosystem, including seabirds;
- Successfully renominating Jim King to continue to serve on the Public Advisory Group to the EVOS Trustee Council.

Anticipated Activities During 1995-1996

The Conservation Committee cannot predict in detail its activities during the coming two years. Whenever there are opportunities to influence federal or state land management or ocean management programs that affect seabirds, the Conservation Committee will provide PSG's perspective and expertise.

The Committee will continue its program to encourage federal and state governments and private entities to remove alien predators from seabird colonies in the Pacific. This includes communications with Congress, senior officials at the U.S. Department of the Interior and FWS, FWS regional directors, and refuge managers. We may communicate with state officials in appropriate circumstances. In this regard, we intend to resubmit our request to the *Exxon Valdez* Oil Spill Trustees and foundations to develop a predator management plan in Alaska.

If the Mexico Committee believes that it would be useful, we will continue to raise funds for conservation projects in Mexico in 1995 and establish a small grants program that would be administered in conjunction with the Mexico Committee.

We ask PSG members to bring important issues to the Conservation Committee in a timely manner, to volunteer to review documents, and to assist the Committee in drafting PSG letters.

Marbled Murrelet Habitat Threatened

The House of Representatives passed a bill in the house that will allow logging of occupied Marbled Murrelet sites on U.S. Forest Service (USFS) lands in Oregon, Washington and California. Rep. Bunn (R-Corvallis) added a rider to a Salvage Logging Bill (part of the Contract with America Recession Bill) that would allow logging of the 318 Timber Sales (1989 Hatfield-Adams Rider). The rider allows logging of these sales without regard to any environmental laws and prevents public appeal. The 318 sales were sold and awarded in 1989 and 1990, but were held up when the Marbled Murrelet was listed as threatened by the U.S. Fish and Wildlife Service (USFWS) in 1992. Subsequently, the USFWS decided that logging these sales would jeopardize the survival and recovery of the

murrelet. The USFS had been negotiating to buy back the sales from the purchasers when Congress intervened. The bill will go to the Senate in mid-March and then to President Clinton.

Tenyo Maru Oil Spill Restoration

A settlement between the Natural Resource Trustees and the parties potentially liable for the Tenyo Maru oil spill was finalized in December 1994. The settlement agreement allocates \$5.2 million for natural resource restoration. The Tenyo Maru Trustee Committee was established to draft and implement, a natural resource restoration plan. The Trustee Committee is composed of representatives of the National Oceanic and Atmospheric Administration, the Department of the Interior, the State of Washington, and the Makah Tribe. The Committee is in the process of reviewing projects to be included in a draft restoration plan. The present schedule calls for a public scoping process to occur in June 1995, followed by release of a draft restoration plan on 15 October 1995. The final restoration plan is currently targeted for release in June 1996.

Nestucca Oil Spill Restoration

The Nestucca Oil Spill Restoration Plan is scheduled to be finalized by mid-April 1995. Three of the preferred alternatives, Net Fishery Investigation, Education, and Monitoring, require minor modifications and will be implemented during this fiscal year. A more detailed Environmental Assessment will be conducted for the Destruction Island Habitat Improvement alternative.

Cormorant Hazing

A bill has recently been introduced to the Oregon Legislature that would legalize hazing of all cormorants on estuaries in Tillamook County, Oregon. Senate Bill 707 sponsored by Senators Kintigh and Bunn, and representatives Federici, Josi, and Tarno would declare an emergency, effective on passage, relating to protection of juvenile salmonids. Apparently, sport fishing enthusiasts have decided that cormorants are

harming salmon runs in Tillamook County by preying on smolts. This is not a new issue, but one that has been on going since at least the late 1980's. According to statements in an article in *The Northwest Steelheader*, a publication by the Association of Northwest Steelheaders, an apparent unauthorized hazing program has been ongoing in Tillamook County. This bill would legalize the hazing program by the issuance of up to 3 permits to fishermen to haze cormorants and directs the State Fish and Wildlife Commission to pay the fishermen up to \$120,000 per year out of the State Wildlife Fund, to conduct this program. Section 3 of this bill states, "This Act being necessary for the immediate preservation of the public peace, health and safety, an emergency is declared to exist, and this Act takes effect on its passage."

Chinook salmon smolts have one of the longest estuarine residency times ranging from 3 weeks to more than 3 months. If cormorant predation in these estuaries is a serious problem, it should be reflected in this species. Interestingly, chinook salmon populations in Tillamook County are one of the few current salmonid success stories with either stable or slightly increasing populations. This bill apparently does not have the support of the Oregon Department of Fish and Wildlife.

Status of the Common Murre

The U.S. Fish and Wildlife Service is in the process of preparing a working report on the status of the Common Murre in California, Oregon, Washington, and British Columbia. The report will summarize information on life history; population and habitat trends; conservation and management issues/concerns; and monitoring and research needs. This effort is being coordinated by Tara Zimmerman in the USFWS Portland Regional Office (503) 231-6164. If you have unpublished data and observations that would be useful for this project, please contact Tara.

Seabird Take Washington Gillnet Fisheries

Observer programs to monitor entanglement of seabirds in gillnet and purse seine fisheries were conducted during the

summer of 1994. The observer program was utilized in the August sockeye salmon fishery in north Puget Sound (Areas 7/7A) and fall chum salmon fisheries in Hood Canal and central Puget Sound. Funding was provided by the National Marine Fisheries Service and the Washington Department of Fish and Wildlife with local tribes implementing the programs. One marbled murrelet was entangled but released alive in the 7/7A sockeye gillnet fishery. The estimated number of murrelets entangled was 15 (range=2-59) for the combined non-tribal and tribal fishery. In the non-tribal fishery only, the estimated number of common murrelets entangled in Area 7 was 2,532 ($r=342-4,722$) and 181 ($r=78-283$) in Area 7A. The estimated number of rhinoceros auklets entangled was 656 ($r=396-916$) in area 7 and 131 in ($r=19-243$) in Area 7A. Total seabird entanglement was 3,224 ($r=982-5,466$) in Area 7 and 345 (184-505) Area 7A. This was probably a year of low bird entanglement since the large influx of murrelets observed in 1993 did not occur, and the San Juan Islands (Area 7) were closed to fishing by the nontreaty fleet after the third week of five week season. Area 7 is typically where were bird/gillnets conflicts are highest. In the purse seine fishery, minor bird mortality and no marbled murrelet mortality was observed. No marbled murrelet mortality was observed in the chum fisheries either and an estimate of total seabird mortality is not available, but entanglement rates were lower than in the Area 7 fishery. A pilot study of alternate gear was also conducted, which suggested that testing of a 10" visible mesh panel in the top 15 ft. of the net merited further testing. The multi-filament net, which has been suggested by some groups as reducing bird entanglement, entangled similar numbers of birds as single-strand monofilament in the pilot study.

Based on murrelet distribution data collected by Washington Department of Fish and Wildlife since 1993, WDFW is proposing closures of the majority of the areas with significant numbers of murrelets, primarily with closures extending out 1500 feet from the shoreline. These should provide significant benefits to marbled murrelets, although they do not contain common murre and rhinoceros auklet concentrations. Hood Canal has been closed within 1,000 feet of the eastern shoreline for the past two seasons as a coho salmon

protection measure, based on observations during the Puget Sound Ambient Monitoring Program and the 1994 fisheries observer program, it was evident that this closure also benefits murrelets.

Given the precarious status of the Washington common murre breeding population, estimated at about 3,000-7,000 birds, the entanglement of an estimated 2,532 murrelets in Washington last year is a serious problem.

The WDFW and the USFWS are continuing to look at measures that would address seabird take. Funding for a gear testing proposal, which will test the 10"

visible mesh panel more rigorously, is being pursued for this year. At the same time, a group in Washington called Save Our Sealife is attempting to get an initiative passed that would impose strict bycatch standards on the fisheries. It is a fairly complicated initiative put forth by fishing interests. In essence, under this initiative if a fishery couldn't meet the bycatch standards they wouldn't be allowed to fish, unless the fishery is for salmon that is more important commercially than the bycatch. The director of WDFW could then liberalize the bycatch standards.

Pacific Seabird Group & Colonial Waterbird Society Meeting 1995

The Pacific Seabird Group and the Colonial Waterbird Society will hold a Joint Annual Meeting in Victoria, British Columbia, Canada 8-12 November 1995. This will constitute the Twenty-third PSG Annual Meeting.

The scientific meetings will be held in the new Conference Centre in downtown Victoria. The theme will be "Behavioral mechanisms of population regulation". Invited plenary speakers, workshops, paper and poster sessions are planned for three days. Victoria is one of the best locations for birds in Canada and November is one of the best months to see them. Seabirds, seaducks, and marine mammals abound along the shores of Vancouver island. Field trips to see wildlife and take in the scenery are planned. An announcement and call for papers containing all necessary information will be mailed to PSG members in early summer.

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Scientific Program Chairs are William T. Everett, Western Foundation of Vertebrate Zoology, 439 Calle San Pablo, Camarillo, California 93012, Phone (805) 388-9944, fax (805) 388-8663, e-mail wteverett@aol.com and James Kushlan, Department of Biology, University of Mississippi, MS 38677, Phone (601) 232-7203, fax (601) 232-5144, e-mail: byjak@cypress.mcsr.olemiss.edu.

Regional Reports

PSG members are urged to send information on their activities to their regional representatives. Addresses and phone numbers of regional representatives are listed on the back inside cover of each issue of Pacific Seabirds.

Canada

As the last Canada report was mainly about the Pacific coast, this one deals mainly with the Atlantic and Arctic (we have 3 oceans in Canada, remember).

On 7-8 March the Canadian Wildlife Service SEABIRD COMMITTEE met at the Bedford Institute of Oceanography, Dartmouth, Nova Scotia to consider future strategies for seabird research and monitoring. The following were present: Peter Blancher (Headquarters, Ottawa), Hans Blokpoel (Ontario Region, Ottawa), Birgit Braune (HQ), Neil Burgess (Atlantic Region, Sackville), Gilles Chapdelaine (Quebec Region, Quebec City), John Chardine (Atlantic Region, St. John's, Newfoundland), Richard Elliot (AR, Sackville), Eric Hiscock (AR, Dartmouth, Nova Scotia), Tony Gaston (HQ), Tony Lock (AR, Dartmouth), David Nettleship (AR, Dartmouth), Peter Wells (AR, Dartmouth), Mary Wyndham (HQ). The C.W.S. staff were joined by Bill Montevecchi, of Memorial University, Newfoundland and Tony Diamond and Phil Taylor, of the Atlantic Cooperative Wildlife Ecology Research Network (ACWERN)

The first day was devoted to discussing a more ecosystem oriented approach to CWS research. Richard Elliot presented the management view, outlining the dominant themes of ecosystem management, and the science components of an ecosystem approach. Research groups need to rethink how they do business, and examine how they might work more cooperatively with other biologists involved in related aspects of the same ecosystem. The approach will be broader than in the past, and will involve collaboration with biologists in other areas such as plants, water, toxicology and communities.

John Chardine presented summaries

of ecosystem changes and seabird studies (1990 to present) in Newfoundland. There is concern over the declining capelin stocks, the simultaneous crash of several ground-fish stocks, the breeding failure in r-selected surface feeders (such as the Black-legged Kittiwake and *Larus* gulls), and the decrease in murre numbers in eastern bays (from Nov. to Mar.). The decline of the capelin is may be linked to a decrease in salinity resulting from a North Atlantic Oscillation (NAO) anomaly (decreased water temperatures off Labrador and the east coast of Newfoundland). Capelin spawning has become less synchronous since 1991. The finding of smaller sized capelin in the food loads of Atlantic Puffins in Newfoundland illustrates the importance of taking an ecosystem approach in marine bird studies.

Seabird evidence for ecosystem changes off Newfoundland were presented by Bill Montevecchi who suggested that surface feeders could not access capelin stocks in recent years, because of a thermal barrier of warm water. Black-legged Kittiwakes would make a good index to test this. The effects of oceanography on bird populations are not well understood, but the scale of declines in surface feeders is too large to be accounted for by fisheries alone. Bill continues to monitor seabirds as indicators of change in marine ecosystems.

Tony Diamond described the structure of the Atlantic Cooperative Wildlife Ecology Research Network: a network including three universities: Univ. of New Brunswick (senior chair, Tony Diamond), Acadia (chair Philip Taylor) and Memorial University of Newfoundland (chair Ian Jones), funded by the CWS and NSERC for five (renewable) years. The main focus will be on birds as indicators of ecosystem stress (although other animals will be used when they are better indicators). The three major research areas are forest wildlife ecology, seabird ecology, and conservation biology. Some ongoing studies that are benefiting from ACWERN resources involve monitoring of tern and puffin productivity; translocation of puffins from Newfoundland to smaller islands; studies of brood survival of eiders; and interactions of gull, eider, and herring populations.

Philip Taylor described how landscape ecology links the knowledge gained at fine spatial scales to larger spatial scales. Individual organisms, whether vertebrate

or invertebrate, respond to changes in ecosystems in similar ways. Looking at the larger picture will indicate if observed trends are occurring throughout a whole system, or if they are just localized events. In this context, Philip hopes to begin research on the metapopulation dynamics of terns in the Bay of Fundy and Gulf of Maine.

Ian Jones, previously with the Cooperative Wildlife Chair at Simon Fraser University, British Columbia, will shift to Memorial University this summer and proposes to develop a long term study of seabird behaviour in relation to changes in marine ecosystems, based either in southeast Newfoundland, or on the Gannet Islands, Labrador, where a detailed baseline is available from studies carried out by Tim Birkhead and David Nettleship in the 1980s. This summer, he proposes also to visit the remote murre and fulmar colony at The Minarets, Baffin Island, along with Grant Gilchrist, newly hired as a seabird biologist by the CWS Yellowknife office.

Discussion followed on research needs for the next five years. Some familiar arguments were rehearsed. If detailed studies are to be conducted in the context of the ecosystem, do we need annual monitoring at a limited number of key sites? What is the best measure of ecosystem health - bird population numbers, prey availability, adult survival rate, or bird body condition? Should we concentrate on a particular trophic level, such as species at the top of the food web? The consensus was that the management questions had not been defined sufficiently clearly to allow rational research priorities to be generated. However, if seabirds are going to be used as indicators of large-scale oceanographic processes, then annual monitoring of species from different trophic levels and at different sites is desirable. The particular species monitored would vary regionally, but would be characteristic of the same trophic levels. Species considered included Black-legged Kittiwake, Atlantic Puffin, Northern Gannet, storm-petrels and cormorant species. The following sites were discussed: Arctic Canada: Prince Leopold I., Coburg I., Digges Is., Cape Hay; Labrador/Newfoundland: Gannet Is., Funk I., Wadham Is., Witless Bay, Baccalieu I., Cape St. Marys; Gulf of St Lawrence: Bonaventure I., Bird Rocks, Kouchibouguac, Mingan I., Corossol I., other north shore islands; Bay of Fundy: Machias Seal I., Peters I., The Brothers.

Gilles Chapdelaine described the situation at Bird Rocks, an important gannetry and Federal Migratory Bird Sanctuary in the Gulf of St. Lawrence, where a local tour operator had applied for a permit to develop a hotel. The developer had already renovated the existing lighthouse buildings, vacated as a result of automation. He proposed to bring tourists in by helicopter. As the island is only about 400 m across, disturbance to nesting birds seemed inevitable. The committee forwarded a unanimous resolution to the director for Quebec Region, recommending that permission for this development be denied and suggesting boat tours as a more appropriate means of providing tourist access. We have since hear that the permit has been refused.

Peter Wells outlined the current approaches to, and structure of, European and North American monitoring systems for marine ecosystems. The quoted statement "there is no single magic set of ecosystem health indicators applicable to all marine (coastal) ecosystems" reiterates that the question being asked will determine the method to be used. Selection criteria for ecosystem level measures include a high signal to noise ratio and a rapid response rate. More work is needed in developing a suite of techniques that would work at the population and community level.

Monitoring populations of seabirds in arctic and eastern Canada was addressed by **David Nettleship**, who reviewed the objectives and achievements of the CWS monitoring program to date. The priorities of the monitoring program for the next five years will reflect the new (ecosystem) approach.

John Chardine described current monitoring in relation to offshore oil developments and pollution. There is a high probability that the carcass of a bird oiled at sea will not be found. Nevertheless, since 1980 over 6000 seabird carcasses have been collected, mostly through Beach Bird Surveys (now part of Operation Clean Feather). Data from these carcasses have been computerized. He queried, given the problems in estimating mortality due to oil pollution, the problems in generating an index of absolute levels of mortality, and the problems in monitoring oil pollution from offshore developments, whether there was any justification for continuing the surveys? The consensus from discussion was that monitoring should continue, as offshore

developments in Atlantic Canada (e.g. Hibernia) will likely result in increased rates of oiling, especially as a result of increased transport. An index of the rate of oiling of birds is also an index of the rate of oil pollution.

Monitoring of contaminants in seabirds in Arctic Canada was described by **Birgit Braune**. There is concern that organic contaminants and heavy metals in arctic seabirds may pose a health risk to people who eat them. A 1993 study of contaminant loading in eggs and chicks of three seabird species breeding in arctic Canada showed that PCB and DDE levels in seabird eggs are continuing to decrease or have stabilized. The source of most arctic contaminants observed is atmospheric deposition from SE Asia. **Glaucous Gulls** have higher OC levels, perhaps because they are in a higher trophic level than the other two species studied. Lead and cadmium levels in chicks are greater than in eggs, therefore the chicks are taking these in locally.

Neil Burgess described monitoring of contaminants in seabirds in Atlantic Canada. The programme was originally initiated in response to the serious declines observed in some species in some sites (such as **Northern Gannets** on Bonaventure Island). The program monitors levels of DDE, PCBs and other OCs, as well as heavy metals, in three species (**Storm Petrel**, **Atlantic Puffin**, and **Double-Crested Cormorant**) in three areas (St. Lawrence, Bay of Fundy, and Newfoundland). Of the OCs found in eggs, about 75% is PCB and the rest is mostly DDE. The OC levels in eggs have been fairly constant since the mid-80s, and are higher in the St. Lawrence and Bay of Fundy. DDE and PCB levels in birds have continued to decrease since the 70s. They are similar in cormorants and petrels, and lower in puffins. High cadmium levels in petrels, and high mercury levels in cormorants, may be having toxic effects.

In discussion, both Birgit and Neil asked the Committee to consider whether further routine monitoring for contaminants was justified, now that contaminant levels have stabilized. The chemical analyses are very expensive. It was agreed that collection of eggs and tissues should continue on an opportunistic basis, and that these samples would be stored in the data bank until needed (bearing in mind that freezer space is limited).

Tony Lock showed his recently produced *Atlantic Seabird Gazetteer*, which provides all the information non-seabird biologists such as the Coast Guard and environmental impact assessors need to know about seabird populations in Atlantic Canada. It required the packaging of many pre-existing databases and is produced in shocking colour - giving a very striking message. Future work will involve inclusion of additional data such as **Richard Brown's** and the offshore transects from the aerial dataset and integration of data from Manomet Observatory.

An update on seabird programs in Quebec was given by **Gilles Chapdelaine**. Analysis of data from gannet surveys in Newfoundland and the Gulf show that the gannet populations are still increasing. No problems are evident from either productivity studies or analysis of contaminants in eggs. On the North shore of the Gulf of St. Lawrence, a **Razorbill** banding program begun in 1986 will continue for at least another year. An investigation into the population explosion of **Double-crested Cormorants** in the Estuary of the St. Lawrence has shown that capelin is the most important food item for this species. To improve the productivity of terns, those gulls which specialized in predated on tern chicks were removed at one colony. Tern productivity increased from 0 to 30%, and would have been higher, except that it took time to identify which gulls were the specialists. Last summer, over 10,000 **Ring-billed Gull** eggs were removed from an industrial site in Quebec City, considerably reducing nuisance problems. The citizens of the city were pleased with this result and want to have the work repeated this summer.

Hans Blokpoel gave an update on Great Lakes seabirds. A phoenix wailer (siren) was tested as a gull deterrent, but had no effect on the birds. Reef rafts are being developed as **Common and Caspian tern** nesting sites. Three artificial rafts will be created in Hamilton Harbour, as part of that city's remedial action plan. The rapid increase in the number of cormorant colonies is resulting in the use by cormorants of trees where **Blue Herons** used to nest. Cormorant populations are coming under fire (literally) from sport fishermen who hold them responsible for declining salmonids, despite evidence that their effect is negligible.

There is concern for **Black Tern** populations. Small nesting platforms were

erected for them in the Bay of Quinte area, to provide nesting habitat for individual pairs. These have not been used, probably because the population in that part of Lake Ontario is in serious decline. More work is needed on Black Terns, but they are difficult to survey. The rest of the Great Lakes waterbird atlas will be published as the last two of five reports. Problems with Ring-billed Gulls seem to have stabilized in some areas, because of control programs in place. A video is being produced to offer advice to members of the public experiencing gull nuisance problems.

Tony Gaston briefly described the work of the Laskeek Bay Conservation Society in British Columbia. This group, based in the Queen Charlotte Islands, is attempting to build a bridge between scientists and public by carrying out seabird research and monitoring using mainly volunteer labour. They have now obtained 5 years of data, mainly on Ancient Murrelet breeding biology and population dynamics and they have achieved a fairly stable funding situation. Twenty to thirty volunteers a year are involved, about half locals, and school children and tourists also visit the field camp for demonstrations and to participate in the night banding of murrelet chicks. They have demonstrated that it is possible for amateurs to carry out responsible research. Tony admitted that their strict adherence to a "zero-tolerance" policy on environmental damage has improved his own approach to research. Answering questions from non-specialists can lead to improvements in research techniques.

In a general discussion covering the entire committee workshop a catch-22 situation developed where researchers asked for guidelines on future funding and managers suggested that funding would be decided on the quality of programs proposed. It was noted that there are large data sets, such as the one collected at Prince Leopold over 18 years, and the extensive data collected by Richard Brown throughout his career, which should be computerized systematically and analyzed. Tony Gaston, David Nettleship, John Chardine undertook to assess how successful the monitoring program has been to date, starting with an analysis of data from Prince Leopold Island.

In other news from Canada:

David Cairns, now a fisheries scientist, continues to take an interest in seabirds

and has a student, Chris Riley, mapping the foraging distribution of Double-crested Cormorants around a large colony on Prince Edward Island.

In the Canadian Wildlife Service, Pacific and Yukon Region, Anne Harfenist will do the second year of her demographic study of Cassin's Auklets at Frederick Island. She will collaborate with Todd Golumbia of Parks Canada to resurvey some of the seabird colonies in the southern Queen Charlotte Islands and develop guidelines for tourists. Along with Doug Burles of Parks Canada and members of the Laskeek Bay Conservation Society, they will monitor raccoon activities on seabird colonies in the archipelago.

Meanwhile, Gary Kaiser will be pushing to eradicate rats from Langara Island this year. The main poisoning will be carried out in late summer. In conjunction with Andy Derocher of the B.C. Forest Service, Kathy Martin of University of B.C. and members of the Coop Wildlife Chair at Simon Fraser University, he is also planning another mass trapping of Marbled Murrelets this year. In 1994 the same group caught 176 murrelets and put transmitters on 43, resulting in one successful tracking to a nest site in a high elevation old-growth Mountain Hemlock forest remnant.

The Wildlife Chair (Fred Cooke) will again be running the field station on Triangle Island to catch Cassin's Auklets, Rhinoceros Auklets and Tufted Puffins as part of a long-term demographic study. The departure of Ian Jones for Newfoundland leaves that programme temporarily without an organizer. A new leader should be appointed shortly.

