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WHY CANOPY ACCESS IS ESSENTIAL TO UNDERSTAND CANOPY BIRDS: FOUR EXAMPLES FROM THE SURUMONI CRANE PROJECT

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Resumen. – El acceso al dosel es esencial para entender las aves de dosel. – En la última década, rápidos avances en las técnicas de acceso al dosel han grandemente mejorado nuestro entendimiento de la ecología y comportamiento de las aves de dosel en las selvas lluviosas. Sin embargo, todavía sabemos tan poco acerca de las aves de dosel en las selvas lluviosas que es necesario enfatizar la importancia del uso generalizado de las técnicas de acceso al dosel. Las observaciones realizadas desde una grúa de dosel ubicada en la selva lluviosa amazónica (Proyecto Grúa Surumoni, sur de Venezuela) son usadas como ejemplos para ilustrar como el acceso al dosel puede incrementar nuestra comprensión sobre las aves de dosel. Algunas especies son frecuentemente catalogadas como especies que prefieren los hábitat de borde de bosque, pero observaciones desde la grúa han demostrado que estas especies son encontradas más frecuentemente en el dosel cerrado de lo que era obvio basándose en observaciones realizadas desde el suelo. De igual modo, las observaciones desde el dosel pueden cambiar nuestra percepción sobre la abundancia y preferencia de hábitat de las aves de dosel, lo cual es esencial para determinar su estatus de conservación. Comportamientos posiblemente territoriales o de cortejo se describen como ejemplos de comportamientos que solo son visibles desde puntos de observación por encima del dosel. Finalmente, se notó un incremento marcado en la actividad y movimiento de aves al final de la época de lluvia, sugiriendo que muchas especies, especialmente los atrapamoscas de la familia Tyrannidae, pueden migrar hacia nuevas áreas para alimentarse. Muchas de las observaciones descritas hubieran sido imposibles de realizar desde el suelo. Aún las técnicas tradicionales de acceso al dosel, como escalada o torres de dosel, solo brindan un acceso limitado al dosel sin permitir el seguimiento activo de las aves que es posible con grúas de dosel. Además, las grúas de dosel también mejoran la observación de las especies del sotobosque medio e inclusive especies del sotobosque. Por lo tanto, el tener un mejor acceso al dosel, y especialmente el uso más generalizado de grúas de dosel, es esencial para comprender la ecología y comportamiento de las aves del dosel en selvas tropicales así como en selvas templadas.

Abstract. – Canopy access is essential to understand canopy birds. – Rapid advances in canopy access techniques in the last decade have greatly improved our understanding of the ecology and behavior of rainforest canopy birds. However, we still know so little about rainforest canopy birds that the argument for much more widespread canopy access has to be made. Observations made from a canopy crane located in the Amazonian rain forest (Surumoni Crane Project, southern Venezuela) are used to illustrate how canopy access may enhance our understanding of canopy birds. Some species are often portrayed as species preferring forest edge habitats, but observations from the crane demonstrated that these rather lethargic and inconspicuous species are more often found in closed canopy than was obvious from ground-based observations. Likewise, canopy observations may change perceptions of the abundance and habitat preferences of canopy birds that are essential for assessing their conservation status. Possible territorial or courtship displays are described as examples of behaviors only visible from above the canopy. Finally, a marked increase in bird activity and movement was noted at the onset of the rainy season, sug-

gesting that many species, especially Tyrannidae flycatchers, may migrate to new foraging grounds. Most of the described observations would have been impossible to make from the ground, but even more traditional canopy access techniques such as rope techniques or canopy towers give only limited access as they do not allow the active pursuit of birds that a mobile crane makes possible. Furthermore, a crane also improves observation of midstorey and even understorey species. Therefore, improved canopy access, and especially the more widespread use of canopy cranes, is essential to understand the ecology and behavior of canopy birds in tropical as well as temperate forests. *Accepted 21 July 2003.*

Key words: Stratification, canopy access, canopy crane, rainforest birds, conservation assessment, migration.

