



# NEW WORLD SECTION

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## An overview of the seasonal distributions of the North American shorebirds

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### INTRODUCTION

The latitudinal distributions of the North American shorebirds are complex: there are many species and their distributions are diverse and dynamic (*e.g.* Morrison 1984). A simplifying overview is needed to make these complex distributions more easily understood. To date overviews have taken the form of a general statement: North American shorebirds are concentrated on their breeding grounds during summer and spread-out over almost the entire New World during winter (Pitelka 1979; Boland 1988). This is a useful simplification but it is time to take it one step further.

Boland (1988) has shown that leap-frog migration is common among the North American shorebirds and that some species migrate very long distances and leap-frog other species that migrate only short distances or not at all. In this paper I present a pictorial overview of North American shorebird migration that incorporates these leap-frog migration patterns. I group species with similar wintering range characteristics and illustrate the seasonal distributions of the North American shorebirds as well as the leap-frog migration among these groups of species.

### METHODS

Forty-seven species of shorebirds breed in North America and winter in the New World (Johnsgard 1981; Boland 1988). The latitudinal limits of their breeding and wintering ranges were obtained from Blake (1977), A.O.U. (1983), and Johnsgard (1981). Breeding and wintering mid-latitudes were calculated for each species as the points midway between the northern and southern limits of their breeding and wintering ranges respectively (see Appendices 1 and 2 for data).

In order to group the species, I examined their winter range widths and wintering mid-latitudes, and looked for natural breaks between species. I then grouped species with similar wintering range characteristics.

### RESULTS

#### *1. Defining the groups*

During the Boreal winter most of the North American shorebirds have range widths of between 10° and 60° latitude (Figure 1); but there are 12 species with very wide ranges (*i.e.* < 70°; Figure 1). These 12 species have wintering mid-ranges in the tropics (between 10°N and 20°S; Figure 2); but



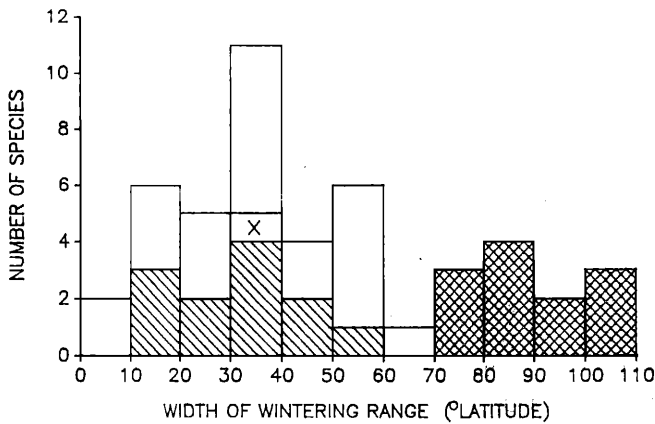


Figure 1. Wintering widths of the North American shorebirds. The darkly shaded areas represent species have winter ranges greater than 70° latitude and form the Bicontinental Wintering Group. The lightly shaded and unshaded areas represent species that form the South American Wintering Group and North American Wintering Group, respectively. The range width of the Semipalmated Sandpiper is marked with an X.

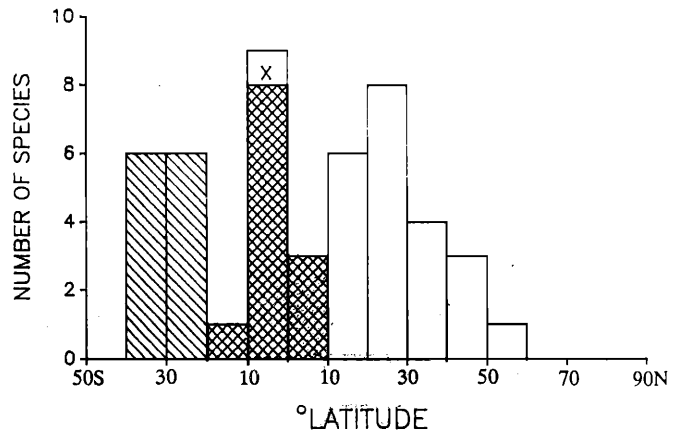


Figure 2. The latitudinal distribution of the North American shorebirds during the boreal winter using mid-latitudes. The darkly shaded areas represent species that have winter ranges greater than 70° latitude and form the Bicontinental Wintering Group. The lightly shaded and unshaded areas, species form the South American Wintering Group and the North American Wintering Group, respectively. The Semipalmated Sandpiper is marked with an X.