Paul Jones and the Friends of Caren (Caren Range on the B.C. coast) continue to study Marbled Murrelet nesting in the forests of the Caren, possibly the oldest in Canada. In 1994 a nest found the previous year was again used. The group have reservations about some field techniques currently used to study Marbled Murrelets and are in favour of a less invasive approach to Marbled Murrelet research. Paul carries out regular boat and shore surveys for seabirds in Malaspina Strait, off the Sunshine Coast.

Peter Ewins continues to work with Chip Weseloh on Great Lakes seabirds, as well as Ospreys and Bald Eagles. He also recently completed a survey (with Kees

Vermeer and Ken Morgan) of Pigeon Guillemots on the west coast of Vancouver Island. His recent publications, dealing with Double-crested Cormorants, Herring Gulls, Caspian Terns and Black Guillemots are too numerous to mention, but he is working on a retrospective analysis of monitoring data for Shetland Black Guillemots (with Martin Heubeck) that should be of interest to those wanting to use *Cephus* species as indicators of inshore pollution.

Mike Rodway has completed his M.Sc. at Memorial University on methods for monitoring populations and reproductive success, especially in Atlantic Puffins. He and Heidi Regehr are now busy at publishing a mass of data on puffins and kittiwakes at the Witless Bay islands, Newfoundland.

I am aware that this is just a skimming of what is going on in Canada in the field of seabirds, but my mailing to members yielded only six responses. Come on, Canada, speak up!

Tony Gaston

Washington/Oregon

WASHINGTON Ulrich Wilson, U. S. Fish and Wildlife Service (USFWS) Washington Coastal Refuges Office in Sequim, is continuing his annual photographic census of breeding cormorants and Common Murres on the outer coast and in the strait of Juan de Fuca, including Protection and Smith islands. Aerial censusing of murres will be increased from one survey to three to describe the changes in colony attendance through the season. Ulrich is also continuing more intensive breeding surveys and studies on land and by boat at Protection and Smith islands, with emphasis on cormorants, Pigeon Guillemots, Rhinoceros Auklets and Tufted Puffins. Other species surveyed by Ulrich included Peregrine Falcons (May-June), Brant (October-May), and waterfowl in the Dungeness/Sequim Bay area (October-May).

Don Williamson (USFWS) Willapa Bay NWR, will be conducting Snowy Plover surveys during the summer at Leadbetter Point and will continue Brant surveys of Willapa Bay fall-spring. Don is also hoping to initiate a census of the Brandt's Cormorant colony located at Fort Canby.

Mary Mahaffy (USFWS) Puget Sound Estuary Program is continuing to coordi-

nate work on **Pigeon Guillemots** in Puget Sound. They will be banding adults and chicks in natural and artificial nests, installing additional nest boxes, and documenting nesting chronology and success.

Dave Nysewander, Janet Stein, Matthew Nixon, Joe Everson and Wendy Parson (Washington Department of Fish and Wildlife (WDFW)) are continuing their seabird/waterbird studies under the auspices of the Puget Sound Ambient Monitoring Project. In addition to boat work, aerial surveys will be flown in July, January and February covering all inland marine waters and shorelines of Washington state. They will also be continuing to document adult/juvenile ratios for **Marbled Murrelets** in the study area. Last year during August and September juvenile murrelets comprised about 8-11% of the sightings recorded.

Greg Scherato, Matthew Nixon and others, WDFW, initiated study of **Harlequin Ducks** in 1994. Flightless young and molting adults were trapped and banded with USFWS metal bands and coded yellow plastic bands. Birds were captured near Protection Island, Oak Harbor, Cherry Point and in the Strait of Juan De Fuca. One of their marked birds was observed in the Crescent City, California Boat Harbor this winter.

John Pierce (WDFW) is coordinating the initiation of a research project on the outer Washington coast to examine **Marbled Murrelet** abundance and distribution, and to identify foraging relationships in outer coast habitats of **Common Murres** and **Marbled Murrelets**. They will also be looking at adult/juvenile ratios in this area as well.

The Washington Department of Natural Resources (DNR) is continuing a series of **Marbled Murrelet** forest habitat relationships studies in support of its habitat conservation planning (HCP) process. These studies address 1.4 million acres of forest trust lands in 6 HCP planning units within the murrelet's Washington range and will provide data needed to develop an effective, long-term murrelet conservation strategy. In 1995, studies will be completed in the North Coast and South Coast planning units. Field work within these planning units is being conducted by the WDFW through an interagency agreement with the DNR. New work may be initiated in the Strait of Juan de Fuca and Columbia

River planning units. For more information on these studies contact coordinator, **Lenny Young** (DNR) at (360) 902-1744.

Dr. Patrick Jodice working through the Forest and Rangeland Ecosystem Center of the National Biological Service (NBS) and the Department of Fisheries and Wildlife at Oregon State University (OSU), is planning to initiate a **Marbled Murrelet** radio telemetry project in the San Juan Islands this summer pending approval of endangered species permits from the USFWS and WDFW. His project will focus on locating telemetered birds both inland and at sea in an effort to better define habitat selection.

Terry Wahl and others will continue to gather and analyze data on seabird occurrence off the outer coast of Washington for the 24th consecutive year. Anyone interested in participating can contact Terry at (360) 733-8255.

OREGON **Jan Hodder** and students at the Oregon Institute of Marine Biology will be continuing their study of the nesting success of **Pelagic Cormorants** at the OIMB colony in Sunset Bay at Cape Arago. This is the 24th consecutive year this colony has been studied.

During the summer of 1995, **Kim Nelson**, Oregon Cooperative Wildlife Research Unit at OSU plans to continue research started in 1993, using tree climbing to locate **Marbled Murrelet** nests. This year the project will be conducted on a regional basis in cooperation with Tom Hamer in Washington and Esther Burkett in California. They propose an integrated study that incorporates exploratory and observational techniques to investigate **Marbled Murrelet** nesting biology. They hope to locate active nests and monitor nest success, and compare the characteristics of successful to unsuccessful nests to determine optimal murrelet habitat. Specific objectives are to (1) determine if nest abundance (density) and nest distribution differ between edge and interior plots, (2) compare stand structures of nest and non-nest plots, (3) locate active nests using tree climbing techniques and by monitoring murrelet behavior, (4) compare nest and stand characteristics between successful and unsuccessful nests, (5) describe preferred nest platform, nest tree, and nest stand characteristics, and (6) develop models of stand structural characteristics and con-

figurations that will maximize habitat suitability and reproductive success.

Kim continued her monitoring of **Marbled Murrelet** nest sites in summer 1994. Murrelets returned to all nesting stands monitored, however only one bird was observed landing (but not nesting) in a historic nest tree. Four new murrelet nests were found bringing the states total to 26. Two of the nests were successful, one failed (predation of a 3-4 week old chick most likely by a **Sharp-shinned Hawk**), and one was an old nest with an unknown outcome. The old nest was found by climbing trees within a 40-m-radius plot; 16 trees were climbed and one nest was located (see *Pacific Seabirds* 21:46 for details on technique). New intriguing data from these nests included the following: (1) two nests were located within 30 m of one another; previously 100 m was the closest for two active nests (Washington); and (2) one of the adults at a nest was in basic plumage (black and white instead of mottled brown) while the nest was active in July. Vocalization recording was also continued last year.

Roy Lowe and **David Pitkin** of the USFWS - Oregon Coastal Refuges office, will be continuing annual seabird monitoring projects in Oregon in 1995. Activities include aerial photographic censuses of **Common Murre** and **Brandt's** and **Double-crested Cormorant** colonies on the Oregon coast. In a cooperative effort funded by the USFWS and the Oregon Department of Fish and Wildlife (ODFW), 10-15 murre colonies will be flown an additional 5 times to describe changes in murre colony attendance through the season. **Robin Brown** (ODFW) will also participate in this study. Other field work by Oregon Coastal Refuges include monitoring nesting attempts by **Pelagic Cormorants** at 17 colonies near Newport again this year. A beached bird mortality study on 7.1 km of beach located between Seal Rock and Alsea Bay in Lincoln County, Oregon will continue from June through September. This is the 9th consecutive year of this study. In association with the beached bird mortality study, **Roy Lowe** and **David Pitkin**, Oregon Coastal Refuges and **Ted Burger**, USFWS, Portland ES Field Office, will be investigating concentrations of contaminants and hormone levels in **Common Murres** during the annual summer die-off near Newport. An aerial survey of **Brown Pelicans** along the Oregon and

Washington Scoter Decline

The Puget Sound Ambient Monitoring Program coordinated by Dave Nyswander has detected an apparent decline in wintering scoter populations in the inland marine waters area of Washington. Results of recent surveys have been compared with similar data collected in the 1970's and 1980's and show a decline of 40-50%. Surveys conducted in a portion of the Alaskan breeding range of scoters show a similar decline. For more information contact Dave Nyswander (360) 902-2693.

Washington coasts is planned for mid-September if funding permits and Spring and fall aerial surveys of Aleutian Canada Goose use of Oregon coastal rocks and islands is also continuing.

Jeremy Buck, USFWS, Portland ES Field Office, will be the lead biologist working to further characterize the organic contaminant loading in Double-crested Cormorant eggs from lower Columbia River colonies located within Lewis and Clark National Wildlife Refuge. They will determine if Double-crested Cormorants are a suitable surrogate species for Bald Eagles when addressing contaminant impacts along the Columbia River. Chemical analyses of Double-crested Cormorant eggs collected at this location in 1990 and 1991, showed elevated concentrations of DDE, PCB's, dioxins and furans. Bald Eagles nesting near this refuge are experiencing low productivity that is strongly correlated with high DDE and PCB concentrations. Bioassay results from Double-crested Cormorant eggs collected in 1993 indicated that exposure to PCB and/or dioxin compounds were at concentrations high enough to impair reproductive success.

Robert Pitman, with the assistance of Oregon Coastal Refuges, is continuing a long term study of the reproductive biology of Leach's Storm-Petrels on Saddle Rock, Oregon. Banding of storm-petrels was initiated here in 1979 and has continued annually. To date a total of 6,771 birds has been banded, including 3,395 adults and 3,376 chicks. There have also been 187 recaptures.

Mary Jo Hedrick (ODFW) initiated a wintering Harlequin Duck survey this year from Yaquina Bay to near Heceta Head on the Oregon central coast. Monthly counts were conducted from December-March and will continue next year. Volunteers conducting these surveys were Bob Demory and Paul Reed.

Daniel Varoujean, Wendy Williams and Doug Warrick, through research funds provided by private industry to Marzet in North Bend, Oregon, continue to conduct at-sea aerial surveys in northern California, Oregon and Washington. These surveys are designed to document the abundance and distribution of Marbled Murrelets as well as the nearshore abundance of other seabirds.

Pending receipt of funding, Craig Strong, Crescent Coastal Research, will be monitoring the Marbled Murrelet population level and productivity along the Oregon coast. This work will be accomplished by statewide vessel surveys with concentrated surveys planned for the central and south coast areas.

Robert Loeffel and Don & Sara Brown are continuing their long-term, year-round beached bird mortality study on 7.4 km of beach just south of Newport, Lincoln County, Oregon. This study is now in the 18th consecutive year.

Roy W. Lowe

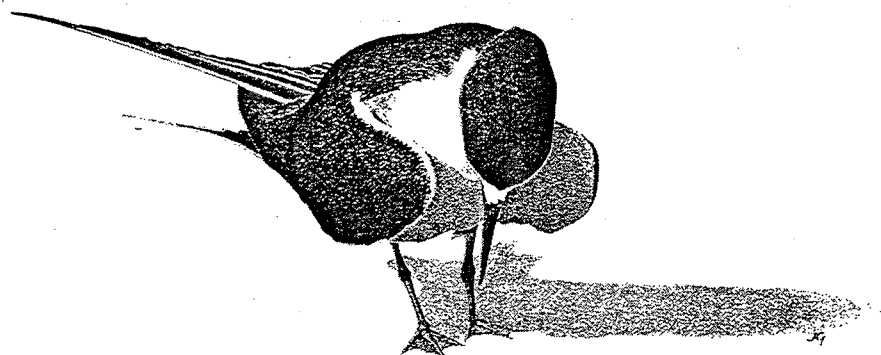
Non-Pacific United States

In work by the Seabird Restoration Program of the National Audubon Society, Stephen Kress and Richard Podolsky have started the second year of attraction studies with Laysan Albatross on Kaohikaipu Is-

land, Oahu, Hawaii. In mid-November, Ken McDermond set out 50 life-size models, 8 chick models, and two playback systems of recorded albatross calls. Albatross were sighted on the island one month earlier than last year, and prospecting birds have frequented the island during the first three months of the study season. The study season will continue until 1 May. Kress is preparing now for field work on the Maine coast this coming summer that will include restoration work with puffins, terns, murrelets, and razorbills.

At the University of Wyoming, Clayton Derby and Jim Lovvorn have found that otoliths in the esophagi and gizzards of Double-crested Cormorants collected by shooting yield the same results about species and sizes of fish eaten as do otoliths found in cast-up pellets and regurgitations collected at the colony. Thus, in coldwater river systems, otolith data can be collected by either method, depending on the relative importance of logistics, public relations, or population consequences (i.e., nest loss from disturbance of colonies versus killing adults away from colonies). In the same study area, they also found that American White Pelicans eat few stocked trout, whereas cormorants in some years might eat a large fraction of several hundred thousand stocked trout. However, because few trout appear to survive winter to grow to size classes catchable by anglers, it is difficult to determine whether this severe predation by cormorants ultimately affects fishing opportunities for humans. Also, Chris Nations completed his Masters thesis entitled "Mark-resighting analysis of a California Gull population," based on work at the Bamforth Lake colony, near Laramie.

Jim Lovvorn



Book Reviews

Wetlands in Danger. Patrick Dugan (ed.). Oxford University Press, New York. 192 pp., numerous color photographs and maps. ISBN 0-19-520942-7, cloth \$35.00.

Wetlands include some of most important and neglected habitats. This volume highlights the importance and conservation needs of wetlands. Patrick Dugan, the editor, is one of the most qualified to edit this volume. He has been the coordinator of the Wetland Program of the International Union for the Conservation of Nature (IUCN) since 1984. He has been heavily involved in the conservation of wetlands throughout the world, and primarily in Europe and West Africa.

This is the third volume in a series on conservation of ecosystems by Oxford University Press. The two preceding volumes are *The Last Rain Forests*, and *Deserts: The Encroaching Wilderness*.

The book begins with a series of introductory chapters on "What are Wetlands," "Why we need Wetlands," "Adapting to Life in Wetlands," and "Wetland Loss." These are followed by the bulk of the book: an "Atlas of the world's wetlands." The land masses of the world excluding the Antarctic are divided into 19 areas which are covered individually. Each section of 4 to 12 pages (median 6) has been written by a group of authors. The book concludes with a chapter on "The Challenge of Conservation."

The Section on "The United States - The Lower 'Forty-eight'" includes sections on the national wetlands inventory and the concept of no net loss as well as sections on major wetlands: floodplains, the loss in California's Central Valley, the Chesapeake Bay, the Mississippi delta, and the Everglades. One to two paragraphs are devoted to each topic.

The book is a well-researched coffee-table book. It is lavishly illustrated, often with three photographs per page. The information is up to date, but each geographic area or topic is only briefly summarized. The result is a nice, but limited overview. The text may offer a short introduction to wetlands in geographic regions with which the reader may be unfamiliar, but for those areas that the reader knows, the text will be of little help.

I can only recommend this as a coffee-

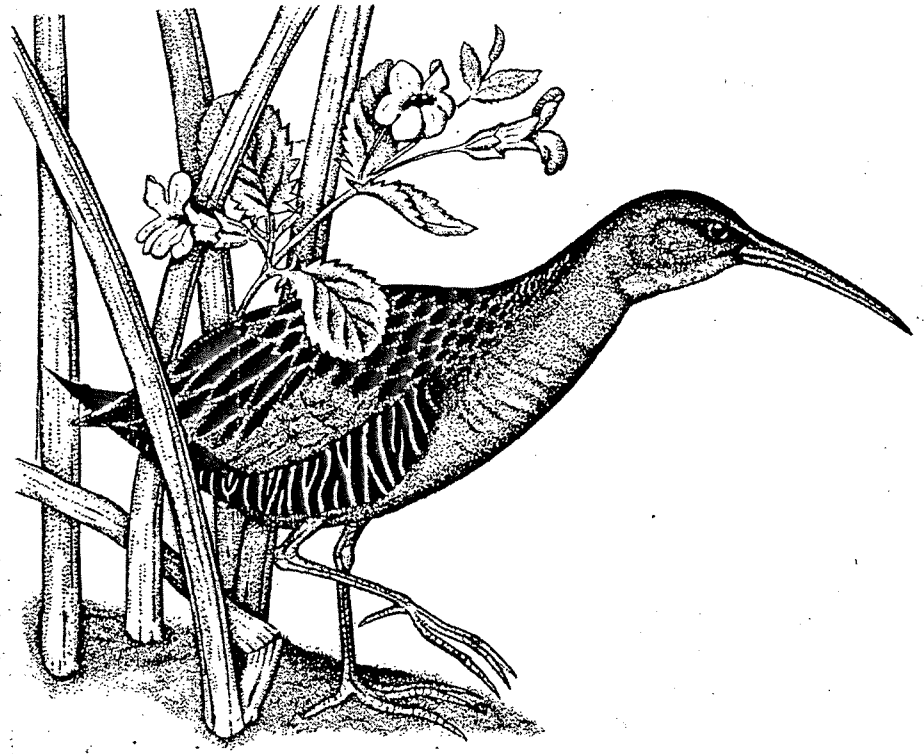


table introduction for wetlands conservation. Those who need details and more specifics should seek more detailed references.

*Malcolm C. Coulter, P. O. Box 48,
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Andell, P., J., Durinck, and H. Skov, 1994. Baltic marine areas of outstanding importance for wintering seabirds. *World Wildlife Fund Baltic Bulletin* March 1994: 2-8. (P. Andell, Dept. of Ecology, University of Lund, S-223 62 Lund, Sweden.)

Though the Baltic Sea is far away from our Pacific seabirding areas, this paper, indeed the whole bulletin of the World Wildlife Fund, is worthy of our attention. The first complete survey of the offshore wintering seabirds of the Baltic Sea was carried out in January and March 1992 and 1993 by ship-based transects, complemented during the second year by aerial census, total count, of all waterbirds along all coastal areas. While the survey was coordinated by Danish scientists, all nine Baltic countries (Denmark Estonia, Finland, Germany, Latvia, Lithuania, Poland, Sweden, and Russia) contributed to its success. We find here for the first time the total numbers of wintering seabirds of the Bal-

tic, and the classification and tabulation of the 39 most important wintering areas (offshore as well as inshore) of the 30 seabird species present. Among the seabirds are the Fulmar, five species of loons and grebes, a cormorant, a coot, a swan, 13 kinds of sea ducks and mergansers, five species of gulls, and three alcids. Almost all of the northwest European population of the Old Squaw and Velvet Scoter winter in the Baltic, together with one-third of the three million Common Eiders. A total of over nine million seabirds were found in the censused, southern portion of the Baltic, more than twice as many as previously estimated. The northern Baltic arm, the Bay of Bothnia was not included, apparently it often freezes in winter and thus offers no good offshore wintering areas. The authors summarize the necessity, indeed urgency of increased protection of areas of wintering concentrations and we learn that a special international commission is working on management plans. This report is accompanied by excellent color photos of Baltic seabirds. This issues of the W.W.F. Baltic Bulletin has other seabird-related articles as well

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Abstracts from the Twenty-Second Annual Meeting of the Pacific Seabird Group

ABUNDANCE OF MARBLED AND KITTLITZ'S MURRELETS (*BRACHYRAMPHUS MARMORATUS* AND *BREVIROSTRIS*) IN SOUTHCENTRAL AND SOUTHEAST ALASKA. Beverly A. Agler, Steven J. Kendall, Pamela E. Seiser, and David B. Irons, U. S. Fish and Wildlife Service, Anchorage, Alaska 99503.

We used small boats to conduct surveys of Lower Cook Inlet (June 1993, February-March 1994), Prince William Sound (July 1993, March 1994), and Southeast Alaska (June-July 1994). In all areas, we surveyed randomly-selected, short transects. Although transect length and definition of strata varied among surveys, survey methodology was identical. We used a ratio estimator to estimate population sizes and variances. Marbled and Kittlitz's murrelets were combined as *Brachyramphus* murrelets, because of the difficulty in separating these species in breeding plumage. We estimated (+95% CI) that there were 58,227 + 16,058 *Brachyramphus* murrelets in Lower Cook Inlet during June 1993, and 11,627 + 7,410 murrelets in the eastern half during February-March 1994. For Prince William Sound, we estimated 159,433 + 42,059 *Brachyramphus* murrelets during July 1993, and 36,318 + 17,705 murrelets during March 1994. We estimated that 687,061 + 201,162 *Brachyramphus* murrelets were in Southeast Alaska during June-July 1994. Estimated densities by area were: Lower Cook Inlet, summer 4.2 birds/km², winter 3.1 birds/km²; Prince William Sound, summer 17.8 birds/km², winter 4.0 birds/km²; and Southeast Alaska, summer 19.4 birds/km². We discuss the distribution of *Brachyramphus* murrelets in these three areas and the validity of these estimates.

WILL THE THREATENED NEWELL'S SHEARWATER SOON BE ENDANGERED? D.G. Ainley, L. DeForest, N. Nur, R. Podolsky, G. Spencer, PRBO, Stinson Beach CA 94970; and T.C. Telfer, Dept. Land & Natural Resources, Lihue HI 96766.

We investigated the status of Newell's Shearwater on Kauai in three ways: (1) analysis of data gathered annually, 1978-1994, on 1000-2000 fledglings by the Save Our Shearwaters (SOS) program provided an index to population trends; (2) field work in a breeding colony and in the urban corridor encircling the breeding areas, 1993-94, helped to calibrate and interpret SOS data; and (3) population modeling projected the consequences from various factors. Estimated size of the breeding population is 12,600 pairs. We found (1) a high incidence of non-breeding among burrow occupants (0.46%); (2) a high incidence of predation on subadults and adults by introduced house cats and Barn Owls (2.5% of burrow occupants per year); (3) respectable success among breeding pairs (0.66 chicks per year); (4) about 15% of all fledglings produced each year are processed by SOS; (5) mortality of fledglings due to fallow (coming to ground after attraction to lights) is high (ca. 10%); and (6) mortality to adults and especially subadults from collisions with powerlines is lower (0.6-2.1% per year). Driving population (negative) growth is, foremost, mortality of adults/subadults by introduced predators and, secondarily, mortality of fledglings and adults/subadults due to collisions with human-made structures. The SOS program is critical to reducing the rate of population decline.

INTRODUCTION OF FOXES TO ALASKAN ISLANDS—HISTORY, EFFECTS ON AVIFAUNA, AND ERADICATION. Edgar P. Bailey, Alaska Maritime National Wildlife Refuge, 2355 Kachemak Bay Drive, Homer, Alaska 99603.

Foxes originally were absent from most Alaskan islands in the North Pacific. Red foxes (*Vulpes vulpes*) were indigenous to the Fox Islands in the eastern Aleutians and to some islands off the Alaska Peninsula and in the Gulf of Alaska. The first recorded introduction of foxes was in 1750 when Russians released arctic foxes (*Alopex lagopus*) from the Commander Islands on

Attu, the westernmost island in the Aleutians. Russians released red and arctic foxes on other islands mainly in the early 1800s. By the 1930s, over 450 islands had been stocked mainly with arctic foxes for fur farming. During this period the first government surveys and concerns about the effects of alien foxes on insular avifauna arose, although Aleuts had indicated that seabirds were disappearing on some islands with introduced foxes as early as 1811. Besides foxes, Norway rats (*Rattus norvegicus*), ground squirrels (*Spermophilus undulatus*), and other mammals were introduced. Foxes eliminated populations of Aleutian Canada Geese (*Branta canadensis leucopareia*) on all except three small islands. Populations of seabirds, particularly burrow-nesters, were also drastically reduced by foxes. Refuge personnel began eliminating foxes in 1949, and spectacular recoveries of bird populations are occurring. Introduced foxes remain on 40 islands, mostly in the Aleutians and south of the Alaska Peninsula.

