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BIRDS OF SANTA TERESA, ESPÍRITO SANTO, BRAZIL: DO HUMANS ADD OR SUBTRACT SPECIES?

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ABSTRACT

In uplands and lowlands of Santa Teresa, central Espírito Santo State, Brazil, 405 bird species were confirmed by field, museum, and literature studies. Of these, 16 seem to have disappeared, while 67 other species seem to have been lost from the lowlands (where no large biological reserves exist). Due to a suggestion that human areas add species to beta-diversity, we verified that up to 79 species now present have perhaps "invaded" with human activity (and 10 others are likely to invade), a total similar to that for lost species. However, lost species are often rare and invading species often widespread, resulting in exchange of "Picassos for Coca-Cola bottles." Furthermore, gains exceed losses only when large biological reserves are present, as in the uplands (Nova Lombardia, Santa Lúcia Reserves, each with over 250 species). Small or irregular reserves usually lose well over half their species, and these are only partly replaced by the invaders, resulting in net losses of up to half the local avifaunas. If one lists only 31 probable invaders, rather than a possible 79, things are even worse; net losses occur even in the entire township and near reserves, reaching over 200 species around lowland private reserves. Future "productive" development of human areas can eliminate or maltreat many invading species, too. While approving taxes on improductive use of land, as it leaves other areas free, we suggest that many current local "uses," such as for coffee, are "luxury" production and could be taxed.

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KEYWORDS: Atlantic forest, avifaunas, beta-diversity, biodiversity, biogeography, biological reserves, Espírito Santo, luxury tax, productivity.

RESUMO

Nas terras altas e baixas de Santa Teresa, região central do Estado de Espírito Santo, Brasil, 405 espécies de aves foram confirmadas por estudos de campo, museu e de literatura. Destas, 16 parecem ter desaparecido, enquanto outras 67 espécies parecem ter sido perdidas nas baixadas (onde não existem reservas biológicas de grande extensão). Baseado na sugestão de que as áreas humanas adicionam espécies à beta diversidade, nós verificamos que até 79 espécies ora presentes talvez possam ter "invadido" junto com as atividades humanas (e outras 10 provavelmente invadirão), um total semelhante àquele de espécies perdidas. Entretanto, as espécies perdidas são freqüentemente raras e as espécies invasoras são freqüentemente de distribuições amplas, resultando em troca de "Picassos por garrafas de Coca Cola". Ademais, os ganhos excedem as perdas somente quando extensas áreas de reservas biológicas estão disponíveis, como nas terras altas (Reservas de Nova Lombardia e Santa Lúcia, cada uma com mais de 250 espécies). Reservas pequenas ou irregulares geralmente perdem mais que a metade de suas espécies, sendo estas somente parcialmente substituídas pelas invasoras, resultando em uma perda líquida de até metade da avifauna local. Se listarmos somente as 31 espécies provavelmente invasoras, ao invés das 79 possíveis, a situação torna-se ainda pior; a perda líquida ocorre até mesmo em todo o município e áreas próximas às reservas, alcançando mais de 200 espécies em torno das reservas privadas da baixada. Um desenvolvimento futuro "produtivo" de áreas humanas pode também eliminar ou maltratar muitas espécies invasoras. Aprovando-se impostos sobre o uso improdutivo das terras, deixando-se outras áreas livres, nós sugerimos que muitos dos "usos" locais atuais, como as plantações de café, são produções de "luxo" e poderiam ser taxadas.

PALAVRAS-CHAVE: Mata Atlântica, avifaunas, diversidade beta, biodiversidade, biogeografia, reservas biológicas, Espírito Santo, impostos sobre o luxo, produtividade.

INTRODUCTION

The mountains of the region of Santa Teresa reach just over 1000 m in the center of the southeastern Brazilian state of Espírito Santo, just south of the low-

lands of the Rio Doce, between the cities of Colatina and Vitória. Here we register birds of the region, especially of the Biological Reserves of Augusto Ruschi (Nova Lombardia) and Santa Lúcia, based on museum, literature and field records.

With the publication of Forrester (1993) and Parker and Goerck (1997), the number of ornithologists visiting the reserves, and the Biology Museum Prof. Mello Leitão (MBML) in the center of Santa Teresa, has increased greatly. Augusto Ruschi, founder of the MBML, encouraged collection and observations of birds for many years before his death in 1986, and left many publications (1949 *ff.*). However, publications and field records need checking, for ornithologists can err in identifications, or indicate less exact localities than needed today.

One can also ask if biological reserves are needed in Santa Teresa. Ruschi even threatened the governor of Espírito Santo if he tried to take over the reserve of Santa Lúcia for a proposed state plantation of palm-heart palms (*Euterpe edulis*). Many scientists, like Ruschi, find parks and reserves valuable. However, there always seem to be those who would like to plant crops all over. Specifically, Morris (1995), criticizing a book by A. Gore (then vice-president of the U. S. A.) in the important British journal "Nature," claimed that agriculture and cities add "new species" of wildlife. He certainly was not talking about bio-engineered new forms (Cade 1982), but his invading "species" from outside could "add to" local avifaunas, or beta-diversity of cleared plus patchy native habitats. However, Morris seemed to forget that native species can also be lost with human activity. What is the net result of invasions plus losses, the "bottom line," for birds in a well-studied region like Santa Teresa? Here, we estimate gains and losses, at a time when fairly large areas of original forest are still preserved atop the mountain range, but only a few small areas lower down the slopes.

