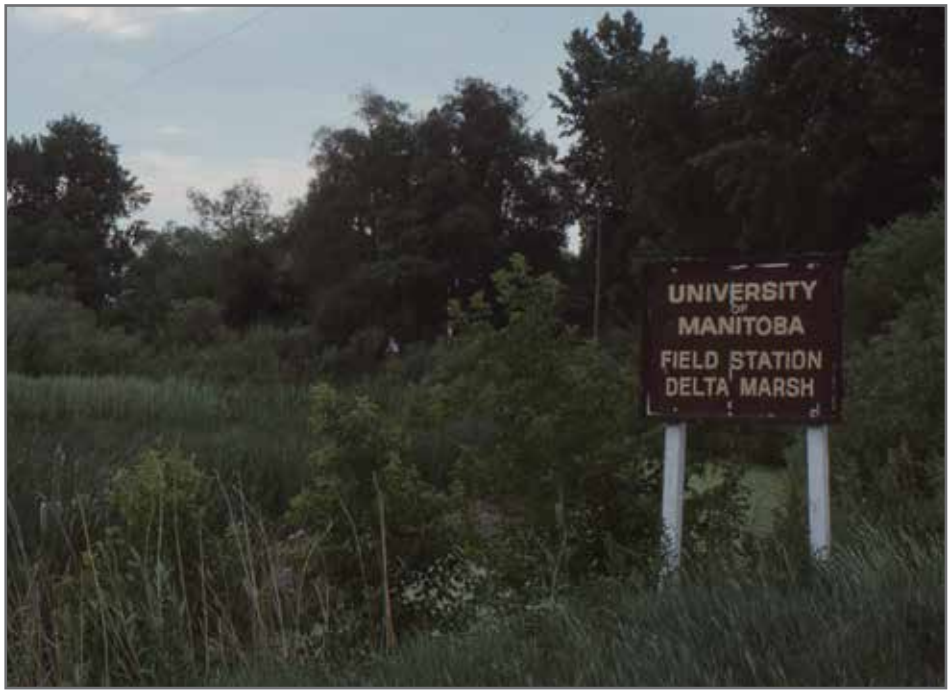
REPORT ON BIRDS BANDED IN THE DUNE-RIDGE FOREST, DELTA MARSH, MANITOBA, 1973-1988



Entrance to the University of Manitoba Field Station (Delta Marsh), 1988. Photo credit: S.G. Sealy

"Bell house", the small building situated in the courtyard of the field station, served as the "lab" where many of the mist-netted birds were banded. Following banding, each bird was released at the original capture site in the dune-ridge forest, many transported for release by banders on bicycles, June 1977. Photo credit: S.G. Sealy

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An integral part of the research conducted by students and me on the biology of songbirds in the dune-ridge forest, Delta Marsh, Manitoba, involved banding birds and, for many species, also colour-marking them. Banding facilitated recognition of individuals at nests and generated data from birds recaptured in the same and subsequent years on the study area. Here I report the number of individuals banded of species recorded nesting on the study area in at least one year, from 1973 to 1988, and migrants banded in some years. Also recorded are individuals banded on the study area and recovered elsewhere, and encounters in the ridge forest of species banded at other localities. After a hiatus of a few years, banding reported here was extended on the same site by personnel of the newly formed Delta Marsh Bird Observatory (DMBO).

Study area and Mist-netting Protocol

Research in the ridge forest spanned the years 1973 to 2010, but birds were banded, and in many cases colour-marked, from 1973 to 1988 and, in the case of Brown-headed Cowbirds, also 1993 to 1998 (order and scientific names of species listed in Table 1 follow the American Ornithological Society's Checklist of North American Birds). Ten Yellow Warblers were banded in 1973, but the banding effort was expanded the following year and continued

through 1988 when the focus of the work shifted to experimental studies of Brown-headed Cowbirds and their hosts. From 1993 to 1998, cowbirds were colour-marked during studies of mating system, host use, and demography of this brood parasite at Delta Marsh.[1,2] In the first banding period (1973-88), birds were captured in mist nets, but in some years nestlings were also banded. Most cowbirds were captured in baited funnel traps. Mist-netting occurred predominantly in a 1.2 km (10 ha) portion of the dune-ridge forest that extended westward from the Assiniboine River Diversion (50°11′N, 98°19′W)[3-5], a diked waterway that carries water from the Assiniboine River north to Lake Manitoba during springs when run-off water is excessive.[6] This stretch of habitat was situated on the properties of the University of Manitoba Field Station (Delta Marsh) and, continuing to the west, Portage Country Club. The location of the primary study area and vegetation of the dune-ridge forest have been described previously.[3,4,7,8]

Mist nets (30 and 36 mm mesh, most 12 m long) were operated daily, when weather permitted, at eight permanent sites in conjunction with ongoing studies. Net sites were selected to cover north (lake) and south (marsh) sides of the ridge forest, as well as sites in the middle.[4] Shorter nets were employed opportunistically to capture individuals on territories and at nest sites for colour-marking.

