PETIT, D. R., L. J. PETIT, AND K. G. SMITH. 1992. Habitat associations of migratory birds overwintering in Belize, Central America. Pp. 247–255 *in* Ecology and conservation of Neotropical migrant landbirds (J. Hagen and D. Johnston, eds.). Smithsonian Institution Press, Washington, D.C.

ROBBINS, C. S., B. A. DOWELL, D. K. DAWSON, J. A. COLÓN, R. ESTRADA, A. SUTTON, R. SUTTON, AND D. WEYER. 1992. Comparison of neotropical migrant landbird populations wintering in tropical forest, isolated forest fragments, and agricultural habitats. Pp. 207–220 *in* Ecology and conservation of Neotropical migrant landbirds (J. Hagen and D. Johnston, eds.). Smithsonian Institution Press, Washington. D.C.

ROGERS, D. T., JR., D. L. HICKS, E. W. WISCHUSEN, AND J. R. PARRISH. 1982. Repeats, returns, and estimated flight ranges of some North American migrants in Guatemala. J. Field Ornithol. 53:133–138.

SAAB, V. A. AND D. R. PETIT. 1994. Impact of pasture development on winter bird communities in Belize, Central America. Condor 94:66–71.

UNIVERSIDAD RAFAEL LANDÍVAR. 1987. Perfil Ambiental de la Republica de Guatemala. Guatemala City: Universidad Rafael Landívar.

WAIDE, R. B. 1980. Resource partitioning between migrant and resident birds: the use of irregular resources. Pp. 337–352 *in* Migrant birds in the Neotropics: ecology, behavior, distribution and conservation (A. Keast and E. S. Morton, eds.). Smithsonian Institution Press, Washington, D.C.

———, J. T. EMLEN, AND E. J. TRAMER. 1980. Distribution of migrant birds in the Yucatán Peninsula: A survey. Pp. 165–171 *in* Migrant birds in the Neotropics: ecology, behavior, distribution and conservation (A. Keast and E. S. Morton, eds.). Smithsonian Institution Press, Washington, D.C.

WUNDERLE, J. M., JR. AND R. B. WAIDE. 1995. Distribution of overwintering nearctic migrants in the Bahamas and Greater Antilles. Condor 95:904–933.

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Ungulate ectoparasite removal by Black Caracaras and Pale-winged Trumpeters in Amazonian forests.—Interspecific interactions in which an organism eats the ectoparasites of another, usually larger, organism (sometimes referred to as "cleaning symbioses"; Wittenberger 1981) comprise a relatively common form of mutualism. In terrestrial vertebrates, these associations are chiefly represented by a few bird species which routinely remove ticks and hematophagous diptera from large mammals. Such interactions, however, are by no means regularly distributed across different macrohabitats and appear to be more common in tropical savannas where recent radiations of large herbivores and their parasites are most impressive. Cleaning mutualisms are thus perhaps best illustrated by certain savanna bird species of sub-Saharan Africa such as Yellow-billed (*Buphagus africanus*) and Red-billed oxpeckers (*B. erythrorhynchus*) which are highly specialized in plucking ticks from a wide range of wild and domestic ungulate hosts for the mainstay of their diet (Attwell 1966, Bezuidenhout and Stutterheim 1980, Hart et al. 1990). In other open habitats, similar interactions also occur less frequently, for example, between Fan-tailed Ravens (*Corvus rhipi-*

durus) and camels (*Camelus dromedarius*) (Lewis 1989), Pale-winged Starlings (*Onychognathus nabouroup*) and mountain zebras (*Equus zebra*) (Penzorn and Horak 1989), Black-billed Magpies (*Pica pica*) and moose (*Alces alces*) (Samuel and Welsh 1991), and Yellow-bellied Bulbuls (*Alophoixus phaeocephalus*), and klipspringers (*Oreotragus oreotragus*) (Roberts 1993). Cattle Egrets (*Bubulcus ibis*) are perhaps the best known case of open-habitat cleaning mutualists in the New World (Burger and Gochfeld 1982), but here domestic bovid herds have largely replaced the aborigine megaherbivores with which this species was formerly associated.

