

## AUTUMN MIGRATION ROUTE OF BLACKPOLL WARBLERS: EVIDENCE FROM SOUTHEASTERN NORTH AMERICA

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Abstract.—Cooke (1904, 1915) proposed that the Blackpoll Warbler (*Dendroica striata*) migrates to South America through southeastern North America. Nisbet et al. (1963) and Nisbet (1970) argued that most Blackpoll Warblers fly directly from northeastern North America over the Atlantic Ocean to their winter range. Murray (1965, 1989) questioned this view and supported Cooke's hypothesis. Data from nocturnal accidents, banding stations and sightings demonstrate that Blackpoll Warblers are rare autumn migrants south of Cape Hatteras, North Carolina, whereas north of Hatteras they are common. This evidence contradicts Cooke and Murray's hypothesis, and supports Nisbet's alternative.

### RUTA TOMADA POR *DENDROICA STRIATA* DURANTE LA MIGRACIÓN OTOÑAL: EVIDENCIA DEL SURESTE DE NORTE AMÉRICA

Sinopsis.—Cooke (1904, 1915) propuso que *Dendroica striata* migraba a Sur América a través del sureste de Norte América. Nisbet et al. (1963) y Nisbet (1970) argumentaron que la mayoría de estas aves volaban directamente del noreste de Norte América, hacia su lugar invernal, sobre el Atlántico. Murray (1965, 1989) puso en duda dicha hipótesis y apoyó lo propuesto por Cooke. Datos tomados de accidentes nocturnos, de estaciones de anillamiento y una serie de observaciones demuestran que el ave es un raro migrante otoñal al sur del Cabo de Hatteras y Carolina del Norte. Sin embargo, el ave es común al norte de Hatteras. La evidencia suministrada en este trabajo contradice lo propuesto por Cooke y Murray y apoya la hipótesis de Nisbet.

Cooke (1904, 1915) proposed that the Blackpoll Warbler (*Dendroica striata*) migrates to South America through southeastern North America. Nisbet et al. (1963) and Nisbet (1970) hypothesized that most Blackpoll Warblers leave from the northeastern United States and the Canadian Maritime Provinces for a flight over the northwestern Atlantic Ocean. Nisbet (1970) maintained that the southern limit of departure is Cape Hatteras, North Carolina. Murray (1965, 1989) questioned this view, and argued in support of Cooke's southeastern route. Murray (1989) specified that the critical difference between the two hypotheses is whether most Blackpoll Warblers leave North America from north or south of Hatteras. If Cooke and Murray's hypothesis is correct, then most Blackpoll Warblers must move through the southeast Atlantic coastal plain south of Cape Hatteras.

To test Cooke and Murray's hypothesis, we examined Blackpoll Warbler status during autumn migration in the southeastern coastal plain

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and adjacent Piedmont. We used information from nocturnal accidents, banding and sight records since 1968, the last year of the data fully reviewed by Nisbet (1970).

#### METHODS

Both Nisbet (1970) and Murray (1989) agree that few Blackpoll Warblers migrate in autumn to the southwest of Murray's hypothetical departure area (Fig. 1 in Murray 1989). Thus we focus on the coastal plain and adjacent Piedmont between Virginia and the east coast of Florida. We tabulate the number of Blackpoll Warblers captured at four coastal banding stations in 1963–1990. All stations were operated mid-September to late October, when most Blackpoll Warblers are migrating (Nisbet 1970). Two stations in South Carolina operated beyond early November. To compare numbers of Blackpoll Warblers between banding stations, we calculated the frequency of captures at each site as percentage of total number of *Dendroica*. As the Yellow-rumped Warbler (*D. coronata*) at Kiptopeke Beach, Virginia, and the Palm Warbler (*D. palmarum*) at Jekyll Island, Georgia, account for a disproportionately high number of captures, at these stations we give the percentage of Blackpoll Warblers captured excluding these species (see Nisbet 1970).

Nocturnal accidents were at television towers, except at Merritt Island, Florida, where they were at a rocket assembly building. Information on television-tower killed birds is from published sources except those of Post and M. M. Browne from two towers near Raleigh, North Carolina, and those of Post from two towers at Awendaw and Mount Pleasant, South Carolina.

We evaluated published records of Blackpoll Warblers during autumn migration in the Southeast, and solicited unpublished reports from workers listed in acknowledgments. These sources are independent of other ground-based data.