because of their wide ranges they are not exclusively tropical wintering species but bicontinental wintering species. [The Semipalmated Sandpiper, *Calidris pusilla* (marked with an X in Figures 1 and 2), is an exception to the rule: that species with wintering mid-latitudes in the tropics have wide winter ranges. This species has a wintering mid-latitude of 4°S but a relatively narrow winter range. It is the only shorebird that breeds in North America that has exclusively tropical wintering grounds. It does not fit into any of the groups but, because of its tropical wintering mid-latitude, I have included it in the bicontinental group.]

If one were to remove these bicontinental species from Figure 2, a distinctly bimodal picture would remain. Wintering in the Northern Hemisphere is a group of 22 narrow range species (mean winter range width = 35.6°, sd = 16.8°, n = 22) and wintering in the Southern Hemisphere is a group of 12 narrow range species (mean winter range width = 34.6°, sd = 11.6°, n = 12).

Table 1. The proportions of miscellaneous, plover and sandpiper species in the three groups. The miscellaneous category includes two species of oystercatcher, a stilt and an avocet. CI

Group	misc.	plovers	sandpipers
N.Am.W.G. (22 spp.)	.13	.23	.64
Bicont.W.G. (13 spp.)	.08	.15	.77
S.Am.W.G. (12 spp.)	0	.08	.92

I consider this trimodal picture (Figure 2) justification for dividing the species into three groups: the Bicontinental Wintering Group (13 species), the North American Wintering Group (22 species), and the South American Wintering Group (12 species). [Appendix 1 lists the species in each group.]

Notice that the composition of the three groups is slightly, though not significantly, different (Table 1; Chi-square test,  $p > 0.05$ ). The North American Wintering Group is rich in miscellaneous species (*i.e.* oystercatchers, avocets, stilts) and plovers, whereas the South American Wintering Group is particularly rich in sandpipers.

### 2. The breeding and wintering distributions of the three groups

Because the groups were defined on the basis of their different wintering mid-latitudes it is not surprising that there are significant differences among the wintering mid-latitudes of the three groups (Kruskal-Wallis test,  $p < 0.005$ ). However there are also significant differences among the breeding mid-latitudes of the three groups (Kruskal-Wallis test,  $p < 0.005$ ); and the order of the three groups is reversed (Figure 3).

It is from these elements that I have constructed a diagram of North American shorebird seasonal distributions (Figure 4). The North American breeders are concentrated on their breeding grounds during the Boreal summer and spread-out over almost the entire New World during the Boreal winter. In addition, these birds can be divided into three groups that undertake a vast leap-frog migration each fall and spring (Figure 4).