This effort resulted in a variable mist-netting effort among years, depending on the nature of other studies being conducted on the site. Each bird was fitted with an aluminum band issued by the U.S. Fish & Wildlife Service, plus for many species a unique combination of coloured celluloid bands. Birds were aged as nestlings or flightless fledglings (Local, in banding terminology), in the year of hatching (HY), or after the year of hatching (AHY). Delayed plumage maturation of male Baltimore and Orchard orioles facilitated

TABLE 1. Summary of banding records of species that nested in at least one year in the dune-ridge forest, Delta Marsh, Manitoba, 1973-1988. In some years, no individuals were captured, whereas in other years, individuals may have been captured but were not banded. Only Brown-headed Cowbirds were banded in 1993-98. Recaptures of individuals banded in the same or in previous years are not included.

SPECIES[a]	BANDING YEARS	# OF YEARS	# BANDED
Mourning Dove (*Zenaida macroura*)[b]	1977	1	2
Black-billed Cuckoo (*Coccyzus erythropthalmus*)	1975-78,80-85	10	84
Ruby-throated Hummingbird (*Archilocus colubris*)	1977-79,81,83	5	176
Downy Woodpecker (*Picoides villosus*)	1976-77,80-84	7	43
Western Kingbird (*Tyrannus verticalis*)	1976-78,80,82,85-86	7	22
Eastern Kingbird (*T. tyrannus*)	1976-86	11	252
Eastern Wood-Pewee (*Contopus virens*)	1976-78,80-83,85	8	29
Least Flycatcher (*Empidonax minimus*)	1976,78,80-86	9	2065
Eastern Phoebe (*Sayornis phoebe*)	1976-82,84-86	10	55
Warbling Vireo (*Vireo gilvus*)	1976-86	11	616
Red-eyed Vireo (*V. olivaceus*)[c]	1976,80-83	5	77
Tree Swallow (*Tachycineta bicolor*)	1977	1	100
Barn Swallow (*Hirundo rustica*)	1976-77,81,84,87	5	46
White-breasted Nuthatch (*Sitta carolinensis*)[d]	1986	1	1
House Wren (*Troglodytes aedon*)	1977-78,81-85	6	291
Veery (*Catharus fuscescens*)	1977-79,81-86	9	125
American Robin (*Turdus migratorius*)	1975-84,86-87	12	231
Gray Catbird (*Dumetella carolinesis*)	1976-78,82-88	10	1147
Brown Thrasher (*Toxostoma rufum*)	1976-85	10	49
Cedar Waxwing (*Bombycilla cedrorum*)	1977,85	2	31
Song Sparrow (*Melospiza melodia*)	1977-78	2	93
Chipping Sparrow (*Spizella passerina*)	1968	1	1
Clay-colored Sparrow (*S. pallida*)	1978	1	3
Orchard Oriole (*Icterus spurius*)[e]	1976-86,88	12	88
Baltimore Oriole (*I. galbula*)	1974-86,88	14	2471
Brown-headed Cowbird (*Molothrus ater*)[f]	1975-78,81-83,86,93-98	13	1147
Common Grackle (*Quiscalus quiscula*)	1980-81,84	3	16
Bay-breasted Warbler (*Setophaga castanea*)[g]	1976	1	8
Yellow Warbler (*S. petechia*)[h]	1973-88	16	15253
Rose-breasted Grosbeak (*Pheucticus ludovicianus*)	1976-78,80	4	33

[a] Single nests of Great Horned Owl (*Bubo virginianus*), Black-billed Magpie (*Pica hudsonia*), and Swamp Sparrow (*M. georgiana*) were recorded in one or more years but no individuals were banded. Red-winged Blackbirds (*Agelaius phoeniceus*) nested abundantly in the marsh and along the edge of the ridge forest, but were not banded. American Goldfinches (*Spinus tristis*) nested in small numbers, but were not banded.

[b] Mourning Doves nested abundantly in the ridge forest, but only a few were banded because they were not held in the nets with the smaller mesh sizes used in our banding operations.