FLIGHT ENERGETICS OF FREE-RANGING WEDGE-TAILED SHEARWATERS. Lisa T. Ballance, SW Fisheries Science Center, 8604 La Jolla Shores Drive, La Jolla, CA 92037.

Flight energetics of free-ranging Wedge-tailed Shearwaters (*Puffinus pacificus*) were quantified on Johnston Atoll using doubly labeled water to measure field metabolic rate (FMR), an open-flow system to measure oxygen consumption rate, and activity recorders to monitor foraging behavior at sea. Birds spent an average of 9% of the time brooding, 25% sitting on the water, and 65% in flight. Mean FMR was 7.9 W; mean resting metabolic rate was 3.0 W; and the power required for flight averaged 9.9 W. The latter value was only 37% of that predicted (26.8 W) from equations based on aerodynamic theory. Aerodynamic theory predicts that birds in this study would require a mean of 0.5 m s⁻¹ of lift to be able to soar. Wind velocity during the period of FMR measurement averaged more than ten times this, 5.5 m s⁻¹. Thus, this striking difference between measured and predicted costs of flight is likely due to the ability of birds to soar, and in fact, observations of Wedge-tailed Shearwaters at sea confirm that their flight includes a complex set of behaviors which probably serve to take advantage of wind energy and substantially

lower their energetic cost of flight.

RESTORATION OF SEABIRD ISLANDS.
Brian Bell, Wildlife Management Inc., Wellington, NZ

Seabirds are most vulnerable at their breeding sites, the oceanic and continental shelf islands. Most of these have been affected by the introduction of exotic animals, particularly but not exclusively mammals. There have been many reasons for these introductions which historically interesting but more important are the affects that have had on the ecology, especially seabird habitat and numbers. Today we have the ability to remove most of these animals through improved technology and poisons and better transportation. This does not mean there are no problems and challenges to be met, but with commitment and resources these can be overcome.

The variety of animals which have been introduced is large, but some stand out as the more significant. Goats and rabbits have proved most destructive to seabird habitat causing gross devegetation and loss of soil, while cats and rats species, and man himself have caused mass depletion of seabird numbers. The eradication of problem animals can result in a rapid restoration of habitats and numbers, and often no further action is required (rehabilitation). On other islands, the degradation may be so great and recovery so slow that some interventionist management may be required to assist or speed up the recovery (restoration). This may involve regeneration projects or the translocation of species. There are excellent examples available which illustrate these approaches.

International recognition that action can be taken to restore islands in growing. Several countries have undertaken projects and some international agencies are prepared to fund such programmes. There is a need for this message to be spread and applied throughout the world. The PSG conference is a step in that direction.

What remains to be accepted is the conviction that even large islands with multiple problems can be restored, the only restriction being resources. New Zealand is moving into this phase over the next year or two.

CHRONIC OIL POLLUTION IS A LARGE SOURCE OF MORTALITY FOR MAGELLANIC PENGUINS (*SPHENIS-*

CUS MAGELLANICUS). *P. Dee Boersma*, Dept. of Zoology, Univ. of Washington, Seattle, WA 98195.

Chronic pollution appears to be a global problem and may be a more important source of seabird mortality than currently recognized. Chronic oil pollution kills more than 22,000 juveniles and 20,000 adults Magellanic Penguins each year along the coast of the Province of Chubut, Argentina. Mortality of this magnitude from chronic pollution exceeds mortality from many major oil spills. At Punta Tombo, Argentina the penguin population has declined each year since 1987. The largest decline occurred in 1991, a year when a large amount of oil was released as penguins returned to breed. Oil pollution appears to be a factor in the decline of the population, however, other factors such as variation in food appear to also be important. When seabird populations are already in decline, chronic oil pollution may accelerate the process.

ALCID REPRODUCTIVE BIOLOGY AT THE OREGON COAST AQUARIUM.
Laurel L. Brogan, Oregon Coast Aquarium, 2820 S.E. Ferry Slip Road, Newport, OR 97365.

The seabird breeding program at the Oregon Coast Aquarium has been involved in ongoing research projects dealing with the reproduction of captive seabirds. The research program has been initially aimed at our breeding population of tufted puffins (*Lunda cirrhata*). The project started in 1993, replacing four Tufted Puffin eggs with a dummy egg containing radio telemetry equipment to measure incubation temperatures. This data was transmitted to a base computer for storage and later retrieval and analysis. Utilizing this data, the staff set the incubator to reflect a more accurate parent incubation temperature for the pulled eggs. The result of this effort was the first Tufted Puffin to be hatched by artificial incubation. The chick was hand raised, but was later euthanized due to possible congenital problem. In the 1994 breeding season, we placed six dummy eggs with an upgraded computerized egg containing orientation sensors and microchip thermocouples to gain more accurate data on egg incubation temperature and rotation. Concurrently, we again artificially incubated, hatched, hand raised, and this time, successfully fledged a Tufted Puffin.

We intend to adapt this technology to further our captive breeding program of Rhinoceros Auklets (*Cerorhinca monocerata*) and Pigeon Guillemots (*Cephus columba*).

THE COMPOSITION, DENSITY AND DISTRIBUTION OF THE SEABIRD FAUNA OFF SOUTHWESTERN VANCOUVER ISLAND IN 1993-1994.
Alan E. Burger, Dept. of Biology, Univ. of Victoria, Victoria, B.C., Canada V8W 2Y2; and *Andrea D. Lawrence*, 5012 Old West Saanich Road, Victoria, B.C., Canada V8X 3X1.

Vessel surveys were made once a month along a 145 km transect loop, over the broad continental shelf off southwestern Vancouver Island. This is a productive and physically dynamic area which supports high densities of seabirds, particularly non-breeding migrants. There is also a high risk of oil spills here, from large volumes of shipping and the Alaska-Puget Sound tankers. Seabird densities were compared with sea surface temperatures, salinity, relative prey abundance (measured with a 200 kHz echosounder) and bottom topography at both coarse (>10 km; monthly means) and fine (250 m; 1 min) scales. The presence of hake factory ships in summer and fall strongly affected the distribution of surface-feeding species (shearwaters, fulmars and gulls) but had negligible effect on divers (cormorants and alcids). Concentrations of both guilds were sometimes, but not invariably, associated with fine-scaled thermosalinity fronts. The highest concentrations of several species were found in shallow shelf areas (50-80 m deep) adjacent to the Juan de Fuca Canyon.

INTERANNUAL VARIATIONS IN THE DENSITIES AND BEHAVIOUR OF MARBLED MURRELETS ON LAND AND AT SEA, VANCOUVER ISLAND.
Alan E. Burger, Dept. of Biology, Univ. of Victoria, Victoria, B.C. Canada V8W 2Y2.

Standardized dawn surveys of Marbled Murrelets (*Brachyramphus marmoratus*) were made in old-growth forest in the Carmanah-Walbran watersheds, SW Vancouver Island from 1990 through 1994. Within each season, data were selected from a 9-week core period to make interannual comparisons. Marine censuses were made in three nearshore areas (Trevor Channel and the Broken Group Islands in

Barkley Sound, and off the West Coast Trail) in most of these years. High nearshore sea temperatures were associated with decreased abundance of prey (euphausiids and schooling fish) in 1992 and 1993. In these years there were lower densities and premature departures of murrelets at sea, and lower detection frequencies and smaller proportions of occupied (subcanopy) behaviours at several inland sites. The timing of inland activity peaks also varied among years, but usually by less than 10 days. These interannual variations make it difficult to confirm and interpret apparent declines in the densities of local populations of Marbled Murrelets over the past 15 years. They also show the risks associated with assessing inland habitat suitability and occupancy from single-season studies.

DISTRIBUTION AND HABITAT RELATIONSHIPS OF THE MARBLED MURRELET IN CALIFORNIA. *Esther E. Burkett, Heather L. Johnson, Thomas Lupo*, Calif. Dept. of Fish and Game, 1416 Ninth Street, Sacramento, CA. 95814; and *Peter Morrison*, Sierra Biodiversity Institute, P.O. Box 298, Winthrop, WA. 98862.

Distribution information on the Marbled Murrelet has increased since the species was state-listed as endangered and federally-listed as threatened in 1992. The State has been compiling inland and at sea distribution information into a data base to aid in recovery planning. Information comes from public and private sources and includes historical, anecdotal, and systematically-collected data. Geographic Information System technology allowed historic and current extent of old-growth redwood forests to be combined with murrelet distribution for mapping purposes. Records most indicative of murrelet nesting behavior were used to help refine the current extent of murrelet nesting habitat through satellite imagery interpretation. An analysis for Del Norte and Humboldt counties found ninety-six percent of murrelet nesting-associated records within 400 meters of old-growth redwood forests. The maps demonstrate that nesting-associated records rarely extend beyond thirty miles, and the eastern distribution boundary closely matches the historical extent of old-growth redwood forests. At sea records demonstrate clumped breeding season distribution, and limited non-breeding season movement from nesting areas. Additional surveys inland and at

sea are needed to help recovery planning efforts.

MONITORING SEABIRDS ON THE ALASKA MARITIME NATIONAL WILDLIFE REFUGE: A PROPOSED LONG-TERM APPROACH. *G. Vernon Byrd*, Alaska Maritime NWR, 2355 Kachemak Bay Dr., Suite 101, Homer, AK 99603.

As part of its ecosystem management initiative, the U.S. Fish and Wildlife Service is emphasizing long-term wildlife status and trends monitoring programs on National Wildlife Refuges in Alaska. The Alaska Maritime NWR contains 80% of Alaska's estimated 50 million seabirds of some 35 species breeding at several thousand sites. The proposed strategy for long-term monitoring on this refuge is to select indicator species of seabirds based on trophic guilds for which annual productivity, major prey, and environmental correlates would be measured annually at 9 sites scattered geographically over the refuge. Population trends would be tracked from index plots surveyed at the 9 sites at least every 3 years. Information from these annual sites would be used as a basis for identifying resource problems and for interdisciplinary studies of ecosystem processes. Geographic gaps would be filled by less frequent observations at other sites. Input is being sought from seabird experts on whether this plan is biologically sound and whether it is a reasonable approach even if it is only partially funded.

FACTORS AFFECTING THE COST-EFFECTIVENESS OF OILED WILDLIFE RESPONSE. *Curtiss J. Clumpner*, International Bird Rescue Research Center, Berkeley, CA.

After the *Exxon Valdez* oil spill much discussion among environmentalists, trustee agency personnel and oil industry representatives centered on the cost of the oiled wildlife response. Many questioned the expenditure of millions of dollars to attempt to save less than 2,000 wild animals. This paper will compare costs among several spills that have occurred since 1988, including the *Exxon Valdez*, *American Trader*, *Shell Martinez*, *Nestucca*, and *Texaco Fidalgo Bay*. It will compare the total cost, cost per animal treated, and ratio between costs of wildlife response and overall response costs of a spill and attempt to

identify factors that can affect them.

PENGUIN FORAGING BEHAVIOR IN RELATION TO THE DISTRIBUTION OF PREY. *Donald A. Croll*, Institute of Marine Sciences, University of California, Santa Cruz, Ca. 95064; *Roger P. Hewitt*, Southwest Fisheries Science Center, La Jolla, Ca. 92038; *David A. Demer*, Scripps Institution of Oceanography, La Jolla, Ca. 92093; *John K. Jansen*, Oregon Institute of Marine Biology, University of Oregon, Charleston, Or. 92074.

The diving behavior of 7 breeding Chinstrap Penguins (*Pygoscelis antarctica*) (N=12,171 dives) was measured concurrently with a hydroacoustic assessment of the vertical distribution and abundance of their primary prey, krill (*Euphausia superba*) in the vicinity of Seal Island, Antarctica between January 19 and March 10 1992. Penguin foraging was concentrated around noon and midnight, with a reduction in effort around dawn and dusk, perhaps a result of diel changes in the methods used by penguins to locate prey. The depth of Chinstrap Penguin dives followed the migration pattern of krill which dispersed in the upper portion of the water column at night and was concentrated and deeper during the day. On average, chinstrap penguins dove to the shallow limit of the distribution of krill. The maximum depth of penguin dives did not exceed the maximum depth distribution of krill. Our results suggest that penguins do not require dense aggregations of prey in order to capture sufficient krill to meet their energetic needs. We hypothesize the diel migration pattern of krill, found to be variable in different study locations at different times, may in part be determined by the intensity of predation pressure in the upper portion of the water column.

FLIGHT SPEEDS AND COSTS DURING REPRODUCTION IN HEERMANN'S GULLS. *Horacio de la Cueva*, CICESE, Ensenada, Baja California, México, 22800.

Estimations of reproductive expenses and daily energy balance of any bird with parental responsibilities should include the costs of chick rearing, adult maintenance, and foraging. I consider chick growth (estimated with a Gumperts curve), adult maintenance and flight costs, and morphology to determine parent's optimal flight speed and

energy expenditure when feeding young. Predicted (testable) flight speeds and costs, respectively, for *Larus heermanni* (Heermann's Gull) are: minimum power (9.2 ms⁻¹, 5.3 W), maximum range (12.6 ms⁻¹, 6.1 W, and optimal speeds for feeding 1-3 young (13.6 ms⁻¹, 8.6 W; 14.6 ms⁻¹, 11.3 W; and 14.2 ms⁻¹, 14.2 W, respectively). When food load and predominant winds are taken into account optimal speeds, flight costs, and foraging ranges change. The model can be tested measuring: chick growth rate, load size, flight speeds, and maximum flight range of adults rearing chicks.

IMPACTS OF AIRCRAFT DISTURBANCE ON REPRODUCTIVE SUCCESS OF THICK-BILLED MURRES: MAJOR THREAT OR MINOR STRESSOR. *Tarra Curry and Edward Murphy*, Institute of Arctic Biology and Dept. of Biology and Wildlife, Univ. of Alaska Fairbanks, Fairbanks, AK 99775.

During the years 1992-93, we monitored Thick-billed Murres on St. George Island for reproductive success both on plots which were heavily disturbed by aircraft overflights and on plots farther from the airport. These plots were monitored every 1-3 days from the first egg-laying until the last chick-fledging to determine hatching success, duration of incubation, fledging success, and duration of the chick period. In addition, several plots were selected for videotaping with cameras set up to record behavior of the murres prior to, during, and after aircraft overflights. Videos were analyzed and scored for birds leaving the plot, incubators standing off of their eggs, brooders standing off of their chicks completely and brooders tending (standing off of their chicks but with wings in a protective positions). Our analyses failed to detect a significant decrease in reproductive success due to aircraft disturbance; plots in the vicinity of and distant from the airport showed similar success rates and breeders seldom abandoned eggs or chicks, even temporarily, during overflights. There was a strong correlation between the noise level of a light and the number of non-breeders flushing in response.

MOVEMENT PATTERNS OF DARK-RUMPED PETRELS AND NEWELL'S SHEARWATERS AT KAUAI ISLAND, HAWAII. *Robert H. Day and Brian A.*

Cooper, ABR, Inc., P.O. Box 81934, Fairbanks, AK 99708.

We studied movement patterns of these two endangered, nocturnal tubenoses at Kauai in 1992-1994 with ornithological radar and night-vision scopes. Movement rates for both species peaked for 2 h around sunset and sunrise but were low in the middle of the night. Dark-rumped Petrels generally moved when there was more ambient light than did Newell's Shearwaters, which were strongly nocturnal. Movement rates were much higher in fall 1993 than in fall 1992 (probably because of Hurricane Iniki in 1992) and were higher in summer than in fall. Movement rates increased through time in summer, probably because of increasing numbers of subadults at that time but declined through time in fall because of fledging. Lunar effects on movement rates appeared to be small. Movement rates varied geographically, being much higher on eastern and northern Kauai than on southern Kauai. Movements were predominantly inland in evening, seaward in the morning, and both directions in the middle of the night. Most birds flew 25-275 m above ground level, with no relationship between elevation of a site and flight altitude of birds at that site. Flight altitudes at a site were similar seasonally and were highest in early evening in summer but not different in fall. Dark-rumped Petrels flew at significantly higher altitudes than did Newell's Shearwaters in fall 1993 and summer 1994 but not in summer 1993.

VOCALISATIONS OF THE XANTUS' MURRELET: REPERTOIRE, INDIVIDUALITY, AND MANAGEMENT IMPLICATIONS. *Sharon B.C. Dechesne*, Dept. of Biology, Univ. of Victoria, Victoria B.C. V8W 2Y2.

Accurate population sampling of Xantus' Murrelet (*Synthliboramphus hypoleucus*) is complicated by many factors. First, traditional techniques are logistically difficult and costly. Second, the murrelets' nocturnal activity pattern at their colony and cave or crevice nesting further hinders observations. Third, census efforts on the colony provide information on the population of breeders, but not non-breeders. Finally, none of these techniques capitalise on the birds' only conspicuous colony activity, the nightly chorus, occurring on the waters surrounding the colony. Individually distinct vocalisations are pre-

dicted for this species to facilitate mate, parent, and/or offspring recognition (as necessitated by their life histories); they have also been found in closely related species. If individual differences in the vocalisations could be detected, inexpensive tape-recordings could complement other census techniques. Relative to other techniques, recording is also not invasive: an important factor to this candidate for threatened or endangered species status (C2: USFWS). In this preliminary study I determined the murrelets' call repertoire, measured the call-type variation, and, where possible, measured the individual variation of the vocalisations. Some aspects of the adult and chick calls appear to show sufficient stereotypy to be useful for individual discrimination and may prove useful in population censusing.

WINTER DISTRIBUTION OF THICK-BILLED MURRES FROM THE NORTHWEST ATLANTIC IN RELATION TO COLONY OF ORIGIN. *G.M. Donaldson*, Dept. of Biology, University of Ottawa, Ottawa, Ontario, K1N 6N5; *A.J. Gaston*, Canadian Wildlife Service, 100 Gamelin Blvd., Hull, Québec K1A 0H3; *J. Chardine*, Canadian Wildlife Service, St. John's Newfoundland; *K. Kampp*, Zoological Museum, Universitetsparken 15, DK-2100 Copenhagen 0, Denmark; *R.D. Elliot*, Canadian Wildlife Service, Sackville, New Brunswick.

Distributions of recoveries of birds banded at colonies on Coats, Digges, and Coburg Islands, at Cape Hay and in Greenland, showed some similarities which were characteristic of colonies from similar geographic areas. Murres from Hudson Strait colonies were recovered later in the winter than birds from all other locations. Significant differences in distribution were detected between colonies located relatively closely to one another. Recovery rates of first winter and second winter birds from Digges Island were significantly lower than those for birds of the same age from the adjacent colony on Coats Island suggesting different spatial distributions of the young birds from the two colonies. Differences in the overwintering areas for adults from Coburg Island and Cape Hay, again located closely together, differed significantly with Coburg adults recovered in greater numbers in Newfoundland while Cape Hay adults were recovered most often in West-

ern Greenland. A small number of recoveries from adult birds banded on Prince Leopold Island were all recovered in Greenland.

THE PROPOSAL TO LIST THE ALASKA BREEDING POPULATION OF STELLER'S EIDERS AS THREATENED UNDER THE ENDANGERED SPECIES ACT: AN OVERVIEW. *Janey B. Fadely and Lori Quakenbush*, U.S. Fish and Wildlife Service, 1412 Airport Way, Fairbanks, AK, 99701, and *Karen Laing*, U.S. Fish and Wildlife Service, 1011 E. Tudor Road, Anchorage, AK, 99503.

In July, 1994, the U.S. Fish and Wildlife Service published a proposal to list the Alaska breeding population of the Steller's Eider as threatened under the Endangered Species Act. A final rule on the listing is expected in 1995. Rough estimates of the world population in the 1960s ranged from 400,000 to 500,000, but the current estimate, based on aerial surveys, is between 150,000 and 200,000. Most Steller's Eiders nest in Russia and winter in the Aleutian Islands of Alaska. As many as 3,500 pairs were estimated to nest on the Yukon-Kuskokwim Delta in the 1960s; however, only one nest has been found on the Delta since 1975. Currently the only documented breeding population in Alaska is in the vicinity of Barrow on the arctic coastal plain. The size of that population is uncertain. Causes of the decline of Steller's Eiders are unknown.

USE OF PESTICIDES FOR MANAGING PREDATORS TO ENHANCE SEABIRD POPULATIONS. *Kathleen A. Fagerstone*, Denver Wildlife Research Center, P.O. Box 25266, Denver Federal Center, Denver, CO 80225-0266.

In recent years, the Animal Damage Control (ADC) program and its research facility, the Denver Wildlife Research Center (DWRC), have become increasingly involved in protection of seabirds and of threatened and endangered species. This talk will describe some of those efforts. The DWRC developed required data and coordinated efforts to register diphacinone in Hawaii to control mongooses, which prey on endangered bird species. The DWRC is also working with a variety of groups to register diphacinone to control rat depredation on Hawaiian threatened and endangered plants and animals. A program has

been established to control brown tree snake populations, which have caused the extinction of most bird species in Guam, and prevent their introduction into Hawaii. The ADC program conducted the following work in the Pribilof Islands to protect populations of ground-nesting seabirds: 1) eradicated arctic foxes from Kiska Island using Compound 1080 baits; 2) registered the M-44 for controlling arctic foxes; 3) assessed the potential impact of rodents on island environments; and 4) assisted in establishing a surveillance system to prevent rat infestations. An emergency use registration for brodifacoum was obtained by ADC for use against rats in American Samoa on Rose Atoll. DRC-1339 labels were expanded to include protection of threatened and endangered, including the California least tern, from predators. Additional examples will be provided.

BREEDING BIOLOGY OF THE MAGNIFICENT FRIGATEBIRD (FREGATA MAGNIFICENS) ON THE ISLAND OF BARBUDA, WEST INDIES. *Jack P. Feldman*, Point Reyes Bird Observatory, 4990 Shoreline Hwy., Stinson Beach, CA 94970; and *Wayne Z. Trivelpiece*, Dept. of Biology, Montana State University, Bozeman, MT, 59717.

The Magnificent Frigatebird has a unique breeding strategy among seabirds, where males can attempt breeding every year, while successful females can only breed every other year. Due to the long chick-rearing period (13 months+), at least one of the parents must take care of the single chick, thus negating the possibility of breeding the following year. In this species, the male departs when the chick is approximately 3 months old, leaving the female to provision the chick for the remaining 10 months of post-fledging care. About 120 pairs were followed in each of two consecutive years between Nov. 1988 and June 1990 in a large colony on the island of Barbuda in the NE corner of the Caribbean, to determine basic breeding biology, including reproductive success, breeding chronology and parental investment. Also included were diet samples, and chick monitoring to determine growth rates as well as sex ratio.

MARbled MURRELET PRODUCTIVITY IN 1994: AGE DETERMINATION AT SEA AND AGE RATIOS AS A MEAS-

SURE OF PRODUCTIVITY. *David Fix, Jeff Jacobsen, Craig S. Strong, Ron LeValley, and Brian Smith*, Crescent Coastal Research/Mad River Biologists, 1696 Ocean Dr., McKinleyville CA 95521.

Assessment of Marbled Murrelet productivity using hatch-year/after hatch-year (HY/AHY) ratios at sea is confounded by difficulty in distinguishing HY birds from AHY birds in advanced prebasic molt. During marine surveys in northern California from June to September, 1994, we examined body and wing molt characteristics to evaluate which were most useful for accurate age determination in the field. As the season progressed, the most effective criterion changed from upper body molt to abdominal body molt to primary wing molt and behavior. Accurate age determination was possible until mid-September. Daily HY/AHY ratios averaged 5.4% during August and September (range 0 to 21.8%). The proportion of HY birds increased from June to late July, but did not show an increasing trend after late July. The significance of this apparently low reproductive rate is discussed.

