

Contents

Chapter 1. Introduction

R.I.G. Morrison and R.K. Ross

1.1 Distributional studies and the international conservation of shorebirds	11
1.2 The Mexican Shorebird Atlas Project	12
1.3 Literature cited	13

Chapter 2. Methods

R.K. Ross and R.I.G. Morrison

2.1 Aerial survey procedures	15
2.2 Data analysis	17
2.3 Habitat descriptions	17
2.4 Map production	17
2.5 Limitations of the data	17
2.6 Literature cited	19

Chapter 3. The geography of Mexico, with emphasis on coastal regions

P.C.F. Shepherd, R.I.G. Morrison, R.K. Ross, and J. Guzman P.

3.1 General geography and geomorphology	20
3.1.1 Introduction	20
3.1.2 Continental Mexico	22
3.1.3 Coastal classification, geomorphology, and shorebird distribution	22
3.2 Climate	22
3.3 Hydrology	23
3.4 Vegetation	24
3.5 Oceanography	24
3.5.1 Physiography	24
3.5.2 Tides and currents	24
3.5.3 Productivity	25
3.5.4 El Niño / La Niña	26
3.6 Literature cited	26

Chapter 4. Geomorphology, habitats, and distribution of Nearctic shorebirds on the coast of Mexico

R.I.G. Morrison, P.C.F. Shepherd, R.K. Ross, J. Guzman P., and D. Kirk

4.1 Introduction	28
4.2 East coast: Gulf of Mexico / Caribbean	28
4.2.1 Northwestern Gulf Coastal Province (eco-units 1-3, sectors 1-20)	28
4.2.1.1 Geomorphology and habitats	28
4.2.1.2 Shorebirds	31
4.2.1.3 Laguna Madre (sectors 2-3, outer beach = sector 1)	34
4.2.1.4 Other lagoons	34
4.2.1.5 Other habitats	35
4.2.2 Yucatán Platform Coastal Province (eco-units 4-5, sectors 21-41)	35
4.2.2.1 Geomorphology and habitats	35
4.2.2.2 Shorebirds	35
4.2.3 Caribbean Coastal Province (eco-unit 6, sectors 42-52)	35
4.2.3.1 Geomorphology and habitats	35
4.2.3.2 Shorebirds	39
4.3 Pacific coast	39
4.3.1 Panamanian Coastal Province (eco-units 7-8, sectors 53-67)	39
4.3.1.1 Geomorphology and habitats	39
4.3.1.2 Shorebirds	44
4.3.1.3 Laguna Mar Muerto (sectors 63-64)	44
4.3.1.4 Laguna La Joya (sector 61)	44
4.3.1.5 Other sites	44
4.3.2 Central Pacific Coastal Province (eco-units 9-10, sectors 68-119)	44
4.3.2.1 Geomorphology and habitats	44
4.3.2.2 Shorebirds	50
4.3.2.3 Laguna Cuyutlán / Manzanillo wetlands (sector 109)	50
4.3.2.4 Other lagoons and habitats	50

4.3.3	Golfo de California Coastal Province (eco-units 11–18, sectors 120–185)	50
4.3.3.1	Geomorphology and habitats	50
4.3.3.2	Shorebirds	53
4.3.3.3	Marismas Nacionales (sectors 121–122, 124–133)	54
4.3.3.4	Río Colorado (sector 174)	58
4.3.3.5	Bahía Santa María (sectors 149–152)	58
4.3.3.6	Topolobampo (sectors 153, 155)	59
4.3.3.7	Estero Lobos (sector 161)	59
4.3.3.8	Ensenada Pabellones (sector 146)	59
4.3.3.9	Estero Tóbari (sector 160)	59
4.3.3.10	Bahía La Guadalupeana (sector 144)	59
4.3.3.11	Other areas	59
4.3.4	Californian Coastal Province (eco-units 19–23, sectors 186–207)	59
4.3.4.1	Geomorphology and habitats	59
4.3.4.2	Shorebirds	62
4.3.4.3	Laguna Ojo de Liebre (sector 197) and Laguna Guerrero Negro (sector 199)	63
4.3.4.4	Laguna San Ignacio (sector 193)	63
4.3.4.5	Other areas	63
4.4	Literature cited	63