[c] Most Red-eyed Vireos banded in the ridge forest were migrants, with the exception of one pair that nested in 1981, of which both adults were banded.[13] An AHY Red-eyed Vireo (1370-35318), banded on 20 June 1976 and recaptured on 19 July 1978 while replacing wing and body feathers, suggested nesting.[13] By the late 1990s, up to a dozen nests were discovered every year.

[d] The White-breasted Nuthatch was rarely observed in the ridge forest during the breeding season, but one active nest was discovered in 1986 and one of the adults was banded.

[e] No Orchard Orioles were banded in 1973-75.

[f] Includes Brown-headed Cowbirds banded and colour-marked from 1993 to 1998.[1,2]

[g] Six active nests of the Bay-breasted Warbler were studied in 1976, the only year in which this species nested in the ridge forest, apparently in response to an outbreak of Forest Tent Caterpillar (*Malacosoma disstria* Hbn.).[14]

[h] Includes 10 Yellow Warblers banded in August 1973.

TABLE 2. Age-classes of Baltimore Orioles banded in the dune-ridge forest, Delta Marsh, 1974-1982. Nestlings were not banded after 1982. Recaptures of individuals banded in previous years are not included.

NUMBER BANDED IN	L-U[1,2]	HY-U	AHY-F	SY-M	ASY-M	TOTAL
1974	4	5	12	2	6	20
1975	4	55	32	3	29	123
1976	96	416	142	40	129	823
1977	199	140	122	53	77	591
1978	4	8	57	20	29	118
1979	2	10	24	3	41	80
1980	28	0	38	7	13	86
1981	38	30	81	5	52	206
1982	26	3	19	10	18	76

[1] L = local (nestling or flightless fledgling); HY = in year of hatching; AHY = after year of hatching; SY = second year after hatching; ASY = after second year of hatching; and U = unknown sex. Includes resident breeders but also possibly migrants.

[2] Nestlings comprised 18.9% of the total number of Baltimore Orioles banded.

identification of individuals in the first year after hatching (SY) or second year after hatching (ASY). Hatch-year and AHY migrants were distinguished by a procedure known as skulling.[11]

Mist nets were operated during the following periods: 1974, 2 Jul-6 Aug; 1975, 19 May-10 Sep; 1976, 19 May -13 Aug; 1977, 10 May-16 Aug; 1978, 25 May-29 July; 1979, 26 May-1 Aug; 1980, 15 May-26 Jun; 1981, 11 May-3 Sep; 1982, 21 May-23 Oct; 1983, 18 May-30 Oct; 1984, 17 May-20 Sep; 1985, 17 May 1 Sep; 1986, 15 May-5 Sep; 19 May-7 Aug; and 1988, 19 May-6 Aug. Net hours ranged from 700 in 1974 to 7,500 in 1977. In 1981, netting continued in September (6, 12-13, 16-17, 22-23, 28), and October (5-6)[10] and through October 30 in 1982-84 during a study of timing of fall-migrating wood-warblers.[11] Additional details pertaining to mist-netting protocol and nestling banding have been published previously.[11,12]

Nesting species banded, 1973-1988, 1993-1998

The number of individuals of 30 species banded that were recorded nesting in or along the edge of the dune-ridge forest in at least one year during the 16-year banding period are summarized in Table 1. Red-eyed Vireo, Bay-breasted Warbler, and White-breasted Nuthatch were recorded nesting in only one year. The nomadic Black-billed Cuckoo nested in some years, as did the Rose-breasted Grosbeak. The other species nested in all or most years, although not all species were banded each year. Nestling Black-billed Cuckoos, Least Flycatchers, Eastern Kingbirds, Baltimore Orioles, and Yellow Warblers were banded in some years and are included in the totals summarized in Table 1. Birds recaptured on the study area in the year of banding, i.e., repeats, and recaptures of birds in years following banding are not included in Table 1; this deflates the total number captured.[12] These data do not provide indices of the relative abundance of the species in the dune-ridge forest, or accurately identify fluctuations in numbers among years that occurred (but see Table 2). Nevertheless, the most frequently captured species were the most abundant: Least Flycatcher, Baltimore Oriole, Yellow Warbler, and Gray Catbird[9] (Table 1).