Methods and Study Areas

We studied specimens from Santa Teresa in the MBML, the National Museum of Rio de Janeiro (MNRJ), the Museum of Zoology of the University of São Paulo (MZUSP), and the Federal University of Minas Gerais, in Belo Horizonte (UFMG, Paviotti Collection). We registered information on labels, checked wing molt and reproductive data, and measured certain specimens. In the MNRJ, workers brought us specimens, for we were not allowed direct access to the collection or to ornithological catalogues. At UFMG, we were told that some specimens had disappeared.

With the kind help of B. Forrester, we contacted ornithologists whose lists are included in his book. We accepted unusual records only when detailed information was provided by letter.

Our own field and bird-banding studies began 15-16 December 1974, when we visited Augusto Ruschi, his museum, and the reserves of Santa Lúcia

and Nova Lombardia. In 1989-1997, we visited those and other areas, in visits of several days to weeks. With binoculars (8 x 30 or 9 x 23), voice recordings (Uher, Marantz, Sony DAT), and mist-net captures (mainly of hummingbirds, for a banding and ectoparasite project of Oniki), we censused birds as well as working on other projects (Oniki 1996, Oniki and Willis 1998, 1999, Willis and Oniki 1998).

Here we register information about local species. We use Sick 1997 for names, except a few changed by later authors. In an appendix, we note birds registered by Willis in 10 localities visited: the 4400-ha Augusto Ruschi or Nova Lombardia Reserve (NL, 850-950 m, headquarters 19°55'S and 40°34'W); the 300-ha Santa Lúcia Reserve (SL, 600-850 m, headquarters 1958/4032); the patchy woods of Sítio Rincão do Serafim (RS, 730 m and 1957/4040); the Mello Leitão Museum grounds (ST, 680 m, 1958/4036); a forest patch below Santa Lúcia ("Mata de Luiz Grande," Santa Lúcia Abaixo or SLA, 380-460 m, 2000/4030), a nearby bridge and patchy scrub and croplands on the Timbuí River ("Santa Lúcia Ponte," SLP, 400 m, 1959/4030, just N of SLA and just E of the waterfall of SL); the headquarters and orchards of the Fazenda Vale do Canaã (VC, 430 m, 1955/4037); dry slope woods above the Agrotechnical School of São João do Petrópolis, plus orchards and fields (EA, 150-300 m, 1949/4040); the 100-ha woodlot of Sr. Adílio Colombo in Santa Júlia Abaixo (SJA, 200-300 m, 1939/4041); and the smaller woodlot and nearby river of Sr. Adolfo Neunmerkl in Queiradeus Abaixo (QA, 200-260 m, 1937/4049).

Censuses in these localities were by transect counts, along trails or roads, for the following number of days, January/December: NL, 22/27/18/2/2/0/20/3/4/2/0/7 for a total of 107 days; SL 22/9/7/5/6/4/11/1/10/2/0/13 for a total of 90 days; RS, 3/0/1/1/1/0/5/1/1/1/0/3; ST for 3/6/7/3/2/0/6/1/3/2/0/3; SLA and SLP in Feb (2), March, April, May, July, Oct., and Dec.; VC in March (3); EA on 30/1/1995 and 23/5/1996; SJA in Feb., March (2) and May (2); QA in May (2).

Rainfall is higher in NL (205 days/year, 1566 mm) than in ST (1360 mm and 168 days) or in the lowlands near VC and EA (1009 mm, 130 days/year), according to Ruschi (1979). He notes that, on the east side of the range in Fundão (41 m elevation), there is more rain in fewer days (118 days, 1440 mm), but little rain on the west side of the range (60 days/year, 956 mm), in Alto Caldeirão. The uplands form a sort of cloud forest, with drizzles on many days when it is cloudy on the east or seaward side. The uplands, especially NL, can be quite cool in winter and pleasant in summer, while the lowlands are hot in summer and warm in winter.

Literature Records

Forrester (1993) indicated species for "NL," based on earlier literature and birds listed by him and other visitors. Most visitors listed birds seen outside

the reserve as well as inside. Forrester (*in litt.*) kindly indicated observers for uncertain records, and many responded to our letters. C. de Roever and D. Temple were not located, while A. Ruschi, J. de Roever and T. Parker (Parker and Goerck 1997) had died. We received comments from C. Balchin, G. Dobbs, B. & E. Forrester, N. & D. Gardner, L. Gonzaga, A. Greensmith, J. Hornbuckle, M. Kessler, D. & N. Massie, M. Pearman, R. Schofield, D. Trent, J. Tobias, and B. Whitney. Certain birds, indicated below with the initials of the observer, were not accepted when the observer indicated doubts or we were dubious. Some are species that may occur, perhaps outside the reserve; but one needs detailed information.