UPDATE ON THE STATUS OF SEABIRDS BREEDING IN THE TROPICAL ISLAND PACIFIC. *Elizabeth N. Flint*, U.S. Fish and Wildlife Service, Pacific Remote Islands National Wildlife Refuge Complex, P.O. Box 50167, Honolulu, HI 96850, U.S.A..

I reviewed seabird distribution and conservation status on all islands and archipelagos of the tropical Pacific administered by 26 different governments. Information levels from each island nation vary, but a common theme of widespread loss of breeding populations of all but the most predator-resistant species was evident. Threats to seabirds in the region include predation by introduced mammals including man, habitat destruction by introduced mammals including man, various fishery interactions, contaminants including oil, volcanic eruption, and sea level rise. Introduced mammals are almost ubiquitous. I assigned breeding seabirds to four classes of predator vulnerability based on their ability to coexist with various combinations of introduced mammals. Class A birds include storm-petrels, *Pterodroma* petrels, small shearwaters, and Blue-gray Noddies. All species in this group have undergone dramatic range and population declines since human

colonization of the Pacific. Entire archipelagos and island nations have apparently lost all breeding Procellariiforms. Of the 26 countries surveyed, perhaps only eight still have healthy colonies of class A species, and only six of these have legal protection for sites and management plans. Just a subset of these countries are actually implementing management of their seabird colonies.

INVOLVEMENT OF THE COMMUNITY OF BAHIA ASUNCION IN THE RESTORATION OF SEABIRD COLONIES IN THE ISLANDS OF ASUNCION AND SAN ROQUE, BAJA CALIFORNIA SUR, MÉXICO. *Lourdes Flores*, School of Marine Affairs, University of Washington, HF-05, Seattle, WA 98195; *Raven Skydancer*, The Evergreen State College, 2417 Island Dr, Olympia, WA 98502; *Bernie Tershy, Don Croll and Dawn Breese*, Island Conservation and Ecology Group, Long Marine Lab., University of California, Santa Cruz, CA 95060.

To obtain better results in the eradication of non-native cats and rats and the restoration of migratory seabird colonies in the islands of Asuncion and San Roque, BCS, Mexico, we developed a program for community involvement in the adjacent town of Bahia Asuncion. The program consisted of several visits to Bahia Asuncion. During the first visit we 1. identified key members in the community and introduced ourselves and the restoration project, and 2. explored feasible ways to introduce the information about the project to the community and to promote individual participation. Three months later we made a second visit in which we 1. did surveys in the schools, fishing cooperatives and general public to assess knowledge and use of the islands before the eradication and restoration project started; 2. organized a workshop with the elementary school teachers to provide information on basic ecology of islands and environmental education, as well as to explore their ideas on the subject; 3. obtained information from the school teachers on how to elaborate an adequate product to inform the kids at school and the general public about the restoration project; and 4. interviewed several of the first settlers of the community to obtain information on the early history of Bahia Asuncion and the natural history and usage of the islands to assess the date of introduction of

non-native rats and cats and which bird species used to nest there. We concluded that local community involvement plays a critical part in seabird restoration projects.

SEABIRDS OF HOWLAND AND BAKER ISLAND – SEVENTY YEARS OF ADAPTING TO DISTURBANCE, INTRODUCED PLANTS, RATS, AND CATS. *Douglas J. Forsell*, U.S. Fish and Wildlife Service, 177 Admiral Cochrane Dr., Annapolis, MD 21401.

Howland and Baker islands are located near the equator at approximately 176 degrees west longitude. In the past 130 years the islands have been subjected to guano mining, colonists, and military occupation. These occupations have brought several severe disturbances by man and each has left rats, cats, or introduced plants. Although the islands are separated by 40 miles, several hundred thousand seabirds of 12 species have moved between the islands responding to each disturbance. The entire colony moved from Baker Island to Howland Island with the occupation by the military in 1942. The military left cats and a vigorous growth of *Digitaria* on Baker Island. Cats and *Digitaria* were eliminated from Baker in the late 1960's. By the early 1970s most of the birds had moved to Baker from Howland which still had cats and had developed a vigorous growth of *Digitaria*. Only Red-tailed Tropicbirds, Masked Boobies, and a few Brown Boobies remained on Howland. Cats were eliminated from Howland Island in 1986. Red-footed Boobies have started nesting and several other species have been seen on Howland. Nesting chronology indicates the cats preyed on young chicks of Masked Boobies.

ECOTOURISM, FIELD STUDIES AND STRESS: BEHAVIORAL AND HORMONAL RESPONSES OF MAGELLANIC PENGUINS TO NEST SITE DISTURBANCE. *Gene S. Fowler*, Dept. of Biology, Pomona College, 609 N. College Ave., Claremont CA 91711.

Seabird colonies can be tourist attractions, and often receive many visitors, but human visitation at nest sites poses many potential problems for breeding birds. I studied behavioral and hormonal responses to nest visits at a Magellanic Penguin colony, in 3 areas with very different histories and rates of human visitation. One area (TOURIST) received many visits daily, and had for

many years. The other 2 (STUDY and CONTROL) received a single daily visit for 2 years, or none at all, respectively, prior to this study. I visited nests for 5 minutes and collected behavioral data, and then collected a blood sample to assess levels of corticosterone as an indicator of stress. STUDY and CONTROL area birds did not differ in either behavioral or hormonal responses, but both differed strongly from TOURIST area birds, which exhibited fewer alarm behaviors and had lower corticosterone titers. Penguins appear to habituate to constant high levels of visitation, but not to less constant (even though regular) visitation. These results suggest that tourism should be concentrated in as small an area as possible, allowing the visited birds to habituate to humans, while leaving the majority of the colony undisturbed.

CONSERVATION GENETICS OF MARBLED MURRELETS. *V.L. Friesen*, Dept. Biology, Queen's University, Kingston, Ont. K7L 3N6, Canada; *A.J. Baker*, Dept. Ornithology, Royal Ontario Museum, Toronto, Ont. M5S 2C6, Canada; and *J.F. Piatt*, NBS, 1011 E. Tudor Rd., Anchorage, AK 99503.

Genetic information is important for the design of a successful conservation policy for Marbled Murrelets (*Brachyramphus marmoratus*). Most importantly, as a population declines, its genetic resources become depleted; this depletion can decrease the animals' ability to cope with environmental perturbations, such as climatic change or disease epidemics. If local populations of murrelets are genetically different, then populations must be managed as independent units to prevent loss of genetic variation; if the species is essentially panmictic, protection of individual subpopulations will be less critical. Genetic data can also provide insight into the extent of gene flow among local populations, and thus the potential for natural recolonization of depopulated areas. Furthermore, genetic information is essential for restocking or captive breeding. We are currently conducting genetic analyses of murrelets from throughout the North Pacific. Preliminary results of protein electrophoresis and sequence analysis of the cytochrome b indicate that Long-billed Murrelets (*B. m. perdix*) are genetically isolated from North American Marbled Murrelets (*B. m. marmoratus*) and repre-

sent a distinct species. Genetic differences also exist among North American Marbled Murrelets, with murrelets from Attu Island being most distinct.

MASS AND DATE AT DEPARTURE AFFECT THE SURVIVAL OF ANCIENT MURRELET *SYNTHLIBORAMPHUS ANTIQUUS* CHICKS AFTER LEAVING THE COLONY. *Anthony J. Gaston*, Canadian Wildlife Service, National Wildlife Research Centre, 100 Gamelin Blvd., Hill, Quebec K1A 0H3, Canada.

I compared the timing of colony departure and mass of 53 Ancient Murrelet *Synthliboramphus antiquus* chicks that were retrapped as adults in Haida Gwaii, British Columbia, with those of 3992 chicks not retrapped. Assuming that the probability of recapture is a measure of survival, I found that survival was related to both mass and date. The chances of survival increased with mass at departure for chicks from the Reef Island colony, while at East Limestone Island, those that left after the median date of departure survived better than those that left earlier. The effect of date was not related to a seasonal change in departure mass, because chick mass declined with departure date. I suggest that, because of heavy adult mortality during breeding, the timing of breeding in the Ancient Murrelet is based on a compromise between the optimum dates for chick and adult survival. This is in contrast to evidence from other, non-precocial, seabirds.

SUCCESSIVE CLUTCHES IN THE BLACK NODDY, *ANOUS MINUTUS*. *Vanessa Gauger*, Zoology Dept., Univ. of Hawaii, Honolulu, HI 96822.

Most tropical seabirds have been reported to raise a single brood per year; however, the reproductive strategy of nesting more than once a year has seldom been looked for. I studied Black Noddies nesting on Tern and Laysan Islands in the Northwestern Hawaiian Islands, and on Heron Island in eastern Australia, to determine whether pairs attempt successive clutches within an annual nesting season. I also studied factors which may affect a pair's reproductive success, including mate and nest fidelity, timing of nesting, and the fledgling's behavior in prolonging the period of post-fledging feeding. I monitored the reproductive success of color-banded pairs on Tern Island from 1987 to 1989.

During the nesting season from November 1987 to October 1988, 36% of 56 pairs fledged two successive chicks (about five months apart). During the 1988-1989 year-long nesting season, 37% of 75 pairs fledged two successive chicks, and 4% fledged three successive chicks. These results indicate that successive clutches may regularly contribute to reproductive success in this population. However, I observed no attempts at successive clutches by pairs nesting on Heron Island during the 1992-1993 nesting season, nor on Laysan Island during the 1993-1994 nesting season. I compared chick growth rates, and incubation shift lengths between the three populations, as indirect indicators of the availability of food resources.

AGE AND BREEDING SITE SELECTION IN THICK-BILLED MURRES: EFFECTS ON VULNERABILITY TO PREDATION BY GLAUCOUS GULLS. *H. Grant Gilchrist, Leah N. deForest, and Anthony J. Gaston*. (H.G.G) Dept. of Zoology, University of British Columbia, 6270 University Blvd., Vancouver, BC, Can. (L.N.d. & A.J.G.) Canadian Wildlife Service, 100 Gamelin Blvd., Hull, Que., Canada.

Thick-billed murres (*Uria lomvia*) breeding for the first time (inexperienced) typically have lower reproductive success than experienced breeders. Vulnerability to egg and chick predation by glaucous gulls (*Larus hyperboreus*) may provide a proximate mechanism for this observation. We compared gull predation and reproductive success of murres in relation to age and type of breeding site (e.g. number of neighbours, ledge width, proximity to rock walls, etc.) During calm wind conditions, gulls foraged on foot and successfully attacked edge nest sites on broad ledges. During windy conditions, gulls attacked narrow ledges by using updrafts that increased their maneuverability in flight. Based on these observations murre breeding sites were ranked from most to least vulnerable: 1) broad ledge, low breeding density, 2) narrow ledge, low density, 3) narrow ledge, high density, 4) broad ledge, high density. Murres breeding for the first time nested on sites that were associated with high rates of gull predation and low reproductive success. However, young breeders had a lower reproductive success than older breeders, even when both occupied the same type of site. We

concluded that an increased probability of gull predation due to occupation of sub-optimal breeding sites accounted for part, but not all of the differences in breeding success between young and older breeders.

COMMUNITY-BASED SEABIRD MANAGEMENT IN NORTH-WEST GREENLAND. *H. Grant Gilchrist*, Dept. of Zoology, University of British Columbia, 6270 University Blvd., Vancouver, B.C. Canada.

The Thick-billed Murre (*Uria lomvia*) has declined dramatically at many breeding colonies in West Greenland due primarily to the substantial by-catch of the salmon gill-net fishery during the 1970s, and to persistent hunting and eggging at colonies. In response to these declines, the Greenland Home Rule Government introduced legislation in 1988 which prohibited human access to colonies and hunting during the breeding season. However, the effectiveness of these restrictions in restoring murre numbers is largely unknown. Indeed, recent censuses in the Upernavik region indicate that colonies continue to decline there. I integrated data concerning murre reproductive ecology, gull predation, sources of colony disturbance, and hunting dynamics in the Upernavik region in a simulation model to assess the effectiveness of current legislation. The model indicated that hunters could meet their annual demand despite current seasonal constraints by concentrating their effort just prior to egg-laying. The model predicted the extirpation of several murre colonies in the region within 20 years. Smaller daily bag limits and a shorter hunting season could reverse this trend assuming high levels of hunter compliance, something that is unlikely given present levels of enforcement. I recommend: 1) further research on murre reproduction in the area, 2) that a detailed hunter survey is conducted, and 3) that community-based education programs are established to increase the level of voluntary compliance with current and future hunting legislation.

MONITORING ACTIVITY OF A MARKED MARBLED MURRELET POPULATION IN BRITISH COLUMBIA. *Michael J. Gill and Irene A. Manley*, c/o Chair of Wildlife Ecology, Biological Sciences, Simon Fraser University, Burnaby, B.C., V5A 1S6; *Andrew E. Derocher*, B.C. Ministry of Forests, 2100 Labieux Road,

Nanaimo, B.C., V9T 6E9; and Gary W. Kaiser, Canadian Wildlife Service, P.O. Box 340, Delta, B.C., V4K 3Y3.

During the 1994 breeding season, we attempted to study the local stability and movements of a population of Marbled Murrelets in an area near Powell River, British Columbia. Between June and July, we captured and color-marked 174 individuals and attached 43 telemetry transmitters. Color-marks were dyed feathers attached to the back of the head. This proved to be a poor marker as the feathers would remain attached for only a short period. Marbled Murrelets were captured at dawn and dusk in a narrow inlet using an array of three mist nets floating on light rafts. The mean capture times were 5 min before sunrise and 22 min after sunset. The mean capture rate was 2.5 birds/h (SE=0.2) with a high of 8.8 birds/h on the evening of 25 Jun. 1994. Fifty-eight resightings of 32 individuals (including a recapture of a bird banded in 1993 at the same site) were made. Forty-two of these resightings were made through radio-tracking, 13 through direct sightings of color marks, and three through recapture.

IMPROVING SAMPLING DESIGNS AND ANALYTICAL TREATMENT OF MARINE BIRD SURVEYS. *J. Christopher Haney*, The Pennsylvania State University, DuBois, PA 15801.

Since the early 1970s, exploration for energy reserves on continental shelves of North America (e.g., the OCSEAP studies) prompted numerous ship-board and aerial surveys of marine birds. These data are routinely used to estimate density and population size, detect habitat use and foraging patterns, and model trophic relationships. Here, I provide examples for improving analytical quality of these studies. (1) For exploratory surveys that seek primarily to document taxonomic composition and seasonal occurrence, asymptotes of cumulative species curves plotted against effort can reveal marginal costs (in ship time or travel distance) arising from added effort; (2) rarefaction from such curves allows valid comparisons of species richness across regions or seasons. (3) When available and bias-free, species proportions at colonies provide null models against which to test composition of species detected at sea (e.g., via log-linear analysis). Lower- or higher-than-expected proportions may indicate that

some species are under-represented by marine sampling, that some species have more non-breeders foraging near the colony, or both. (4) Because they provide unbiased estimates of density and population size, adaptive cluster sampling is appropriate when locations and shapes of clusters (foraging patches) cannot be predicted a priori, a common problem in at-sea surveys of marine birds.

COMPARATIVE DEMOGRAPHY OF BLACK-LEGGED KITTIWAKES (*RISSA TRIDACTYLA*) IN THE GULF OF ALASKA AND SEA OF OKHOTSK. *S.A. Hatch*, Alaska Science Center, National Biological Survey, 1011 E. Tudor, Anchorage, AK 99503, *A. Ya. Kondratyev* and *L.F. Kondratyeva*, Institute of Biological Problems of the North, Russian Academy of Sciences, 24 Karl Marx St., Magadan 685000 Russia.

By Atlantic standards, the productivity of kittiwakes in Alaska is low and declining. Compensating for their low productivity, Pacific kittiwakes are relatively long-lived. We posed the question, "What mechanisms produce the observed trade-off of productivity and survival in different populations of Black-legged Kittiwakes?" We're testing two hypotheses by comparing productivity and survival rates at kittiwake colonies in the Gulf of Alaska and Sea of Okhotsk. H1: The inverse relation between productivity and survival is a direct result of the cost of reproduction. (Prediction: productive colonies in the Sea of Okhotsk will have lower rates of adult survival, consistent with the contrast between Pacific and Atlantic populations.) H2: The inverse relation between productivity and survival reflects the relative amounts of seasonality in different systems. (Prediction: Pacific colonies should have relatively similar rates of over-winter survival because birds from different colonies experience much the same environment in winter.) Our preliminary findings support hypothesis 2. In spite of differences in productivity between the Gulf of Alaska and Sea of Okhotsk, kittiwakes in these two regions have similar mean survival rates. We suggest the following conclusions based on hypothesis 2: (1) over-winter survival is determined primarily by the interaction of population density and food supply in winter, (2) kittiwakes from widely separated Pacific colonies experience relatively simi-

lar feeding conditions in winter, and (3) Pacific kittiwakes experience less seasonal variation (summer versus winter) in food resources than Atlantic kittiwakes.

RECOVERY MONITORING OF PIGEON GUILLEMOT POPULATIONS IN PRINCE WILLIAM SOUND, ALASKA. *D. Lindsey Hayes*, U.S. Fish and Wildlife Service, Anchorage, AK 99503.

The population of Pigeon Guillemots in Prince William Sound decreased from about 15,000 in the 1970s to about 3,000 in 1993. Some local populations were affected by the *Exxon Valdez* oil spill in 1989, but there is evidence suggesting the overall population was already declining. In 1994, we monitored 20 guillemot nests on Naked Island (NI) and 24 on Jackpot Island (JI) from the egg stage through fledging. Hatching success was 0.89 (n=37, NI) and 0.80 (n=46, JI); fledging success was 0.55 (n=33, NI) and 0.76 (n=37, JI). On NI, predation was the cause of several nesting failures and suspected of being the cause of numerous others. The most likely mammalian predators were river otters. Predation on eggs by jays, crows, or especially magpies was also suspected. Although predation was infrequent or nonexistent on JI, abandonment of eggs was high. Sandlance accounted for about 1% and 8% of prey items delivered to guillemot chicks at JI and NI in 1994; by contrast, the sandlance component of the chick diet at NI was about 55% in 1979. Gadids were much more prevalent in the diet of guillemot chicks at NI in 1994 (about 30%) than in 1979-1981 (<7%). Changes in the relative proportions of benthic and schooling fish in the diet of guillemot chicks might represent a key change in the ecosystem that is affecting several species of marine birds and mammals in the Sound.

WING MORPHOLOGY AND FLIGHT BEHAVIOR OF PELAGIC SEABIRDS ON JOHNSTON ATOLL. *Fritz Hertel*, Dept. of Biology, UCLA, Los Angeles, CA 90024; and *Lisa T. Ballance*, SW Fisheries Science Center, 8604 La Jolla Shores Drive, La Jolla, CA 92037.

Johnston Atoll in the central Pacific provides a breeding site for twelve species of pelagic seabirds that exhibit a variety of feeding behaviors including plunge diving, pursuit plunging and aerial feeding. Data were collected from eight of these species,

which represent a taxonomic diversity of three orders and four families. Wing loadings (body weight/wing area) and aspect ratios (wing span²/wing area) were calculated for each species and analyzed using a principal components analysis and a discriminant function analysis. Results indicate that wing loadings and aspect ratios are reasonable predictors of flight behavior in these species even when considering historical factors by adjusting for differences in phylogeny.

EGG SIZE AND THE GROWTH OF NESTLING THICK-BILLED MURRES: AN EGG SWITCH EXPERIMENT AT TWO COLONIES IN HUDSON STRAIT, N.W.T., CANADA. *Mark Hipfner*, Dept of Biology, Univ. of Ottawa, Ottawa, Ontario, K1N 6N5; and *Garry Donaldson*, Canadian Wildlife Service, Hull, Quebec, K1A 0H3.

We examined the contributions of egg size and parent quality to the growth of nestling Thick-billed Murres *Uria lomvia* by switching eggs at random among breeding pairs at two Low Arctic colonies, Coats and Digges Islands, N.W.T., Canada. Egg sizes were similar at the two colonies. Feeding rates were ca. 3 times higher at Coats than at Digges, so that by 14 days of age chicks at Coats averaged 70% heavier than those at Digges. At Coats, the size of foster eggs and the mass of foster chicks were positively and significantly correlated at 2 days of age, but the correlation weakened considerably as chicks grew older. At Digges, the correlation was still significant when chicks were 14 days old. At neither colony was the size of egg laid by a breeding pair a good predictor of the growth of the chick they fostered. The importance of egg size may vary depending on the potential growth of the chick.

FACTORS AFFECTING THE LENGTHS OF INCUBATION PERIODS OF THICK-BILLED MURRE EGGS AT COATS ISLAND, N.W.T., CANADA. *Mark Hipfner*, Dept of Biology, Univ. of Ottawa, Ottawa, Ontario, K1N 6N5; and *Anthony J. Gaston*, Canadian Wildlife Service, Hull, Quebec, K1A 0H3.

We examined the effects of lay date, mean daily air temperature, and egg size on the lengths of incubation periods of eggs of Thick-billed Murres *Uria lomvia* at Coats Island, N.W.T., Canada. There was a sig-

nificant negative correlation between incubation period and lay date. This seasonal decline in incubation periods was not caused by the seasonal warming trend. Nor could it have been caused by obvious seasonal changes in the incubation behaviour of adult birds, because murres lay a single egg and incubation is continuous from the time of laying. There was no relationship between egg size and incubation period. In fact, the seasonal decline in incubation periods occurred in the absence within our sample of a seasonal decline in egg sizes. A seasonal decline in incubation periods could be adaptive for murres in that it may increase hatching synchrony among breeding pairs. It may also contract the length of the breeding season for late-laying pairs. The proximate cause of the decline is unknown.

CENSUS TECHNIQUES AND POPULATION TRENDS OF BLACK-LEGGED KITTIWAKES IN GLACIER BAY, ALASKA. *Elizabeth R. Hooge*, NBS, Alaska Science Center, Glacier Bay Field Station, Gustavus, AK, 99826; and *Museum of Vertebrate Zoology, Dept. of Integrative Biology, Univ. of California, Berkeley, CA, 94720.*

Glacier Bay National Park hosts several Black-legged Kittiwake (*Rissa tridactyla*) colonies. I will report on techniques being developed to measure fine-scale population trends. In 1993 we tested the multiple-count method with a bootstrapping technique, and demonstrated that five counts are sufficient to encompass the observed variation in colony attendance and to detect changes as small as five percent. In addition, a new photographic census technique was tested; it greatly reduced the time required for censusing while producing counts that were not significantly different. The number of breeding pairs at Margerie Glacier declined significantly from 1991 through 1993, and fewer than ten percent of nests produced a chick in 1991 and 1992. However, in 1993, a record-breaking warm year, chick production was very high, with 47% of all nests producing at least one chick. In the subsequent year (1994) adult colony attendance increased significantly to the highest value observed to date, yet virtually no chicks were produced. I will present a hypothesis to explain the large variance in colony attendance and reproduction, which will be tested in subsequent years.

PROGRESS IN RAT EXTERMINATION ON LANGARA ISLAND, BRITISH COLUMBIA. *G. R. Howald*, Dept. Animal Science, University of British Columbia, Vancouver, B.C.; *G. W. Kaiser*, Canadian Wildlife Service, P.O. Box 340, Delta, B.C., V4k 3Y3; *P. F. Buck*, Huksta Forestry Services, P.O. Box 258, Massett, Haida Gwaii, B.C., V0T 1M0.