Total numbers of individuals of several species would be greater if recaptures of birds banded in previous years were included. Also, these data do not reveal fluctuations in numbers experienced by some species among years, as illustrated for the Baltimore Oriole in Table 2. The number of individuals of each age-class banded from 1974 to 1982, the last year nestling Baltimore Orioles were banded, are obscured in the totals summarized in Table 1. The high numbers of Baltimore Orioles banded in 1976 and 1977 followed by a decrease in 1978 and in subsequent years were interpreted as a short-term reproductive response to an outbreak of the Forest Tent Caterpillar.[8,12]

Migrants banded, 1976-1988

In addition to nesting species banded in the ridge forest (Table 1), 47 species – migrants and post-breeding dispersers – were banded irregularly; their numbers are summarized in Table 3. Numbers of wood-warblers and kinglets were augmented in 1982-84 during banding by H.E. den Haan focused on timing of fall migration.

Birds banded in the ridge forest and recovered off the study area

BLACK-BILLED CUCKOO

An unsexed, AHY cuckoo (762-35830), banded on 20 August 1976, was found dead at Rugby (48°20'N 99°50'W), North Dakota, on 26 May 1977, about 390 km southwest of the banding site. Black-billed Cuckoos nested in the ridge forest in 1976[16,17], but I did not determine whether this individual was among them. Of the 84 cuckoos banded in the ridge forest (Table 1), none was recaptured or observed on the study area in subsequent years, probably a reflection of this species' nomadic tendencies. Of 1,115 Black-billed Cuckoos of all ages banded in Canada from 1955 to 1995, 11 were encountered, including the bird banded at Delta, the only one west of Ontario.[18]

WARBLING VIREO

A female (880-27980), banded and colour-marked after its first year of hatching on 26 June 1977, was found dead in Jutiapa (14°10'N 89°50'W), Guatemala, on 2 November 1978.[19] Coincidentally, this bird was banded within 10 days of two Baltimore Orioles that were recovered, one also in Guatemala (see below). This is the only long-distance recovery of a Warbling Vireo.[18]

YELLOW WARBLER

A male (1450-24882), banded in its year of hatching on 24 July 1978, was found dead in Omaha, Nebraska (41°10'N 95°50'W), on 28 May 1979 – the only recovery outside the ridge forest out of 15,253 banded. The low frequency of recovery of this species is typical, confirmed by Yellow Warblers banded in Saskatchewan (1 out of 13,154)[20] and across Canada, 1921-1995 (115 out of 63,619, or 1/1000 banded)[18].

BROWN-HEADED COWBIRD

A male (621-08948), banded in its year of hatching on 12 July 1977, was found dead about 15 km southeast, in Oakland (49°38'N 99°50'W), Manitoba, nearly four years later, on 2 May 1981. It was not encountered on the study area during the three intervening breeding seasons. The date of this recovery predated the earliest occurrence of cowbirds on the study area in spring by about four days and is consistent with observations of early-arriving cowbirds foraging in fields south of Delta Marsh before moving to the ridge forest.[21]

BALTIMORE ORIOLE

Three Baltimore Orioles were recovered away from the banding site. An HY individual (861-04018) of unknown sex, banded on 22 July 1977, was recovered nearly one year later near Lovells (44°46'N 84°27'W), Michigan, on 30 April 1978. Two SY males recovered off the banding

TABLE 3. Summary of banding records of migrants or post-breeding dispersers in the dune-ridge forest, Delta Marsh, Manitoba, 1973-1988. In some years, no individuals were captured, whereas in other years, individuals may have been captured but were not banded. None of these birds was encountered in subsequent years on or off the banding site.