Unconfirmed birds are these: *Crypturellus soui* (LG), *Harpagus bidentatus* (JH), *Leucopternis lacernulata* (LG, TP, DS), *Buteo albicaudatus* (SD), *Aramides cajanea* (DS), *Leptotila rufaxilla* (GD, TP), *Brotogeris tirica* (MK), *Amazona amazonica* (BW), *Dromococcyx phasianellus* (JR), *Bubo virginianus* (DG), *Pulsatrix perspicillata* (TP), *Cypseloides fumigatus* (JR, BW), *Chaetura meridionalis* (NG), *Popelairia langsdorffii* (DM, TP), *Chlorestes notatus* (AG), *Amazilia fimbriata* (GD, NG, DS, JT), *Chloroceryle aenea* (JR), *Baryphthengus ruficapillus* (LG), *Pteroglossus aracari* (BF, BW), *Ramphastos dicolorus* (GD), *Piculus chrysochloros* (BF, JR), *Xiphorhynchus guttatus* (NG, RS), *Furnarius leucopus* (GD), *Synallaxis frontalis* (MP), *Anabacerthia amaurotis* (JR), *Syndactyla rufosuperciliata* (TP, RS), *Heliobletus contaminatus* (GD), *Mackenziaena severa* (DT), *Thamnomanes caesius* (BF), *Myrmotherula unicolor* (MK), *Pipra rubrocapilla* (BW), *Schiffornis turdinus* (LG), *Myiarchus tyrannulus* (NG, TP), *Tolmomyias poliocephalus* (JH, BW), *Ramphotrigon megacephala* (TP), *Todirostrum cinereum* (BW), *Hemitriccus margaritaceiventer* (MP), *H. orbitatus* (MP), *Serpophaga nigricans* (GD), *Elaenia parvirostris* (GD, DM), *E. chiriquensis* (BF, BW), *Phyllomyias virescens* (GD, DM), *Ramphocaenus melanurus* (TP), *Basileuterus leucoblepharus* (DI), *Conirostrum speciosum* (DS), *Tachyphonus rufus* (GD, NG, JT), and *Amaurospiza moesta* (JH).

Typographical errors were *Bubo virginianus* (JT), *Lophornis chalybea* (CB), *Tachycineta albiventer* (GD) and *Basileuterus leucoblepharus* (RS). Registers of two *Oryzoborus* in a book of IUCN (1982) are not likely (B. Forrester, *in litt.*)

Ruschi (1979) lists 307 species for NL (*Amazilia versicolor brevirostris* he considered a separate species, but there are many hybrids), but 125 or 41% lack confirmation: *Crypturellus tataupa, Tachybaptus dominicus, Botaurus pinnatus, Cochlearius cochlearius, Dendrocygna autumnalis, Cairina moschata, Amazonetta brasiliensis, Nomonyx dominicus, Elanus leucurus, Harpagus bidentatus, Accipiter superciliosus, A. bicolor, Leucopternis albicollis* (Amazonian bird), *L. lacernulata, Buteogallus urubitinga, Busarellus nigricollis, Parabuteo unicinctus, Morphnus guianensis, Spizaetus ornatus, Micrastur*

mirandollei, Falco sparverius, F. femoralis, Ortalis araucuan, Rallus sanguinolentus, Aramides cajanea, Porzana albicollis, Charadrius semipalmatus, Gallinago (gallinago) paraguaiae, G. undulata, Columba speciosa, Leptotila rufaxilla, Ara severa, Brotogeris tirica, Forpus xanthopterygius, Pionus menstruus, Coccyzus euleri, C. melacoryphus, Crotophaga major, Guira guira, Tyto alba, Otus choliba, Pulsatrix perspicillata, Glaucidium brasilianum, Pseudoscops clamator, Nyctibius grandis, Caprimulgus maculicaudus, C. longirostris, Cypseloides fumigatus, Ramphodon naevius, Phaethornis idaliae, Lophornis chalybea, Popelairia langsdorffii, Discosura longicauda, Chlorestes notatus, Hylocharis cyanus, Polytmus guainumbi, Amazilia fimbriata, Heliothryx aurita, Heliomaster squamosus, Ceryle torquata, Chloroceryle amazona, Baryphthengus ruficapillus, Galbula ruficauda, Malacoptila striata, Pteroglossus aracari, Colaptes campestris, Melanerpes flavifrons, Veniliornis affinis, Campephilus melanoleucus, Xiphorhynchus guttatus, Furnarius figulus, Synallaxis frontalis, Certhiaxis cinnamomea, Thripophaga macroura, Syndactyla rufosuperciliata, Sclerurus caudacutus, Batara cinerea, Mackenziaena severa, Taraba major, Thamnophilus doliatus, Biatas nigropectus, Myrmotherula axillaris, Formicivora grisea, Formicarius colma, Scytalopus speluncae, Pipra rubrocapilla, Machaeropterus regulus, Xolmis cinerea, Knipolegus lophotes, Onychorhynchus coronatus, Tolmomyias poliocephalus, Todirostrum cinereum, Tachycineta albiventer, Hirundo rustica, Riparia riparia, Thryothorus genibarbis, Donacobius atricapillus, Turdus fumigatus, Polioptila lactea, Molothrus bonariensis, Gnorimopsar chopi, Scaphidura oryzivora, Agelaius ruficapillus, Conirostrum speciosum, C. bicolor, Cyanerpes cyaneus, Tangara seledon, T. desmaresti, Euphonia chlorotica, Stephanophorus diadematus, Piranga flava, Nemosia pileata, Thlypopsis sordida, Cissopis leveriana, Passerina brissonii, Sporophila collaris, S. nigricollis, S. lineola, Oryzoborus angolensis, Sicalis flaveola, Coryphospingus pileatus and *Arremon semitorquatus.*