In 1995, the Canadian Wildlife Service plans to recover a seabird colony habitat by eradicating rats on Langara Island (3,200 ha) and adjacent Lucy Island (40 ha). During 1994, we used remote sensing cameras to record scavengers at carcasses of trapped rats and tested baiting methods on Lucy Island. After a 7-day delay, rats took all of the baits offered until a sudden cessation of activity 8 to 10 days later. Most of the baits and carcasses remained underground, offering limited exposure to non-target animals. We terminated the test baiting as soon as activity ceased, but a rat was trapped 3 weeks later. The actual baiting period will need to be extended in 1995 to ensure success. The local population of dusky shrews (*Sorex obscurus*) was hit very hard (perhaps 85% loss), but a mitigation plan has been developed. The remote sensing cameras recorded many crows and ravens scavenging carcasses of snap-trapped rats. We made a great effort to make such rats available to eagles, but they showed no interest. Beetles (*Nicrophorus* sp.) buried many rat carcasses within 2 to 14 days.

CALIFORNIA'S OFFICE OF OIL SPILL PREVENTION AND RESPONSE (OSPR) OILED WILDLIFE CARE NETWORK. *David A. Jessup*, Veterinary Services Unit, CDFG-OSPR, 1701 Nimbus Rd. "D", Rancho Cordova, CA, 95670.

Catastrophic oil spills can cause considerable environmental damage and immediate loss of wildlife. In 1990 California Legislature passed SB 2040 which states "The administrator shall establish rescue and rehabilitation stations for sea birds, sea otters, and other marine mammals." To meet this mandate OSPR is building a facility in Santa Cruz for rehabilitation, veterinary care, and research on oiled marine wildlife. When completed in the summer of 1996 at a cost of approximately \$5 million dollars this facility will be capable of caring for at least 125 sea otters, be flexible enough to care for other marine animals, and house ongoing research projects. In 1993 a sec-

ond piece of legislation, SB 775 (Watson) allowed OSPR to use the interest from the \$50 million dollar Emergency Response Fund to establish an Oiled Wildlife Care Network for the entire California coast in conjunction with existing scientific, educational institutions and wildlife rehabilitation facilities. The Network will share pertinent information, improve and standardize treatment and cooperate in research. OSPR's goals are to improve our ability to care for oiled marine wildlife, and to improve our ability to determine both the immediate and sublethal effects of oil pollution on marine animal populations.

DAILY VARIABILITY IN ACTIVITY PATTERNS OF MARBLED MURRELETS AT INLAND FOREST SITES IN THE OREGON COAST RANGE. *Patrick G.R. Jodice and Michael W. Collopy*, National Biological Survey Forest & Rangeland Ecosystem Science Center, Corvallis, OR, 97331.

Surveys for Marbled Murrelets were conducted at 4 inland forest sites in the Oregon Coast Range from 1 May–4 August, 1994. Surveys generally followed the Marbled Murrelet Survey Protocol, with the exception that each station was surveyed 55–66 times. Numbers of detection/day ranged from 0–198 across the 4 sites, with a maximum two day range of +100 detections. Daily detection maximums occurred from early July through early August. Mean number of detections/day ranged from 16–36 across the 4 sites, and most detections were auditory only. Variability in numbers of daily detections was high, with coefficients of variation (CV) ranging from 0.49–1.34. Mean duration of daily activity was also quite variable, with means ranging from 44–68 minutes, and CV's of 0.41–0.94. Mean time of first detection was 24 minutes prior to sunrise, and mean time of last detection was 28 minutes after sunrise. Measures of variation in daily Marbled Murrelet activity (e.g., detections, duration) will be useful in determining the feasibility of using these metrics for long-term monitoring at inland forest sites.

DID AETHIA AUKLET ORNAMENTS EVOLVE THROUGH SEXUAL SELECTION FOR SENSORY EXPLOITATION? *Ian L. Jones*, Department of Biological Sciences, Simon Fraser University, Burnaby, British Columbia, V5A 1S6, CANADA.

Male and female auklets (*Aethia* spp., Alcidae) display conspicuous facial ornaments including white plumes, crests and colorful bill plates during the breeding season. Previous experimental work has shown that Least and Crested auklets *Aethia pusilla* and *A. cristatella*, express mating preferences for elaborate natural ornaments, suggesting that the ornaments are favoured by mutual inter-sexual selection. I experimentally measured the sexual response of naturally crest-less Least Auklets to crests of different sizes on seven realistic least auklet models made from skins, at a large mixed species auklet colony at Buldir Island, Alaska. Least Auklets not only expressed a heterospecific mating preference for artificial crests similar to the crest ornament of Crested and Whiskered auklets *A. pygmaea*, but they also preferred larger crests over smaller ones. This is the first example from any bird of a sexual preference for the ornament of a different species. Because Least Auklets are ancestral to the two naturally crested auklet species, it is possible that crests evolved due to a mating preference that existed before the evolution of the ornament itself. These results are consistent with the sensory exploitation hypothesis, but do not preclude a role for other sexual selection mechanisms.

WHERE DO ADELIE CHICKS GO? *Nina J. Karnovsky, Bill Fraser, Donna Patterson, Wayne Trivelpiece, Doug Wallace*. Montana State University, Dept. of Biology, Lewis Hall, Bozeman, MT. 59717.

Adelie Penguins are highly philopatric to their natal colony but seldom return before the age of two. Several large colonies of Adelie Penguins breed on the Antarctic peninsula. Although it is well known that adults winter on the edge of the pack ice, it has not been known where the juveniles go during the winter period. We conducted seabird censuses during daylight hours in the Bellinghausen sea from 26 August, to 23 September 1993, on board the RVDuke. The transects covered the area between 64–68°S Lat. and 96–88°W Long. We encountered 123 Adelie Penguins and made the first observations on the pelagic distribution of juveniles. Like adults, juveniles were associated predominately with permanent ice. Although juveniles tended to make up a greater proportion of the Adelies found in the northern part of the study area, the high proportion of adults in

the southern region was possibly a result of the close proximity to the Adelaide Island breeding colonies and the return migration of adults to colonies in the Anvers Island region. However, the tendency for a difference in distributions between the age classes could also have been related to difference in habitat preference or dispersal tendency.

FORAGING BEHAVIOR OF JAPANESE CORMORANTS IN RELATION TO ANNUAL CHANGE IN PREY TYPE. *Akiko Kato*, National Institute of Polar Research, Itabashi, Tokyo 173, Japan; *Yutaka Watanuki*, Lab. Appl. Zool., Hokkaido Univ., Sapporo 060; *Yasuhiko Naito*, Natl. Inst. Polar Res.

Annual difference in foraging behavior of Japanese Cormorants in relation to change in food availability was studied at Teuri I., Hokkaido in 1992–94 breeding seasons. Diving patterns were recorded with micro data loggers for 11 birds. Mean depth and duration of dives were 5–20m and 22–45 sec, respectively. Dive duration was dependent on dive depth. Distribution of dive depth were bimodal and varied between years. There were significant differences in food availability between years. In the years that pelagic fish (Japanese sand lance in 1992 or Japanese anchovy in 1994) dominated, the cormorants fed on pelagic fish utilizing shallower dives. In 1993 that pelagic fish was not abundant, they fed on benthic fish (greenling) utilizing deeper dives. Mean growth rate of chicks did not differ between years. They made shorter foraging trips more frequently in 1992 than later two years. Although they spent more time for foraging in 1993, fledging success was lower in that year. Japanese Cormorants appear to be opportunistic feeders, and that they can change their foraging patterns in response to prey availability.

DISPERSAL OF YOUNG WHITE PELICANS FROM WESTERN BREEDING COLONIES. *James O. Keith*, 159 Highland Dr., Bailey, CO 80421 and *Edward J. O'Neill*, Box 69, Merrill, OR 97633.

Young White Pelicans in three breeding colonies were either sprayed with dyes or fitted with patagial tags during six years to monitor their movements after fledging. This was part of an effort to determine where White Pelicans were contacting insecticides responsible for an unusual and continuous mortality. Young at Anaho Is-

land NWR were color-marked green, while those at Lower Klamath NWR were marked with yellow and those at Clear Lake NWR with red. Dyed birds provided greatest sightings (76%), but colors disappeared in 4 months. Fewer birds with tags were seen (24%), but reports continued for up to 34 months. Of 838 reports received from the public and biologists, 36% were from California, 18% from the western Great Basin, 27% from the northern Great Basin, 17% from the Snake River plain and Great Salt Lake, and 2% from elsewhere. Young from Anaho Island NWR were primarily seen in California (45%) and the western Great Basin (38%). Those from Lower Klamath NWR and Clear Lake NWR had similar dispersal patterns and were reported from the northern Great Basin (40%), California (29%), and the Snake River plain and Great Salt Lake (23%).

ESTIMATES OF MARINE BIRD ABUNDANCE IN SOUTHEAST ALASKA, DURING SUMMER 1994. *Steven J. Kendall, Beverly A. Agler, Pamela E. Seiser, David B. Irons*, U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, Alaska 99503; and *John Lindell*, U.S. Fish and Wildlife Service, Ecological Services, Juneau, Alaska 99801.

During June and July, 1994, we conducted a small boat survey of Southeast Alaska. This was a preliminary survey done to estimate the abundance and distribution of marine birds. No such study had ever been done in this region. We used two 25-foot boats to survey short (approximately 1 mile long) transects distributed randomly throughout the entire southeastern Alaska panhandle. There were 650 transects selected from two strata, pelagic (> 200m from shore) and shoreline (< 200m of shore). Survey methods were similar to those used previously in Prince William Sound and Lower Cook Inlet. Population estimates and variances were calculated using a ratio estimator. We estimated the total marine bird population (+ 95% CI) as, 1,924,662 + 568,894 birds. The most abundant species or species groups were *Brachyramphus murrelets* (687,061 + 201,162); waterfowl (Family Anatidae; 309,444 + 414,485), mostly scoters (*Melanitta* spp.; 252,213 + 413,588); gulls (*Larus* and *Rissa* spp.; 221,888 + 60,247), Rhinoceros Auklets (*Cerorhina monocerata*; 199,373 + 120,961) and murrelets (*Uria* spp.; 137,777 +

77,7333). To examine bird distribution we generated maps for important species and species groups using observation data from the transects. We also examined ways to improve the precision of the estimate for future surveys.

CHANGES IN MASS AND THE ADULT WITHIN-SEASON SURVIVAL RATE OF CASSIN'S AUKLETS ON TRIANGLE ISLAND, B.C. *Hugh Knechtel*, Department of Biological Sciences, Simon Fraser University, Burnaby, B.C. Canada V4A 1S6.

I describe changes in mass and the adult within-season survival rate of Triangle Island Cassin's Auklets during the 1994 breeding season. Triangle Island supports over a million Cassin's Auklets making it the largest colony of this species in the world. Birds were captured as they departed the colony to minimize disturbance, between April 6 and August 6, 1994. The total number of individuals trapped was 1001, while the total captures were 1609. Comparisons were made between two capture sites of different nesting density (West Bay nesting site is all Cassin's Auklets, while Calamity Cove is a mix of Rhinoceros Auklets and Cassin's Auklets), between sexes and between adults (white eyes) and sub-adults (brown eyes). Changes in mass are evaluated in the light of two hypotheses that concern mass loss by birds during breeding: that mass loss is a symptom of stress or that it is an adaptive response to optimize mass in relation to the increasing demands of breeding activities. Significant differences were found among groups of different age and breeding status. I propose to continue this study for an additional two years to examine the relationship of body mass and adult survival with environmental variability.

THE GROWTH OF CAPTIVE ANCIENT MURRELETS. *Alexander Ya. Kondratyev and Luba F. Kondratyeva*, Institute of Biological Problems of the North, Russian Academy of Sciences, Magadan 685000, Russia.

Ancient Murrelet chicks (*Synthliboramphus antiquum*) leave their nesting burrows at 2-3 days of age, so growth patterns cannot be studied under natural conditions. We collected two Ancient Murrelet chicks from different nests just before they left their burrows on Talan

Island, Sea of Okhotsk, and raised them in captivity at our field station on the island. The chicks preferred to eat small fish such as capelin (*Mallotus villosus*), sand lance (*Ammodytes hexapterus*), and Arctic smelt (*Osmerus mordax*). During the first week of the chicks' life we fed them small amounts every 30-45 minutes day and night. During this week the chicks consumed about 100% of their body mass each day and doubled their body mass. At 8-9 days contour feathers appeared on the breast, belly, flank, and shoulder, and scapulars, but the growth rate did not decrease. Secondaries and tertials appeared at two weeks. Plumage growth was complete at one month except for the primaries and rectrices. Body mass increased rapidly for 30-35 days, at which time 80% of adult mass was attained; slow growth continued thereafter. At 45 days down was still visible on the nape and rump, and primaries and rectrices were still growing rapidly.

A SURVEY OF SEABIRD COLONIES IN THE NORTHERN SEA OF OKHOTSK. *Alexander Ya. Kondratyev*, Institute of Biological Problems of the North, Russian Academy of Sciences, Magadan 685000, Russia, and *Vivian M. Mendenhall*, U.S. Fish and Wildlife Service, Anchorage, Alaska 99503, U.S.A.

We surveyed 650 km of coastline in the Gulf of Shelikov, at the northern end of the Sea of Okhotsk (Russian Far East), for seabird colonies during 10-19 July 1994. This area had not been surveyed for bird populations previously. We recorded a total of 320,000 seabirds in 31 colonies. Most colonies consisted of a few hundred Pelagic Cormorants (*Phalacrocorax pelagicus*), Slaty-backed Gulls (*Larus schistisagus*), Spectacled Guillemots (*Cephus carbo*), and Tufted and Horned puffins (*Fratercula cirrhata* and *F. corniculata*). We found two major colony complexes of approximately 85,000 and 200,000 birds. The primary species in these colonies were Common and Thick-billed Murres (*Uria aalge* and *U. lomvia*), and smaller numbers of Black-legged Kittiwakes (*Rissa tridactyla*). We hope that future work in this region can elucidate the prey resources that support these colonies and can survey portions of the coast that we were unable to.

USE OF AN ABANDONED DREDGING RIG AS AN ARTIFICIAL NESTING

PLATFORM BY DOUBLE-CRESTED CORMORANTS IN SAN DIEGO COUNTY. *John K. Konecny, Susan E. Wynn, and Doreen Stadlander*, U.S. Fish and Wildlife Service, Coastal Ecosystem Program, 2730 Loker Avenue West, Carlsbad, California, 92008.

The Double-crested Cormorant (*Phalacrocorax auritus*) is a common permanent resident in California along the coast, and locally common on inland lakes in the coastal slope region. During spring and summer, numbers usually decrease and nesting occurs on coastal islands and inland near large rivers and lakes. Coastal Double-crested Cormorant nesting colonies are located in the Channel Islands, Farallon Islands, and Los Coronados Islands, and on nearshore rocks and islands north of San Francisco. The total breeding population on the coast of California is estimated to be approximately 2000 individuals. Breeding has not been documented in San Diego County until recently. For the last eight years the Double-crested Cormorant has opportunistically nested on an abandoned dredging barge anchored within Western Salt, Inc., in south San Diego Bay. Thirty-four nests were documented on the barge during the 1993 nesting season, and 44 nests were initiated during the 1994 season. The success of this barge as a nesting platform illustrates the high feasibility and likely success of creating artificial nesting structures at other locations in southern California.

CONTROL OF GULLS AND INTRODUCED PASTURE GRASSES FOR RESTORING TERN NESTING HABITAT ON MAINE COAST ISLANDS. *Stephen W. Kress*, Seabird Restoration Program, National Audubon Society, 159 Sapsucker Woods Road, Ithaca, New York 14850.

To restore a historic tern colony of Common Terns (*Sterna hirundo*) and Roseate Terns (*S. dougallii*) at Eastern Egg Rock in Muscongus Bay, Maine, 82 Great Black-backed Gulls (*Larus marinus*) and Herring Gulls (*L. argentatus*) were killed using the avicide DRC 1339 in 1973 and 1974. Subsequent control using shooting, nest destruction and human presence has kept nesting attempts to less than 25 pairs. To create nesting habitat for Common Terns, we found that application of rock salt (halite) at the rate of 0.73 kg/m limits plant growth during the season of application,

but not in subsequent years and a controlled burn in spring had no apparent effect. Of the techniques tested to date, placement of landscape fabric to create patches of open space has proved most successful with 65 pairs of terns using these plots 4 years after placement. Grazing by goats and sheep within fenced enclosures at Seal Island NWR also offers promise of creating open patches for tern nesting. These techniques have resulted in restoration of the Egg Rock tern colony and its growth to 1198 pairs of Common Terns, 63 pairs of Roseate Terns and 48 pairs of Arctic Terns (*S. paradisaea*) in 1994.

FORAGING OF RADIO-TAGGED MARBLED MURRELETS IN PRINCE WILLIAM SOUND, ALASKA. *Katherine J. Kuletz, Dennis K. Marks, Debbie Flint*, U.S. Fish and Wildlife Service, Anchorage, AK 99503, and *Rick Burns and Lynn Prestash*, 726 E 4th st., N. Vancouver, BC, Canada V7L1K2.

We radio-tagged 46 Marbled Murrelets in Prince William Sound, Alaska, to study foraging patterns. We hypothesized that birds in Port Nellie Juan (PNJ), a deep water fjord, traveled farther than birds at Naked Island (NI), which is surrounded by relatively shallow water. We caught birds at sea in June 1994 and attached a 2 g transmitter to the back. In June and July we tracked by air (N=231 locations; 24 days), and boat (N=177; 42 d). Six inland sites (= 1.6 km inland) were assumed to be nests. We found no significant differences between birds at PNJ (N=33) and NI (N=13). Average straight-line distances for birds at PNJ were 17 km from capture site, 11 km between consecutive sites, 23 km maximum distance, and 129 km² (minimum area polygon). Birds at NI averaged 15 km, 7 km, 20 km and 54 km², respectively. From nests, average distance around land was 21 km, and 40 km for 1 bird. After chick hatching began, distance from capture site increased, but minimum area polygons decreased. Birds at NI used shallow areas (<80 m) more than expected based on availability. Birds at PNJ used depth classes in proportion to availability, and frequently used sites of upwelling. Thus, between areas, birds modified their habitat use, but not the distances traveled. These distances may represent a limitation for murrelets during the breeding season.

ADAPTIVE SIGNIFICANCE OF LAMPFISH DIETS FOR REPRODUCTION IN RED-LEGGED KITTIWAKES. *Brian K. Lance and Daniel D. Roby*, Alaska Coop. Fish and Wildlife Res. Unit, Univ. of Alaska, Fairbanks, AK 99775-0990.

Red-legged Kittiwakes (*Rissa brevirostris*) breeding on the Pribilof Islands, Alaska feed their young primarily lampfish (Myctophidae), while Black-legged Kittiwakes (*R. tridactyla*) are generalists that feed on a more diverse array of prey. Lampfish are extremely high in lipids and have over twice the energy density of gadids. We interspecifically cross-fostered chicks of the two kittiwake species to test the hypothesis that the more specialized diet of Red-legged Kittiwakes confers some adaptive advantage to chick of that species. Survival rates and peak body mass of cross-fostered chicks were not different from those of conspecific control chicks. Black-legged Kittiwake chicks had higher growth rates and greater lean mass at fledging than Red-legged Kittiwake chicks, regardless of whether they were raised by foster parents. But chicks of either species raised in Red-legged Kittiwake nests were on average 50% fatter at fledging than those raised in Black-legged Kittiwake nests. Consequently, growth rate of lean tissue was genetically/physiologically constrained, while fat deposition rate was constrained by diet. We hypothesize that the adaptive advantage of lampfish diets for Red-legged Kittiwake chicks is manifest in higher post-fledging survival.

RELATIONSHIPS BETWEEN PREY ABUNDANCE AND THE SPATIAL CORRELATIONS OF SEABIRDS AND PREY. *Elizabeth Logerwell*, Ecology and Evolutionary Biology, University of California, Irvine, CA 92717.

I studied the at-sea distribution and abundance of Common Murres (*Uria aalge*) and their prey, juvenile Pacific Herring (*Clupea harengus pallasii*), off the west coast of Vancouver Island in July 1993. I found that murres were successfully locating large-scale regions of high herring abundance but that within those regions murre and fish numbers were not correlated. To investigate whether the weak small-scale correlation between murres and herring was related to high prey abundance, relative to seabird food requirements, I estimated regional seabird consumption rates. In 1993

the seabird community consumed 22% of the biomass of juvenile herring off the west coast of Vancouver Island. These consumption rates may have been sufficiently low that it was not necessary for the murres to forage at the largest prey aggregations in order to meet their daily energetic needs—a foraging strategy that would result in poor small-scale correlations between the abundance of murres and herring. If correct, this hypothesis could explain the lack of small-scale correlation between the abundance of seabirds and their prey that has been observed by a number of authors in a variety of pelagic systems.

SPATIAL FORAGING MODEL OF CONTAMINANT UPTAKE BY DIVING DUCKS. *James R. Lovvorn*, Department of Zoology & Physiology, University of Wyoming, Laramie, WY 82071; and *Michael P. Gillingham*, Faculty of Natural Resources & Environmental Studies, University of Northern British Columbia, Prince George, BC V2N 4Z9.

Contaminant studies of migratory birds include two main approaches: (1) collecting wild birds and analyzing their tissues, and (2) toxicity assays with captive birds. In the first approach, one seldom knows how long individual birds have been in the area (perhaps they acquired contaminants elsewhere), and sites are often in urban environments where shooting is problematic. The second approach with captive birds ignores changes in food and contaminant intake with varying activity and weather experienced by wild birds. Neither of these approaches alone can predict maximum allowable contaminant levels in foods that avoid toxic effects under different field conditions, or what body burdens accumulate during varying lengths of stay and affect the birds' biology at other places and times. To allow such predictions, we developed an individual-based model of food intake by diving ducks for varying weather, water depth, food dispersion, and nutrient content of food. Food-intake estimates are combined with laboratory data on contaminant uptake as a function of food consumption and contaminant content. As an example, we estimate cadmium uptake by Canvasback ducks foraging on belowground tubers of the submerged plant *Vallisneria spiralis*.

USE OF FRESHWATER LAKES AND

THE NEW AIRSTRIP BY KITTIWAKES ON ST. GEORGE ISLAND, ALASKA. *Sharon D. Loy* and *Edward C. Murphy*, Department of Biology and Wildlife, University of Alaska Fairbanks, Fairbanks, AK, 99775.

Red Legged Kittiwakes (*Rissa brevirostris*) and Black Legged Kittiwakes (*R. tridactyla*) aggregated in large numbers on the new airstrip on St. George Island, Alaska in 1993. Atka Lake, a freshwater lake near the airstrip, is a strong attraction for kittiwakes (for bathing, preening, and drinking), and about half the kittiwakes leaving Atka Lake flew to the airstrip to roost. Habitat manipulations in 1994 (hazing on the airstrip and a wire array covering Atka Lake) precluded use of Atka Lake and reduced numbers of kittiwakes roosting on the airstrip. In 1994, counts at Govorushka Lake were significantly higher than in 1993, but counts at Umanangula Lake were significantly lower. Telemetry data from 1993 showed that kittiwakes used freshwater lakes an average of 0.44 times/day. Kittiwakes nesting on the northwest and west cliffs (the areas of highest nesting densities) used the airstrip and the lakes near the airstrip most often. Birds nesting on the south side of the island typically used Umanangula Lake. Kittiwakes visit lakes most often after nest duty, before going out to feed. Birds may stay at nests for periods exceeding 48 hours.

ORGANOCHLORINE CONTAMINANTS IN NORTH PACIFIC ALBATROSSES: LONG-TERM IMPLICATIONS FOR REPRODUCTION AND POPULATIONS. *James P. Ludwig*, *Heidi J. Auman*, and *Cheryl L. Sumner*, The SERE Group, Ltd., Box 556, Eureka, MI 48833 USA.