SPECIES	BANDING YEARS	# OF YEARS	# BANDED
American Woodcock (*Scolopax minor*)	1976	1	1
Yellow-bellied Sapsucker (*Sphyrapicus varius*)	1984	1	1
Northern Flicker (*Colaptes auritus*)	1980	1	1
Olive-sided Flycatcher (*Contopus cooperi*)	1977,81-83	4	7
Yellow-bellied Flycatcher (*Empidonax flaviventris*)	1980-83	4	55
Alder Flycatcher (*E. alnorum*)[a]	1977,80-86	8	373
Say's Phoebe (*Sayornis sayi*)	1979	1	1
Great Crested Flycatcher (*Myiarchus crinitus*)	1978,81-83	4	10
Yellow-throated Vireo (*Vireo flavifrons*)	1978	1	1
Blue-headed Vireo (*V. solitaries*)	1983-84	2	32
Philadelphia Vireo (*V. philadelphicus*)	1978,84	2	12
Black-capped Chickadee (*Poecile atricapillus*)	1986	1	7
Boreal Chickadee (*P. hudsonicus*)	1983	1	4
Red-breasted Nuthatch (*Sitta canadensis*)	1987	1	1
Golden-crowned Kinglet (*Regulus satrapa*)	1983-84	2	42
Ruby-crowned Kinglet (*R. calendula*)	1983-84	2	259
Gray-cheeked Thrush (*Catharus minimus*)	1986	1	1
Swainson's Thrush (*C. ustulatus*)	1986-87	2	40
House Sparrow (*Passer domesticus*)	1977,81	2	8
Red Crossbill (*Loxia curvirostra*)	1985	1	1
Pine Siskin (*Spinus pinus*)	1977-78,84-85	4	149
Harris's Sparrow (*Zonotrichia querula*)	1980	1	24
Dark-eyed Junco (*Junco hyemalis*)	1986	1	12
Ovenbird (*Seiurus aurocapilla*)	1977,82-85	5	156
Northern Waterthrush (*Parkesia noveboracensis*)	1976-77,80-85	8	529
Golden-winged Warbler (*Vermivora chrysoptera*)	1984,87-88	3	4
Black-and-white Warbler (*Mniotilta varia*)	1976-77,82-84	5	79
Tennessee Warbler (*Oreothlypis peregrinus*)	1976-77,82-85,87	7	940
Orange-crowned Warbler (*O. celata*)	1977, 82-84	4	138
Nashville Warbler (*O. ruficapilla*)	1976.82-85	5	70
Connecticut Warbler (*Oporornis agilis*)	1982-84	3	18
Mourning Warbler (*Geothlypis philadelphia*)	1976,80,82-84	5	45
Common Yellowthroat (*G. trichas*)[b]	1982-86	5	393
American Redstart (*Setophaga ruticilla*)	1976,83-86	5	403
Cape May Warbler (*S. tigrina*)	1982-84	3	8
Magnolia Warbler (*S. magnolia*)	1982-84	3	97
Blackburnian Warbler (*S. fusca*)	1982-84	3	5
Chestnut-sided Warbler (*S. pensylvanica*)	1983-84	2	11
Blackpoll Warbler (*S. striata*)	1982-84	3	106
Black-throated Blue Warbler (*S. caerulescens*)	1981,83-84	3	3
Palm Warbler (*S. palmarum*)	1982-84,86	4	72
Yellow-rumped Warbler (*S. coronata*)	1976,82-84,86	5	719
Black-throated Green Warbler (*S. virens*)	1984	1	1
Canada Warbler (*Cardellina canadensis*)	1976,82-84	4	37
Wilson's Warbler (*C. pusilla*)	1977,82-84,86-87	6	203
Summer Tanager (*Piranga rubra*)	1983,88	2	2
Scarlet Tanager (*P. olivacea*)	1982	1	1

[a] Alder Flycatcher was not recorded nesting in the dune-ridge forest until a few pairs began nesting each year in the early 1990s.

[b] Most Common Yellowthroats were banded during the post-breeding period and as migrants, but some nested at Delta Marsh[15] along the edge of the dune-ridge forest.

site were banded and colour-marked within two days of each other, in 1977. The first (861-03511), banded on 18 June 1977, was reported from an unknown locality in Guatemala (16°??'N 90°??'W), in January 1981.[22] It was neither observed nor recaptured on the study area during subsequent breeding seasons, before its final migration.

The other SY male (861-03529), banded on 20 June, was found dead 29 days later near Goodridge (48°08'N 95°48'W), Minnesota, on 10 July 1977, about 245 km southeast of the banding site. This male had not begun to shed its primaries by the date of banding and there would not have been sufficient time for flight feathers to have been replaced for a departure in early July.[22,23] These dates suggest this male left the ridge forest before its prebasic molt was complete, as both SY and ASY male Baltimore Orioles initiate this molt in late June or early July[19] (also see Appendix 1), after the young have fledged and, in the case of ASY males, complete it by mid-August before migrating.[23] Weekly mist-net captures of SY and ASY males over the course of breeding seasons from 1976 to 1983 revealed SY individuals departed by late July, as inferred from the lack of mist-net captures after 18-25 July.[22,23] The male recovered in Minnesota in early July 1977 may have shed some of its primaries before migrating, then interrupted the process during migration, expecting to complete it on the wintering ground. The molt status of this bird was not reported to the banding office, and an inquiry elicited no response. I should state, however, that banding and analyses that followed did not identify SY males that possibly postponed the entire wing molt until after migration, although records in Appendix 1 revealed all SY males captured in early July had initiated this molt.