Chapter 5. The distribution and abundance of Nearctic shorebirds on the coast of Mexico: overview and species accounts

R.I.G. Morrison, R.K. Ross, and D. Kirk

5.1	Introduction	65
5.2	General overview	65
5.3	Small shorebirds	67
5.3.1	“Peeps” (unidentified small shorebirds, mostly Western Sandpipers <i>Calidris mauri</i>)	67
5.3.2	Small plovers (<i>Charadrius</i> species)	67
5.3.3	Spotted Sandpiper <i>Actitis macularia</i>	68
5.3.4	Sanderling <i>Calidris alba</i>	69
5.4	Medium-sized shorebirds	81
5.4.1	Black-bellied Plover <i>Pluvialis squatarola</i>	81
5.4.2	Killdeer <i>Charadrius vociferus</i>	81
5.4.3	Yellowlegs species <i>Tringa melanoleuca</i> and <i>T. flavipes</i>	85
5.4.4	Wandering Tattler <i>Heteroscelus incanus</i>	85
5.4.5	Ruddy Turnstone <i>Arenaria interpres</i>	85
5.4.6	Surfbird <i>Aphriza virgata</i>	85
5.4.7	Red Knot <i>Calidris canutus</i>	85
5.4.8	Dowitcher species <i>Limnodromus scolopaceus</i> and <i>L. griseus</i>	91

5.5	Large shorebirds	91
5.5.1	American Oystercatcher <i>Haematopus palliatus</i>	94
5.5.2	Black Oystercatcher <i>Haematopus bachmani</i>	94
5.5.3	Black-necked Stilt <i>Himantopus mexicanus</i>	94
5.5.4	American Avocet <i>Recurvirostra americana</i>	98
5.5.5	Whimbrel <i>Numenius phaeopus</i>	98
5.5.6	Long-billed Curlew <i>Numenius americanus</i>	98
5.5.7	Marbled Godwit <i>Limosa fedoa</i>	102
5.5.8	Willet <i>Catoptrophorus semipalmatus</i>	102
5.6	Literature cited	102

Chapter 6. Important sites for Nearctic shorebirds on the coast of Mexico

R.I.G. Morrison, R.K. Ross, and D. Kirk

6.1	Environmental conditions and the distribution of shorebirds on the coast of Mexico	106
6.2	Conservation of key shorebird areas: criteria for identifying important shorebird sites	106
6.3	Important sites for Nearctic shorebirds on the coast of Mexico	107
6.3.1	Laguna Madre	109
6.3.2	Tampico lagoons (Río Tamesi and Río Pánuco deltas)	109
6.3.3	Alvarado lagoons	109
6.3.4	Pantanos de Centla (Tabasco wetlands)	109
6.3.5	Campeche / Puerto Progreso	109
6.3.6	Dzilam de Bravo	109
6.3.7	Río Lagartos	109
6.3.8	Estero Buenavista / Estero Pereyra / La Encrucijada	109
6.3.9	Laguna La Joya	110
6.3.10	Laguna Mar Muerto	110
6.3.11	Laguna Corralero	110
6.3.12	San Marcos (Laguna Tecamate)	110
6.3.13	Laguna Mitla	110
6.3.14	Laguna Cuyutlán / Manzanillo wetlands	110
6.3.15	Marismas Nacionales	110
6.3.16	Bahía La Guadalupeana	111
6.3.17	Ensenada Pabellones	111
6.3.18	Bahía Santa María	111
6.3.19	Topolobampo	111
6.3.20	Bahía Jitzamuri / Estero Agiabampo	111
6.3.21	Bahía Yavaros (Bahía Santa Bárbara)	111
6.3.22	Estero Tóbari	111
6.3.23	Estero Lobos	112
6.3.24	Estero Los Algodones	112
6.3.25	Río Colorado	112