Certain specimen labels have "IBDF" in pencil, but this does not indicate NL; it showed that the taxidermist, E. Lorenzetti, had permission from the Instituto Brasileiro de Desenvolvimento Florestal (IBDF, now IBAMA) to collect, according to taxidermists now at the museum.

Ruschi lists *Glaucis hirsuta hirsuta* and *G. h. abrawayae* from NL; but no recent observer has encountered either form. This bird is common only near large creeks downstream, and evolution of a different subspecies in uplands seems unlikely. The type specimen of *abrawayae*, on loan to the MNRJ, is rather bronze above, not so green; it could be a bird in new plumage (September).

The "species" *Phaethornis nigrirostris*, which Ruschi (1973b) described from NL, seems a variant individual. On loan to MNRJ, the type is a male that looks like *P. eurynome*, although a bit pale below (like a female of *eurynome* in

the same loan). It was ending wing molt in April (the outer primary nearly grown, the next one small, on each wing) and is slightly paler on the center of the lower mandible. The tail is a normal 68 mm, not "62" as Ruschi indicated; the wing is a little short (54 vs. 58), maybe due to molt; the beak is 36 mm, like two males of *eurynome* on loan. It is not a young bird as some have thought, for young *eurynome* already have yellow under the mandible (Oniki, captures). Visitors should remember that yellow is hard to see in the field, and try to capture truly black-billed birds.

Ruschi (1977) registered 299 species for SL (*Syndactyla rufosuperciliata* listed twice, *P. nigrirostris* is not valid, and *A. brevirostris* is a subspecies, so he says "302"). Some 112 species or 37% are not confirmed: *Crypturellus tataupa, Podilymbus podiceps, Dendrocygna bicolor, Nomonyx dominicus, Elanus leucurus* ("tezoura" or "scissors," probably *Elanoides forficatus), Harpagus bidentatus, Accipiter superciliosus, A. striatus, Asturina nitida, Buteogallus urubitinga, Morphnus guianensis, Harpia harpyja, Spizaetus ornatus, Geranospiza caerulescens, Micrastur gilvicollis, Falco rufigularis, F. sparverius, Aramides cajanea, Laterallus melanophaius, Porphyrula martinica, Jacana jacana, Tringa solitaria, Gallinago paraguaiae, G. undulata, Columba speciosa, Claravis godefrida, Ara severa, Brotogeris tirica, Pionus menstruus, Coccyzus melacoryphus, Guira guira, Tyto alba, Pulsatrix koeniswaldiana, Athene cunicularia, Pseudoscops clamator, Nyctibius grandis, Hydropsalis torquata, Macropsalis forcipata, Streptoprocne zonaris, Cypseloides fumigatus, Panyptila cayennensis, Anthracothorax nigricollis, Chrysolampis mosquitus, Popelairia langsdorffii, Discosura longicauda, Chlorestes notatus, Hylocharis sapphirina, Polytmus guainumbi, Amazilia fimbriata, A. lactea, Heliomaster squamosus, Baryphthengus ruficapillus, Colaptes melanochloros, Melanerpes candidus, Celeus flavescens, Picumnus pygmaeus, Xiphorhynchus guttatus, Nasica longirostris (*Amazonian bird; see *Campylorhamphus), Synallaxis frontalis, Certhiaxis cinnamomea, Thripophaga macroura, Syndactyla rufosuperciliata, Taraba major, Thamnophilus doliatus, T. ambiguus, T. ruficapillus, Chamaeza ruficauda, Conopophaga melanops, Merulaxis ater, Scytalopus indigoticus, Laniisoma elegans, Phibalura flavirostris, Pyroderus scutatus, Pipra rubrocapilla, P. pipra, Xolmis cinerea, Tolmomyias flaviventris, Todirostrum cinereum, Rhynchocyclus olivaceus, Arundinicola leucocephala, Satrapa icterophrys, Tyrannus savana, Myiarchus tyrannulus, Onychorhynchus coronatus, Knipolegus lophotes, Platyrinchus platyrhynchos (*Amazon, maybe *leucoryphus*), *Tachycineta albiventer, Riparia riparia, Thryothorus genibarbis, Mimus saturninus, Donacobius atricapillus, Turdus fumigatus, Molothrus bonariensis, Scaphidura oryzivora, Psarocolius decumanus, Gnorimopsar chopi, Leistes superciliaris, Conirostrum speciosum, Cyanerpes cyaneus, Euphonia chlorotica, Piranga flava, Orthogonys chloricterus, Tachyphonus rufus, Nemosia pileata, Cissopis leveriana, Passerina brissonii, Sporophila*

nigricollis, Amaurospiza moesta, Sicalis flaveola, Coryphospingus pileatus, Ammodramus humeralis, and *Volatinia jacarina.*