In comparison, documented cases of avian species conducting similar lifestyles under close-canopy tropical forests are apparently rare. It remains to be seen, however, whether this should be attributed to the fact that (1) these habitats support far fewer species and lower densities (or smaller surface area) of large-bodied terrestrial herbivores, or (2) far less is known about the behavior and interspecific associations of forest vertebrates. Here I report two distinct cases of previously undocumented bird-ungulate mutualistic interactions observed at different Amazonian forest sites. The bird species involved in these interactions are the Black Caracara (*Daptrius ater*) and Pale-winged Trumpeter (*Psophia leucoptera*) which were observed providing "cleaning" services to Brazilian tapirs (*Tapirus terrestris*) and gray brocket deer (*Mazama gouazoubira*), respectively. Moreover, despite the disparate ecological and phylogenetic differences between these bird species, it is suggested that these interactions may be consistent throughout much of the Amazon basin.

Black Caracaras are small (330–445 g) raptors more closely related to polyborine falcons rather than to true falcons and hawks (Griffiths 1994). The Black Caracara is widely distributed throughout the Amazon basin from the eastern slopes of the Andes east to Maranhão, north to the Guianas, and south to the woodland fringes of northern Mato Grosso, Brazil. In Brazilian Amazonia, this species is more commonly found along rivers, forest edges, and associated habitats than in vast undisturbed areas of unflooded (terra firme) forest interior far removed from large rivers (Peres and Whittaker 1991, unpubl. data). Small family flocks of 3–5 individuals are often seen along rivers where they scavange primarily on small carrion, prey on arthropods and nestling birds, and occasionally feed on ripe fruit pulp (Brown and Amadon 1968, pers. obs.). *Daptrius ater,* therefore, diverges from its widely sympatric congener, the Red-throated Caracara (*D. americanus*), which is more social, far more frugivorous, but also specializes on raiding collonial wasp and bee nests (Thiollay 1991, pers. obs.).

Black Caracaras were observed cleaning a tapir on 12 September 1993 (late dry season) along a small stream draining a "cacaia" (i.e., water-logged forest patch where trees undergo a sudden die-off following a change in stream channel) on the right bank of the upper Tarauacá river, western Acre, Brazil (9°23′S, 71°54′W). A field assistant and I saw a group of eight Black Caracaras, ca 25 m from us, immediately next to an adult male tapir. An additional 10 or more caracaras were perched in the understory nearby, apparently awaiting their turn to descend upon the tapir. The tapir partly exposed its ventral parts and one of its inner hind-thighs, while lying on its side in a rather relaxed posture. The single juvenile and several adult caracaras (differentiated by the lemon-yellow and bright-orange facial skin, respectively) were actively searching for and plucking ticks attached to the large tapir which was later determined to be a bull. Four of these caracaras were searching for and grooming ticks while perched directly on top of the tapir. Another bird meticulously inspected the ventral side of the tapir between its front- and hind-quarters, whereas a third caracara partly circled around the back and dorsal flanks of the tapir, also examining its body surface. We were unable to observe whether the other caracaras were also foraging in this manner, for they were obstructed from view on the opposite side of the tapir. Upon detecting our pres-

ence 4–5 min later, all caracaras suddenly retreated to nearby perches, thus startling the tapir which immediately got up and fled from us through Maranthaceae-dominated undergrowth.

Interviews with subsistence hunters of three local communities of different parts of the Brazilian Amazon—Kaxinawá Indians of the Rio Jordão Reserve in western Acre, Kayapó Indians of A'Ukre, southeastern Pará, and caboclo (non-tribal) hunters of Vila Moura, upper Tefé river, central Amazonas—revealed that the associations between Black Caracaras and tapirs witnessed in the upper Tarauacá also occurred at these forest sites. Cleaning sessions in the upper Xingú basin (Rio Riozinho), as reported by Kayapó warriors, usually involve one adult tapir and 3–4 *D. ater,* and may last several hours while tapirs "roll over on both sides to facilitate tick removal from all body parts". Most intriguingly, experienced Kayapó hunters reported that tapirs and Black Caracaras typically are able to approach one another through a series of vocal exchanges (whistles in the case of tapirs; rasping calls in the case of *D. ater*), which apparently helps to coordinate their encounters within a closed-canopy habitat where visibility is inherently poor. Both Black Caracaras and tapirs, however, are reported to discontinue counter-calling and to remain very quiet once they eventually get to within sight of one another and during actual cleaning sessions. Indeed, hunters well aware of such rallying calls have reported cueing onto vocalizations of Black Caracaras suspected of "searching for tapirs" in order to home in on a potentially easy kill, for tapirs are the largest-bodied and often most preferred game species of native Amazonians. Should the occurrence of such mutual "approach calls" be confirmed, they would suggest that such cleaning mutualism between Black Caracaras and tapir is relatively stable and has a long history. Interestingly, both Black Caracaras and tapirs are more commonly found in river-edge, backwater palm swamps, and river- or stream-disturbed habitats, rather than in high terra firme forest on well drained soils (e.g., Bodmer 1990, Peres in press). Furthermore, Black Caracaras have not been reported to pick ticks from any other Amazonian ungulate, which perhaps suggests a high degree of specificity in these associations.