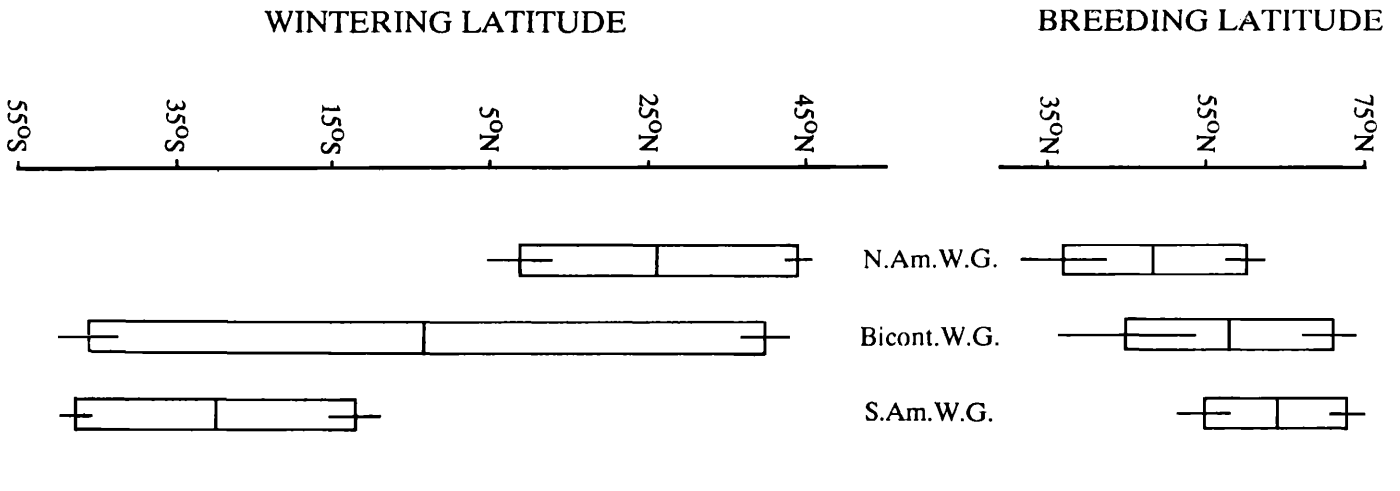


Figure 3. The breeding and wintering distribution of the three North American species groups. The mean northern and southern limits ( $x + 1 se$ ), and the mean mid-latitudes are given for each group.

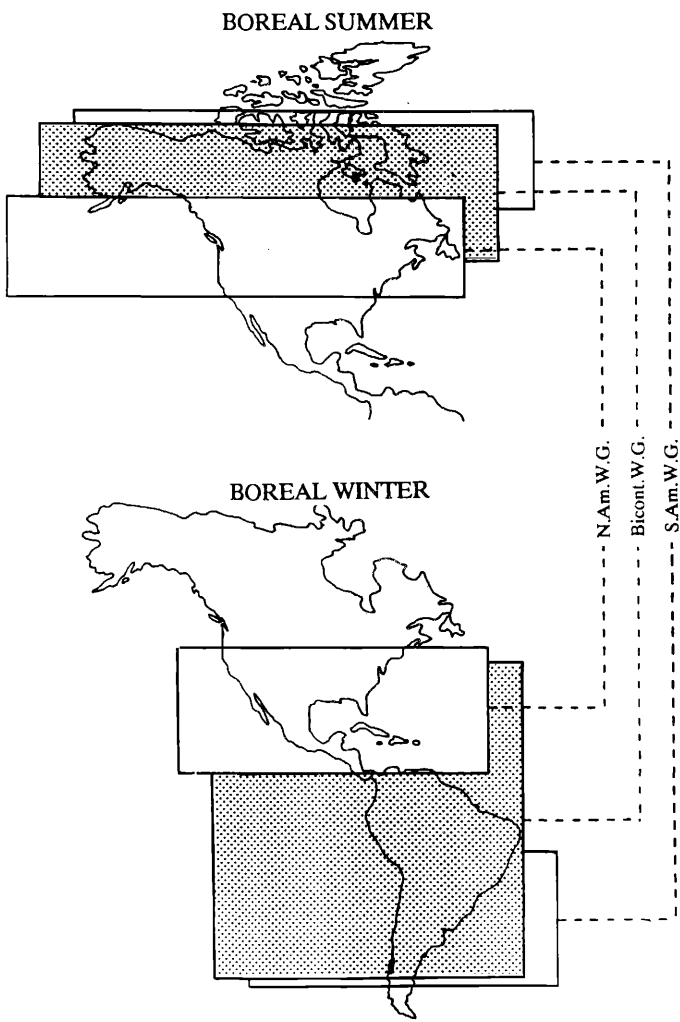


Figure 4. A diagram illustrating the breeding and wintering distributions of the North American shorebirds as the leap-frog migration among three species groups. The mean northern limit and mean southern limit of each group is used.