Ruschi (1977) indicated that all these SL birds were collected, but only 3 species (see "B," below) are labeled from SL Reserve. Most specimens in the collections are marked "Santa Tereza," with no way to verify the specific locality. Some were captive birds. Collectors should always indicate this fact, plus indicate origin of the bird and date when it was captured; but Ruschi was more careful in the 1940's than later, when he hired others to skin his birds.

Ruschi (1965) listed 285 species from "Chácara Anita" or the MBML (he listed a second subspecies of *Turdus albicollis* and of *Pteroglossus aracari*, plus *A. brevirostris*, and indicated "288 species"), with a map of the 8 original hectares. The 3 ha of tall forest at the rear of the area, as well as neighboring forests, have been cleared. Ruschi indicates that *˜Tinamus solitarius* and *Crypturellus obsoletus* disappeared before 1945. In 1968-1969, Ruschi (1969) made another list, without indicating days or hours of study. He indicated that 105 species had disappeared and that 180 still were present. He registered, also, four vagrant hummingbirds (even *Discosura longicauda* of the lowlands) attracted by sugar water. At the time, he still recorded *Ramphodon naevius*, now absent. He also registered *Phaethornis ruber, Popelairia langsdorffii, Chlorestes notatus, Hylocharis sapphirina, Polytmus guainumbi, Heliothryx aurita* and *Amazilia fimbriata,* not registered recently at the feeders; but these are rare as vagrants in the mountains.

Ruschi's lists seem to have been the first to register loss of species with reduction of area of natural habitat, but were not as careful as studies on Barro Colorado Island in Panama (Willis 1974) or in São Paulo (Willis 1979). In fact, many birds Ruschi registered before 1965 or in 1968-69 are not confirmed.

Of 105 species registered before 1965 and not in 1968-69, we found no evidence for 36: *Dendrocygna viduata, Harpagus bidentatus, Accipiter bicolor, A. poliogaster, Asturina nitida, Morphnus guianensis, Spizaetus ornatus, Micrastur gilvicollis, Ortalis araucuan* (except introduced birds), *Aramus guarauna, Aramides cajanea, Gallinago undulata, Sterna superciliaris, Aratinga leucophthalmus, Brotogeris tirica, Amazona aestiva, A. vinacea, Bubo virginianus, Cypseloides fumigatus, Veniliornis spilogaster, Synallaxis albescens, Thripophaga macroura, Sclerurus caudacutus, Taraba major, Thamnophilus torquatus, Tijuca atra, Carpornis melanocephalus, Gubernetes yetapa, Onychorhynchus coronatus, Elaenia spectabilis, Mionectes oleagineus, Anthus lutescens, Scaphidura oryzivora, Basileuterus rivularis, Conirostrum bicolor* and *Passerina brissonii.* Of birds supposedly still present in 1968-69, we found no evidence for 33: *Elanus leucurus* ("tezoura"), *Accipiter superciliosus, Falco peregrinus, Penelope superciliaris, Rallus maculatus, Pluvialis squatarola, Panyptila cayennensis, Phaethornis ruber, Chlorestes notatus, Polytmus guainumbi, Amazilia fimbriata, Discosura longicauda,*

Chloroceryle aenea, Picumnus pygmaeus, Campylorhamphus trochilirostris (falcularius), Synallaxis phryganophila, Thamnophilus doliatus, Myrmorchilus strigilatus, Chamaeza ruficauda, Merulaxis ater, Xolmis cinerea ("viuvinha da mata," perhaps *Colonia colonus*), *Knipolegus nigerrimus, Tyrannus savana, Conopias trivirgata, Philohydor lictor, Hirundo rustica, Riparia riparia, Conirostrum speciosum, Euphonia xanthogaster, Tangara desmaresti, Tachyphonus rufus, Schistochlamys melanopis*, and *Amaurospiza moesta*. Certain other species are not likely at Santa Teresa, being lowland birds.

In fact, we cannot use Ruschi's lists unless the birds have been seen recently or there are specimens marked "Chácara Anita" or "Museu" (see Species List). Certain other specimens marked "Museu" cannot be used because they may have been captive individuals: *Chondrohierax uncinatus, Penelope obscura, P. superciliaris, Crax blumenbachii, Ortalis araucuan, Geotrygon montana, Leptotila verreauxi, Pyrrhura frontalis, Triclaria malachitacea, Rallus nigricans, Ramphastos vitellinus, Icterus jamacaii, Sicalis flaveola, Gnorimopsar chopi,* and *Saltator similis.*

Species List

Tinamus solitarius – Only in large reserves and, even in these, killed by poachers and stray dogs. MBML, 2 specimens, one from 5 years in captivity; male, April, wing molt. Young from Conceição da Barra in Oct., one being from forest with 5 siblings; male incubating 4 eggs, other with 2 young.