#### RESULTS

*Banding stations.*—Blackpoll Warblers comprised 0–0.5% of *Dendroica* warblers at four banding stations on the coast of South Carolina and Georgia (Table 1). At Jekyll Island, Georgia, Blackpoll Warblers accounted for 2% of all *Dendroica*, excluding the Palm Warbler. In contrast, at Kiptopeke Beach, Virginia, Blackpoll Warblers accounted for 8.9% of *Dendroica* (mean = 59/yr), excluding the Yellow-rumped Warbler. The most banded at Kiptopeke Beach was 102 on 2 Oct. 1964 (Kain 1987). Significantly more Blackpoll Warblers were caught north of Cape Hatteras than at stations south of Hatteras ( $\chi^2 = 47.1$ ,  $P < 0.001$ , 1 df; Table 1).

*Nocturnal accidents.*—At the northernmost television towers, near Raleigh, North Carolina, Blackpoll Warblers were uncommon, averaging 1/night, yet comprising 10.6% of all *Dendroica* (Table 2). By contrast, they were even less frequent at inland and coastal sites farther south, averaging much less than 1/night, and accounting for no more than 7%

TABLE 1. Numbers of Blackpoll Warblers caught in autumn at banding stations south and north of Cape Hatteras, North Carolina, 1963–1990.

Station	Years operated (# net-hr × 1000)	# Blackpoll Warblers caught		Reference
		Total	% of all <i>Dendroica</i> ( <i>n</i> )	
South of Cape Hatteras				
Mount Pleasant, SC	1985, 1987 (3.2)	0	0 (1193)	Charleston Mus., unpubl.
Sullivan's Island, SC	1983–1986 (6.1)	7	0.5 (1289)	Charleston Mus., unpubl.
James Island, SC	1990 (1.1)	1	0.3 (360)	Charleston Mus., unpubl.
Jekyll Island, GA	1978–1990 (17.3)	38	0.4 (10,355)	D. and D. Cohrs, unpubl.
Total, south of Cape Hatteras		46	0.3 (13,197)	
North of Cape Hatteras				
Kiptopeke Beach, VA	1963–1990 (382.0)	1677	2.0 (84,130)	W. P. Smith, unpubl.

\*\*\* Among all *Dendroica*, significantly fewer Blackpoll Warblers were caught south of Cape Hatteras ( $\chi^2 = 177.3$ ,  $P < 0.001$ , 1 df).

of all *Dendroica* at any location (Table 2, Fig. 1). Compared with Raleigh, significantly fewer Blackpoll Warblers were found at the three locations farther south ( $\chi^2 = 47.6$ ,  $P < 0.001$ , 1 df). Blackpoll Warblers occurred from late September to late October at most localities. All Blackpoll Warblers killed at television towers near Raleigh (28 Sep.–27 Oct.) were heavy. Their mean weight was  $19.2 \pm 1.3$  g SD ( $n = 27$ ), and all individuals but one were extremely fat (fat class 3 of Helms and Drury 1960).

*Sight records.*—In Virginia, the Blackpoll Warbler is “common, . . . usually less common in fall” in the Piedmont, where a peak count of 59 was made at Richmond on 9 Oct. 1949 (Kain 1987:99). In the Coastal Plain, Blackpoll Warblers are a “common transient . . . though irregular in fall,” with peak counts occurring at Kiptopeke Beach, most records being from mid-September to early November (Kain 1987:99; Kiptopeke banding records of P. W. Smith, unpubl. data).

In North Carolina, the Blackpoll Warbler is uncommon (<2 records/d) in the Piedmont, and rare to uncommon (1–5 records/5 yr to <2 records/d) in the interior coastal plain (LeGrand 1975). On the coast south of Cape Hatteras, the species is uncommon (<2 records/d) from late September to late October, but is sometimes common on barrier islands after strong NW cold fronts (J. O. Fussell III, pers. comm.). On 7 Oct. 1978 and 14–15 Oct. 1989, on the Outer Banks of Cape Hatteras

TABLE 2. Number of Blackpoll Warblers killed at man-made structures in southeastern North America, 1967–1986.