The second set of observations involves a group of trumpeters (Psophiidae), which are highly social, large-bodied (ca 1200 g), terrestrial frugivore-insectivore birds foraging almost entirely on the forest leaf-litter. The three recognized species of trumpeters White-winged Trumpeter (*P. leucoptera*), Green-winged Trumpeter (*P. viridis*), and Gray-winged Trumpeter (*P. crepitans*) are of widespread occurrence in Amazonian and the Guianan Shield forests, and comprise the only representatives of the entire family Psophiidae. Closed membership monospecific groups of 4–10 individuals maintain relatively large, stable territories which are actively defended against neighboring groups (Sherman 1991). I made these observations at a remote terra firme forest 4 km inland from the headwaters of the Urucu river, Amazonas, Brazil (4°50′S, 65°16′W). Trumpeter group size at this site averaged 6.2 individuals (N = 12). On the morning of 26 September 1988 (late dry season), as I sat under a stationary group of woolly monkeys (*Lagothrix lagotricha cana*), I observed an approaching group of seven White-winged Trumpeters walking slowly alongside an adult male Gray Brocket Deer (*Mazama gouazoubira*). Four of those trumpeters immediately next to the deer were clearly gleaning over specific parts of its pelage surface from ground level while striving to maintain fixed positions relative to the front- or hind-quarters of this cervid. Horse flies (Diptera: Tabanidae) of 15–25 mm swarming around the brocket deer were being rapidly snatched by the trumpeters through precise pecking and neck-stretching maneuvers, some of which involved a quick upward leap off the ground. I observed three tabanids beeing successfully, captured by two different trumpeters during an observation period of 45 sec. Moreover, I suspect that ticks which may have been attached to the deer (which unfortunately could not be resolved through a pair of 10 × 40 Zeiss binoculars) were also being removed and eaten: several pecks were directed at specific leg and ventral parts of the animal for no other obvious reason. Once the birds and the deer had already cleared the

nearest distance between their path and the point where I had been sitting, one of the birds sounded an alarm call, presumably directed at me. This clearly triggered the deer to sprint away in leaps and bounds, and the typical collective response of trumpeters under contexts of predation threat, which involves increased group vigilance and alarm-calling, followed by a rapid withdrawal from the source of threat once it has been identified (pers. obs.).

As suggested by several interviews, both sets of observations reported here may have a more widespread occurrence across the geographic distribution of *Daptrius ater* and *Psophia* spp. in Amazonia. Of particular interest, Sick (1984) named *Daptrius ater* as "Gavião-de-Anta" ("tapir-hawk"), but although he reports that this species "sometimes removes ticks and maggots from wild animals" (my translation), he does not specify which species of "animals" those might actually be. The larger, more terrestrial and better known relatives of forest caracaras (*Milvago*), which typically inhabit cattle-raising districts and savannas farther south, also engage in similar interactions with other species of large mammals. Yellow-headed Caracaras (*Milvago chimachima*), for instance, are well reknowed to be professional "tick-eaters", frequently picking ectoparasites off livestock and capybaras (*Hydrochaeris hydrochaeris*) in the Brazilian pantanal and cerrado (Sick 1984, F. Olmos, pers. comm.). *M. chimachima* and a number of other avian species which remove ectoparasites from large mammals (e.g., magpies: Goodwin 1986) can, however, take advantage of these associations to nibble at flesh and, therefore, maintain or enlarge branding wounds on their mammalian hosts (Brown and Amadon 1968). Although this clearly brings nutritional advantages to these birds, it remains to be determined whether or not *Daptrius ater* and *Psophia leucoptera* "cheat" in these otherwise mutualistic interactions by also eating live tissue from open sores.