Laysan and Black-footed albatross tissues from Midway Atoll in the North-central Pacific were sampled for contaminants in 1992–1994. Blood and eggs have been tested for total and coplanar PCBs, dioxins, furans, other organochlorines and dioxin equivalents (TCDD-EQs). Black-foots were 2–4 times more contaminated than Laysans by PCBs and DDT-group compounds. Neither species was highly contaminated, but the patterns were unique; TCDD-EQs were elevated enough to cause reproductive problems. Black-foots had lower rates of egg viability, more egg cracking and higher embryo death rates than

Laysans in 1993–94. Hazard indices for both species suggest that Laysans are near the NOAEL value for TCDD-EQs, but that black-foots are well into the LOAEL range where reproductive effects are expected. DDT-group levels are below levels expected to initiate eggshell thinning, but a third of the DDT compounds recovered were parent DDT isomers and not DDE, which indicates widespread active sources to this pelagic environment. Partially burned plastics from landfills are suspected as a source of the unique dioxin-furan contamination in these birds. Further increases in TCDD-EQs is predicted to cause greater transgenerational reproductive damage.

PIGEON GUILLEMOT NEST BOX PROJECT. *Mary S. Mahaffy*, U.S. Fish and Wildlife Service, Olympia, Washington 98501.

Wooden nest boxes for Pigeon Guillemots were placed at five locations in Washington between 1992 and 1994. Chicks and adults were color banded for individual recognition. These nest boxes are part of the bird monitoring program in Puget Sound under the Puget Sound Ambient Monitoring Program (PSAMP). PSAMP is an inter-agency, long-term monitoring program for measuring ambient, or background conditions in Puget Sound. The health of the Sound's fish and wildlife and their habitats are monitored to assess cumulative effects of contamination and habitat degradation. Depending on the success of the nesting box project, Pigeon Guillemots may be used as a contaminants monitoring species. Nest boxes were placed under piers at three locations in Puget Sound, on Protection Island National Wildlife Refuge, and on a coastal breakwater. Boxes were used by pigeon guillemots at all locations except one of the piers. Two boxes were used all three years at one location and a banded adult returned to the same box at a different location. Chicks were weighed and wing measurements taken. Rock doves used the boxes at all the pier sites. After the nesting season at one site, a mist net was attached to the outside edge of the pier and eight adult guillemots were captured and banded.

SEABIRD DENSITY AND SPECIES COMPOSITION ON MONTEREY BAY DURING EL NIÑO AND NON-EL NIÑO PERIODS. *John W. Mason*, Moss Landing Marine Laboratories, Moss Landing, CA

PO Box 401; and *James T. Harvey*, Moss Landing Marine Laboratories, PO Box 450, Moss Landing, CA.

Long term monitoring of seabird populations is necessary to determine effects of large scale oceanographic events such as El Niños. Seabirds have been censused intermittently in Monterey Bay since the early 1980's. Density and species composition were determined from strip transects conducted on Monterey Bay from 1984-1987 (n=30) and 1992-1993 (n=16). For this study, seabird data collected from 1992-1993 represented El Niño effects, whereas 1984-1987 was considered non-El Niño data. Mean seabird densities were consistently greater in 1992-1993 than 1984-1987. For both El Niño and non-El Niño years, Procellariidae, Laridae, and Alcidae, respectively, were the most abundant families. For all years, Sooty Shearwaters were the most abundant species. Shearwaters occurred from May to October and accounted for 40 to 95% of total seabirds. Fifty-four seabird species were observed during El Niño years and only 44 species during non-El Niño years. Differences in species diversity may be El Niño related or an artifact of sample timing. Densities did not differ markedly between El Niño and non-El Niño years, however, species composition was affected by changes in oceanographic conditions.

CONTROL OF THE ALIEN PLANT *CENCHRUS ECHINATUS* ON LAYSAN ISLAND, NORTHWESTERN HAWAIIAN ISLANDS. *Duane K. McDermond, Elizabeth N. Flint, Marc A. Webber, and Cynthia A. Newton*, U.S. Fish and Wildlife Service, Honolulu, Hawaii, 96850.

In June 1991 Hawaiian Islands National Wildlife Refuge staff initiated a control and monitoring program for the introduced plant sandbur (*Cenchrus echinatus*). The sandbur infestation covers approximately 28% of the 212ha vegetated portion of the island. Monitoring data shows that sandbur displaces native vegetation and degrades habitat for fossorial seabirds and two endangered endemic landbirds. We evaluated several techniques to control sandbur, including manual removal, burning, and application of herbicides. The preferred method of control evolved into a combination of herbicide treatment and pulling of sprouts. Our long range objective is eradication of sandbur on Laysan Island. We

will accomplish this by eliminating scattered outlying infestations while containing the main infestation within marked boundaries. After controlling outlying areas, our efforts will turn to elimination of the main infestation. As of October 1994, we are actively controlling 33ha of sandbur. Given the magnitude of Laysan's sandbur infestation, elimination of parent plants and an extensive seed bank will require years of vigilant effort.

CONTAMINANT LEVELS AND TROPHIC POSITIONING OF MARINE BIRDS AND MAMMALS IN THE GULF OF THE FARALLONES. *Elizabeth B. McLaren, William J. Sydeman, Peter Pyle, PRBO, 4990 Shoreline Hwy., Stinson Beach, CA 94970, Walter M. Jarman, Corrine E. Bacon, Janet A. Bott, Univ. of California, Santa Cruz, Santa Cruz, CA 95064, and Keith Hobson, Canadian Wildlife Service, Saskatoon, SK, Canada S7N 0X4.*

We conducted an integrative study of contaminant levels, trophic structure and trophic interactions in the food web of the Gulf of the Farallones with an emphasis on marine birds and mammals. We utilized stable isotope analysis to quantify trophic positioning, conventional diet studies to determine trophic interactions and assessed levels of organochlorine compounds and heavy metals in zooplankton, fish, seabird eggs and marine mammal tissue. Results indicate elevated levels of certain organochlorines (DDE and PCBs) and metals (mercury) in Common Murres and Steller's sea lions. Stable isotope analysis proved useful in quantifying trophic structure and bioaccumulation of organochlorines in the marine food web. Overall results indicate that most Farallon seabirds and their prey are relatively free of environmental contaminants.

MONITORING OF SEABIRD POPULATIONS AND PRODUCTIVITY IN WESTERN ALASKA, 1989-1991. *Vivian M. Mendenhall*, U.S. Fish and Wildlife Service, Anchorage, AK 99503; *Donald E. Drago* and *Arthur L. Sows*, U.S. Fish and Wildlife Service, Homer, AK 99603; *Ada C. Fowler*, National Biological Survey, Anchorage, AK 99503; *Lisa Haggblom*, U.S. Fish and Wildlife Service, Dillingham, AK 99576; *Edward C. Murphy*, University of Alaska, Fairbanks, AK 99775; *Mike*

Nishimoto, U.S. Fish and Wildlife Service, Honolulu, HI 96850, and *Brian E. Sharp*, 2234 NE 9th, Portland, OR 97212.

The U.S. Fish and Wildlife Service and Minerals Management Service jointly monitored populations and productivity of kittiwakes (*Rissa* spp.) and murrelets (*Uria* spp.) at six colonies in the Bering and Chukchi Seas: St. George Island, Cape Peirce, St. Matthew Island, Bluff, Little Diomed Island, and Cape Thompson. Diets were also monitored at several sites. Methods were standardized to facilitate comparisons among colonies and years. Most populations have been stable since 1984 or earlier at colonies where we could analyze trends by comparison with earlier data. Exceptions were a long-term decline in Red-legged Kittiwakes at St. George and recent moderate declines in two species at St. Matthew. Productivity (particularly of kittiwakes) fluctuated during the study, probably in association with diet. Mean productivity differs greatly among colonies in western Alaska; causes appear to include food resources and possibly predation. In order to detect and interpret population trends, we need statistically sound monitoring studies, careful selection of representative sites, observations at frequent intervals, and supporting data on life history and environmental factors.

VARIANCE-SENSITIVE PROVISIONING IN COMMON TERNS. *Dave Moore*, Dept. of Biol. Sciences, Simon Fraser University, Burnaby, B.C. V5A 1S6.

Until recently, Central Place Foraging theory has not considered how the effects of parent or offspring state may effect provisioning behaviour. In response to variation in brood demand, parents can adjust (a) the amount of time spent foraging, (b) their provisioning rate, or (c) their foraging decisions (e.g., prey selection criteria). An important factor in the latter case is that food items of different value also differ in variability about the mean encounter rate. Theory predicts that when the mean energy gains of two foraging options are similar, parents with a low probability of satisfying brood demand should choose the foraging option associated with high variability in expected energy gain and 'gamble' on an above-average encounter rate. Individuals able to meet brood demands should avoid such variability (i.e. foraging decisions are "variance-sensitive"). To test the predic-

tion that provisioning decisions of Common Terns are variance-sensitive, I manipulated brood size to simulate variation in energy demand on parents. I assessed parental responses to changes in demand by observing the types of prey they delivered to chicks, employing radio-telemetry to determine foraging locations and flight speeds, and measuring chick growth.

FACTORS AFFECTING THE FLEDGING DECISION OF CASSIN'S AUKLETS (*Ptychoramphus aleuticus*).

Yolanda E. Morbey, Dept. of Biological Sciences, Simon Fraser Univ., Burnaby, B.C., V5A 1S6.

A seasonal decline in fledging mass is widely reported for alcids with semi-preocial or intermediate fledging strategies. This phenomenon is usually explained by seasonal deterioration of food availability or parental quality. An alternative explanation considers the differential growth and mortality faced by chicks in the nest and at sea. The est is characterized by low predation but low growth; the sea offers high growth but high predation. A chick should fledge when the benefits of higher growth at sea outweigh the costs of higher predation risk. When the fledging decision is modelled given these conditions, a seasonal decline in fledging mass is predicted (Ydenberg 1989). This general model also predicts that chicks hatched later in the season should fledge lighter and younger. I empirically tested the model using Cassin's Auklets by manipulating hatch date and measuring fledging mass and age. I conducted this research from Apr-Jul 1994 on Triangle Is., as part of the Triangle Is. Research Project. I will briefly describe the experimental protocol, describe the patterns of fledging behaviour, and compare the observed patterns to those predicted by the model.

WHITE BLOOD CELL REFERENCE RANGES OF ALASKAN SEABIRD SPECIES AND THE POTENTIAL EFFECTS OF OIL AND REHABILITATION ON THE AVIAN IMMUNE SYSTEM. *Dr. Scott Newman*, Wildlife Health Center, University of California, Davis, CA, 95616.

White blood cell counts and differential cell counts are among several routine blood tests performed to assess the health of a particular patient upon presentation to a rehabilitation facility following an oil

spill. Alterations in these test values may be due to the effects of oil, the effects of stress, or a combination of the two. In the past few years, research has been undertaken to establish normal values for avian species commonly affected by oil spills.

During the summer of 1989, blood samples were collected from 13 species of sea birds which inhabit the Shumigan Islands, Alaska. Blood smears from these birds were used to estimate the white blood cell count and to perform a differential cell count of heterophils, lymphocytes, monocytes and eosinophils. During the summer of 1994, more baseline sea bird blood studies were conducted in California and Alaska. This work is currently being supported by The Department of Fish and Game, Office of Oil Spill Prevention and Response. In this paper I will discuss the avian immune system, how white blood cell counts and differential counts are performed, and the application of this information to veterinarians attempting to treat oiled wildlife.

THE SIGNIFICANCE OF CHRONIC OILING FOR SEABIRD POPULATIONS IN CENTRAL CALIFORNIA. *Nadav Nur, Peter Pyle, Lynne Stenzel, David G. Ainley, William J. Sydeman, and Elizabeth McLaren*. Point Reyes Bird Observatory, 4990 Shoreline Highway, Stinson Beach, CA 94970.

We evaluate the utility of two long-term data sets, collected by PRBO, for studying impacts of chronic and acute oiling incidents on seabird populations in Central California. The first data set consists of beached bird surveys conducted along California beaches, 1971-1984. Of 39,444 dead or dying marine birds censused, cause of death was ascribed for 4713 (11.9%), mostly attributed to oiling (83%). The second data set consisted of oiled birds (live or dead) observed at Southeast Farallon Island, 1977-1994. During this time, 2385 oiled birds or marine mammals were observed, mainly Common Murres (62%), but also Western Gulls and Cassin's Auklets. During this time period, four major oiling episodes were recorded (defined as >100 oiled birds observed in a restricted time period), only two of which were associated with a known oil spill; nine minor episodes of oiling were identified. 692 oiled individuals were observed outside major or minor oiling episodes. We compare temporal and taxonomic patterns of oiling for the

two data sets, to provide insight into the spatial extent of oiling (local vs. regional), and compare known population trends with indices of oiling mortality (number and proportion of oiled birds). We discuss difficulties with determining population impacts from beached bird data. We conclude that chronic oiling presents an important source of mortality for many seabird species.

STATUS OF JAPANESE MURRELET COLONIES IN THE IZU ISLANDS, JAPAN, IN 1994. *Leigh K. Ochikubo*, Natl. Biol. Survey, 6924 Tremont Road, Dixon, CA 95620; *Harry R. Carter*, Natl. Biol. Survey, 6924 Tremont Road, Dixon, CA 95620; *John N. Fries*, Inst. of Ecology, Univ. of California, Davis, CA 95616.

The status of the three largest colonies of the Japanese Murrelet (*Synthliboramphus wumizusume*) in the Izu Islands, Japan, was investigated in April 1994 by a joint expedition between the Pacific Seabird Group and Japanese biologists, including H. Higuchi and M. Ueta (Wild Bird Soc. Japan, Tokyo Res. Ctr.), M. Hasegawa (Chiba Nat. Hist. Mus. and Inst.) and J. Moyer (Wild Bird Soc. Japan, Miyakejima Nat. Ctr). Between 100-400 nests were estimated for each colony at Onbase Reef, Tadanae Island and Sanbondake Reef, based on nests discovered and amount of available nesting habitat surveyed on these small islands. At all islands, we found many broken eggshells and carcasses of dead adults, apparently due to predation by Jungle Crows and Peregrine Falcons, respectively. Populations on Onbase Reef and Sanbondake Reef apparently have declined since the late 1950s. At Sanbondake Reef, numbers had declined earlier due to bombing by the U.S. military in the early 1950s. At Tadanae Island, murrelets are further predated by Striped Snakes which also may be contributing to decline there.

CROW PREDATION ON JAPANESE MURRELETS ON BIRO ISLAND, JAPAN. *Koji Ono*, Dept. of Biol., Toho Univ., 2-1, Miyama 2, Funabashi, Chiba, 274 Japan; *John Fries*, Division of Environmental Studies, Univ. of Calif., Davis, CA 95616; *Yutaka Nakamura*, Miyazaki Medical College, 5200 Kiwara, Kiyotake, Miyazaki, 889-16 Japan.

The Japanese Murrelet (*Synthliboramphus wumizusume*) nests on islands off the

coast of Japan and South Korea. Biro Island (400m x 400m, 75m a.s.l.), Miyazaki Prefecture, Japan, is the largest known colony, with an estimated 3000 birds. We conducted a preliminary study of predation at this colony from March–May 1994. Large numbers of people fish off the rocks around the base of the island, broadcasting ground-up seafood over the surface of the water to attract fish. Unused bait and other refuse is often left on the rocks, attracting crows from the mainland (2 km distant). Several crows (*Corvus corone*, *C. macrorhynchos*) breed on the island; however, we've observed more than thirty at a time fly in from the mainland. Our study site represents 17% of the island's surface. Evidence of predation was most often found in an open, rocky area at the foot of a cliff with a high density of murrelet nests. In 1994, we collected shell fragments from nearly 100 separate eggs and several adult kills. In order to reduce crow numbers, the local government plans to begin a program of education aimed at recreational fishermen.

EVALUATION OF MARINE CONCERNS RELATED TO THE MARBLED MURRELET. *John F. Palmisano*, JPBC, 1990 NW 156th Avenue, Beaverton, Oregon 97006.

Although they nest inland, Marbled Murrelets spend the majority (>98 percent) of their life in the near-shore marine environment where they reach sexual maturity and obtain virtually all of their food requirements—including food brought inland for nesting chicks. Governmental decisions to list the murrelet as a threatened species, and to propose critical habitat, have failed to adequately consider the significance of the marine environment. Specifically, that natural and human-influenced marine conditions can markedly reduce murrelet individual survival, reproductive rates, and population abundance. Natural factors include oscillations in ocean productivity and associated fluctuations in the abundance of murrelet and prey populations. Human influences include incidental fishing losses, oil spills, competition for food, policies that increase population abundance of competitor and predator species, and disturbance from commercial, recreational, and military activities. Because many marine conditions are influenced by human activities, potential adverse effects could be minimized by protecting near-shore marine ar-

reas critical to murrelet survival. Humans may be unable to control natural factors, but they can manage related natural resources during unproductive periods to favor murrelets. Human-directed actions intended to reduce abundance of competitor and predator species, and thus increase prey availability while reducing stress and predation, could help minimize adverse effects of natural events.

AN INTEGRATED PREDATOR MANAGEMENT PROGRAM TO PROTECT BREEDING SNOWY PLOVERS. *Michael W. Parker*, U.S. Fish and Wildlife Service, San Francisco Bay National Wildlife Refuge, Post Office Box 524, Newark, California, 94560; and *Gary W. Page*, *John S. Warriner*, and *Jane C. Warriner*, Point Reyes Bird Observatory, 4990 Shoreline Highway, Stinson Beach, California, 94970.

Snowy Plover (*Charadrius alexandrinus nivosus*) nest success has been limited by non-native red fox (*Vulpes vulpes regalis*) predation at the Salinas River National Wildlife Refuge (SRNWR) and adjacent lands. Between 1988 and 1990 approximately 47 percent of plover nests were lost to red fox predation at the SRNWR, and nest success was only 21% between 1986 and 1990. Since May 1991, predator exclosures have been installed around individual plover nests on the SRNWR and adjacent lands. Predator exclosures proved successful at increasing nest success; in 1992 plover nest success was 80 percent at the SRNWR. Exclosures did not protect plover chicks beyond the hatching stage because chicks are precocial and leave the protection of the exclosures within hours of hatch. Fledging success was approximately 19 percent at the SRNWR in 1992. Our data linked an increased mortality of adult breeding plovers, whose nests were protected by exclosures, to non-native red foxes. Predator control was initiated in August 1993 to improve fledging success and reduce the adult mortality. Preliminary results suggest that this integrated approach, which combines predator exclosures with the removal of non-native mammals, can be successful at increasing Snowy Plover production.

ALTERING ECOLOGICAL INTERACTIONS BY HABITAT MODIFICATION: A RESTORATION TECHNIQUE FOR COMMON MURRES. *Julia K. Parrish*, Dept. of Zoology, Univ. of Washington,

Seattle, WA 98195.

Seabird populations suffer from a variety of natural and human-induced sources of mortality and loss of lifetime reproductive output. On the outer coast of Washington state, Common Murres, *Uria aalge*, have been declining due to a combination of factors including El Niño, the Tenyo Maru oil spill, and gillnet by-catch. At present, murres are only reproductively active on Tatoosh Island. On this colony, reproductive success had been severely depressed by interactions between murres and Bald Eagles, *Haliaeetus leucocephalus*, because the latter indirectly facilitates egg predation, which has led to reproductive failure. Because predator removal is unfeasible, and creation of "traditional" habitat is difficult, we have designed a manipulation which upgrades existing habitat by modulating community interactions. A pilot study of our temporary modification, the "silk forest," indicated that murre response to eagles was mediated, with a resulting increase in egg production. Manipulations which take advantage of innate tendencies (such as gregarious nesting) and augment the natural protection afforded by the system, are an effective and cost-efficient way of stabilizing populations. In this case, altering the balance between murres and their predators may allow time for other more broadly-based conservation strategies to take effect.

MUDDY WATERS: SEABIRD MORTALITY FOLLOWING THE EXXON VALDEZ OIL SPILL. *Julia K. Parrish*, Dept. of Zoology, Univ. of Washington, Seattle, WA 98195.

The Exxon Valdez oil spill has left us with vivid images of oil-covered seabirds and a general impression that the environment was devastated. For seabirds, these impressions are bolstered by scientific assertions that half a million birds were killed, the majority of which were murres. Initially, bird mortality projections ranged from 100,000 to 300,000. By 1993, the mortality model had been refined and total bird mortality increased to 375,000. Estimates reported in the popular science press and college textbooks were even higher. There is no doubt that many seabirds were killed; 30,000 carcasses is the largest number ever recovered following an oil spill. Assessing mortality impacts, however, requires careful science accompanied by accurate pre-

spill information on population status. For murre populations in the path of this spill, much of the necessary information was rudimentary, or lacking entirely. Science clearly has a pivotal role to play in assessing injury and culpability, but the expectation that scientists can clearly delineate cause and effect given little or no data is unrealistic. While it is essential that scientific results be translated for general consumption, it is imperative that findings not be sensationalized or exaggerated, especially in inherently emotional situations.

DEVELOPMENT OF A PREDATOR MANAGEMENT PLAN: AN ECOSYSTEM APPROACH. *Mark Alan Pavelka*, U.S. Fish and Wildlife Service, Carlsbad, CA, 92008.

The goal of most predator management plans is to limit or reduce the impacts of predation on the reproductive success of target species by removal or exclusion of predatory animals. In cases where the primary predators are native species this approach has led to the creation of "outdoor zoos" where the target species are "farmed" and isolated from elements of the surrounding ecosystem. An alternate approach is to consider the role of each species, or group of species, in the ecosystem and develop a plan which strives to restore the functional integrity of that system. This approach requires an understanding of the natural predator-prey dynamics, and an acceptance that some predation will be permitted. The difficulties lie in defining the limits of natural predation and determining the balance between acceptable loss and long term population stability. Implementation strategies other than removal (for native species), such as site restoration or behavior modification of individual predators, must also be considered to prevent further degradation to the system. The U.S. Fish and Wildlife Service is using this approach to develop a plan for managing predators in the vicinity of California Least Tern (*Sterna antillarum browni*) nesting colonies.

DISTRIBUTION, MOVEMENTS, AND POPULATION STATUS OF CRAVERI'S MURRELET: IMPLICATIONS FOR ECOLOGY AND CONSERVATION. *Robert L. Pitman, Lisa T. Ballance, Stephen Reilly*, SW Fisheries Science Center, P.O. Box 271, La Jolla, CA 92038; and *Mike Force*, 2304 Prince Albert St., Vancouver,

B.C., Canada V5T 3W5.

We censused marine birds throughout the Gulf of California and off the west coast of Baja California, Mexico, July to November 1993. The total population size for Craveri's Murrelet (*Synthliboramphus craveri*) was estimated to be 21,872 birds (95% CI: 8,405; 56,915). The majority of sightings (54%) were of paired birds (mean group size = 2.6; SE = 0.23) and nearly all (90.3%, n = 353) occurred in a 250 X 50 km area over the continental shelf break off Sinaloa, Mexico. Few were in the northern and western Gulf where breeding islands are located; almost none were present along the west coast of Baja. We argue that year-round pairing, precocial young, and rapid departure from the Gulf after breeding are adaptations that allow murrelets to complete their breeding cycle rapidly and take their chicks to distant, more productive feeding grounds. This allows this alcid to breed in waters that are, in general, much less productive relative to higher latitudes where the remaining members of the family are found. Because a large proportion of an already small Craveri's Murrelet population appears to occur in such a restricted area at the end of the breeding season, this species is particularly at risk to environmental disturbances, either natural or human-induced.

