Table 1. Frequencies of Red Knots banded at Sands Point on 6 January 1981 and subsequently found in flocks at various locations.

	Location	Distance (km) from banding site	Flock size	No. of birds checked	No. marked	Percent marked
7 January 1981	Siesta Key	7	4,200	1,054	90	8.5%
8 January 1981	Sands Point	0	400	400	10	2.5%
8 January 1981	Siesta Key	7	2,230	1,251	96	7.7%
9 January 1981	Sands Point	0	900	659	19	2.9%
7 October 1981	Maderia Beach	62	550	622	15	1.4%
9 October 1981	Sands Point	0	350	735	31	4.2%
16 October 1981	Indian Shores	69	800	1,130	9	0.8%
18 January 1982	Manasota Key	42	1,125	1,906	29	1.5%
21 January 1982	Longboat Key	15	1,499	781	31	3.9%

erlings *Calidris alba* in California had complex, within-flock, social organisation.

Second, our result of non-random occurrence of marked birds between flocks indicates that care should be used in calculating population estimates using ratios of marked/unmarked birds unless broad, representative sampling is achieved. For example, at Sands Point in January 1981 we found 29 of the 238 marked Knots among 1,059 birds checked, giving an estimate of 8,691 Knots in the area population. On the other hand, at Siesta Key we found a ratio of 186 marked to 2,305 unmarked Knots, leading to population estimate of 2,949 Knots. Combining the ratios from both areas gives a population estimate of 3,724, much closer to the number we estimated (3,875) from counts made in an aerial survey on 31 December 1980.

To summarize, ornithologists frequently work on the assumption that birds are randomly associated in their flocks. Our findings with Knots, and those of Furness & Galbraith (1980) with another species of wader, suggest such assumptions may be incorrect.

Reference

Furness, R.W. & Galbraith, H. 1980. Non-random distribution in roosting flocks of waders marked in a cannon net catch. *Wader Study Group Bull.* 29: 22–23.

Rationale and suggestions for a hemispheric colour-marking scheme for shorebirds: a way to avoid chaos

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Within the next few years the number of shorebird colour marking projects in the New World is likely to expand considerably. One common goal shared by many of these programs is tracking movements between breeding and wintering grounds, and identifying stop-over sites used by specific populations during migration. The prospect for success in this work is enhanced greatly by expanding the number of projects involved. But this expansion may result largely in confusion, unless considerable effort is made to co-ordinate colour-marking schemes. We outline here a system that should function if adopted by shorebird banders working in the New World.

The system we proposed is based on a series of practical considerations and research goals, summarised below. The system is complex, but so is the problem it addresses. No perfect solution is available given the diversity of interests and countries and the limitations on materials and resources. We hope this system strikes a reasonable balance. We hope that researchers will provide feedback to us on its usefulness and drawbacks.

1. This system uses coloured leg bands and flags made of a plastic, darvic, with UV-stable colours to prevent fading. The flags provide extraordinary visibility when placed beneath the tarsometatarsal joint of shorebirds. The flags are long-lived and colour-fast, and until 1982 were virtually unused in New World shorebird banding. Flags are immediately distinguished in the field from coloured leg bands. Thus this

scheme will not interfere with any local project not interested in migration work. In fact, the flags offer an easy way to permit local population studies to continue without interfering with migration research (more on this below).

A sample and instructions on flag-making and placement can be obtained by writing to the first author of this note. The flags are made from blanks (small cut strips of darvic) obtained from A.C. Hughes, Ltd (1 High St., Hampton Hill, Middlesex, TW12 1NA, England). The bands can be purchased from A.C. Hughes, already made. We find the most secure and efficient way to fasten both flags and bands in place is to use a small soldering iron (or in the field a metal probe heated over a primus-type stove) to seal the edges.

2. There are nine useful colours available in this material: red, yellow, dark blue, dark green, light green, white, black, grey, and orange. By useful we mean those that can be reliably distinguished by observers using good optical equipment up to 100 m away. Casual, untrained observers may have difficulty with a few of the colours.