At oxbow lake- and river-edge habitats along white-water rivers of western Amazonia, Giant Cowbirds (*Scaphidura oryzivora*) are commonly observed catching tabanid flies, and perhaps ticks, parasitizing capybaras (J. Terborgh, pers. comm.), and Robinson (1988) once observed a Giant Cowbird foraging on the back of a tapir. One of the few other cases of ectoparasite removal from *Tapirus* was reported for white-nosed coatis (*Nasua narica*) grooming a few individuals of Baird's tapirs (*T. bairdii*) near the Barro Colorado Island Field Station in Panamá (McClean 1992). This interaction, however, was apparently learned locally and represented a human artefact in that both species had been routinely fed in the laboratory clearing, and thus spent a disproportionately large amount of time together.

The three-way interactions reported here, although easily overlooked in forest habitats, may be of great importance to hematophagus arthropods, large mammalian hosts, and bird species, such as caracaras and trumpeters, which successfully take advantage of such foraging opportunities. Ticks and tabanid flies, particularly if engorged with a full bloodmeal, may represent a key nutritional supplement to the birds. For the ungulate hosts, too, this may represent the most efficient way of eliminating unwelcome ectoparasites, which could serve as vectors of major debilitating diseases. Of special interest, Amazonian forest ungulates, such as tapirs, both brocket deer species (*Mazama americana* and *M. gouazoubira*) and peccaries (*Tayassu tajacu* and *T. pecari*) appear to be particularly susceptible to infestations of large ticks. Hunters throughout the region often report examining carcasses of these species with conspicuous ectoparasite loads, suggesting that infestation rates may be faster than removal rates by mutualists or spontaneous withdrawal of the ectoparasite. In the case of tapirs, kills are reported either to be heavily infested with ticks or conspicuously "clean" (carrying no ticks), which suggest that tick-removal bouts by avian mutualists may be relatively sporadic. Indeed, several species of ungulate may lose physical condition if subject to chronic ectoparasite infestations, but whether or not such associations depress ectoparasite populations to any significant extent is yet to be determined (but see Samuel and Welsch 1991). Indeed, greater population densities of open-habitat mutualists (such as

that of Yellow-headed Caracaras in central Brazil) appear to be available to provide ectoparasite removal services to savanna and forest-edge grazers than are their equivalent forest species to browser-frugivore ungulates. Perhaps the evolutionary opportunity presented by the inherently low densities (and smaller body surface area) of forest megaherbivores—which could otherwise subsidize larger populations of large-bodied hematophagous arthropods—was never significant enough to be claimed by cleaning mutualists more specialized than caracaras and trumpeters.

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LITERATURE CITED

ATTWELL, R. I. G. 1966. Oxpeckers, and their associations with mammals in Zambia. Puku 4:17–48.

BEZUIDENHOUT, J. D. AND C. J. STUTTERHEIM. 1980. A critical evaluation of the role played by the red-billed oxpecker Buphagus erythrorhynchus in the biological control of ticks. Onderstepoort. J. Vet. Res. 47:51–75.

BODMER, R. E. 1990. Responses of ungulates to seasonal inundations in the Amazon floodplain. J. Trop. Ecol. 6:191–201.

BROWN, L. AND D. AMADON. 1968. Eagles, hawks and falcons of the world. McGraw-Hill, New York, New York.

BURGER, J. AND M. GOCHFELD. 1982. Host selection as an adaptation to host-dependent foraging success in the cattle egret (*Bubulcus ibis*). Behaviour 79:212–229.

GOODWIN, D. 1986. Crows of the world, 2nd ed. Univ. of Washington Press, Seattle, Washington.

GRIFFITHS, C. S. 1994. Syringeal morphology and the phylogeny of the Falconidae. Condor 96:127–140.

HART, B. L., L. A. HART, AND M. S. MOORING. 1990. Differential foraging of oxpeckers on impala in comparison with sympatric antelope species. Afr. J. Ecol. 28:240–249.

LEWIS, A. D. 1989. Notes on two ravens *Corvus* spp. in Kenya. Scopus 13:129–131.

MCCLEAN, D. 1992. The rise and fall of a mutualism? Coatis, tapirs, and ticks on Barro Colorado Island, Panamá. Biotropica 24:220–222.

PENZHORN, B. L. AND I. G. HORAK. 1989. Starlings, mountain zebras and ticks. Koedoe 32: 133–134.