INTRODUCTION

Continuous access to the rainforest canopy has already revolutionized our understanding of the "high frontier" (Moffett 1993), the upper crowns of the forest that until the previous decade had largely been inaccessible to scientists. The last decade saw many rapid advances in canopy access techniques, which enabled canopy scientists to safely and repeatedly access the canopy of various rainforests around the world (Lowman & Wittman 1996, Sutton 2001). Ornithologists have also profited from improved access, and our understanding of the ecology and behavior of rainforest canopy birds has thus improved greatly (Munn & Loiselle 1995, Winkler & Preleuthner 2001). However, we still know so little about rainforest canopy birds that the argument for much more widespread canopy access has to be made. Therefore, I will use my own observations made from a canopy crane located in the Amazonian rain forest to illustrate how canopy access may enhance our understanding of the ecology, behavior and conservation of rainforest canopy birds. To emphasize the importance of canopy access, I will restrict my examples to the most illustrative observations that could not have been made from the ground. These examples are thus solely chosen to illustrate why canopy access is essential to improve our understanding of rainforest canopy birds.

METHODS

Fieldwork was conducted in lowland tropical forests located in the catchment area of the upper Orinoco, near Esmeralda, Estado Amazonas, southern Venezuela (65°32'W, 03°11'N, altitude ~110 m a.s.l.). Esmeralda lies within a patch of lowland grassland and scrub surrounded by lowland and flooded tropical evergreen, river-edge, river island, gallery, palm and second-growth forests (cf. Stotz *et al.* 1996). Esmeralda is located almost at the centre of the Alto Orinoco-Casiquiare Biosphere Reserve (87,000 km^2), which has so far been spared from extensive human disturbance. The only anthropogenic influences are the hunting and the slash-and-burn agriculture of the local native populations (Anhuf & Winkler 1999). Average daily temperatures are around 26°C, relative humidity ranges from 40–100%, and average annual precipitation is around 3000 mm, ranging between 1000–4000 mm annually (Anhuf & Winkler 1999). The dry season usually lasts from December to March, and the rainy season from April to November with two precipitation peaks during May–July and September–October.

I made most observations from the 40-m high canopy crane (Fig. 1) situated approximately 15 km west of Esmeralda, close to the mouth of the Surumoni river (65°40'W, 03°10'N, altitude ~105 m a.s.l.; Anhuf & Winkler 1999). The crane plot is characterized by lowland (*terra firme*) and flooded tropical evergreen forest. The forest canopy is

FIG 1. A view of the Surumoni Crane close to the mouth of the Surumoni river, near Esmeralda, upper Orinoco, Estado Amazonas, southern Venezuela (Courtesy of Dr. Joerg Szarzynski).

between 15–30 m high, and its structure is heterogeneous with small and large gaps. Supplementary observations were made at six other forest sites near Esmeralda that covered a variety of forest habitats (lowland and flooded tropical evergreen, river-edge, gallery and second-growth forests). More details of the study site and the methods are published in Anhuf & Winkler (1999) and Walther (2002a, 2002b). About 15 ornithologists worked on the crane site between 1994 and 2000, usually for periods of several weeks to several months (H. Winkler pers. com.). My own behavioral observations were made during two field seasons (May–June 1998, February–April 1999) between 06:20 and 18:30 from the crane. I was able to use the crane on 6 and 19 days during each field season, respectively (the remainder of days was mostly spent on ground-based observations). The crane was operated by remote control from the cabin (Fig. 2) that can be moved to any point within the 1.5-ha study plot covered by the crane's 40-m jib (Fig. 1) and its 100-long rail track. Because of the great mobility of the crane, birds can be actively pursued. The behavior of birds was not obviously disturbed by the crane's movements since no avoidance behavior was evident even when the cabin was within 10 m of a bird. The overall goal was to establish when and where each species forages in a mature forest with a closed canopy. Any observations made at gap, edge or secondary habitats were therefore excluded, as were any observations not related to foraging (for more details, see Walther 2002a, 2002b). The foraging observations were then used to establish the preferred foraging stratum (ground, understorey, midstorey or canopy) and foraging relative height (dividing the height of the bird by the height of the forest canopy in the

FIG. 2. Ornithologists observing birds in the Surumoni Crane gondola (Courtesy of Dr. T. Hoepker).

immediate vicinity of the bird) of each bird species.

RESULTS

Ecology. Canopy access allows improved assessment of the vertical stratification of rainforest birds. In two studies (Walther 2002a, 2002b), I detailed the vertical strata and movements of 92 rainforest species. All results presented in those studies pertain to forests with a closed canopy. Here, I will point out how some of the results of my two studies differ from published sources on the ecology of these species.