6.3.26 Bahía Magdalena	112	Map 5.1. Distribution of Nearctic shorebirds (all species) on the coast of Mexico	66
6.3.27 Laguna San Ignacio	112	Map 5.2. Distribution of Nearctic shorebirds (small species) on the coast of Mexico	70
6.3.28 Laguna Ojo de Liebre and Laguna Guerrero Negro	112	Map 5.3. Distribution of "peeps" (unidentified small shorebirds, mostly Western Sandpipers <i>Calidris mauri</i>) on the coast of Mexico	77
6.3.29 Estero de San Quintín	112	Map 5.4. Distribution of small plovers (<i>Charadrius</i> species) on the coast of Mexico	78
6.4 Other sites	113	Map 5.5. Distribution of Spotted Sandpipers <i>Actitis macularia</i> on the coast of Mexico	79
6.5 Literature cited	113	Map 5.6. Distribution of Sanderlings <i>Calidris alba</i> on the coast of Mexico	80
Appendix 1. Densities of Nearctic shorebirds in survey sectors on the coast of Mexico		Map 5.7. Distribution of medium-sized shorebirds on the coast of Mexico	82
		Map 5.8. Distribution of Black-bellied Plovers <i>Pluvialis squatarola</i> on the coast of Mexico	83
List of maps		Map 5.9. Distribution of Killdeer <i>Charadrius vociferus</i> on the coast of Mexico	84
Map 2.1. Locations of survey sectors and eco-units on the coast of Mexico	18	Map 5.10. Distribution of yellowlegs (<i>Tringa</i> species) on the coast of Mexico	86
Map 3.1. The 11 principal physiographic provinces and the states of Mexico	21	Map 5.11. Distribution of Wandering Tattlers <i>Heteroscelus incanus</i> on the coast of Mexico	87
Map 4.1. Locations of major physiographic coastal provinces, eco-units, and survey sectors on the coast of Mexico	29	Map 5.12. Distribution of Ruddy Turnstones <i>Arenaria interpres</i> on the coast of Mexico	88
Map 4.2. Coastal provinces, eco-units, and geographical features on the east coast of Mexico	30	Map 5.13. Distribution of Surfbirds <i>Aphriza virgata</i> on the coast of Mexico	89
Map 4.3. Distribution of Nearctic shorebirds along the western coast of the Gulf of Mexico, including Laguna Madre	31	Map 5.14. Distribution of Red Knots <i>Calidris canutus</i> on the coast of Mexico	90
Map 4.4. Distribution of Nearctic shorebirds along the southern coast of the Gulf of Mexico	32	Map 5.15. Distribution of dowitchers (<i>Limnodromus</i> species) on the coast of Mexico	92
Map 4.5. Distribution of Nearctic shorebirds on the coasts of the Península de Yucatán	36	Map 5.16. Distribution of large shorebirds on the coast of Mexico	93
Map 4.6. Coastal provinces, eco-units, and geographical features on the southern part of the Pacific coast of Mexico	40	Map 5.17. Distribution of American Oystercatchers <i>Haematopus palliatus</i> on the coast of Mexico	95
Map 4.7. Coastal provinces, eco-units, and geographical features on the central and northwestern parts of the Pacific coast of Mexico	41	Map 5.18. Distribution of Black Oystercatchers <i>Haematopus bachmani</i> on the coast of Mexico	96
Map 4.8. Distribution of Nearctic shorebirds on the southern Pacific coast of Mexico, Panamanian Coastal Province	42	Map 5.19. Distribution of Black-necked Stilts <i>Himantopus mexicanus</i> on the coast of Mexico	97
Map 4.9. Distribution of Nearctic shorebirds on the south-central Pacific coast of Mexico, Acapulco Eco-unit	45	Map 5.20. Distribution of American Avocets <i>Recurvirostra americana</i> on the coast of Mexico	99
Map 4.10. Distribution of Nearctic shorebirds on the central Pacific coast of Mexico, Puerto Vallarta and Marismas Nacionales eco-units	46	Map 5.21. Distribution of Whimbrels <i>Numenius phaeopus</i> on the coast of Mexico	100
Map 4.11. Distribution of Nearctic shorebirds on the southern part of the Pacific northwest coast of Mexico	51	Map 5.22. Distribution of Long-billed Curlews <i>Numenius americanus</i> on the coast of Mexico	101
Map 4.12. Distribution of Nearctic shorebirds on the northern part of the Pacific northwest coast of Mexico	52	Map 5.23. Distribution of Marbled Godwits <i>Limosa fedoa</i> on the coast of Mexico	103
Map 4.13. Distribution of Nearctic shorebirds in the northern Golfo de California and northern part of the east coast of the Península de Baja California	53	Map 5.24. Distribution of Willets <i>Catoptrophorus semipalmatus</i> on the coast of Mexico	104
Map 4.14. Distribution of Nearctic shorebirds on the southern coast of the Península de Baja California	54	Map 6.1. Locations of important sites for Nearctic shorebirds on the coasts of Mexico	108
Map 4.15. Distribution of Nearctic shorebirds on the northern part of the Pacific coast of the Península de Baja California	60		