Location	Period	# Blackpoll Warblers killed		Reference
		# kills (d)	% of all <i>Dendroica</i> (n)	
South of Raleigh, NC				
Bladen and Brunswick Counties, NC	1970–1977	46	25	2.3 (1093) Carter and Parnell 1976, 1978
Awendaw and Mt. Pleasant, SC	1984–1986	12	3	2.9 (103) Charleston Museum, unpubl.
Merritt Island, FL	1970–1980	16	5	6.2 (80) Taylor and Kershner 1986
Total, south of Raleigh, NC			33	2.6 (1276)
Raleigh, NC	1967–1980	49	48	10.6 (455) Post and M. M. Brown, unpubl.

\*\*\* Among all *Dendroica*, significantly fewer Blackpoll Warblers were killed south of Raleigh, NC ( $\chi^2 = 47.6$ ,  $P < 0.001$ , 1 df).

following cold fronts with northwest winds, experienced observers saw 192 and 200 Blackpoll Warblers, respectively, unprecedented numbers for the northern coast (LeGrand 1979, 1990). In contrast, south of Hatteras, at Fort Fisher, Davis and Parnell (1983) saw only two Blackpoll Warblers in the autumn of 1978 (0.01% of all birds), and none on 7 Oct. 1978, the heaviest day of migration that year. This was the day on which large numbers of Blackpoll Warblers were seen on the Outer Banks 300 km to the northeast (LeGrand 1979). At Fort Fisher in the autumns of 1977, 1979 and 1980, R. Davis (*in litt.*) saw a total of 11 Blackpoll Warblers. Also at Fort Fisher, G. Massey saw 13 Blackpoll Warblers on 14 Oct. 1990, an unusually high count (LeGrand 1991).

Blackpoll Warblers are rare in South Carolina (1–5 records/5 yr) from 22 Sep. to 14 Nov. This status is based on Post and Gauthreaux (1989) and on unpublished records. As an example of Blackpoll Warblers' rarity in autumn, A. T. Wayne (notebooks, Charleston Museum) recorded it on only 10 d in 44 yr (1884–1927) around Charleston. The daily maximum collected by Wayne was six (specimen locations unknown except for two, Museum of Comparative Zoology Nos. 212060 and 212065) on 14 Oct. 1885, when a tropical storm hit the South Carolina coast. Despite Wayne's few records of the species, he stated that it was abundant (Wayne 1910), an assessment apparently based on the six he collected in 1885.

Evidently, Burleigh's (1934, 1958) statement that the Blackpoll Warbler was common in coastal Georgia in the autumn was based on Wayne (1910), as Burleigh presented no Georgia data to support his contention. Three Georgia checklists (Denton et al. 1977, Greene et al. 1945, Haney et al. 1986) classify the species as a rare (<3 records/yr) autumn migrant throughout Georgia, except in the southwest, where it is even rarer.