For example, Rasmussen & Collar (2002) write that "few puffbirds are denizens of deep, unbroken forest. Rather, they seem to favour forest edges, tree-fall gaps and other clearings". However, during my 25 crane observation days, I observed White-necked (*Notharchus macrorhynchos*) and Pied (*N. tectus*) puffbirds 20 and 10 times, respectively, but Pied Puffbirds only once from the ground. In the canopy, they usually sit quietly for long periods without moving or calling before darting off to catch insect prey (e.g., butterflies, caterpillars, grasshoppers). Therefore, I would support the suggestion by Rasmussen & Collar (2002) that "because puffbirds are so lethargic, their apparent proclivity for open habitat may be due to the fact that they are easier to observe there than in denser habitats" (see also p. 314 in Hilty & Brown 1986, and p. 449 in Hilty 2003). Another rather inconspicuous species is the Bronzy Jacamar (*Galbula leucogastra*) which is characterized as perching along rainforest edges, especially along rivers at medium heights (Meyer de Schauensee & Phelps 1978, Hilty & Brown 1986, Tobias *et al.* 2002, Hilty 2003). However, one individual, and sometimes pairs or even three individuals, could be seen almost daily from the crane (a total of 20 times, with

TABLE 1. Use of edge and disturbed habitats by 92 bird species observed inside closed mature tropical evergreen forests near Esmeralda, Estado Amazonas, southern Venezuela. Each bird species was assigned a relative height category in closed mature forest: (1) "ground and understorey", (2) "midstory", and (3) "canopy" (see Walther 2002a, 2002b for details). For each species, I then noted whether it was described as living in forest edge habitat and disturbed habitat, respectively, by any of seven bird guides (Meyer de Schauensee & Phelps 1978, Hilty & Brown 1986; Ridgely & Tudor 1989, 1999; Sick 1993, Isler & Isler 1999, Ridgely & Greenfield 2001). Edge habitat included any mention of forest edge or borders while disturbed habitat included any mention of clearings, second-growth forest, or other human-disturbed habitats such as plantations, gardens, or other areas of human habitation.

Relative height category	Observed in edge habitats	Not observed in edge habitats	Observed in disturbed habitats	Not observed in disturbed habitats
Ground & understorey	8	5	8	5
Midstorey	24	8	27	5
Canopy	47	0	43	4

only 5 observations from the ground). They perched on exposed canopy branches from which they would start short sallies to catch insects (e.g., dragonflies).

Traditional ground-based surveys use observations, mist-nets and tape recordings. Ground-based observations and mist-nets are bound to miss many of these inconspicuous canopy species, and recordings may establish their presence but still severely underestimate their abundance if some individuals call irregularly or not at all. Therefore, some canopy species (e.g., puffbirds) may be more abundant in the rainforest canopy than at the rainforest edge, but any visual ground-based census will inevitably be biased towards observations in more open situations. The ultimate test would be a comparison of a ground-based versus a crane-based survey of canopy birds. Although I did not attempt such a systematic comparison, I know that I saw a very different set of birds from the ground versus from the crane.

Of course, the above examples do not extend to more conspicuous species whose ecology is generally well-described in the literature. In fact, when I correlated the mean stratum for the 92 species analysed in Walther (2002a, 2002b) with the average stratum given in seven bird guides (references in Table 1), the two data sets were highly correlated (n = 92 species, $r^2 = 0.72$, $P < 0.0001$). But even the ecology of abundant and conspicuous species may be misrepresented because they are much easier to observe in open situations. For example, the Blue Dacnis (*Dacnis cayana*) is usually portrayed as a bird of forest edges and clearings, second growth woodlands, gallery forests, haciendas and even open fields (Meyer de Schauensee & Phelps 1978, Hilty & Brown 1986, Ridgely & Tudor 1989). Isler & Isler (1999) reiterate these habitat preferences, but add that the species may also be "found in the canopy of ... forest to an uncertain extent". Only recently have authors found the species to be "fairly common to common in the canopy and borders of humid forest, secondary woodland, and in clearings and gardens" (Ridgely & Greenfield 2001) and "a common and widespread resident in canopy" (Hilty 2003). These statements are probably closer to the truth as the Blue Dacnis was the second most abundant tanager in the canopy of the crane plot after the Yellow-backed Tanager (*Hemithraupis flavicollis*) (Walther 2002a, 2002b). Canopy access will thus help to refine the habitat preferences of even well-known and conspicuous species.