Crypturellus obsoletus – Uplands, survives even in small woodlands. MBML, 9 specimens (including male of 400 gms, females of 430-550). MNRJ, 6 (males to 450 gms, female 560; young in molt in Jan. and July).

Crypturellus variegatus – MBML, specimen from "200 m," 500 gms, July 1945. Other, from "Santa Teresa," 1975, could be a captive or from lowlands like the first.

Crypturellus soui – Woodlots in lowlands. The name "sururina" is used for *C. obsoletus* in Santa Lúcia Abaixo.

Crypturellus tataupa – Second growth and low woodlands, slopes and base of mountains. MBML, male of 225 gms from 710 m, July 1941; other may be a captive, with damaged beak and head.

Crypturellus parvirostris – Invader of bushy pastures at base of serra. Register in NL (Forrester 1993) perhaps was of *C. tataupa*.

Rhynchotus rufescens – Invader of bushy pastures on slopes and base of serra.

Podilymbus podiceps – MBML, specimen from Valley of S. Pedro, Jan. 1955.

Tachybaptus dominicus – MBML, male (150 gms, at brickpond); 4 mounted specimens, 3 from 212 m. MNRJ, 8 from lake of Fazenda Pagani, 200 m, including female with small young (8 gms) 17 Jan. 1941 and male with 2 young (8 and 10.5) the following day; adults 115-190 gms.

Ardea alba – MBML, specimen (330 m, Patrimônio de Santo Antônio, April 1942). Mounted bird from "Rio Perdido."

Egretta thula – Visitor in lowland marsh-pond, May.

Butorides striatus – Small rivers and marshes. MBML, 4 specimens (one of "250" gms); many young from Linhares in Feb.-April. MNRJ, 3 of 175-188 gms, including young male Feb.; female of 26 Jan. 1941 "on nest with young." MZUSP, one specimen.

Tigrisoma lineatum – Habitat of *B. striatus*, including just above SL and at entrance marsh of NL (G. Dobbs *et al., in litt.*; Forrester 1993). MBML, immature 900 gms, Nov. 1961.

Cochlearius cochlearius – MBML, 2 specimens, one from "Penha, Rio Timbuí" just above SL in Aug. 1955, other "Santa Teresa" in March 1949. MNRJ, specimen April 1940, SL, in molt, 660 gms.

Ixobrychus exilis – MBML, female of Nov. 1984, "Museu," perhaps captive.

Amazonetta brasiliensis – Pair flying up Timbuí above SL, 11 Feb. 1995. Common at base of serra. MBML, mounted male (250 m, 420 gms).

Dendrocygna autumnalis – MBML, female June 1971; perhaps a lowland species.

Nomonyx dominicus – MBML, female (480 gms, insects in stomach, 312 m, Feb. 1942). MNRJ, male 450 gms, seeds in stomach, lake Faz. Pagani (220 m) Jan. 1941.

Sarcoramphus papa – In NL, soaring high over Jan. (2), Feb. (1) and March (1). Over Vale do Canaã (Ruschi 1980). In lowlands northward, soars over open zones and registered even over small woodlots.

Coragyps atratus – Invader of open zones, soaring even over large reserves. MBML, 4 specimens, one 1600 and other 1800 gms.

Cathartes aura – Over forests or open zones. MBML, 2 females of 1350 and 1500 gms.

Cathartes burrovianus – Lowlands (SJA), with records in Forrester (1993) referring to lowland birds when we checked, except a possible observation by J. Tobias (*in litt.*) from NL.

Leptodon cayanensis – Forests, borders, and tall second growth, less common than in dryer zones. MBML, 4 specimens include a young male of 600 gms (Feb. 1973, larva Lepidoptera in stomach) and female of 700 gms (frog in stomach). Another female has plumage "mimetic" with *Spizastur melanoleucus*.

Chondrohierax uncinatus – Vagrant from lowlands, 28 Sept. 1993, in NL (D. Massie, *in litt.*; Forrester 1993). MBML, young male Dec. 1984.

Elanoides forficatus – Summer visitor, soaring over reserves and nearby, 8 Sept. to 7 March (1994-5). Young left a nest in Goiapaba-Açu near NL, Feb. 1995 (Sr. José). MBML, male 480 gms, insects in stomach. MNRJ, male 440 gms. Ruschi used "*Elanus leucurus*" for the "tezoura," several times.

Harpagus diodon – Summer visitor, reserves and nearby, 8 Oct. (specimen) or 21 Oct. (1996) to 24 March (1995). Once MBML, 19 Feb. 1997, hunting near hummingbird feeders, seen well. MBML, male 200 gms and young male in molt above, Jan. MNRJ, female 245 gms, Feb., insects in stomach.