ORCHARD ORIOLE

An unsexed individual (1201-33130) banded in its first year, on 23 July 1983, struck a window in Oakland, Manitoba, 25 days later on 17 August 1983 (University of

Daniel G. Busby (left) and J. Paul Goossen, seen here removing Yellow Warblers from a mist net, were among the first students who contributed to the banding effort, June 1976. Photo credit: S.G. Sealy

Manitoba Zoology Museum # 2413), suggesting a fall departure date.[7]

Orchard Orioles became established as breeders in the ridge forest about 40 years ago. Although a SY male Orchard Oriole was observed there in June 1971, before my work began, I did not record it until a HY individual was mist netted in August 1975, but not banded.[7] By the following year a small breeding population became established[7], which persisted through the duration of the fieldwork.[24] Orchard Orioles postpone wing molt until after arrival on the wintering grounds.[7,25]

Encounters in the ridge forest of birds banded at other localities

BLUE-WINGED TEAL *(Anas discors)*

A male (805-45752), banded in its first year by personnel of the Manitoba Department of Natural Resources on 29 August 1977 at Pasquia Lake (53°40'N 10°21'W), Manitoba, was mist netted at a temporary pond at the edge of the ridge forest in May 1981.

AMERICAN GOLDFINCH

A AHY male (1340-88681), banded on 10 March 1975 near Krakow (44°45'N 88°15'W), Wisconsin, was mist netted on the study area on 4 August 1975.

Discussion

Birds banded in the dune-ridge forest during the breeding and migration seasons of 1973-1988 have provided insights into breeding biology and molt[7,23], community and population changes[7,8,12], functional and numerical responses to an outbreak of Forest Tent Caterpillar[8,12,14,16], change in nesting phenology[26], migration and stopover dynamics[11,27-29], nomadism[16,30], and demography of the Brown-headed Cowbird and its hosts[1,2,21,31]. Unexpected, however, was that as research and eventual banding at DMBO progressed, destruction of the dune-ridge forest occurred during a particularly severe weather event in the spring of 2011. Water and ice from Lake Manitoba was forced on to the dune ridge, and prolonged flooding occurred on its south side, which destroyed much of the riparian forest. This led to the closure of the Delta Marsh Field Station[32], and an end to banding in the dune-ridge forest. The banding records summarized in Tables 1-3 provide a permanent record of this activity.

A brief historical account of banding in the ridge forest, chronicled in *Delta: A Prairie Marsh and Its People*[33], focused on banding conducted by DMBO, upon its inception in 1995. Heidi den Haan's songbird banding during the fall migrations of 1982 to 1984 was credited with providing important data for comparison with changes in numbers recorded 10 years later when Keith Hobson banded there from 1992 to 1994. Den Haan's banding was an integral part of the broader banding effort in the ridge forest that had been underway since 1973, as documented above. This banding effort revealed that high numbers of songbirds stopped over in the ridge forest during spring and fall migrations, providing the impetus for the establishment of a migration monitoring station. DMBO became one of the most productive bird observatories in Canada in terms of catch rate and the number of birds banded each year.[34]

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APPENDIX 1. Molt status of second-year male Baltimore Orioles banded in the dune-ridge forest.

Among the Baltimore Orioles for which I quantified the onset and progression of primary replacement in 1976-7823, 12 were SY males (6 in 1976, 6 in 1977). In 1976, SY males (791-26974, -26808) had not begun to replace primaries when banded on 30 June and 2 July, respectively. Males (791-26813, 26814), however, had shed the first 2 primaries by 3 and 5 July, respectively, and male 791-29921, although not molting when banded on 17 June, had shed its first 2 primaries by 5 July and the new primaries were sheathed. Although male 791-29916 was not molting when banded on 17 June, by 20 July its primary molt was nearly complete (primaries 1-7 new, primaries 8 and 9 sheathed). In 1977, SY males (861-03731, -03834) had shed the first 3 primaries by 30 June and 1 July, respectively, whereas males (861-03848, -03532) had shed the first 5 and 4 primaries by 5 and 12 July, respectively. In 1978, SY male 76-144494 had replaced the first 7 primaries by the time it was banded on 9 July. A male captured at its nest on 30 June 1978, although not banded, had shed its first 5 primaries. SY male Baltimore Orioles were more abundant in the ridge forest in 1976 and 1977, when higher nesting densities were recorded in response to an outbreak of Forest Tent Caterpillar (Table 2).[8,12]