Conservation. Abundance is one of the crucial factors to determine conservation priorities. Estimates of abundance may also change with canopy access, and I mention two possible examples here.

Although the Dotted Tanager (*Tangara varia*) is not listed as threatened in BirdLife International (2000), Ridgely & Tudor (1989) list it as a species of conservation concern and state that "it everywhere appears to be very rare; its forest habitat remains little modified over most of its range, and thus its evident rarity is a puzzle". However, the Dotted Tanager was uncommonly, but regularly observed from the Surumoni crane. From 1995 to 1998, the Dotted Tanager was observed more than 10 times from the crane by several ornithologists, but never from the ground (H. Winkler pers. com.). On 20 June 1998, I observed from the crane one Dotted Tanager foraging together with a typical canopy flock consisting of Gilded Barbets (*Capito auratus*), Spot-backed Antwrens (*Herpsilochmus dorsimaculatus*), Spot-winged Antshrikes (*Pygiptila stellaris*), Purple-breasted Cotingas (*Cotinga cotinga*), White-browed Purpletufts (*Iodopleura isabellae*), Green (*Chlorophanes spiza*), Purple (*Cyanerpes caeruleus*) and Short-billed (*C. nitidus*) honeycreepers, Blue Dacnis, Rufous-bellied Euphonias (*Euphonia rufiventris*), Yellow-backed, Palm (*Thraupis palmarum*), Flame-crested (*Tachyphonus cristatus*), and Opal-rumped (*Tangara velia*) tanagers. I suggest that Dotted Tanagers, although not common, would be more often observed (as, for example, in Cohn-Haft *et al.* 1997) if canopy access was more widespread in the Amazon rainforest. From the ground, the Dotted Tanager's presence can be established by its distinctive call, but it is still hard to see because of its coloration. Canopy access may thus change assessments of abundance and conservation status for many canopy species.

On the other hand, canopy access may confirm that a species is indeed rare. Ridgely & Tudor (1989) also list the White-bellied Dacnis (*Dacnis albiventris*) as a species of conservation concern and state that it "seems inexplicably rare across all of its relatively large Amazonian range", and Hilty (2003) simply states that it is rare, poorly known, and possibly overlooked. This species was only observed twice from the crane, once in 1996 (H. Winkler pers. com.) and once on 23 February 1999 when I observed a male foraging together with a canopy flock consisting of Black-capped Becards (*Pachyramphus marginatus*), Gray Elaenias (*Myiopagis caniceps*), Guianan Gnatcatchers (*Polioptila guianensis*), Yellow-backed and Flame-crested tanagers.

Another crucial factor in conservation assessment is habitat preferences. It is a well-known fact that many canopy birds are also foraging outside continuous forest in more open habitats that have environmental conditions similar to those of the canopy (Orians 1969, Terborgh & Weske 1969, Pearson 1971, Greenberg 1981, Winkler & Preleuthner 2001). Canopy birds may therefore be less dependent on undisturbed forest than mid-storey and understorey birds (Cohn-Haft & Sherry 1994). My observations supported this supposition. Of the 92 species observed in undisturbed forest, I only observed 9% of the understorey and midstorey species, but 30% of the canopy species in disturbed habitats near the crane site (Walther 2002b). However, these percentages were certainly underestimates of the use of disturbed habitats since I rarely ventured out to observe birds in disturbed habitats during my study. Therefore, I searched the literature to determine whether the 92 species were described as living in forest edge habitat and disturbed habitat. Only 62% of the ground and understorey species were observed in edge habitat compared with 75% of the midstorey species and 100% of the canopy species (Table 1; $\chi^2 = 17.2$, $P = 0.0002$). Likewise, only 62% of the ground and understorey species were observed in dis-

turbed habitat compared with 84% of the midstorey species and 91% of the canopy species (Table 1; $\chi^2 = 7.1$, $P = 0.03$). These results further corroborate that midstorey and especially understorey species may suffer more from habitat fragmentation than canopy birds, all other things being equal (but see Discussion).

