

## Habitat Selection for Nest Cups of the Pacific Golden Plover

by Whitney Nekoba, 2002 Award Winner, Young Naturalist Awards by American Museum of Natural History  
*Whitney's trip to Alaska to do this research was made possible in part by a research grant from HAS in the spring of 2000.*

Pacific golden plover (*Pluvialis fulva*) nest in western Alaska and winter in Hawai'i and the insular Pacific. Populations that breed in the Russian far east winter in the western Pacific and in coastal areas of Southeast Asia, Australia, and New Zealand. Alaska natives refer to the Pacific golden plover as the tuusiik. (Eskimos name animals by the sound they make.) In Hawai'i the Pacific golden plover is known as kolea, which translates as "one who takes and leaves," an obvious reference to their migratory habits.

Most Pacific golden plover are territorial in their Hawaiian wintering grounds. High return rates are typical of these species (Johnson et al., 1981). Territorial birds reoccupy the same territories each winter, and non-territorial individuals frequent the same general area annually. Obtaining a territory is an adaptive characteristic, as it allows them to control access to essential food resources. A territory occupied on a daily and annual basis may increase the bird's ability to avoid predation by knowing the best escape routes. In 1999, I conducted a study on

the Big Island of Hawai'i regarding the Pacific golden plovers' territorial behavior. They were found to utilize their territory primarily during the morning hours, but could be seen there throughout the day if there was no disturbance. Weather was not found to be a factor determining their presence or absence.

Studies of marked Pacific golden plover on the Seward Peninsula in western Alaska show that males return to the same breeding territory, but females were much less site-specific (Johnson et al., 1993). On the Taymyr Peninsula of the Russian far east, three out of four nesting Pacific golden plover (sexes not indicated) banded by Underhill et al. (1993) returned in the following year, and a female marked by Tomkovich and Vronski (1988) nested at the same site in two consecutive seasons. From the winter of 1999 into the spring of 2000, I conducted another study on the Pacific golden plover, this time examining the male-to-female ratio on lawn habitats such as soccer fields and backyards. I found that there was a highly significant difference in the amount of males versus females. The males seemed to

outnumber the females by 3 to 2. There is still no conclusion as to whether the gender ratios are actually skewed, or if females tended to frequent the non-lawn habitats, such as dirt roads and agricultural fields.

Since the sixth grade, I have created science fair projects annually on the Pacific golden plover, but my interest in the plover goes far deeper. At a very young age I had noticed a bird in the back of my yard every day of the winter season. During the

summer I would never see this mysterious bird, and began to wonder why. That question prompted the first of my science fair projects on the Pacific golden plover's migratory behavior. From then on, my interest in the Pacific golden plover, and other, similar species, has grown tremendously, and has driven me to my newfound exploration in Nome, Alaska.

On a yearly basis, Mr. Phil Bruner, a biologist at Brigham Young University, Hawai'i, and his wife Andrea, perform observations on the Pacific golden plover in Nome, Alaska, during the early summer months. Mr. Bruner is my mentor, assisting me with

my research on the plover. He encouraged me to advance my studies on the Pacific golden plover by traveling to Nome with him and his wife to aid in their ongoing research during the summer of 2000. I finally made the decision to go, at the expense of forsaking personal trips, and am extremely glad that I did. I had never been to Alaska, let alone Nome, and believed it would be an exciting expedition.

The scenery of Nome was beautiful (Figure 1). The air was crisp and clean, no signs of pollution or smog; crystal-clear water flowed through side streams. Snow from the past winter lay on the pristine hills and mountains. Human contact was minimal; the ground was touched only by passing wildlife. Driving down the long and dusty road, every bump on the path was a new adventure, waiting to be explored. Musk oxen, foxes, and moose walked nonchalantly across the tundra, barely noticing the dusty Ford Explorer forging past them (Figure 2). Never have I seen such vast, undeveloped land acreage. It was an