DISCUSSION

Figure 4 describes the complex and dynamic distributions of the North American shorebirds in an easily understood, broad overview. This is the first attempt to incorporate leap-frog migration into a general overview of shorebird distributions, and it suggests that among the North American shorebirds there are three basic migration 'strategies'. It will be interesting to investigate the biology of the species in these groups and to determine whether the birds in each group have other common characteristics.

The problem with overviews like this are that they often leave out important information. Here, for instance, the Semipalmated Sandpiper did not fit into any of the groups and was lumped with the Bicontinental Group. Also, in basing the species distributions on species ranges I have had to assume an even distribution of individuals within the ranges. Finally I have ignored the fact that many individuals remain on the wintering grounds during the Boreal summer (*e.g.* Eisenmann 1951; Spaans 1978) and have used breeding ranges rather than Boreal summer ranges. However it is hoped that more is gained than lost by seeing the migration of the birds places in a simplifying framework.

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APPENDIX 1. The species composition of the three groups:

NORTH AMERICAN WINTERING GROUP

- |  |                                    |
|--|------------------------------------|
| 1. American Black Oystercatcher (AmBIOy) | <i>Haematopus bachmani</i>         |
| 2. Black-necked Stilt (BlNSt)            | <i>Himantopus mexicanus</i>        |
| 3. American Avocet (AmAvo)               | <i>Recurvirostra americana</i>     |
| 4. Thick-billed Plover (TbPl)            | <i>Charadrius wilsonia</i>         |
| 5. Killdeer (Kill)                       | <i>C. vociferus</i>                |
| 6. Piping Plover (PipPl)                 | <i>C. melodus</i>                  |
| 7. Snowy Plover (SnoPl)                  | <i>C. alexandrinus</i>             |
| 8. Mountain Plover (MontPl)              | <i>C. montanus</i>                 |
| 9. Willet (Wil)                          | <i>Catoptrophorus semipalmatus</i> |
| 10. Wandering Tattler (WanTat)           | <i>Heteroscelus incanus</i>        |
| 11. Long-billed Curlew (LbCur)           | <i>Numenius americanus</i>         |
| 12. Marbled Godwit (MarGod)              | <i>Limosa fedoa</i>                |
| 13. Black Turnstone (BTurn)              | <i>Arenaria melanocephala</i>      |
| 14. Western Sandpiper (WestSp)           | <i>Calidris mauri</i>              |
| 15. Least Sandpiper (LSp)                | <i>C. minutilla</i>                |
| 16. Purple Sandpiper (PurpSp)            | <i>C. maritima</i>                 |
| 17. Rock Sandpiper (RockSp)              | <i>C. pilocnemis</i>               |
| 18. Dunlin (Dunlin)                      | <i>C. alpina</i>                   |
| 19. Short-billed Dowitcher (SbDow)       | <i>Limnodromus griseus</i>         |
| 20. Long-billed Dowitcher (LbDow)        | <i>L. scolopaceus</i>              |
| 21. Common Snipe (ComSni)                | <i>Gallinago gallinago</i>         |