Behavior. Behaviors restricted to the canopy are also very difficult to observe from the ground. For example, from a vantage point overlooking the canopy, Snow (1971, 1982) was able to observe male Pompadour Cotingas (*Xipholena punicea*) perform a ritualized chasing display, where the dominant male flew towards a subordinate male perching on a treetop branch and displaced it repeatedly. No other author, to my knowledge, has described displaying male Pompadour Cotingas except Sick (1993). From the crane, however, I observed a male Pompadour Cotinga on 19 different occasions (between 07:50–12:05 and 17:00–18:30). Although I do not know whether all observations pertain to the same male, the observed male regularly flew from treetop to treetop, usually picking one of the highest branches to perch. While flying, the male was incredibly conspicuous because of its gleaming white underwings while much less conspicuous when perched (cf. description of flight on p. 655 in Hilty 2003). Some of the highest trees around the crane were used as perches, and it seemed as if the male was demarcating its territory with its conspicuous flight display (this behavior would be analogous to the "solitary display" behavior described by Snow 1982). Since the observed male never uttered an audible sound, its behavior must have been almost completely undetectable from the ground.

Another behavior only observable from above the canopy was a spectacular flight display by a Dwarf Tyrant-manakin (*Tyranneutes stolzmanni*). On 8 April 1999, I observed a manakin-like bird in the canopy at about 10–15 m distance. I took the following descriptive notes: short and straight flycatcher-like bill, light yellowish eye, light olive-green crown, back, and wings, head more greyish than rest of body, wings a little more brownish than rest of body, no facial markings, crown stripe or wing bars, lighter whitish below with the chest being lightest and faintly streaked, yellowish belly, short dark grey-olive tail. During flight, it was beating its wings very fast in the manner typical of other manakins. At 09:15 and again at 10:45, the individual took off from a small branch in the top of one of the highest trees in the crane plot and flew about 20–30 m straight up with very fast wing beats, then dive-bombed (in the manner of aggressive hummingbirds) back to the original perch. On the perch, it was continuously flicking its wings very quickly. At 09:15, it repeated this display three times. Kevin Zimmer (pers. com.) also observed one Dwarf Tyrant-manakin performing several such displays near a canopy tower in Para, Brazil, and he observed the Tiny Tyrant-manakin (*Tyranneutes virescens*) performing similar displays near a canopy tower north of Manaus, Brazil. Since all observations of this impressive display behavior of tyrant-manakins were recently made from canopy towers or cranes while no such behavior was reported in earlier accounts of manakin behavior (Davis 1949, 1982; Sick 1959, Snow 1961, 1963; Ridgely & Tudor 1994, K. Zimmer pers. com.), it further underlines the importance of canopy access.

Activity and movements. In 1999, the dry season lasted until the end of March, and the beginning of April saw the onset of the rainy season. During this initial period of much heavier rains, a marked increase in bird activity and movement was evident, especially from the canopy crane. On 5 and 8 April, I saw more individuals and species during my morning observation shift than on any other morning