PIGEON GUILLEMOTS AS BIOINDICATORS OF NEARSHORE ECOSYSTEM HEALTH. *Alexander K. Prichard* and *Daniel D. Roby*, Alaska Coop. Fish and Wildlife Res. Unit, Univ. of Alaska, Fairbanks, AK 99775; *Lawrence K. Duffy* and *R. Terry Bowyer*, Institute of Arctic Biology, Univ. of Alaska, Fairbanks, AK 99775.

We are currently evaluating Pigeon Guillemots (*Cephus columba*) breeding in Alaska as bioindicators of contaminants in neritic food webs. Guillemots are well-suited for this purpose because breeding pairs are widely dispersed and feed on nearshore demersal fishes. Average productivity of 62 nests monitored in Kachemak Bay was 0.4 fledglings/nest (Mayfield method). Low egg survival (50%) and hatching rates of surviving eggs (76%) were responsible for poor overall hatching success (38%); 57-69% of chicks that hatched survived to fledging. Predation was a major cause of nest failure. Blood samples were collected from breeding adults and nestlings at 20 d and 30 d post-hatch. We analyzed serum for levels of several

biomarkers of contaminant exposure, including haptoglobins and immunoglobulins. Haptoglobin values ranged from 0 to 282 mg/dl (mean = 103, SD = 62.7), and mean levels differed among nests, but not between _ and _-chicks. Haptoglobin levels did not differ among colonies, sampling dates, or nestling ages, nor were haptoglobin levels correlated with nestling growth performance. These baseline biomarker values will aid future assessment of contaminant exposure.

IMPORTANCIA DEL ESTUDIO DE LAS AVES PARA DAR ALTERNATIVAS DE CONSERVACION EN LAS ISLAS MARIETAS, MEXICO. *Fanny Rebón, Laura Mora y Nora Carrera*, Laboratorio de Vertebrados, UNAM. Ozuluama 20-101 Condesa 06100 México D.F.

Anteriormente a las islas de México solamente se les daba el crédito de ampliar la Zona Económica Exclusiva del país. Actualmente se les reconoce como importantes reservas naturales, por sus endemismos, topografía y condiciones climáticas que las hacen importantes laboratorios biológicos. En el pacífico mexicano existe más de la mitad del territorio insular nacional. Las Islas Marietas, Bahía de Banderas, son un ejemplo de la riqueza ornitológica debida a la abundancia de recursos de la zona. La presente contribución tiene como objetivos destacar la importancia biológica del área, señalar los principales problemas en torno a su conservación y proponer la formación de un grupo para el monitoreo y conservación de las islas. Para evaluar las condiciones que presentan las islas, se visitaron desde marzo de 1987 realizando entrevistas a pobladores de la localidad más cercana y observaciones de la actividad humana en torno a ellas. Se encontraron colonias reproductoras de tres especies de aves, que al parecer, son las más grandes registradas para México. Se detectaron ciertos riesgos que las aves enfrentan para sobrevivir, destacando la perturbación del habitat por el turismo. Con los datos obtenidos, se continúa el estudio encaminado a encontrar estrategias para la protección y uso de las islas. Concluimos con algunas propuestas para cumplir este punto.

COLONIZATION OF CREATED HABITAT BY TWO ALBATROSS SPECIES

AT MIDWAY ATOLL. *Scott A. Richardson*, P.O. Box 1644, Olympia, Washington 98507; and *Marilyn Sigman*, Box 335, Oceanside, Oregon 97134.

The colonization response of Laysan (*Diomedea immutabilis*) and Black-footed (*Diomedea nigripes*) albatrosses to newly-available nesting habitat was measured at Midway Atoll from 1990 to 1994. Chainlink fencing around a 2800-m² plot had excluded albatrosses for decades prior to its removal during year 1 of the study. Laysan Albatrosses rapidly exploited the habitat, with 21 nests during year 1, 92 in year 2, and 150 in year 4. Seven Black-footed Albatross nests were found in year 2, and 39 in year 4. The number of Laysan nests within a surrounding 2-m swath declined from 120 to 42 with the colonization of the plot. Only one Black-foot nest was within 2 m of the plot during years 1 and 2, although the local area supported very high densities. The Laysan:Black-foot ratio was greater in the plot (18.2: similar to the island-wide ratio) than in the local area during year 2, but dropped to 3.8 (comparable to the local ratio) by year 4. Most pioneering Laysans spilled into the plot from within 2 m, reflecting the species' strong nest-site fidelity. Delayed colonization of the plot by Black-foots suggests similar or stronger nest-site fidelity, a low rate of recruitment, or both.

ERADICATING FERAL CATS FROM ISLA ISABEL, MEXICO. *Ma. Cristina Rodríguez* and *Hugh Drummond*. Laboratorio de Conducta Animal, Centro de Ecología. UNAM.

Feral cats (*Felis catus*) were introduced more than 60 years ago to Isla Isabel, México, where they prey heavily on Sooty Terns (*Sterna fuscata*), spiny (*Sceloporus clarckii*) and whiptail lizards (*Cnemidophorus costatus*). In 1991 cats killed 25% of the 1358 sooty terns nesting in the island, as well as an undetermined number of chicks, thereby causing the desertion of the whole colony which failed to fledge a single chick. These figures suggest, using optimistic calculations, that the largest Sooty Tern colony in the Mexican Pacific will face local extinction in approximately 15 years. We intend to completely eliminate the cats' population within 18 months, using fish-baited Tomahawk traps and subsequently shooting at cats who avoid the traps.

Censuses to monitor the numbers of Sooty Terns, spiny and whiptail lizards before, during and after the eradication of cats will permit an assessment of the campaign's effectiveness. Another potential effects of eradicating cats, which will be monitored, is the establishment of seabird species hitherto absent from the island.

PREDATORS AND ANTIPREDATOR BEHAVIOR OF SOOTY TERNS NESTING UNDER DENSE VEGETATION.

Jorge E. Saliva, U. S. Fish and Wildlife Service, Box 491 Boquerón, Puerto Rico 00622, U.S.A. and *Joanna Burger*, Dept. of Biology, Rutgers University, P.O. Box 1059, Piscataway, New Jersey, 08855, U.S.A.

Although most Sooty Terns (*Sterna fuscata*) nest in open areas where they are exposed to predators, in some Caribbean islands they nest under dense vegetation. Sooty Terns nesting under dense vegetation at Culebra Island did not react to predators flying above the canopy of the dense vegetation where they nested. However, terns perched on the vegetation reacted with different antipredator behaviors according to the type of predator present. Hawks exerted a stronger antipredator response than either egrets or gulls. Cats were more active at night, primarily at one end of the colony. Vegetation provided an effective means to prevent incubating and brooding adults from leaving their nests unattended, thus reducing aerial predation and thermal stress, and increasing their breeding success.

PEST MANAGEMENT IN NEW ZEALAND—ENTERING A NEW ERA. *Alan Saunders*, Manager, Threatened Species Unit for Director-General Department of Conservation, Conservation Sciences Center, P.O. Box 10-420, 58 Tory Street, Wellington, New Zealand.

New Zealand conservation managers have made important advances in recent years in their ability to successfully translocate threatened species to "safe" islands and to eradicate pest mammals from islands. The development of second generation anticoagulants rodenticides to eradicate rodents from islands represents a major breakthrough. In the last decade rapid progress has been made on refining poison application techniques so that rodents can now be eradicated from islands larger than

200 hectares. Proposals are currently being developed to eradicate rodents from islands up to 3,000 hectares. Important conservation benefits have already been noted following eradication operations.

In recognition of the importance of pest animals eradications in contributing to the protection of New Zealand's biodiversity, the Department of Conservation has initiated a number of processes to plan and coordinate future activities. A national biodiversity strategy is being prepared as a basis for making more objective conservation management decisions. National island management guidelines are being compiled to identify goals and objectives and to allow for islands to be classified for various conservation uses. An island research strategy is also being prepared which will identify strategic areas for investigation so that management may be directed for greatest conservation benefit. A national islands management coordinator has been appointed to insure project managers are communicating effectively and that increasingly complex programmes are integrated. Feasibility plans which critically evaluate the costs and benefits of restoration programmes, and operational plans identifying tasks, time frames, costs and resources are now being used to guide management and as a basis for on-going consultation. The information needs of key "stakeholders" must be identified and met so that long-term public "ownership" of restoration programmes may be achieved.

DEVELOPMENT AND TRAINING OF THE OIL SPILL WILDLIFE RESPONSE TEAM (OSWRT) IN CALIFORNIA. *Thomas G. Schuster*, *William J. Sydeman*, and *Gary W. Page*, PRBO 4990 Shoreline Highway, Stinson Beach, CA 94970, and *Paul Kelly*, Office of Oil Spill Prevention and Response, California Department of Fish and Game, P.O. Box 944209, Sacramento, CA 94244-2090.

The Oil Spill Wildlife Response Team (OSWRT) was designed and developed for the state of California by PRBO and OSPR-CDFG during the fall of 1994. The team was developed to (i) respond to acute oil spills in a timely fashion, (ii) estimate mortality and the effects of oil pollution on marine wildlife in an expeditious manner, (iii) provide information to trustee agencies, (iv) guide unified command in providing information to the public, and (v) man-

age voluminous information that could ultimately be used for wildlife injury assessments. Team members, selected on the basis of expertise in the identification of seabirds, and accurate data collection, are from state, federal, and non-governmental organizations. A protocol and form developed for collecting data on dead or debilitated seabirds will be presented. We urge further coordination between the states and federal agencies in preparation for future oil spills along the west coast of North America.

EFFECTS OF RAT (*RATTUS RATTUS*) PREDATION ON BONIN PETREL (*PTERODROMA HYPOLEUCA*) REPRODUCTIVE SUCCESS. *Nanette W.H. Seto*, U.S. Fish and Wildlife Service, P.O. Box 50167, Honolulu, Hawaii, 96850.

Island avifaunas, particularly seabirds, are vulnerable to predation by introduced rats. *Rattus rattus* was introduced to Midway Atoll National Wildlife Refuge, NWHI in 1943 and has caused local extinctions or reductions of several species of seabirds. Since the rat introduction, the population of Bonin Petrels has declined from 500,000 birds in the 1930s to an estimated 5,000 nesting pairs in 1979. I examined the effect of rat predation on Bonin Petrels' reproductive success in areas of varying rat activity as controlled by the rodenticide "Vengeance." During this study, I developed a portable, miniature camera/video system that allowed viewing of burrow contents for petrel nesting activity and evidence of rat predation. The petrels were most vulnerable to rat predation during the egg stage of their nesting season, and I observed 100% egg loss in an area of extremely high rat activity. Rodenticide application appeared to effectively reduce rat density and increase Bonin Petrel reproductive success. Bonin Petrel reproductive success was observed to be higher in areas of high burrow density. This work provides the refuge manager with information on the interactions between the Bonin Petrel and the black rat and contributes to a conservation management plan for the Bonin Petrel on Midway.

RETURN OF THE KILLER BUBBLES: INTERACTIONS BETWEEN ALCIDS AND FISH SCHOOLS. *Fred Sharpe*, Dept. of Biological Sciences, Simon Fraser Univ. Burnaby, BC V5A1S6.

The objective of this study was to continue investigations into the interac-

tions between schooling fish and foraging alcids both in the laboratory and in the open water environment of northern Puget Sound. Methods involved the use of sonar, underwater video, and simulated alcid predators on captive fish schools. The underwater video supported earlier findings that rhinoceros auklets and ancient murrelets bubble extensively when foraging on herring and sand lance schools. One hypothesized function of these bubbles is the maintenance of the school as a compact group near the ocean surface, thus preventing shoal expansion which is the first step towards escape from the surface. A second function of the bubbles may be to entice the school to expend their fast-start response prematurely. A third hypothesized benefit of bubbling may be to elicit frantic shoaling behavior, which results in the displacement of members from the school due to the formation of a strong vertical outflow of water from the school. The attacking alcids selectively capture individuals from this outflow jet. Laboratory experiments conducted at Bamfield Marine Stations using an artificial alcid predator and captive fish schools provided some support for these hypotheses. A video of underwater feeding behavior of wild alcids will be presented.

WEIGHT RECESSSION AND DEVELOPMENTAL PATTERNS OF PIGEON GUILLEMOTS ON SOUTHEAST FARALLON ISLAND, CALIFORNIA. *Michael T. Shultz and William J. Sydeman*, PRBO, 4990 Shoreline Highway, Stinson Beach, CA 94970.

We examined patterns of weight recession in Pigeon Guillemot chicks in relation to growth and variation in food availability from 1989-1994. Chick weight recession was apparent after age 35 days in most years. Weight recession averaged 5-7% of the maximum (i.e. asymptotic) weight attained. Weight recession was more pronounced in years of moderate to high food availability, and for chicks hatching early in the season and with relatively high growth rates. Weight recession lasted up to 15 days for chicks which eventually fledged in a healthy state (i.e. weight > 350 g). The role of pre-fledging weight recession will be discussed in relation to the varied breeding strategies of alcids.

TUFTED PUFFIN REPRODUCTIVE SUCCESS: PROPOSED AT-SEA AND

COLONY INTERACTIONS. *Joanna L. Smith*, Department of Biology, University of Victoria, Victoria, B.C. V8W 2Y2.

In 1994, the reproductive success of Tufted Puffins, *Fratercula cirrhata* (Pallas) was re-examined on Triangle Island, the largest puffin colony in B.C. with 25,000 breeding pairs. Productivity was measured on two plots on Puffin Rock: occupancy was found to be 50% (n=80) (the lowest occupancy since 1984), hatching success 25%, fledging success 20%, with overall reproductive success 5%. Egg size was 71.1 ± 2.4 by 48.8 ± 1.4 mm (n=32). Midway through chick rearing, starved chicks were found dead on the surface of the colony and attendance fell quickly to near-zero; at this time, numerous food loads were lost to Glaucous-winged Gull kleptoparasitism. Observations taken at-sea found that foraging behaviours could be associated with activity near the colony. Historically, this population of Tufted Puffins has shown extreme inter-year variation in productivity. Factors such as prey dynamics, nest site quality, kleptoparasitism, mate choice variation and intra-/interspecific competition for suitable breeding locations on Puffin Rock are proposed as influential in reproductive success. This preliminary study will be expanded to establish a marked population of birds for long-term monitoring as part of the demographic studies that will be conducted at this seabird research station.

ALASKA'S RAT INTRODUCTION PREVENTION PROGRAM. *Arthur L. Sowlis*, Alaska Maritime NWR, Homer, AK 99603 and *Joe E. Brooks*, U.S. Department of Agriculture, Denver Wildlife Research Center, Denver, CO 80225.

Norway rats are already present on at least 24 Alaskan islands and will certainly get introduced to more without a preventive program. Shipwrecks pose an on-going threat to almost all islands including some of the largest seabird colonies in the northern hemisphere. The Pribilof Islands are at additional risk because of expanding commercial development that includes new harbors.

In order to protect island wildlife, the U.S. Fish and Wildlife Service is forming a shipwreck response team to prevent rodent introductions. Rodenticides are considered a vital tool and a waiver authorizing their use has been applied for from the Environ-

mental Protection Agency. We are currently conducting training, stashing supplies, and arranging logistics.

A cooperative program has been set-up in the Pribilof Islands to prevent rat infestations. The program utilizes a network of bait/trap stations in both harbors, rodent control ordinances, vessel inspection, and rat prevention on fish processors and cargo vessels. It also includes public and industry awareness campaigns and training.

In the next few years, rats are planned to be removed from Shemya Island in the western Aleutians Islands. Techniques will probably be similar to those developed in New Zealand.

RATS: PAST DAMAGE AND PRESENT THREATS TO ALASKA SEABIRDS. *Art SOWLS and Vern Byrd.* Alaska Maritime NWR, 2355 Kachemak Bay Dr., Suite 101, Homer, AK 99603.

Norway rats have been accidentally introduced to at least 22 Alaska islands (Bailey and Kaiser 1993). The impacts of rats on seabird islands in Alaska have not been clearly documented, but comparisons of bird populations on similar islands with and without rats provides a basis for understanding. It is clear that rats extirpate most species of burrow nesting seabirds; storm-petrels, Cassin's Auklet, and Tufted Puffin. In addition, they prey on, but may not extirpate other species (e.g. auklets, shorebirds, and passerines).

In Alaska most introductions of rats happened during WWII. The danger of introduction by ship wrecks continues today. Furthermore, recent harbor and commercial fishing development has greatly increased the chances of rats establishing on the Pribilof Islands.

The Fish and Wildlife Service is beginning to address this threat by: 1) coordinating with other state and federal agencies, 2) an information and training effort, 3) a preventive program with the Pribilofians which includes trap and bait stations, a possible ship inspections program, and structural innovations to the harbor, etc. and 4) requesting EPA authorizations to use rodenticides to respond to ship wrecks and preparing a ship wreck response team. Ideas and suggestions for further actions are requested.

BREEDING STATUS OF TERNS AND BLACK SKIMMERS NESTING AT

SOUTH SAN DIEGO BAY. *Doreen Stadlander and John K. Konecny,* U.S. Fish and Wildlife Service, Carlsbad, CA 92008.

Although San Diego Bay has been subjected to severe pressure from development in the form of dredging, filling, and water front construction, man-made dikes in the extreme southern portion of the Bay support a unique assemblage of nesting seabirds. Prior to our two years of nest monitoring, systematic surveys to document breeding seabird populations had not been conducted since the early 1980's. In 1993, we estimated the minimum number of breeding pairs (and hatching success) to be 326 Black Skimmers (68.9%), 280 Caspian Terns (77.3%), 312 Elegant Terns (77.1%), 10 Royal Terns (90%), and 10 Gull-billed Terns (79.2%). Predation and inclement weather were the main factors affecting hatching success in 1993. For most species, the number of breeding pairs was similar during 1994 with two notable exceptions: a 78% decline in Elegant Tern breeding pairs, and the complete absence of breeding Royal Terns. The Federally listed endangered California Least Tern was also monitored as part of this study in 1994 and we estimated 52 breeding pairs. Predation was again the main cause for hatching failure in most species. Our data will be used to support National Wildlife Refuge status for the south Bay which is presently under consideration.

ESTIMATES OF MARBLED MURRELET ABUNDANCE IN OREGON AND NORTHERN CALIFORNIA BASED ON MARINE SURVEYS. *Craig S. Strong, Bradford S. Keitt, William R. McIver, Clifford J. Palmer, Jeff Jacobsen, Ian Gaffney, Ron LeValley, and Charles J. Striplen.* Crescent Coastal Research/Mad River Biologists, 7700 Bailey Rd. Crescent City, CA 95531.

Marbled Murrelets were counted in the nearshore waters of Oregon and northern California in order to assess population size and distribution. Surveys in Oregon were made from a boat, from low-flying light aircraft, and with a telescope from shore in 1992 and 1993. Approximately 1,500 km and 1,900 km of boat transects encompassing the states coastline were completed in 1992 and 1993, respectively. Six aerial surveys of the Oregon coastline were conducted. In 1994 two boat transects from

the Oregon border to Point Arena, (38°57' N) California were completed, with additional transects sampling murrelet distribution offshore.

In Oregon, Marbled Murrelets were most abundant in the central region, between Cascade Head and Cape Arago. They were concentrated closer to shore in 1992 than in 1993. In both years there was an apparent shift to the north by late July. Population estimates from vessel transect data ranged from 14,840 to 23,273 birds for all of Oregon, using strip and line transect methods. Estimates based on air and shore surveys were far lower than for vessel surveys and were not considered accurate. Estimates for northern California, using the same methods in 1994, will be presented.

PLASTICS IN ALBATROSSES 1993-1994: A FACTOR IN CHICK MORTALITY AND POSSIBLE SOURCE OF DIOXIN AND FURAN RESIDUES. *Cheryl L. Summer, Heidi J. Auman, James P. Ludwig, Paul D. Jones, John P. Giesy.* The SERE Group, Ltd., Box 556, Eureka, MI 48833, ESR Environmental, Lower Hutt, New Zealand, and Michigan State University, East Lansing, MI 48824.

The load of plastics carried by Laysan Albatross chicks at Midway Atoll was measured carefully in the 1993 and 1994 year cohorts of chicks. Mean weights of plastic objects and fragments recovered from large chicks that died in June and July were 32.3 and 23.8 g. in 1993 and 1994, respectively. Chicks that were mechanically injured (usually broken wings) averaged <11 grams of plastics suggesting that elevated plastics loads played a role in the death of some chicks. Body weights and fat condition in the chicks that died (with greater plastics loads) were significantly lower than in chicks mechanically injured. Partly burned or melted plastic fragments were found among plastic residues recovered from the albatrosses suggesting that partially burned plastics in oceanside dumps may serve as transport mechanisms and sources of highly toxic dioxins and furans. These toxins are easily produced in low temperature (300-500°C) burning in the presence of metals and a chlorine source, and may be incorporated into the melted globs of plastic which float on the surface until eaten by albatrosses. Experiments to confirm plastics as a dioxin source are in process.

RECOLONIZATION, DIET, AND DEMOGRAPHY OF NEARSHORE AND OFFSHORE POPULATIONS OF RHINOCEROS AUKLETS IN CENTRAL CALIFORNIA. *William J. Sydeman, Michelle Hester, and Elizabeth B. McLaren*, PRBO, 4990 Shoreline Highway, Stinson Beach, CA 92970.

Rhinoceros Auklets (re)colonized Southeast Farallon (37°N) and Ano Nuevo (36°N) islands in the early 1970s and 1980s, respectively. Southeast Farallon is located 42 km west of the coastline, whereas Ano Nuevo is within 2 km of the mainland. The population at Southeast Farallon increased throughout the 1980s and has since stabilized. The Ano Nuevo population continues to grow. Demography (reproductive success and adult survival) and diet have been studied on the Farallones since 1986 and on Ano Nuevo since 1992. Productivity on Ano Nuevo (40%) is lower than Southeast Farallon (65%). Diet composition varied between locations with anchovies dominating at Ano Nuevo and rockfish at Southeast Farallon, but diet composition varied annually at both locations. Notably, sardines were used by birds at both sites in 1993 (and by Common Murres in 1994), signifying recovery of this nearly extirpated stock and a new prey resource for seabird populations of the region. Survival was estimated via program SURGE. Rhinoceros Auklets are the only species of seabird increasing in this region. Factors explaining this "anomalous" population trend will be discussed.

RED FOX IMPACTS AND MANAGEMENT IN SOUTH SAN FRANCISCO BAY. *Jean E. Takekawa, Elaine Harding Smith, and Joy Albertson*, U. S. Fish and Wildlife Service, San Francisco Bay National Wildlife Refuge, Post Office Box 524, Newark, California, 94560.

Non-native red fox (*Vulpes vulpes regalis*) predation has had a severe impact on many ground-nesting birds in south San Francisco Bay since the mid-1980s, including the endangered California Clapper Rail (*Rallus longirostris obsoletus*) (Albertson et al. (in prep.), USFWS unpubl. data). Rail numbers fell to a low of approximately 300 birds in south San Francisco Bay in 1991-92; all or portions of nesting colonies of Caspian Terns (*Sterna caspia*), herons and egrets, and California Gulls (*Larus californicus*) were also lost (USFWS and

SFBBO, unpubl. data). A predator management program was designed to reduce intensive predator impacts in areas crucial for California Clapper Rails, as well as some colonial nesting birds. The predator management program was designed in order to be as selective and humane as possible, while retaining effectiveness. Predator management was implemented in 1991, including the use of predator barriers, trapping, and shooting.

Preliminary results indicate a dramatic increase in the number of rails to 600 in 1992-93 and the partial recovery of some colonial nesting birds following the implementation of predator management. We describe predator management planning and environmental compliance needed for implementing such programs.