Male Pacific golden plover with breeding plumage

*continued...*



**Table 1: Tallies of Nesting Environs Found on Nest Cup Sites of Pacific Golden Plover in Nome, Alaska**

| Nest # | Bird              | Year     | Vascular | Non-Vascular | Non-Living |
|--------|-------------------|----------|----------|--------------|------------|
| 1      | F-1-00-U          | 00       | 75       | 79           | 46         |
| 2      | F-1-95            | 95       | 72       | 55           | 73         |
| 3      | F-1-98-F          | 98       | 80       | 120          | 0          |
| 4      | F-1-98-WL         | 98       | 89       | 73           | 38         |
| 5      | F-1-99-WL         | 99       | 65       | 116          | 19         |
| 6      | F-2-88-NC         | 88       | 71       | 112          | 17         |
| 7      | F-2-98            | 98       | 50       | 55           | 95         |
| 8      | F-3-97            | 97       | 160      | 40           | 0          |
| 9      | F-4-94-(00)       | 00       | 56       | 124          | 20         |
| 10     | F-4-94-(95)       | 95       | 80       | 103          | 17         |
| 11     | F-4-94-(96,98)    | 96,98    | 147      | 39           | 14         |
| 12     | F-4-94-(99)       | 99       | 123      | 37           | 0          |
| 13     | F-5-93-(93,94,96) | 93,94,96 | 30       | 114          | 56         |
| 14     | F-5-93-(95)       | 95       | 42       | 147          | 11         |
| 15     | F-5-93-(98)       | 98       | 66       | 92           | 42         |
| 16     | F-5-94-(96)       | 96       | 130      | 70           | 0          |
| 17     | F-5-94-(97)       | 97       | 100      | 60           | 40         |
| 18     | F-6-93-(98)       | 98       | 48       | 112          | 40         |
| 19     | F-6-93-(99)       | 99       | 64       | 110          | 26         |
| 20     | F-6-93-(X)        | X        | 41       | 140          | 19         |
| 21     | F-6-93U           | 93       | 72       | 100          | 28         |
|        | AVE               |          | 79.1     | 90.4         | 28.6       |
|        | MAX               |          | 160      | 147          | 95         |
|        | MIN               |          | 30       | 37           | 0          |
|        | ST DEV            |          | 35.056   | 33.738       | 24.790     |

**Table 2: Relative Frequency**

| Nest # | Bird              | Vascular | Non-Vascular | Non-Living |
|--------|-------------------|----------|--------------|------------|
| 1      | F-1-00-U          | 0.375    | 0.395        | 0.23       |
| 2      | F-1-95            | 0.36     | 0.275        | 0.365      |
| 3      | F-1-98-F          | 0.4      | 0.6          | 0          |
| 4      | F-1-98-WL         | 0.445    | 0.365        | 0.19       |
| 5      | F-1-99-WL         | 0.325    | 0.58         | 0.095      |
| 6      | F-2-88-NC         | 0.355    | 0.56         | 0.085      |
| 7      | F-2-98            | 0.25     | 0.275        | 0.475      |
| 8      | F-3-97            | 0.8      | 0.2          | 0          |
| 9      | F-4-94-(00)       | 0.28     | 0.62         | 0.1        |
| 10     | F-4-94-(95)       | 0.4      | 0.515        | 0.085      |
| 11     | F-4-94-(96,98)    | 0.735    | 0.195        | 0.07       |
| 12     | F-4-94-(99)       | 0.615    | 0.185        | 0          |
| 13     | F-5-93-(93,94,96) | 0.15     | 0.57         | 0.28       |
| 14     | F-5-93-(95)       | 0.21     | 0.735        | 0.55       |
| 15     | F-5-93-(98)       | 0.33     | 0.46         | 0.21       |
| 16     | F-5-94-(96)       | 0.65     | 0.35         | 0          |
| 17     | F-5-94-(97)       | 0.5      | 0.3          | 0.2        |
| 18     | F-6-93-(98)       | 0.24     | 0.56         | 0.2        |
| 19     | F-6-93-(99)       | 0.32     | 0.55         | 0.13       |
| 20     | F-6-93-(X)        | 0.205    | 0.7          | 0.095      |
| 21     | F-6-93U           | 0.36     | 0.5          | 0.14       |
|        | AVE               | 0.395    | 0.452        | 0.143      |
|        | MAX               | 0.8      | 0.735        | 0.475      |
|        | MIN               | 0.15     | 0.185        | 0          |
|        | ST DEV            | 17.528   | 16.869       | 12.395     |

exhilarating feeling for me at the moment – the true beauty of Alaska, the last frontier.

Life history research on the Pacific golden plover has produced much information, including evidence of distinct differences in topographic and vegetative requirements at breeding sites. A nest cup is a shallow depression filled with lichens and moss. The cup may be reused in subsequent breeding seasons

(Connors et al., 1993; Johnson and Connors, 1996; Johnson et al., 1993). One area where data is still needed is on whether or not this species randomly or deliberately selects the actual sites where each plover places its nest cup each season. Until now, no quantified study of the habitat immediately surrounding the nest cups of this species had ever been attempted.