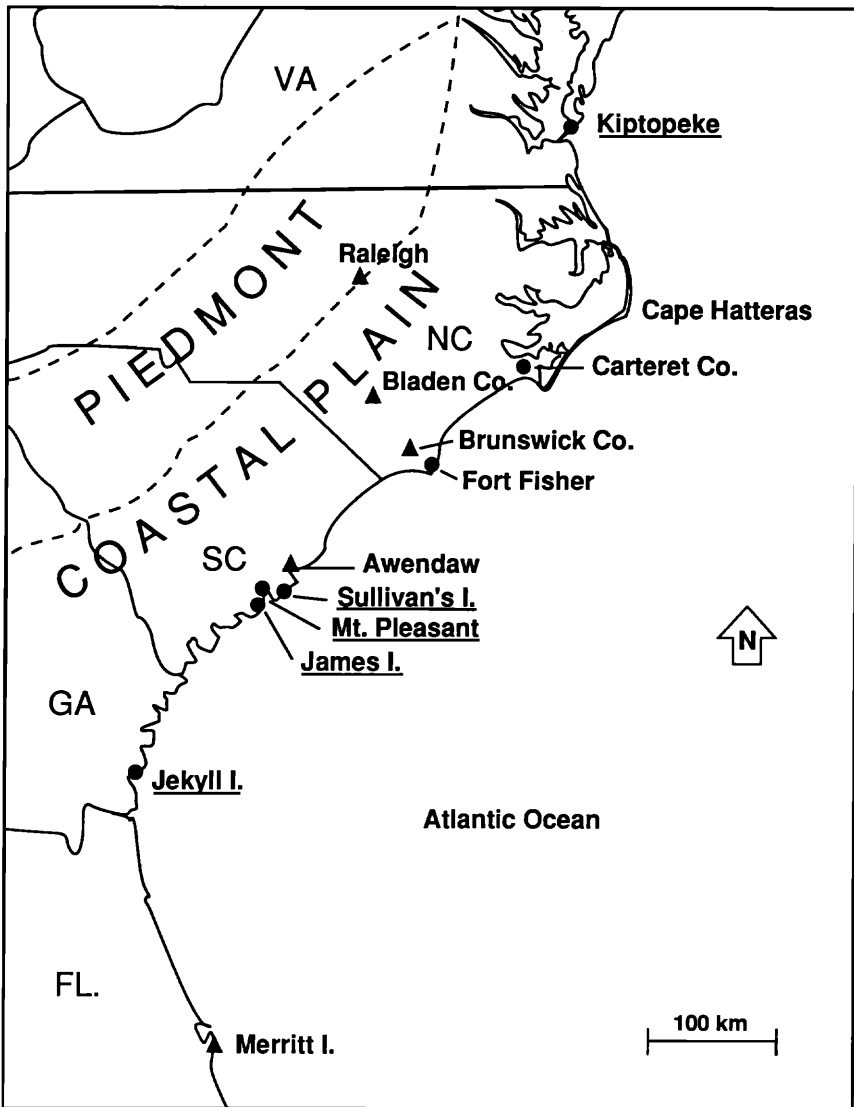


FIGURE 1. Southeastern North America, showing location of Cape Hatteras, North Carolina, banding stations (underlined) and sites where nocturnal mortality occurred (triangles). Solid lines are state boundaries. Dotted lines separate physiographic regions.

On the east coast of Florida, the Blackpoll Warbler is a rare (1–5 records/5 yr) autumn migrant from late September to mid-November (L. Atherton, J. Cooke, W. George, R. Loftin, B. Neville, J. C. Ogden, P. Powell, P. W. Smith, H. M. Stevenson and M. Wheeler, *in litt.*). As examples, Cooke saw a total of only 11 in 1972–1990 in northeast Florida

(Duval County). In southeast Florida, B. Neville saw them during autumn in only 2 yr in 1982–1990. Large numbers on the east coast of Florida during autumn have been associated with hurricanes or tropical storms rather than with normal seasonal weather patterns (Fellers 1988, Murray 1989, Nisbet 1970; J. C. Ogden, *in litt.*).

#### DISCUSSION

Independent data from nocturnal accidents, banding stations and sightings indicate that the Blackpoll Warbler is rare in autumn migration on the southeastern coastal plain below Cape Hatteras, North Carolina. Farther inland in this region, the species is rare, upon which both Nisbet (1970) and Murray (1989) agree (see Figs. 1 and 2 *in* Murray 1989).

In comparison, on the coast north of Hatteras and in the northern Piedmont of North Carolina, the species appears to be fairly common, although its status in this region is still poorly known; few banding stations or television-tower study areas have been established. In the Piedmont and coastal plain of Virginia, the Blackpoll Warbler is fairly common to occasionally common both inland and on the coast during autumn migration (Kain 1987).

Nisbet (1970) stated that the southwest departure limit of the Blackpoll Warbler is the Cape Hatteras region. This agrees with data presented here. He showed in his Table 5, however, that the species was “common” in coastal North Carolina and “fairly common” in coastal South Carolina. Nisbet may have based his assessment on limited and frequently erroneous data, the only information available at the time (see Nisbet 1970 for a review of sources of bias). Also, the high frequencies of the species at banding stations may have been biased upward by uneven sampling effort: (1) sampling on peak days of migration (see Table 3 *in* Nisbet 1970; also see Cherry *et al.* 1985). Sykes (1986), for example, caught 26 Blackpoll Warblers in 14 d, mostly with strong cold fronts and northwest winds; (2) a strong northeast storm in October 1959 caused an unusual fallout of Blackpoll Warblers in South Carolina; e.g., 32 at Folly Beach on 17–20 Oct.; and (3) misidentification of other species as Blackpoll Warblers (e.g., at Effingham in Florence County, South Carolina) was possible (Nisbet 1970).