AVOIDING THE PROBLEMS OF FRAGMENTATION BY CONSERVING NATURAL FRAGMENTS: THE BENEFITS OF RESTORING AND PROTECTING SMALL ISLANDS. *Bernie R. Tershy*, Conservation International México, Sea of Cortez Ecosystem Program, 63 Altos, Col. Miramar, Guaymas, Son 85455, México, and Section of Neurobiology & Behavior, Cornell University, Ithaca, NY 14853; and *Donald A. Croll*, Institute of Marine Sciences, University of California, Santa Cruz, CA 95064.

Most existing reserves are too small and too fragmented for pre-historic ecological and evolutionary processes to continue unhindered by direct human intervention. Unfortunately, human demographic, economic, and sociopolitical forces do not support establishing large, interconnected protected areas. One way to circumvent this disparity between biological necessity and political feasibility is to restore and protect small islands such as the >200 islands and offshore rocks in NW México. Small islands are relatively discrete ecosystems that are important to the conservation of biological diversity for four reasons: 1) they have a large percentage of endemic species and subspecies; 2) they are important breeding areas for seabirds, pinnipeds, and sea turtles; 3) many small islands are not inhabited by humans and are relatively inaccessible to markets; and 4) the species and communities on islands have evolved in natural fragments. Thus, by restoring and protecting small islands we can maintain functioning, unmanaged ecosystems, with high densities of large vertebrates and many

endemic species. Furthermore, these ecosystems can be preserved with relatively minor expenditures for land acquisition or conflicts with local human populations. Small islands are vulnerable to four types of human perturbations: 1) habitat destruction due to economic activities such as guano mining and timber extraction; 2) over-exploitation of animals due to commercial or subsistence hunting and eggging; 3) disturbance of colonial breeding vertebrates, and other animals by visitors; and 4) the introduction of exotic species—the largest cause of recorded extinctions. We recommend research, education, and management steps which will advance island conservation efforts; and outline the use of regional island conservation databases, to prioritize islands for preservation, restoration, or management based on their human use, biological importance, and their amount of ecological degradation.

A BREEDING RECORD OF *STERNA ANTILLARUM* IN SOUTHERN SONORA: IMPLICATIONS FOR MANAGEMENT IN ESTERO DEL SOLDADO. *Marisol Tordesillas*, CECARENA ITESM—Campus Guaymas, A.P. 484, Guaymas, Sonora, México. Present address: 1120 E. Copper, Tucson, AZ 85719.

This work presents the first documented breeding record of *S. antillarum* in southern Sonora. van Rossem and Hachisuka (1937) predicted that *S.a. mexicana* were either breeding or preparing to do, but found no evidence of eggs or chicks, probably because they were in the area too early in the season. Eight years later, van Rossem (1945) published an extensive review of the birds of Sonora without confirming the breeding of *S. antillarum*. This paper documents the presence of a Least Tern breeding colony at Estero del Soldado (27°56'N–110°01'W) during 1992 and 1993. The colony was established in salt flats at the northern end of the estero. The first nests were observed May 31 of 1992. The colony was visited three times (June 2, 8 and 29) in 1992 and five times (May 30, June 6, 11, 15, and 28) in 1993. A total of 8 active nests, 12 eggs and 10 chicks were counted in 1992, and 9 active nests, 15 eggs and 6 chicks in 1993. I used the presence of nesting seabirds as an argument to modify the buffer zone limits between a proposed tourism development and the estero, resulting in the relocation of a planned golf course.

MALE-BIASED SEX RATIO IN A MARINE BIRD WITH REVERSED SIZE DIMORPHISM. *Roxana Torres and Hugh Drummond*, Centro de Ecología UNAM, Apartado Postal 70-275, México D.F. 04510.

According to Fisher's hypothesis progeny sex ratios should be biased toward the less expensive sex when the cost of rearing males and females differ. Blue-footed booby (*Sula nebouxii*) females are larger and roughly 25% heavier than males, thus presumably more costly to rear. We sexed and monitored daily survival of 751 individually marked chicks until fledging (approximately 90 days). Sex ratios at hatching (56%) and at fledging (56%) were male-biased in agreement with Fisher and under the assumption that daughters cost more than sons. No evidence of facultative sex ratio adjustment was found.

A WRECK OF COMMON MURRES IN THE GULF OF ALASKA DURING EARLY 1993, AND METHODS USED TO ESTIMATE TOTAL MORTALITY. *Thomas I. Van Pelt and John F. Piatt*, National Biological Survey, 1011 E. Tudor Rd., Anchorage, AK 99503.

Following a massive wreck of Common Murres (*Uria aalge*) during early 1993, we documented reported carcass recoveries throughout the Gulf of Alaska. In order to refine estimates of total mortality, we monitored the deposition and subsequent disappearance of 398 beachcast murre carcasses during a 100-day period on two beaches in Resurrection Bay, Alaska. Deposition of carcasses declined logarithmically with time after the original event. Persistence rates increased logarithmically over time, in part because fresh carcasses were more likely to be removed between counts than older carcasses. Scavenging appeared to be the primary cause of carcass removal, followed by burial in debris or sand. Based on these data, we present a general method for extrapolating the number of carcasses cumulatively deposited on beaches from single visits. Applying this method to the wreck, and then using extrapolation factors based on other data to account for unsurveyed beaches and for carcasses lost at sea, we estimate that a minimum of 120,000 murres died in this wreck. Determining the magnitude of mortality events is a vital first step in understanding their effects on populations, and in addressing restoration questions.

ERADICATING UNWANTED ANIMALS FROM ISLANDS. *Dick Veitch*, C.O. Ecological Restoration, Auckland Conservancy, Private Bag 68-908, Cnr. Karangahape Road & Liverpool Street, Newton, Auckland, New Zealand.

In New Zealand we have gained experience during the course of 118 eradication operations involving 14 species of pest animals on 94 islands. Knowledge of the biology of the target species has enabled target-specific capture methods, baits and lures to be developed. The methods chosen for each eradication operation need to be the best to remove the target animal rapidly. Delays during an operation often allow food resources to increase and hence efficiency of animal removal to decrease. The chosen eradication method should be used at a time in the life cycle of the target animal when it is most vulnerable—usually a hunger period. Similar knowledge of non-target animals is needed to help the eradication action avoid undue impacts. All action taken and results observed should be recorded but care needs to be taken to avoid diversion of attention away from the eradication task. Determination by the project manager to complete the task is identified as a key factor in the success of an operation. Protecting the island from future invasion is an integral part of the operation.

DIVING PERFORMANCE OF MALE AND FEMALE JAPANESE CORMORANTS. *Yutaka Watanuki*, Lab. Applied Zool., Fac. Agriculture, Hokkaido University, Sapporo, Japan 060; *Akiko Kato and Yasuhiko Naito*, National Institute of Polar Research, Itabashi-ku, Tokyo, Japan 173.

Sexual size difference is reported in a variety of seabirds and it may cause sexual variation of foraging behavior. Diving ability of breath-holding divers appears to be limited by their body size since body size determines oxygen capacity and metabolic rate during diving. Japanese Cormorants are foot-propelled divers foraging benthic fish as well as pelagic fish. They show large sexual dimorphism; males (3.14 kg) and 24% bigger than females (2.53 kg). We studied their diving behavior by using micro data loggers during their chick rearing seasons at Teuri I, Hokkaido. males dived deeper (15.1 m) and longer (37 sec) than females (7.2 m and 24 sec). Maximum dive depth and duration attained by males were also greater than those by females. Dive

duration depended linearly on dive depth both in males and females but males spent relatively shorter time for diving if they dive to the same depth as females. These indicate that the diving capacity of males is greater than that of females. Therefore, male and female cormorants have to be considered as different indicators of marine environments.

REDUCING THE RISK OF ALIEN SPECIES INTRODUCTIONS TO ISLANDS. *Marc A. Webber, Elizabeth N. Flint, Duane K. McDermond, Cynthia A. Newton*, U.S. Fish and Wildlife Service, Honolulu, HI, 96850.

Island ecosystems are always at risk from unnatural invasions of animals and plants. Many seabird nesting islands have been effected by accidental or intentional introductions of aliens, most notably rats and cats. However, the impact of alien plants and insects on colonies is poorly known, infrequently considered and deserves more attention. Visitation of islands for seabird research and conservation activities poses a serious threat to these fragile ecosystems, and ironically, to the seabirds themselves.

Preventing introductions of species known to thrive in an island's environment requires additional care when traveling between islands. Everyone visiting and working on islands should develop and aggressively implement a plan to prevent alien introductions. Measures that reduce risks of new introductions during visits include: designate a team member to implement and police the plan; educate researchers and transport crews to insure cooperation; dedicate gear and clothing (especially footwear) for each island; use easily cleaned and inspected impermeable sealable containers; ban produce and sproutable seeds that could become established; freeze or fumigate supplies; inspect equipment that cannot be frozen or fumigated; and safeguard against transfer of vessel borne pests to stored gear and landing boats.

OPPORTUNITIES FOR SEABIRD RESTORATION THROUGH THE NATURAL RESOURCE DAMAGE ASSESSMENT PROCESS. *Daniel Welsh*, U.S. Fish and Wildlife Service, Sacramento Field Office, 2800 Cottage Way, Room E-1803, Sacramento, CA 95625; and *Roger Helm*, U.S. Fish and Wildlife Service, Region 1,

Eastside Federal Complex, 911 NE 11th Avenue, Portland, OR 97232-4181.

Oil spills and hazardous releases from Superfund sites have negatively impacted seabirds populations along the Pacific Coast. Natural Resource Damage Assessment provisions of Federal environmental legislation (Clean Water Act, Oil Pollution Act, and CERCLA) enable natural resource trustees to sue responsible parties for costs of restoring these injured resources. Ultimate success of the litigation depends to a large extent on the quality of scientific data documenting injuries to natural resources and on the merits of proposed restoration activities. This presentation will describe the process the U.S. Fish and Wildlife Service uses to carry out Natural Resource Damage Assessments and to implement restoration projects with settlement funds.

UTILIZATION BY CALIFORNIA LEAST TERNS OF A NEWLY CREATED NESTING SITE. *Adam Whelchel*, Wetlands Research Associates, Inc. 2169-G East San Francisco Blvd., San Rafael, CA 94901; and *Kathy Keane*, P&D Technologies, P.O. Box 5367, Orange CA 92613; and *Jack Fancher*, United States Fish and Wildlife Service, 2730 Loker Avenue West, Carlsbad, CA 92008.

One of the primary objectives of the draft California Least Tern Recovery Plan (currently under revision) is the establishment of nesting colonies in a minimum of 20 coastal wetland ecosystems. Although approximately 42 nesting sites are currently known, many are used irregularly and/or receive minimum management and protection. The general trend has thus been toward protection and management of large nesting colonies at the expense of smaller, less stable nesting sites; in 1993, 82% of least tern productivity statewide was attributed to seven nesting sites. Least tern researchers and managers have focused recent efforts therefore on the creation of new sites to buffer the local effects of predation and human disturbance, as well as to provide opportunities for re-nesting. Toward this end, the first of five sites at Batiquitos Lagoon in northern San Diego County was created in March 1994 with the removal of approximately 2.1 acres of ice plant (*Carpobrotus* sp.), importation of sand, and installation of fencing. Seventy-two pairs of least terns produced an estimated 68 fledglings at the site in 1994, far exceeding

numbers and productivity recorded in unprotected sites throughout the lagoon over the past 16 years.

FERAL GOAT AND FERAL PIG ERADICATION FROM SAN CLEMENTE ISLAND, CALIFORNIA. *Clark S. Winchell*, Natural Resources Office, P.O. Box 357040, Naval Air Station North Island, San Diego, CA 92135-7040 USA.

In 1994 the U.S. Navy program to eradicate feral goats (*Capra hircus*) and pigs (*Sus scrofa*) from San Clemente Island was completed. This program spanned nearly 22 years, employing many different strategies to complete its goal. The majority of the presentation will focus on the removal of feral goats, which was initiated in 1972, as an effort to protect endemic species from extinction. By the summer of 1989, nearly 29,000 had been removed. Between 1989 and 1991 a "Judas" goat program was implemented to remove a remnant population of goats. A herd, located by a "Judas" goat, was not removed until individuals comprising that herd were identified. After all individuals were accounted for by removal, a two year program was designed to confirm the eradication of goats was complete. The "Judas" technique permitted the final eradication of approximately 200 goats, and was used for three years to eradicate goats and then two years to confirm eradications. Data will be presented illustrating the movement patterns of goats and how this influenced management decisions. Radio collared goats released into areas where other goats existed behaved differently than those released into areas to confirm the absence of feral goats. Efforts to remove feral pigs were secondary to those for goats, until the late 1980's when an organized program was implemented. Pigs were eradicated using constant and systematic hunting pressure from both the air and ground. More than 1,000 pigs were removed under this program. Once pigs

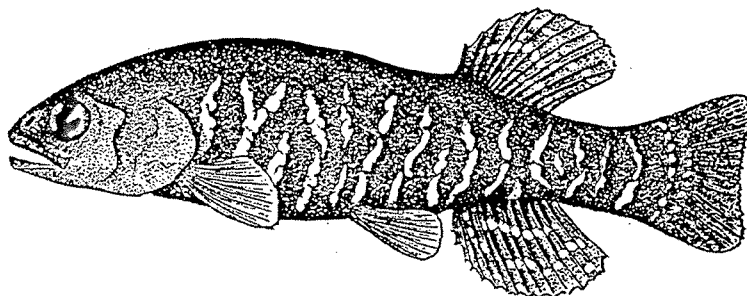
could not be located by hunters, dogs were used to verify their absence. This check phase spanned 18 months, and stratified short deliberate search patterns of dogs overlapping the large home range movements of pigs. A review of this 10-plus year process will be presented, with reference to both political and biological considerations influencing an animal damage control program.

POPULATION TRENDS OF SEABIRDS WINTERING IN KODIAK ALASKA—A FIFTEEN YEAR STUDY. *Denny Zwiefelhofer*, U.S. Fish and Wildlife Service, Kodiak National Wildlife Refuge, P.O. Box 825, Kodiak, AK 99615 and *Douglas J. Forsell*, U.S. Fish and Wildlife Service, 177 Admiral Cochrane Dr., Annapolis, MD 21401.

We conducted shipboard surveys of marine birds in Uyak and Uganik Bays on the western shore of Kodiak Island each February since 1980. Birds were censused within 300 m strip transects of 10 minutes duration run from shore to shore. The same cruise tracts were censused each year resulting in about 135 transects covering about 110 km² or 19 percent of the surface area of the bays.

Population increases were seen in Horned Grebes, Red-necked Grebes, and Glaucous-winged Gulls. Relatively stable populations were found for loons, cormorants, Mew Gulls, Common Murres, and Marbled Murrelets. Pigeon Guillemots have declined by over 50 percent over the past 15 years.

Bird abundance is the result of a number of factors including tradition, weather, food abundance, reproductive success, and the *Exxon Valdez* oil spill. All species except cormorants showed moderate declines following the *Exxon Valdez* Oil Spill. Little oil actually entered these bays and most birds had departed for breeding areas by the time the oil arrived.



Bulletin Board

Nominations for the 1996 Pacific Seabird Group Lifetime Achievement Award or Special Achievement Award

Please send your nomination for the 1996 PSG Lifetime Achievement Award or a Special Achievement Award to the PSG Chair (Mark Rauzon) by 15 May 1995. Please prepare a short 1-page description of the individual's contributions to the study and conservation of Pacific seabirds for review by the PSG Executive Council. If your nominee is selected, you must be prepared to conduct a short presentation at the November 1995 PSG/CWBS meeting in Victoria, British Columbia, and write a summary of the individual's achievements for Pacific Seabirds

California Seabird Coordination Meetings

On 12 December 1994, the fourth California Seabird Coordination Meeting was hosted by NOAA-GFNMS (National Oceanic and Atmospheric Administration - Gulf of the Farallones National Marine Sanctuary [Jan Roletto]) and NBS-CPSC (National Biological Service - California Pacific Science Center [Harry Carter]) at the GFNMS office in San Francisco. These informal meetings have been held in the late fall for the last few years and are designed to update colleagues and other organizations on various seabird research and management activities in California that occurred in the preceding year and that are planned for the following year. Possible joint projects and pooled funding were discussed. Representatives of the following groups attended the fourth meeting: U.S. Fish and Wildlife Service (San Francisco Bay NWR), University of California Davis, National Park Service (Channel Islands National Park & Western Region), Point Reyes Bird Observatory, California Department of Fish and Game (Oil Spill Prevention and Response, Wildlife Management Division, & Non-Game Bird Program), Minerals Management Service (Pacific Region), Pacific Seabird Group (Chair), California State University (Moss Landing Marine Laboratory), NOAA

(GFNMS, Channel Islands National Marine Sanctuary), and NBS-CPSC. The December 1994 meeting notes and a list of recent publications and reports on seabirds in California can be obtained by contacting: Jan Roletto, Gulf of the Farallones National Marine Sanctuary, Fort Mason, Building #201, San Francisco, CA 94123 (phone 415-556-2587; FAX 415-556-1419). The next meeting will be hosted by PRBO and again will be held at the GFNMS office in San Francisco in late fall 1995. To receive information on the next meeting, contact: Bill Sydeman, Point Reyes Bird Observatory, 4990 Shoreline Highway, Stinson Beach, CA 94970 (phone 415-868-1221; FAX 415-868-1946; email wjsydeman@aol.com).

Fisheries Management for Fishermen: A Manual for Helping Fishermen Understand the Federal Management Process

The Auburn University Marine Extension and Research Center and Sea Grant Extension Program recently released a publication that provides fishermen with a general, concise overview of the federal management process (56 pages). The publication is designed to help fishermen understand both the biological basis of regulation as well as the regulatory process.

Information needed to become involved in the management process is also included, such as the addresses and phone numbers of Regional Fishery Management Councils, NMFS Regional Offices, and Interstate Fishery Commissions.

The publication is a result of research partially sponsored by the Mississippi-Alabama Sea Grant Consortium and NOAA, Office of Sea Grant, Department of Commerce, and is available at no cost. For order information contact Deborah McArdle, Marine Advisor at the Sea Grant Extension Office, 105 E. Anapamu #5, Santa Barbara, CA 93101; Phone: 805-568-3330; e-mail: damcardle@ucdavis.edu.

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Published Proceedings of Symposia of the Pacific Seabird Groups

At irregular intervals the Pacific Seabird Group holds symposia at its annual meetings. The published symposia are listed below. Available symposia may be purchased by sending a check or money order (in US Dollars) to Jan Hodder, Treasurer, Pacific Seabird Group, Oregon Institute of Marine Biology, University of Oregon, Charleston, Oregon 97420 USA. Prices include postage (surface rates) and handling.

SHOREBIRDS IN MARINE ENVIRONMENTS. Frank A. Pitelka (Editor). Proceedings of an International Symposium of the Pacific Seabird Group, Asilomar, California, January 1977. Published June 1979 in, *Studies in Avian Biology* Number 2. Out of print.

TROPICAL SEABIRD BIOLOGY. Ralph W. Schreiber (Editor). Proceedings of an International Symposium of the Pacific Seabird Group, Honolulu, Hawaii, December 1982. Published February 1984 in, *Studies in Avian Biology* Number 8. \$12.00.

MARINE BIRDS: THEIR FEEDING ECOLOGY AND COMMERCIAL FISHERIES RELATIONSHIPS. David N. Nettleship, Gerald A. Sanger, and Paul F. Springer (Editors). Proceedings of an International Symposium of the Pacific Seabird Group, Seattle, Washington, January 1982. Published 1984 as, Canadian Wildlife Service, Special Publication. Out of print.

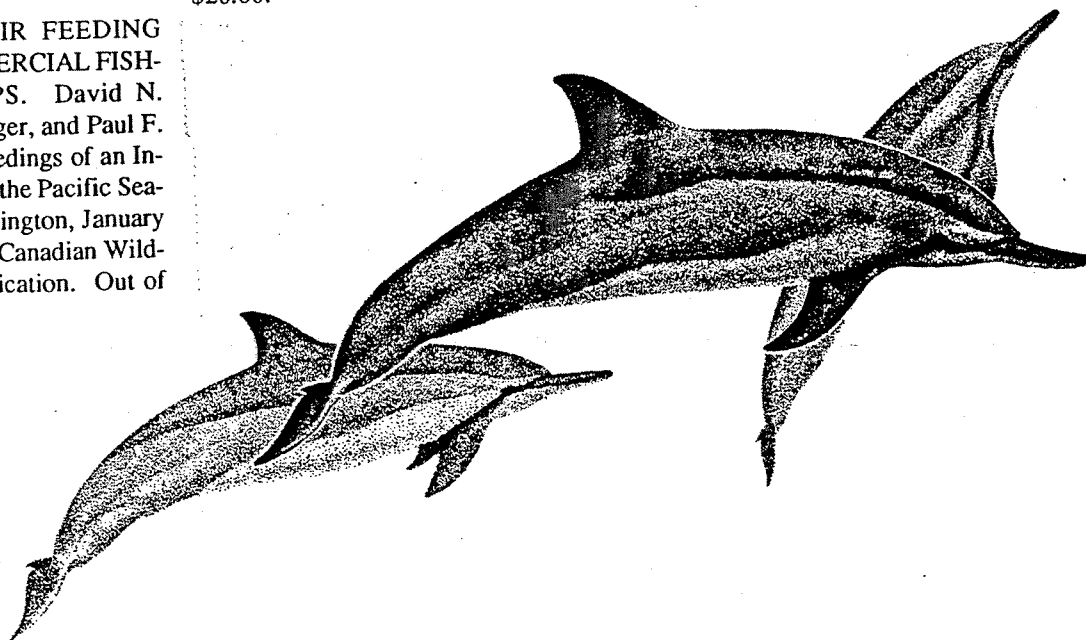
ECOLOGY AND BEHAVIOR OF GULLS. Judith L. Hand, William E. Southern, and Kees Vermeer (Editors). Proceedings of an International Symposium of the Colonial Waterbird Group and the Pacific Seabird Group, San Francisco, California, December 1985. Published June 1987 in, *Studies in Avian Biology* Number 10. \$18.50.

AUKS AT SEA. Spencer G. Sealy (Editor). Proceedings of an International Symposium of the Pacific Seabird Group, Pacific Grove, California, December 1987. Published December 1990 in, *Studies in Avian Biology* Number 14. \$16.00.

STATUS AND CONSERVATION OF THE MARBLED MURRELET IN NORTH AMERICA. Harry C. Carter, and Michael L. Morrison (Editors). Proceedings of a Symposium of the Pacific Seabird Group, Pacific Grove, California, December 1987. Published October 1992 in, *Proceedings of the Western Foundation of Vertebrate Zoology* Volume 5, Number 1. \$20.00.

THE STATUS, ECOLOGY, AND CONSERVATION OF MARINE BIRDS OF THE NORTH PACIFIC. Kees Vermeer, Kenneth T. Briggs, Ken H. Morgan, and Douglas Siegel-Causey (Editors). Proceedings of a Symposium of the Pacific Seabird Group, Canadian Wildlife Service, and the British Columbia Ministry of Environment, Lands and Parks, Victoria, British Columbia, February 1990. Published 1993 as, Canadian Wildlife Service, Special Publication, Ministry of Supply and Services, Canada, Catalog Number CW66-124-1993E. Free. Write: Publications Division, Canadian Wildlife Service, Ottawa, Ontario, K1A 0H3, Canada.

BIOLOGY OF MARBLED MURRELETS - INLAND AND AT SEA. S.K. Nelson and S.G. Sealy (Editors). Proceedings of a Symposium of the Pacific Seabird Group, Seattle, Washington, February 1993. Published in 1994 in, *NORTHWESTERN NATURALIST* Volume 75, Number 3. \$20.00.



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Contact committee coordinators for information and activities of committees and how you can participate.

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