Therefore, the purpose of my study was to examine a one-meter-square area around each nest cup and determine what percentage of this plot was composed of vascular and non-vascular vegetation, or non-living material.

As I explored previously marked sites of Pacific golden plover nest cups on the tundra of Nome (Figure 3), a photograph was taken to identify general habitat features: vascular plants, non-vascular plants (lichen, moss), and non-living material (rocks, soil). If you look closely, there is a clutch of eggs in the nest. Twenty-one nest cup sites were used in this study. Once the exact location of the nest was determined, all artificial indicators used to mark the area were temporarily removed. A string was used to mark a one-meter area around each nest cup. Information regarding nest cup identification was written on an index card and placed on one side of the quadrant (Figure 4). A photograph

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Figure 5: Percentage of Nesting Environs in Each Pacific Golden Plover Nest Cup Habitat in Nome, Alaska

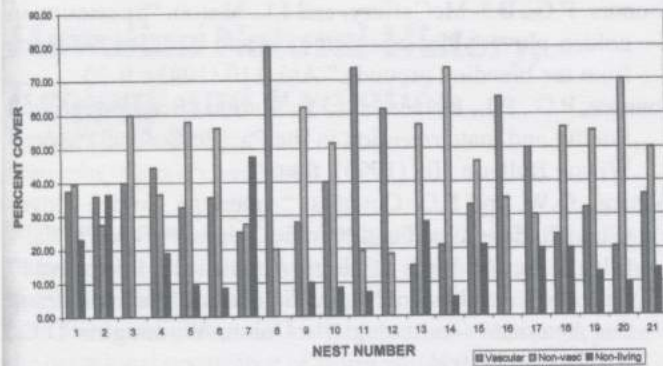
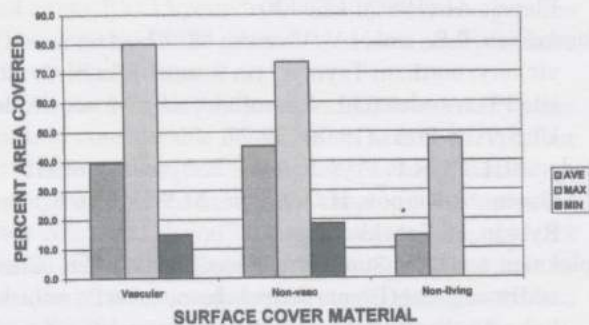


Figure 6: Average, Maximum, and Minimum Percentages of Nesting Covers



was taken of the area with both a digital and 35-millimeter camera. Once this step was completed, the string and index card were carefully removed and all markers were replaced. If a clutch of eggs was present in the nest, extreme caution was used when placing and removing markers in order to minimize the scent of human presence, which might attract predators.

Each photograph was digitally enhanced and was overlapped with a grid of 100 squares. I examined each photograph with the dot-method test. I used a transparent square the size of each computer-grid square, with four equally spaced dots marked on the surface, and placed this square on the computer screen. I chose two of the four dots randomly, and the substrate immediately beneath each chosen dot was recorded. The possible substrate categories were: vascular plants, non-vascular plants, and non-living material (rocks, soil). All of the 100 grid squares were examined (Table 1). The percentage of vegetative type or non-living material was calculated (Table 2 and Figures 5-6). I applied a t-test to the data in order to determine if there were significant differences in the percentage of each substrate.

The data analysis indicated that vascular plants dominated at six cups, non-vascular plants at 13 cups, and non-living material (rocks, soil) at two cups. When the percentages of vascular and non-vascular plant data were compared across at 21 nest plots, using a t-test, no significant differences were found ( $p < 0.01$ ). By contrast, when either vascular plant or non-vascular plant coverage was compared to non-living coverage data for all 21 nest plots, both vascular and non-vascular data were significantly greater ( $p < 0.05$ ) than non-living cover data. These results suggest that Pacific golden plover may prefer a vegetation cover surrounding the nest to non-living material (rocks, soil) in the immediate (one-square-meter) area.



Fig. 1 The beautiful scenery of Nome, Alaska. Musk oxen roam in the background



Fig. 2 Another picture of Nome's scenery. Our dusty Ford Explorer is behind me.