3. There are 23 countries in the mainland New World, plus three in the Caribbean along with several islands of varying political status. It is important for the system to be able to accommodate all potential participants, thus each country gets a unique code. Given the small number of useful colours, most countries receive a two-flag code. Countries with two-flag codes in the same region (for example, Central America) share one flag colour in common and vary the second. Those countries most likely to engage in the greatest amount of banding have the simplest and most visible codes.

4. The goals of investigators will vary considerably. Some may be uninterested in large-scale movements and rather simply wish to colour-mark individuals in a local population. Others will want to look only at population movements and not want to mark birds as individuals. Finally, some will want to look both at individuals and at migration.

Basic features of the scheme

This is a hierarchical system:

1. Studies examining populations in a local area during any period of the year, and thus without interest in regional movements or migrations, need not use coloured leg flags. Investigators working on such projects will be encouraged to use leg flags consistent with their geographic region, but it will not be essential to their work.

2. Studies focusing on migratory or regional movements but without interest in individual identification of birds will use a leg flag particular to their country, plus 2 coloured leg bands. The bands will indicate year of handing and site within the country. Flag placement should be as follows:

Birds banded July–December:
left leg: USF & WS metal above joint, flag beneath
right leg: nothing above joint, location over year bands beneath
Birds banded January–June:
left leg: nothing above joint, location over year bands beneath
right leg: USF & WS metal above joint, flag beneath

The reason for switching the flag from left to right leg is to permit distinctions to be made among northbound and southbound marked birds.

Those countries not wishing to differentiate between sites within a country need not use a location colour band. The advantage to putting a flag on one leg and a band on the other is that a marker will be visible whichever leg a roosting bird is roosting on. We suggest the year bands be consistent among all countries and use the following sequence:

1983/84	yellow
1984/85	red
1985/86	orange
1986/87	white
1987/88	dark green (where the year extends from July–June).

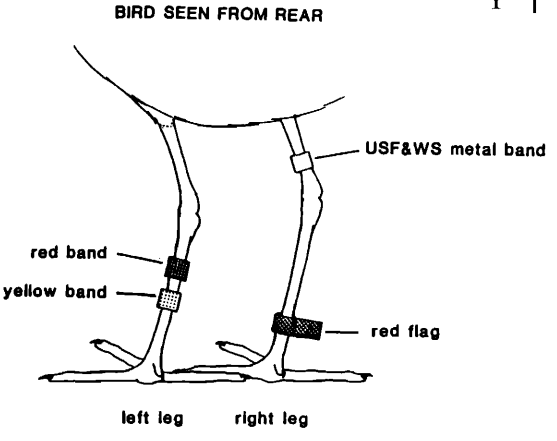
3. The flag scheme is presented in Table 1. Below follow a few examples illustrating its use. To describe a bird's band and flag code there are two convenient notations:

This means the bird had a red band over a yellow band on left and a USF&WS band (m) above the joint and a red flag (Fr) below on the right leg (left of the :). Thus this bird was banded January–June 1984 at site red in Chile.

In notation 1 the colon (:) separates the two legs, and

Notation 1: – , RY : m , F_r **Notation 2:**

–	m
R Y	F_r



within a leg the notation is read from left to right (above to below) with the comma (,) separating bands above versus below the joint. In notation 2, bands above joint are noted above the horizontal line, either to the right of the vertical line (right leg) or to the left (left leg), indicating directly which band is on top. With both notations it is very important to note if no bands were in a particular position. Dashes are used to indicate that. It is also important to discriminate between dark green and light green: G_d vs G_l. See Table 2 for further examples.

4. Some studies require individual identification of birds. This banding scheme is designed to accommodate their needs by permitting more complex combinations of colour bands when necessary, along with the appropriate country flag. The code for each individually-coded bird should include an additional band immediately above the flag (and below the tarsal-metatarsal joint) to immediately identify it

Table 1. Flag colours for regions and countries in the New World.