PERES, C. A. In press. Nonvolant mammal community structure in different Amazonian forest types *in* Mammals of the Neotropics, Vol. 3 (J. F. Eisenberg, ed.). Univ. of Chicago Press, Chicago, Illinois.

——— AND A. WHITTAKER. 1991. Annotated checklist of bird species of the upper Rio Urucu, Amazonas, Brazil. Bull. Brit. Ornith. Cl. 111:156–171.

ROBERTS, S. C. 1993. Yellowbellied bulbul gleaning on a klipspringer. Ostrich 64:136.

ROBINSON, S. K. 1988. Foraging ecology and host relationships of Giant Cowbirds in southeastern Peru. Wilson Bull. 100:224–235.

SAMUEL, W. M. AND D. A. WELSH. 1991. Winter ticks on moose and other ungulates: factors influencing their population size. Alces 27:169–182.

SHERMAN, P. T. 1991. The ecology and social behavior of the white-winged trumpeter (*Psophia leucoptera*). Ph.D. diss., Univ. of California, Davis, California.

SICK, H. 1984. Ornitologia brasileira: uma introdução. Vol. 1. Editora Univ. de Brasília, Brasília, Brazil.

THIOLLAY, J. M. 1991. Foraging, home range use and social behaviour of a group-living rainforest raptor, the red-throated caracara *Daptrius americanus*. Ibis 133:382–393.
WITTENBERGER, J. F. 1981. Animal social behavior. Duxbury Press, Boston, Massachusetts.

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Notes on the status and behavior of the Swainson's Warbler in Cuba.—The Swainson's Warbler (*Limnothlypis swainsonii*) is one of the less common North American warblers (Morse 1989). Although data from the Breeding Bird Survey suggest that the species has undergone a significant range-wide population increase during the period 1966–1988 (Sauer and Droege 1992), regional Neotropical migrant prioritization schemes for the midwestern (Thompson et al. 1993) and southeastern (Hunter et al. 1993) United States consider the Swainson's Warbler among the more vulnerable Neotropical migrants based on its low population, threats on the breeding and wintering grounds, and its restricted range. Considering its vulnerability, the status of the Swainson's Warbler is poorly known in its breeding range (Hunter et al. 1993), and even more so in winter. Here, we summarize recent and historical records for the Swainson's Warbler in Cuba, re-assess its status there, and describe aspects of its foraging and flocking behavior based on casual observations, previously published information, and anecdotal reports.

The Swainson's Warbler winters in the northern Bahama Islands, Cuba, the Cayman Islands, Jamaica, the Yucatán Peninsula, and Belize (AOU 1983). There are also sight and banding records from Puerto Rico (AOU 1983; J. Faaborg, pers. comm.) and sight records from St. John (Raffaele 1989). It is reported as casual on the Swan Islands (AOU 1957). In Cuba, the Swainson's Warbler has been considered a rare winter resident (Garrido and García Montaña 1975). The first report for Cuba was provided by Gundlach (1876) who knew of a single sight record from La Habana (Fig. 1). In the 150 years prior to 1991, it is unknown exactly how many Swainson's records exist for Cuba, but we are aware of only 21 (Fig. 1).

Banding activities carried out during the winters of 1991–1994 by Cuban researchers of the Institute of Ecology and Systematics (IES) of the Ministry of Science, Technology, and Environment, the Cuban National Museum of Natural History; and by a cooperative forest bird survey project of the IES, the Canadian Wildlife Service (CWS), and the Long Point Bird Observatory (LPBO) have provided many new records of Swainson's Warbler. Recent bird-watching tours have contributed additional sight records of the species. In total, 58 individuals were observed, netted, or collected at 17 sites during the winters of 1991–1994 (Fig 1). Highest numbers were at El Cenote, Ciénaga de Zapata, Matanzas Province, where 13 (1.80/100 net-h) were captured 11–14 February 1991, and at Camino al Sitio Viejo, Cayo Coco, Ciego de Avila Province, where 12 (1.67/100 net-h) were captured 27–30 January 1994. Seasonally, Swainson's Warblers have been observed in Cuba from 15 September to 14 April (Garrido and García Montaña 1975; Garrido and Kirkconnell, unpubl. data).

Historical and recent Cuban records indicate that Swainson's Warblers occur in the lowlands, montane regions, and in swampy areas. They apparently prefer semideciduous forest with high shrub and tree stem density, complete, or nearly complete, canopy cover, abundant