There are several possible reasons for this finding. The abundance and distribution of vascular and non-vascular plants to non-living material throughout the breeding territory may be similar to the area immediately around the nest cup. If this is true, then the type of cover immediately around the nest is just a reflection of what is available throughout the territory. This hypothesis would then argue that the location of the nest cup is strictly random. To date, the percentage of cover and the distribution of vascular, non-vascular, and non-living material has not been determined for any of the breeding territories containing the nest cups in this study. On another expedition to the nesting site, several nest cups could be surveyed to characterize these territories ecologically. Data from these surveys could be used to determine if the plover are randomly or deliberately selecting the location of their nest cups.

If the plovers' preference for plant cover around the nest is not just a reflection of what is available, then another hypoth-

*continued...*





Fig. 3 The picture of a Pacific golden plover nest cup. If you look closely, there is a clutch of eggs in the nest.



Fig. 4 A previously marked plover nest cup with the temporary quadrant string around it.

esis needs to be offered. Perhaps Pacific golden plover prefer to place their cups in spots with more vegetation rather than in areas with abundant non-living material (rocks, soil) because the vegetation provides better camouflage for the nest. In those cases where non-vascular plants dominate the area about the nest, the white lichens may provide camouflage for the light-colored eggs.

Finally, this study, like most research, only opens doors to more questions. For instance, how do the results compare with other plover in the same genus? What are the evolutionary implications of random versus active selection in the location of the nest cup?

## References

- Connors, P.G., B.J. McCaffery, and J.L. Maron. "Speciation in golden-plovers *Pluvialis dominica* and *P. fulva*: Evidence from the breeding grounds." *Auk* 110 (1993): 9-20.
- Connors, P.G., P.L. Bruner, and J.L. Maron. "Breeding ground fidelity and mate retention in the Pacific Golden-Plover." *Wilson Bulletin* 105 (1993): 60-67.
- Johnson, O.W. and P.G. Connors. "American Golden-Plover (*Pluvialis dominica*)," and "Pacific Golden-Plover (*Pluvialis fulva*)." In *The Birds of North America* (A. Poole and F. Gill, eds.). Academy of Natural Sciences, Philadelphia, and the American Ornithologist's Union, Washington D.C., No. 201-202 (1996).
- Johnson, O.W., P.M. Johnson, and P.L. Bruner. "Wintering behavior and site faithfulness of Golden-Plovers on O'ahu." *Elepaio* 41 (1981): 123-130.
- Tomkovich, P.S., and N.V. Vronski. "The bird fauna of Dikson vicinity, northern Taymyr" (in Russian). In *Birds of Populated Territories* (O.L. Rossolimo, ed.). Moscow: Moscow University Press (1988): 39-77.
- Underhill, L.G., R.P. Prys-Jones, E.E. Syroechkovski Jr., N.M. Groen, V. Karpov, H.G. Lappo, M.W.J. Van Roomen, A. Rybkin, H. Schekkerman, H.
- Spiekman, and R.W. Summers. "Breeding of waders (*Charadrii*) and brant geese (*Branta bernicla bernicla*) at Pronchishcheva Lake, northeastern Taymyr, Russia, in a peak and a decreasing lemming year." *Ibis* 135 (1993): 277-292.

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## Hawaiian Natural History, Ecology and Evolution

by Alan C. Ziegler

(University of Hawai'i Press, 2002)

When I first began learning about the native flora and fauna of the Hawaiian Archipelago I was intrigued by the question of how the many species arrived and came to settle here. Bird immigration seemed straightforward enough, given the occasional occurrence of storm winds from distant lands. But what about flightless birds such as the *moa nalo*? These prehistorically extinct species had only vestigial wings, weighed as much as 15 pounds, and could browse vegetation as much as 1 meter off the ground. *Moa nalo* could not have arrived on wings of storm.

Alan Ziegler provides the answers to this and many other questions, in considerable detail, in his new book. All four species of *moa nalo* arrived here *before* they lost the ability to fly. That is, they evolved from flight-capable ducks and geese *after* they colonized Hawai'i. Ziegler devotes one of his 28 chapters to "Flightless Birds and Fossil Sites", and in it he discusses the probable evolutionary mechanisms for the loss of flight in the 22 known species of flightless birds in Hawai'i. Only two of these species, the Common Hawai'i Rail or *moho* and the Laysan Rail, survived into historic times before becoming extinct.

*Hawaiian Natural History, Ecology and Evolution* is a certainly a marvelous comprehensive reference work. It could equally well be called a specialized encyclopedia, or a textbook. Indeed in his preface Ziegler suggests that it might be used as the basis for a college course. Each chapter is self-contained, so that it can be profitably read by itself. The language is precise without being overly pedantic, and correct scientific terms, defined if needed, are used throughout.