List of tables

Table 1.1. Occurrence and status of species of shorebirds shared between Canada and Mexico	12
Table 2.1. Summary of information on aerial surveys along the coast of Mexico	16
Table 2.2. Size categories, common and scientific names, and four-letter codes for species of Nearctic shorebirds observed during aerial surveys along the coast of Mexico, 1992–1994	17
Table 4.1. Totals of Nearctic shorebirds in the Northwestern Gulf Coastal Province (eco-units 1–3, sectors 1–20)	33
Table 4.2. Principal habitats in survey sectors in the Northwestern Gulf Coastal Province (eco-units 1–3, sectors 1–20)	34
Table 4.3. Totals of Nearctic shorebirds in the Yucatán Platform Coastal Province (eco-units 4–5, sectors 21–41)	37
Table 4.4. Principal habitats in survey sectors in the Yucatán Platform Coastal Province (eco-units 4–5, sectors 21–41)	38
Table 4.5. Totals of Nearctic shorebirds in the Caribbean Coastal Province (eco-unit 6, sectors 42–52)	38
Table 4.6. Principal habitats in survey sectors in the Caribbean Coastal Province (eco-unit 6, sectors 42–52)	38
Table 4.7. Totals of Nearctic shorebirds in the Panamanian Coastal Province (eco-units 7–8, sectors 53–67)	43
Table 4.8. Principal habitats in survey sectors in the Panamanian Coastal Province (eco-units 7–8, sectors 53–67)	44
Table 4.9. Totals of Nearctic shorebirds in the Central Pacific Coastal Province (eco-units 9–10, sectors 68–119)	47
Table 4.10. Principal habitats in survey sectors in the Central Pacific Coastal Province (eco-units 9–10, sectors 68–119)	49
Table 4.11. Totals of Nearctic shorebirds in the Golfo de California Coastal Province (eco-units 11–18, sectors 120–185)	55
Table 4.12. Principal habitats in survey sectors in the Golfo de California Coastal Province (eco-units 11–18, sectors 120–185)	57
Table 4.13. Totals of Nearctic shorebirds in the Californian Coastal Province (eco-units 19–23, sectors 186–207)	61
Table 4.14. Principal habitats in survey sectors in the Californian Coastal Province (eco-units 19–23, sectors 186–207)	62
Table 5.1. Summary by eco-unit of counts of Nearctic shorebirds observed during aerial surveys of the coast of Mexico	68
Table 5.2. Distribution of Nearctic shorebirds counted in survey sectors on the coast of Mexico	71
