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## SPRING MIGRATION OF SHOREBIRDS IN PANAMA

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The southward migration of shorebirds (*Charadrii*) through North America often involves stopover areas, places where local populations of actively foraging birds increase to peak abundance over several weeks, then decline (Urner and Storer 1949, Jehl 1963, Schneider and Harrington 1981). The purpose of our study was to determine whether a similar pattern occurs at a Central American location during northward migration in the spring.

We chose the Bay of Panama for study because of its geographic and ecological suitability as a staging area. The bay is geographically suitable because it lies between the major wintering areas in South America and breeding grounds in the Arctic for several shorebird species. The bay is ecologically suitable because of the extensive flats uncovered twice a day by the tides, which have a range of 3 to 5 m along the north side of the bay. Primary productivity is high in the bay during the dry season (January to mid-April), due to a local upwelling of nutrient-rich waters (Schott 1935, Glynn 1972).

We counted shorebirds at three locations near the south entrance to the Panama Canal (8°56'N, 79°32'W) during the last half of the wintering season (January to late May 1978). The sites were chosen because of their accessibility, and because each had intertidal flats extending out several hundred meters from the high tide line. Punta Mala was a protected mudflat lying between Fort Amador and Panama City, east of the canal entrance. Farfan was a protected beach of cobble, sand, and silt located on the western bank of the canal, south of Thatcher Ferry bridge. Mangrove was a protected mudflat with mangrove trees on the same bank of the canal as Farfan, but north of the bridge.

Counts from January to March were made while flats were exposed by the tide, or just as the tide was covering the flats. Counts after mid-March were made just as local flats were submerging, to reduce variation in counts due to stage of the tide. To control for the effects of occasional disturbance, we examined the highest count in successive ten-day periods during the study. To control for movement between sites we graphed the highest site count for any one day.

Of the eight common species or species groupings, only Ruddy Turnstones (*Arenaria interpres*) were more numerous during spring (April and May) than during winter (January–March). Black-bellied Plover (*Pluvialis squatarola*) and Semipalmated Plover (*Charadrius semipalmatus*) decreased in numbers from January to May (Fig. 1). Wilson's Plover (*Charadrius wilsonia*) was most abundant in March; the highest count for Short-billed Dowitchers (*Limnodromus griseus*) and peep (*Calidris* spp.) occurred in February (Fig. 1). Numbers of Willet (*Catoptrophorus semipalmatus*) and Whimbrel (*Numenius phaeopus*) dropped sharply in early April. These declines coincided with the first days of prolonged rain, suggesting that the advent of the rainy season acts as a cue for migratory departure. Lack (*in* Moreau 1972) noted the sudden departure of Caspian Plover (*Charadrius asiaticus*) from tropical Africa with the first rains at the end of the dry season.

We found no evidence of a spring build-up in numbers at the three sites in the Bay of Panama. The counts in the

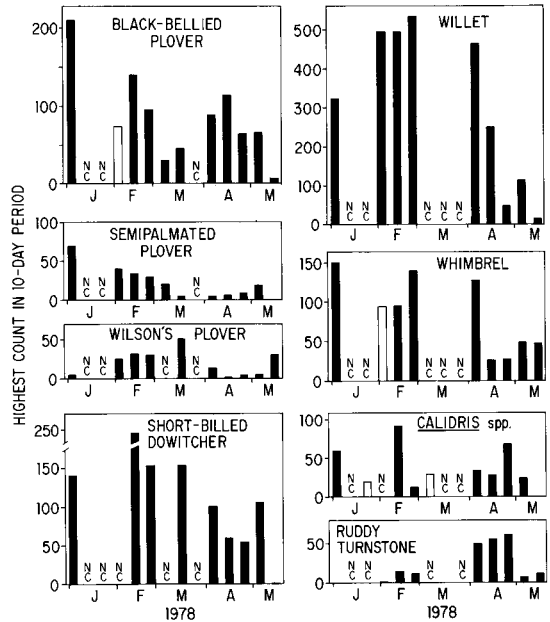


FIGURE 1. Seasonal abundance of migratory shorebirds at count locations west of Panama City during early 1978. NC = no count. Solid bars represent periods when all three areas were censused. Hollow bars represent periods when one or two sites were censused.

study areas indicated fairly stable wintering populations and this was confirmed for Whimbrels in another study (Mallory 1981). Anecdotal reports from the Pacific coast of Central America (Rand and Traylor 1954, Coffey 1960, Slud 1964, Monroe 1968, Land 1970) also indicate low concentrations of migrants at any one point, with no large build-ups in the spring. Smith and Stiles (1979) reported a brief spring migration relative to fall migration at a site near the Pacific coast of Costa Rica. One explanation for this is that spring migration may be accomplished by a northward drift, with individual birds remaining only briefly in one area. Northward drift has been described for Pacific coast populations of the Dunlin (*Calidris alpina*) by Holmes (1966a, b). Alternatively, migrants may bypass Central America entirely. Reports of spring migration from the Galapagos Islands (Leveque et al. 1966) are consistent with transoceanic passage of shorebirds well to the west of the Central American coast.

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