Ziegler has informally divided the subject matter into three parts: physical aspects, flora and fauna, and historical/cultural aspects. Chapter titles in the first part are: "Introduction," "Plate Tectonics," "Hawaiian Archipelago Formation," "Volcanism," "Hawaiian Topography," "Actions of the Ocean," "Climatology," "Freshwater," "Ecological Principles," "Evolutionary Principles," and "The Marine Environment". The middle section has chapters on fishes, flowering plants, arthropods, flies, snails, amphibians, reptiles, mammals, and birds. One entire chapter is devoted to honeycreepers, and, as noted above, another is devoted to flightless birds. The final section deals with Polynesian origin and migration, with Polynesian and historic ecology, and with present-day efforts at natural resource protection. Appendixes to the book cover Hawaiian place names, bibliography, and a fine list of audiovisual aids. The index is detailed and comprehensive.

*Hawaiian Natural History, Ecology and Evolution* merits a place on the bookshelf of anyone interested in Hawai'i and the environment.

## Kilauea Point Service Trip in January 2003

A service trip to Kilauea Point National Wildlife Refuge (at Kilauea Point in northeast Kaua'i) will take place January 18, 19, and 20, 2003 (Saturday, Sunday, and Monday). The refuge is run by the US Fish and Wildlife Service and is home to the Laysan Albatross, Wedge-tailed Shearwater, Red-tailed Tropicbird, Brown Booby, Red-footed Booby, and Great Frigatebird, and the Barn Owl, Pueo, Melodious Laughing Thrush, and Western Meadowlark may also be found there.

We will take 12 people (10 volunteers and the 2 coleaders) and will be staying in the Visitor Center at the refuge. We'll be repairing fences, doing trailwork, planting natives, removing weeds, and doing whatever else the Fish and Wildlife Service needs. This is an excellent chance to improve the habitat for the seabirds, and a great opportunity to do some up-close birding!

Volunteers may contact Randy Ching at oahurandy@yahoo.com (phone 942-0145) or email Adam Liss at adamliss@aol.com for more information.

## Field Trips for 2002

All trips with an \* are still in the process of being planned. Details will be provided as the scheduled dates get closer. A donation of \$2 per participant on all field trips is appreciated.

**December 15 – January 5** Annual Christmas Bird Count.

• **January 25 Field Trip** to Puohala Marsh in Waipahu, being managed by Hawaii Nature Center and Ducks Unlimited. Most of us have never been to this marsh. Call the office to register, 528-1432. Cost for this trip is \$12.50, charged by Hawaii Nature Center, which will provide a knowledgeable docent to lead the trip. All ages welcome.

• **February Field Trip** to be announced in the February issue.

## December Program Meeting – Monday, December 16

A talk will be given on the history of the Audubon Christmas Bird Count in Hawai'i, the importance of the Count, and an introduction to birdwatching and identification of species that may be seen on this year's Count.

This meeting is also HAS's Annual Membership Meeting at which the election results will be announced and the 2003 officers and directors introduced.

Program meetings are held at Henry Hall Room 109 on the Chaminade University campus, 3140 Wai'ala'e Avenue, Kaimuki. Meetings are from 7:30 to 9:30pm. Refreshments are served, and HAS publications, T-shirts, and maps are available for purchase.



# CHRISTMAS BIRD COUNT 2002-2003

The Christmas Bird Count is a coast-to-coast annual bird census. Volunteers count every bird and bird species over one calendar day. Birds are indicators of the overall health of the environment. Christmas bird count data in any given area can provide valuable insight into the long-term health of bird populations and the environment.

Over 45,000 people from all 50 states, every Canadian province, the Caribbean, Central and South America and the Pacific Islands participate in more than 1,700 counts held during a two and a half week period!