Canada	white
US	dark green
Central America	red over:
Mexico	red over yellow
Honduras	red over grey
Costa Rica	red over black
Guatemala	red over orange
Nicaragua	red over dark green
Belize	red over light green
El Salvador	red over blue
Panama	red over white
Caribbean Islands	yellow over:
Haiti	yellow over red
Puerto Rico	yellow over dark green
Dominican Republic	yellow over white
Venezuela	black
Suriname	light green
Northern South America	light green over:
Colombia	light green over yellow
Ecuador	light green over red
Guyana	light green over dark green
French Guiana	light green over blue
Peru	yellow
Brasil	blue
Central South America	orange over:
Bolivia	orange over red
Paraguay	orange over yellow
Uruguay	orange over blue
Argentina	orange
Chile	red

Table 2. Further examples of notations 1 and 2 and their interpretations.

Notation 1	Notation 2	Interpretation
m , F_y : – , R Y	m | – F_y | R Y	Bird banded in Peru, site R, Jul.–Dec. 1983
– , R Y : m , F_y	– | m R | F_y Y	Bird banded in Peru, site R, Jan.–June 1984
m , F_o : – , Y	m | – F_o | Y	Bird banded in Argentina, Jul.–Dec. 1983 (in this example Argentina is not differentiating among different banding sites within Argentina)
m , F_{lg} F_y : – , R Y	m | – F_{lg} | R F_y | Y	Bird banded in Colombia, site R, Jul.–Dec. 1983

as an individually-coded bird. Thus instead of year and location bands, individually-coded birds would carry bands whose meaning was designated by the bander. The chief requirement is that each country in which more complex schemes are used must co-ordinate within-country banding practices. One disadvantage of a more complex scheme is that it increases the probability of observer error, especially that of untrained observers, and thereby decreases the potential utility of casual reports. A second disadvantage is that it means observers of individually coded birds must await responses from the banders to learn specific date and location data, whereas with standard codes this information is readily apparent.

Additional flexibility can be achieved by using flags above the tarsometatarsal joint in addition to country flags beneath the joint. Flags above the joint can be either of the same type as used in the hemispheric scheme, or they can be temporary flags fashioned from coloured adhesive plastic tape wrapped around the metal band. Several banding programs use this type of flag now. They are large enough so that numbers or letters can be written on the tape and used to identify individuals, even for the smallest species. Anyone using such a system should be certain to place the tape flag *above* the tarsometatarsal joint, so that observers will not confuse it with the country-specific flag, which will always be *below* the joint.

5. Colour dyes will be used as a general marker rather than to provide specific location information. Too few good colours exist to devise an adequate regional scheme. We suggest therefore that dyes be used to indicate that a bird has been colour-flagged and that its legs ought to be examined for flags and bands, rather than to indicate precisely where the marking occurred. Because dyes last no longer than the current feathers, at best, their use is more flexible than permanent leg flags. With anticipation, it should be possible to develop programs for a given year that use dyes in more specific ways.

For 1983/84 we propose the following dye scheme:

Fall migration:	Picric acid on right side of bird along Atlantic Coast, on left side of bird along Pacific Coast.
Spring migration:	in South America same as fall migration, in North America substitute diazonone blue for picric acid.

For those of you with ongoing dyeing programs, please bear in mind the concluding remarks, below.

Summary

The banding scheme outlined in this paper is an attempt to avoid disaster. There are many possible schemes, but one must be chosen if hemispheric wide studies of shorebirds are to prosper. No scheme is going to be perfect for all researchers, and any will require adjustments in ongoing banding operations. We ask those of you have ongoing programs to consider the alternative to co-ordination. We can't close the door to new banding programs; we have neither the right nor bureaucratic power to do so. More to the point, we stand to benefit by doing our work in a way that allows as many others as possible to participate.

For those who are about to begin marking programs, we hope that this scheme meets your needs. The benefits for co-ordination vastly outweigh the extra effort.