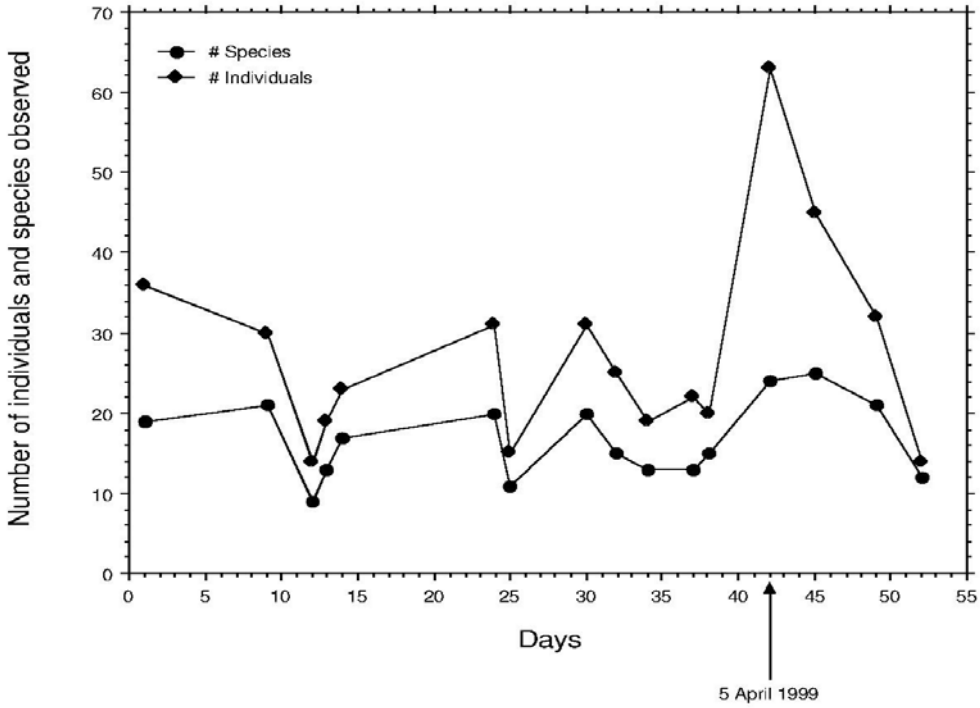

FIG. 3. Number of individuals and species observed from the Surumoni Crane (see text for details). Each point represents the cumulative number of individuals (solid diamonds) and species (solid circles) observed during a 3-h period (08:00–11:00 h) on 16 different observation days in March and April 1999. The 5 April 1999 marked the onset of the rainy season and an activity peak.

shift in 1999 (Fig. 3). Moreover, bird flocks were moving across the crane plot to an extent I had not observed before. For example, on 5 April at 10:00, a flock of at least 30 individuals was moving through the crane plot, containing Gilded Barbets, Streaked Flycatchers (*Myiodynastes maculatus*), a pewee (*Contopus* sp.), Red-eyed Vireos (*Vireo olivaceus*), Blackpoll Warblers (*Dendroica striata*), Short-billed Honeycreepers, Rufous-bellied Euphonias, Flame-crested Tanagers, about 10 Yellow-backed Tanagers and 10 Yellow-rumped (*Cacicus cela*) and one Red-rumped (*C. haemorrhous*) caciques. On 8 April, several more flocks were observed and, on 12 April 1999 at 10:20, two Fork-tailed Flycatchers (*Tyrannus savana*) and one probable White-throated Kingbird (*Tyrannus albogularis*) were "migrating" across the canopy, as they could be seen moving steadily in an easterly direction for more than half a kilometer, occasionally landing on the tops of the highest trees [although I noted all field marks typical for White-throated Kingbird, this observation has to remain "probable" given the ease of confusion with the Tropical Kingbird (*Tyrannus melancholicus*), see Hilty 2003]. These flocks were part of a remarkable increase of flycatchers moving in flocks, with 14 species seen during the 5, 8 and 12 April [*Contopus* sp., Crowned Slaty-flycatcher (*Griseotyrannus aurantiocristatus*), Variegated (*Empidonomus varius*) and Piratic (*Legatus leucophaius*) flycatchers, *Myiarchus* sp., Streaked Flycatcher, Gray and

Forest (*Myiopagis gaimardii*) elaenias, *Tolmomyias* sp., Sulphury Flycatcher (*Tyrannopsis sulphurea*), Yellow-crowned Tyrannulet (*Tyrannulus elatus*), White-throated and Tropical kingbirds, Fork-tailed Flycatcher], suggesting that the onset of rainfall might cause insectivorous species to undertake short- or long-distance migrations, a general phenomenon which has been well-documented in African migratory birds (Jones 1998). The increased bird activity (Fig. 3), the directional movement of flocks, and especially flycatchers, across the crane plot and the observation of three species (*Contopus* sp., Red-rumped Cacique, White-throated Kingbird) only seen once during 6 years of ornithological field work suggest a marked increase in bird activity and movement at the onset of the rainy season.

DISCUSSION

The use of a canopy crane allowed me to make a detailed study of the vertical stratification of rainforest birds (Walther 2002a, 2002b). It further allowed me to observe the habitat preferences and behaviors of canopy species undetectable from the ground (this study). Other bird-related studies that benefited from continuous canopy access are cited in Munn & Loiselle (1995), Lowman & Wittman (1996), and Winkler & Preleuthner (1999, 2001).