22. American Woodcock (AmWood) *Scolopax minor*

BICONTINENTAL WINTERING GROUP

- |                                     |                                |
|-------------------------------------|--------------------------------|
| 1. American Oystercatcher (AmOy)    | <i>Haematopus palliatus</i>    |
| 2. Black-bellied Plover (BlbPl)     | <i>Pluvialis squatarola</i>    |
| 3. Semipalmated Plover (SemiPl)     | <i>Charadrius semipalmatus</i> |
| 4. Greater Yellowlegs (GrYl)        | <i>Tringa melanoleuca</i>      |
| 5. Lesser Yellowlegs (LsYl)         | <i>T. flavipes</i>             |
| 6. Solitary Sandpiper (SolSp)       | <i>T. solitaria</i>            |
| 7. Spotted Sandpiper (SpotSp)       | <i>Actitis macularia</i>       |
| 8. Whimbrel (Whimb)                 | <i>Numenius phaeopus</i>       |
| 9. Ruddy Turnstone (RTurn)          | <i>Arenaria interpres</i>      |
| 10. Surfbird (Surf)                 | <i>Aphriza virgata</i>         |
| 11. Red Knot (RKnot)                | <i>Calidris canutus</i>        |
| 12. Sanderling (Sand)               | <i>C. alba</i>                 |
| 13. Semipalmated Sandpiper (SemiSp) | <i>C. pusilla</i>              |

SOUTH AMERICAN WINTERING GROUP

- |                                      |                                |
|--------------------------------------|--------------------------------|
| 1. American Golden Plover (AmGP)     | <i>Pluvialis dominica</i>      |
| 2. Wilson's Phalarope (WilPh)        | <i>Phalaropus tricolor</i>     |
| 3. Red-necked Phalarope (RnPh)       | <i>P. lobatus</i>              |
| 4. Red Phalarope (Redph)             | <i>P. fulicariis</i>           |
| 5. Upland Sandpiper (UpSp)           | <i>Bartramia longicauda</i>    |
| 6. Eskimo Curlew (EskCur)            | <i>Numenius borealis</i>       |
| 7. Hudsonian Godwit (HudGod)         | <i>Limosa haemastica</i>       |
| 8. White-rumped Sandpiper (WrSp)     | <i>Calidris fuscicollis</i>    |
| 9. Baird's Sandpiper (BairSp)        | <i>C. bairdii</i>              |
| 10. Pectoral Sandpiper (PectSp)      | <i>C. melanotos</i>            |
| 11. Stilt Sandpiper (StilSp)         | <i>C. himantopus</i>           |
| 12. Buff-breasted Sandpiper (BuffSp) | <i>Tryngites subruficollis</i> |

APPENDIX 2. The breeding and wintering ranges of the North American shorebirds. The latitudinal ranges and mid-points of ranges are given. Full species names are given in Appendix 1.

species	BREEDING		WINTERING	
	(range)	(mid)	(range)	(mid)
NORTH AMERICAN WINTERING GROUP				
1. AmBIOy	62°N	29°N	46°N	58°N 22°N 40°N
2. BlNSt	43°N	15°S	14°N	38°N 15°S 12°N
3. AmAvo	53°N	25°N	39°N	39°N 14°N 26°N
4. TbPl	38°N	9°S	14°N	31°N 9°S 11°N
5. Kill	62°N	15°N	38°N	51°N 2°S 24°N
6. PipPl	51°N	37°N	44°N	34°N 25°N 30°N
7. SnoPl	47°N	18°N	32°N	47°N 8°N 28°N
8. MontPl	48°N	34°N	41°N	40°N 23°N 32°N
9. Wil	54°N	26°N	40°N	43°N 17°S 13°N
10. WanTat	70°N	58°N	64°N	36°N 5°S 16°N
11. LbCur	53°N	35°N	44°N	36°N 14°N 25°N
12. MarGod	54°N	45°N	50°N	43°N 12°N 28°N
13. BTurn	67°N	55°N	61°N	62°N 23°N 42°N
14. WestSp	72°N	60°N	66°N	48°N 8°S 20°N
15. LSp	71°N	54°N	62°N	46°N 18°S 14°N
16. PurpSp	76°N	62°N	69°N	46°N 38°N 42°N
17. RockSp	67°N	54°N	60°N	60°N 40°N 50°N
18. DunLin	72°N	54°N	63°N	55°N 23°N 39°N
19. SbDow	62°N	54°N	58°N	40°N 15°S 12°N
20. LbDow	72°N	64°N	68°N	40°N 14°N 27°N
21. ComSni	71°N	35°N	53°N	50°N 5°N 28°N
22. AmWood	49°N	27°N	38°N	38°N 25°N 32°N