We disagree with Murray’s (1989) suggestion that the southeastern coastal plain lacks the conditions for concentrating Blackpoll Warblers. Although the general movement of autumn migration in southeastern North America is parallel to the coast, which matches the prevailing wind direction (Baldwin 1968), many Parulinae are concentrated in the coastal plain, e.g., Black-throated Blue Warbler (*D. caerulescens*), Palm Warbler, American Redstart (*Setophaga ruticilla*), Common Yellowthroat (*Geothlypis trichas*) (Taylor 1973, 1976; unpubl. banding records, Charleston Museum). Blackpoll Warblers are concentrated in the coastal plain of northeastern North America, as are these species. Further, Blackpoll Warblers tend to migrate S or SE, and thus are even more likely to concentrate on the coast than other warblers (I. C. T. Nisbet, pers.

comm.). Blackpoll Warblers are not often recorded in the southeastern coastal plain simply because they are rare there, not because of differences in coastal physiography.

We agree with Nisbet (1970) that Blackpoll Warblers were often misidentified as Bay-breasted Warblers, and sometimes as Pine Warblers (*D. pinus*). Many records, including those from nocturnal accidents and banding stations, were not documented (Nisbet 1970; H. E. LeGrand, Jr. and H. M. Stevenson, *in litt.*). Field workers are now aware of the difficulties in separating Blackpoll and Bay-breasted Warblers. Even if Blackpoll Warblers were misidentified as Bay-breasted Warblers, however, the latter species is even rarer than the Blackpoll Warbler in the southeastern coastal plain. The combined numbers of the two species would still be too low to support Murray's (1989) hypothesis.

In the northeast Piedmont of North Carolina at Raleigh, fat-loaded Blackpoll Warblers were killed at television towers during nocturnal migration under favorable synoptic weather conditions. The individuals killed at Raleigh were only 1.6 g lighter than the estimated weight of 20.8 g for Blackpoll Warblers departing New England (Nisbet et al. 1963). Thus it is likely that their fuel loads would have allowed a long overland and overseas crossing to their winter range (see also Murray 1989).

Blackpoll Warblers are generally irregular from late September to early November (primarily mid- to late October) in Bermuda and the Bahamas (Nisbet 1970). The species occurs irregularly, and is rare to uncommon, in the Greater Antilles (Nisbet 1970), including Puerto Rico (Post, unpubl. data). The period of occurrence after early October is consistent with migration from southern New England (Nisbet 1970) as well as the mid-Atlantic coast of North America, which would include the northeastern part of North Carolina. Though Murray (1989) stated that the Blackpoll Warbler is scarce in the latter half of October north of North Carolina, Nisbet (1970) reported that numbers were present in the mid-Atlantic states as late as 16–20 Oct. at Chestertown and Ocean City, Maryland, and Kiptopeke, Virginia, which agrees with results from coastal northeastern North Carolina and from Virginia. Normal seasonal weight gain (Nisbet et al. 1963, Murray 1989) would enable Blackpoll Warblers to leave the mid-Atlantic area after early October for a trans-oceanic flight. The rarity of Blackpoll Warblers from Cape Hatteras through the east coast of Florida make it clear that this area is not the source of birds in Bermuda, the Bahamas and the West Indies in October and November.