Ictinia plumbea – Summer visitor, borders or nearby, Dec-24 Jan., mainly Goiapaba-Açu at east edge NL, much less common than in lowland forest of Sooretama. MBML, Jan. 1941 and 1942, 3 specimens include male 340 gms and young of 410.

Geranospiza caerulescens – Probably vagrant from lowlands, high in trees of NL road fork, 11 Feb. 1995. MBML, mounted female 550 gms, Oct. 1941.

Accipiter striatus – Highland forests and edges. Songs as soared over RS early 14 July 1994. At dawn, NL headquarters, 13 July 1997, circling high in sky, with short dives; entered in forest and appeared with large female following. MBML, female 200 gms, birds in stomach, at nest in palm tree 9 Dec. 1941. Other female, 255 gms, insects in stomach. Young male attacking humming-

birds at feeders, collected 7 April 1959. One other specimen, plus a female in MNRJ and a male in MZUSP.

Leucopternis lacernulata – Usually a lowland species, vagrant (?) in highlands. 840 m at border of SL, 4 Jan. 1996 (Willis, M. Berres), seen well. Registers in Forrester (1993) not confirmed. MBML, female Oct. 1962.

Leucopternis polionota – Upland species, often confused with preceding, less common recently. Pair building stick nest high in tree on slope across river from lab of SL, 11 July 1993. MBML, female 1000 gms, June 1941, bird in stomach.

Buteo albicaudatus – Invader, bushy pastures, soaring; perhaps present on rocky open zones before humans. MBML, young bird March 1948 plus one other.

Buteo albonotatus – Soaring over on slopes, perhaps vagrant, SLA 30 Dec. 1995 (Willis, A. Z. Antunes, S. S. Santos). May (SJA).

Buteo brachyurus – Invader of borders, soaring to dive on birds of treetops or edges.

Rupornis magnirostris – Invader, edges, perhaps present in small numbers at natural edges before humans. MBML, 10 specimens, two of 300 gms; small snakes or lizard (*Mabuya* sp.) in stomachs. MNRJ, two of up to 360 gms.

Harpia harpyja – Vagrant (Forrester 1993), seen well at road fork in NL, 29 June 1990 (N. & D. Gardner, *in litt.*). MBML, specimen Aug. 1944, captive to 1945; other mounted, male not quite adult, 710 m on Rio Bonito just S of city.

Spizastur melanoleucus – Soaring over reserves or edges; in NL, peeping and soaring in April and Aug., where slopes provide upcurrents of air.

Spizaetus tyrannus – Reserves, at times soaring over small woodlots or even (19 Feb. 1997) over MBML. Mounted young, Jan. 1942, MBML. MNRJ, male ending wing molt 29 April 1940.

Spizaetus ornatus – MBML, mounted male June 1949, perhaps from lowlands where should have occurred in the past.

Caracara plancus – Invader of open zones, at times flying over forests along the Timbuí or elsewhere.

Milvago chimachima – Invader of open zones, more common than *C. plancus* in the serras. MBML, one plus a young male, 350 gms, "Chácara Anita," insects in stomach, Sept. 1942. MNRJ, 330 gms; insects, botfly and tick in stomach. Linhares, young Feb.-May; Conceição da Barra, Nov.

Herpetotheres cachinnans – Borders, perhaps vagrant or invader in serras. MBML, 2 specimens.

Micrastur ruficollis – Forest understory, once diving low across clearing of orchard in SL and surprising Willis and G. Bencke. MBML, female 130 gms, male 150, birds in stomachs, the latter from "Chácara Anita;" plus one other. One in MZUSP. In lowlands, only *M. gilvicollis* in MBML, but Willis found *M. ruficollis* following ant swarm in Sooretama.

Micrastur semitorquatus – Forest understory. Elsewhere, visits small woodlots without nesting.

Falco rufigularis – Invader of forest borders, likely present before humans along large lowland rivers. One frequently visited a tall snag of MBML, at times flying 60 km/hr low along the main street of Santa Teresa after House Sparrows or the like. MBML, mounted male 110 gms, 750 m.

Falco femoralis – Vagrant or invader of lowland pastures, over cleared zones between RS and ST 14 Dec. 1993; SLP, 21 May 1996. Register in Forrester (1993) likely of bird on BR-101 highway, in lowlands.

Falco sparverius – Invader pastures, even near NL (all in Forrester 1993 were outside the reserve, *in litt.*). MBML, male 100 gms, crickets in stomach, female 102, insect and bird in stomach; other a young bird, Jan. 1962. MNRJ, 7 specimens 79-120 gms, with spiders, cricket, roaches in stomachs; two Dec. "males" in female plumage.

Pipile jacutinga – MBML, female 1971; forest or river-edge bird, likely extinct in state.

Penelope obscura – A pair low in small woodlot of RS seemed this species (Willis, G. Bencke). MBML, one of 1450 gms (captive?, "Museu") and another.