Join our Christmas Bird Counts during the official count period from December 15, 2002 to January 5, 2003. If you want to do something good for birds and meet other "bird people," contact one of the coordinators to sign up. There is a \$5.00 charge per person to support compiling and publication of the nationwide results. Note: Special information is needed by the coordinator of the popular "Kulani Prison" count, so contact the Big Island Volcano coordinator by December 1 to ensure your spot.


| <u>Island</u>                | <u>Date</u> | <u>Coordinator</u>   | <u>phone/email</u>   |
|------------------------------|-------------|--|--|
| <b>Kaua'i</b>                |             |  |  |
| Waimea                       | 12/28       | Michelle Ho'okano<br>Marsha Ericson<br>Koke'e Natural History Museum | 808-335-9975   |
| Kapa'a                       | 12/27       | Barbara Stuart   | 808-826-9233   |
| <b>O'ahu</b>                 |             |  |  |
| *Honolulu                    | 12/21       | Arlene Buchholz  | 988-9806 or <a href="mailto:snovakz@juno.com">snovakz@juno.com</a>                 |
| *Waipi'o                     | 12/14       | David Bremer   | 623-7613 or <a href="mailto:bremerd001@hawaii.rr.com">bremerd001@hawaii.rr.com</a> |
| <b>Maui</b>                  |             |  |  |
| Pu'u O Kaka'e<br>(East Maui) | 12/28       | Lance Tanino   | 808-280-4195 or <a href="mailto:lancemanu@hotmail.com">lancemanu@hotmail.com</a>   |
| 'Iao Valley<br>(West Maui)   | 12/14       | same as above  | same as above  |
| <b>Moloka'i</b>              |             |  |  |
| Kalaupapa                    | 12/28       | Arleone Dibben-Young   | 808 553-5992 or <a href="mailto:nene@aloha.net">nene@aloha.net</a>                 |
| Kualapu'u                    | 12/19       | same as above  |  |
| <b>Hawai'i Island</b>        |             |  |  |
| **Kulani Prison<br>(Volcano) | see below   | Larry Katahira   | 808-985-6088   |
| North Kona                   | 01/04       | Reggie David   | 808-326-9141 or <a href="mailto:rdavid@kona.net">rdavid@kona.net</a>               |

\*A presentation will be given on the history of the CBC and on Bird Identification at the HAS Program Meeting on December 16<sup>th</sup>. See article on page 171.


\*\*The public will not be able to participate in the count this year for security reasons.


## Holiday Shopping at HAS New Items!!


 HAS t-shirts are available in great new colors! These white, natural, Pacific blue, and jade tees feature our logo, the 'Elepaio, on the back, with small logo on the front. Also added are HAS tank tops in white and grey, with the large logo just on the front. Kolea Research Hawai'i tees were reordered in all sizes, including XXL. Tees and tanks are \$12.00.

 A new item this year is the Sibley Bird Calendar 2003, written and illustrated by David Allen Sibley. It features one or two birds each month, showing various views of the bird (male and female as juvenile and adult). Text describes habitat and voice, and range maps are also included. The calendars are 10.95 each.

Other great gifts include:

 Hawaii's Birds book (\$9.95)

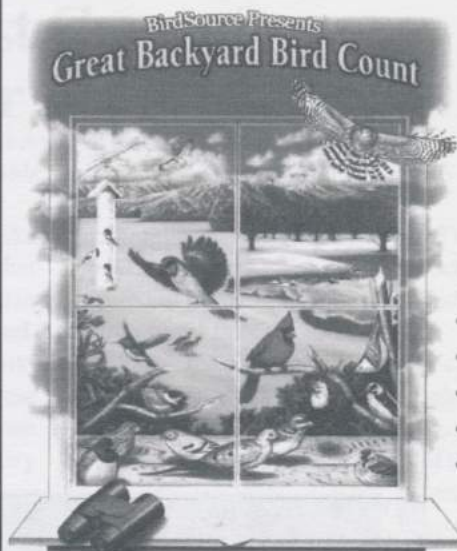
 Voices of Hawaii cassette tape set featuring all of the calls of birds in Hawaii (\$12.50)

 Patrick Ching notecards of endangered birds of Hawaii (\$7.00 set of 8)

Stop by Monday through Friday from 9:30 to 4:30 to buy items. Items can also be mailed.

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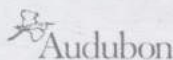
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## Calendar of Events

**December 15 to January 5** Christmas Bird Count. *See page 171.*

**December 16** Program Meeting and Annual Membership meeting. *See page 171.*

**January 18 & 19** HAS Annual Board and Chapter Leaders' Retreat

**January 25** Field Trip to Pouhala Marsh. *See page 171.*

**February** Field Trip to be announced next issue.

**February** Program Meeting to be announced next issue.

**March 10** HAS Board meeting open to all members, 6:30 to 8:30 p.m. at the HAS office. Education and Conservation Committees meet at 5:45 p.m. before Board meetings.

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