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## LITERATURE CITED

- BALDWIN, J. L., ED. 1968. Climatic atlas of the United States. National Climatic Data Center, Asheville, North Carolina. 119 pp.
- BURLEIGH, T. D. 1934. A critical study of the distribution and abundance of *Dendroica castanea* and *Dendroica striata* in the southeastern states during the spring and fall migrations. *Wilson Bull.* 46:142-147.
- . 1958. Georgia birds. Univ. Oklahoma Press, Norman, Oklahoma. 746 pp.
- CARTER, J. H., III, AND J. F. PARNELL. 1976. TV tower kills in eastern North Carolina. *Chat* 40:1-9.
- , AND ———. 1978. TV tower kills in eastern North Carolina: 1973 through 1977. *Chat* 42:67-70.
- CHERRY, J. D., D. H. DOHERTY, AND K. D. POWERS. 1985. An offshore nocturnal observation of migrating Blackpoll Warblers. *Condor* 87:548-549.
- COOKE, W. W. 1904. Distribution and migration of North American warblers. U.S. Dept. Agric. Bull. No. 8.
- . 1915. Bird migration. U.S. Dept. Agric. Bull. No. 185.
- DAVIS, R. J., AND J. F. PARNELL. 1983. Fall migration of land birds at Fort Fisher, New Hanover County, N.C. *Chat* 47:85-95.
- DENTON, J. F., W. W. BAKER, M. N. HOPKINS, JR., L. B. DAVENPORT, JR., AND C. S. ROBBINS. 1977. Annotated checklist of Georgia birds. *Georgia Ornithol. Soc. Occ. Publ. No. 6.* 60 pp.
- FELLERS, P. J. 1988. Recent occurrences of "storm waifs" in Polk County, Florida. *Florida Field Naturalist* 16:7.
- GREENE, E. R., W. W. GRIFFIN, E. P. ODUM, H. L. STODDARD, AND I. R. TOMKINS. 1945. Birds of Georgia. *Georgia Ornithol. Soc. Occ. Publ. No. 2.* 111 pp.
- HANEY, J. C., P. BRISSE, D. R. JACOBSON, M. W. OBERLE, AND J. M. PAGET. 1986. Annotated checklist of Georgia birds. *Georgia Ornithol. Soc. Occ. Publ. No. 10.* 49 pp.
- HELMS, C. W., AND W. H. DRURY, JR. 1960. Winter and migratory weight and fat: field studies on some North American buntings. *Bird-Banding* 31:1-40.
- KAIN, T., ED. 1987. Virginia's birdlife: an annotated checklist. *Virginia Ornithol. Soc., Virginia Avifauna No. 3.* 127 pp.
- LEGRAND, H. E., JR. 1975. Distribution and abundance of the wood warblers in North Carolina during the spring, nesting and fall seasons. *Chat* 39:45-54.
- . 1979. Briefs for the files. *Chat* 43:37-43.
- . 1990. Briefs for the files. *Chat* 54:88-97.
- . 1991. Briefs for the files. *Chat* 55:93-101.
- MURRAY, B. G., JR. 1965. On the autumn migration of the Blackpoll Warbler. *Wilson Bull.* 77:122-133.
- . 1989. A critical review of the transoceanic migration of the Blackpoll Warbler. *Auk* 106:8-17.
- NISBET, I. C. T. 1970. Autumn migration of the Blackpoll Warbler: evidence for long flight provided by regional survey. *Bird-Banding* 41:207-240.
- , W. H. DRURY, JR., AND J. BAIRD. 1963. Weight-loss during migration. Part I: deposition and consumption of fat by the Blackpoll Warbler, *Dendroica striata*. *Bird-Banding* 34:107-138.
- POST, W., AND S. A. GAUTHREUX, JR. 1989. Status and distribution of South Carolina birds. *Contrib. Charleston Mus.* 18. 83 pp.
- SPRUNT, A., JR., AND E. B. CHAMBERLAIN. 1949. South Carolina bird life. *Contrib. Charleston Mus.* 9. 571 pp.
- SYKES, P. W., JR. 1986. Autumn land-bird migration on the barrier islands of northeastern North Carolina. *Occ. Pap. N.C. Biol. Surv.* 1986-11. 49 pp.
- TAYLOR, W. K. 1973. Black-throated Blue and Cape May warblers killed in central Florida. *Bird-Banding* 44:258-266.



- . 1976. Migration of the Common Yellowthroat with an emphasis on Florida. *Bird-Banding* 47:319–332.
- , AND M. A. KERSHNER. 1986. Migrant birds killed at the vehicle assembly building (VAB), John F. Kennedy Space Center. *J. Field Ornithol.* 57:142–154.
- WAYNE, A. T. 1910. Birds of South Carolina. *Contrib. Charleston Mus.* 1. 254 pp.

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### **1994 JOINT ANNUAL MEETINGS OF THE SOCIETY FOR CONSERVATION BIOLOGY AND THE ASSOCIATION FOR TROPICAL BIOLOGY**

The Society for Conservation Biology and the Association for Tropical Biology will hold joint annual meetings on 7–12 June 1994 at the University of Guadalajara, Jalisco, Mexico. The meeting will promote the participation of Latin American biologists in both societies and will provide a good opportunity for “networking” and learning about conservation biology in the Neotropics. Travel, lodging and registration costs will be similar to those of meetings held previously in the U.S.A. Information on symposia, contributed papers, poster sessions and travel arrangements will be mailed to members of both societies in November 1993. Deadline for submission of papers will be in early March. For additional information write or send FAX to:

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