Most of my observations would have been impossible to make from the ground, but even more traditional canopy access techniques such as rope techniques or canopy towers can only render a rather limited and biased impression of canopy birds because they are "stuck" in one small locality. After having enjoyed the possibility of actively pursuing birds with a mobile crane, I would contend that, at the moment, no other method of canopy access comes even close in the quality of observation a crane permits. Cranes allow flexible, repeated access to a large area without disturbing the birds, and also allow canopy nets to be installed in places inaccessible for ground-operated canopy nets. Cranes are very safe and probably remain so for decades with proper service. Even though they are quite expensive when compared to low-tech methods of canopy access (Barker 1997, Barker & Sutton 1997), they are very inexpensive when compared to the equipment costs of modern physics or medicine used in their "cutting-edge" research. Cranes have minimal impact on the forest unless they are installed on tracks like the Surumoni crane thus creating a large linear gap. Cranes thus offer a number of distinct advantages over other canopy access methods (see also Parker *et al.* 1992). It thus comes as no surprise that canopy cranes have become much more popular and widespread in the last decade (Stork 1997).

Canopy access will continue to enhance our understanding of the ecology and behavior of rainforest canopy birds, but also of canopy birds of temperate forests (Lowman & Wittman 1996, Shaw & Flick 1999). It will prove especially valuable in the study of lethargic and inconspicuous bird species that are largely overlooked from the ground. However, even the study of highly conspicuous species is greatly enhanced by canopy access, as more detailed studies of their behaviors are possible. For example, it is actually possible to follow bird flocks for quite a while with the crane, thus getting a much better impression of their overall movements that I likened to "surfing" across the canopy (Walther 2002b). Likewise, the apparent migration of flycatchers and other canopy birds at the onset of the rainy season was only possible because the flexible vantage point above the canopy allowed me to follow the flocks visually for more than half a kilometer.

My and other studies suggest that, in general, canopy birds may be less affected by habitat disturbance than midstorey and

understorey birds, and that some canopy species may be more abundant than previously thought. However, certain species of canopy birds, especially large frugivores, are also very sensitive to habitat fragmentation (Willis 1979). Nevertheless, because dispersal through disturbed to undisturbed habitats is crucial to long-term species survival (Laurance & Bierregaard 1997, Hanski 1999), in general, understorey birds still seem to be at larger risk from habitat fragmentation than canopy birds, unless they move through disturbed habitats at night (Daily & Ehrlich 1996).

All my conclusions, of course, are based on insights from a single canopy plot and will need to be re-examined at other sites. For example, the Dotted Tanager may be more abundant than usual only in the vicinity of our crane plot as it "may be fairly common in southern Amazonas judging from the number of specimens" (Hilty 2003, p. 777). However, there may be genuinely rare canopy birds (e.g., White-bellied Dacnis), and our best chance of understanding their rarity will come from canopy studies (or from ultra-light radio transmitters). Canopy cranes may even improve the study of non-canopy species as the cabin may be lowered to the midstorey and even understorey and improve observational opportunities there. For example, nesting studies of midstorey or canopy birds are virtually impossible without cranes. Several nests were observed from the cabin (H. Winkler pers. com.) and, on 23 June 1998, I observed a Double-toothed Kite (*Harpagus bidentatus*) building a nest at about 25-m height in a forking branch inside the canopy. The following year, I observed an adult Spix's Guan (*Penelope jacquacu*) incubating a nest at about 10-m height inside very dense vine tangles surrounding a tree from 13 to 19 March 1999. On 19 March, both adults and one downy young left the nest and escaped on the ground after I had approached the nest with the cabin. Likewise, studies of the vertical stratification of fruit crops are also only possible with the help of a crane (Schaefer *et al.* 2002).

I included several examples of literature bias in published bird guides to demonstrate that the ecology and behavior of canopy birds is incompletely known. In no way was this done to criticize the authors of the guides, but to point out how important canopy access is to more fully understand canopy birds. Having enjoyed the privilege (and it is nothing less than that) of working with a canopy crane, I simply stumbled into descriptions of canopy birds in the literature that did not agree with my own experiences (however limited they may be both spatially and temporally). In this study, I tried to point out some of the most compelling discrepancies which bring me back to the question that I asked myself after reading the above comments made by Rasmussen & Collar (2002): are forest edge birds really canopy birds? The answer is they are both, but so far we have seen them far too often at the edges of their continuous canopy-like habitat.

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