Penelope superciliaris – Not seen well in field. Many specimens from lowlands in MBML, one of 910 gms from "S. Tereza," Dec. 1984 and other mounted, 800 gms and "700 m." MNRJ, one 730 gms, one in molt in Feb., and one other.

Sight records in NL by B. Forrester, J. Hornbuckle, T. Parker & J. de Roever (in Forrester 1993) could have been *P. obscura*. A recent MBML *Crax blumenbachii* is probably a captive, as are 2 *Ortalis araucuan* (bird introduced and still present on MBML grounds).

Odontophorus capueira – Large forest reserves, on ground, where disappearing with poachers and stray dogs; more common in large reserves of Linhares, in lowlands. MBML, 7 specimens, one from city 316 gms, Sept. 1995, maybe thrown there by hunter. MNRJ, pair July 1940, both 330 gms. MZUSP, female from S. J. Petrópolis (C. Lako).

Rallus nigricans – Common, marshes entering in reserves. MBML, 11 specimens, including 2 black chicks 10-11 gms, 3 Feb. 1942, belly and wings rusty, "2 days old." Males 100-160 gms ("250" for one), females 138-175. The heaviest female had nest with 3 eggs on 31 Oct. 1940. MNRJ, 2 specimens, one young male 28/3/1940 in complete wing molt, like a duck. *Amaurolimnas concolor* of the lowlands could occur, being registered from Ibiraçu (MZUSP). L. P. Gonzaga (*pers. comm.*) registered reply to a playback of this at NL road fork, but *R. nigricans* could respond.

Aramides saracura – Common along Rio Timbuí in SL, less so in other areas. MBML one female, other 410 gms MNRJ, other MZUSP. Registers of *A. cajanea* (Ruschi, Forrester) not confirmed, but could occur lowlands; specimen Ibiraçu (MZUSP).

Porzana albicollis – Wide grassy marshes where Valsugana Creek enters the Timbuí, just above SL, as well as in the reserve. In 1996, owners destroyed the Valsugana marsh. MBML, female of 30 gms "dead in captivity" and a male from "S. Pedro Valley." MNRJ, pair of 79-93 gms and chick of 7 gms, 22 Jan. 1941 (the labels mention 2 young). MZUSP, one male.

Laterallus melanophaius – Valsugana marsh, now destroyed; Parker & Goerck (1997) registered one at NL marsh. MBML, male 50 gms and one other, plus 4 mounted, including female and 2 chicks, 28 April 1941. MNRJ, 5 (50-62 gms, including female 23 Dec. 1940 "in marsh with 5 chicks").

Laterallus viridis – 21 Oct. 1996, singing and seen well in brushy abandoned orange grove near SLA woods; invader; second growth of slopes and lowlands.

Gallinula chloropus – Marshes near rice fields, lowlands. MBML, pair 380 m, both 250 gms. Mounted specimen "S. Pedro," just W of city, 2 April 1969, perhaps vagrant.

Porphyrula martinica – MBML, male "140" gms and 270 m, other 260 gms and 380 m, and mounted female 200 gms and 312 m, all 1942. MNRJ, two of 250 gms, male from 240 m and female 700 m, rice and sand in stomachs. MBML, young from Linhares, Feb. and May, indicating species of lowland marshes.

Cariama cristata – Invader in pastures of lowlands. MBML, "Pasture of Dr. Attorino" June 1949.

Jacana jacana – Marshes, lowlands. MBML, 3 females 160-210 gms, male 92 and young male May, 220-350 m; a female in wing molt in May. Additional mounted birds are a young male 700 m in Jan. and one adult male. MNRJ, male 69 gms and one other. Young from Linhares, March-May, Aug. and Oct., in MBML.

Vanellus chilensis – Invader of pastures and plowed fields, especially on the Timbuí between SL and ST; more common lowlands. MBML, one skin plus female 190 gms.

Gallinago paraguaiae – MBML, females 120 and 134 gms, 800 m, the last 4 Nov. 1940 on nest with 2 eggs. Chick 13 Dec. 1962; male 105 gms and 380 m, May 1942. MNRJ, female 125 gms. Marsh bird.

Tringa solitaria – Lowland marsh by rice, 12 Feb. 1995. MBML, female 47 gms and 674 m, 27 Sept. 1941. Migrant from Arctic, small water areas.

Columba cayennensis – Invader, sleeping in tall second growth near Valsugana Creek but not seen there during day.

Columba picazuro – Invader of cleared zones lowlands, May 1996. MBML, male Nov. 1972.

Columba plumbea – Canopy and edges uplands, flying high over open areas but not staying in small woodlots; dark plumage to warm up in sun early morning. MBML, one plus male of 320 gms. MNRJ, female 250 gms.

Columbina picui – Invader of back yards in lowlands.

Columbina minuta – MBML, pair July 1964 and male ("female," but getting blue crown) Jan. 1976. See *Tolmomyias flaviventris* for doubts about 1976 bird. Wing as in *C. talpacoti*. Lowland bird, perhaps invader even there.

Columbina talpacoti – Invader of cleared areas, even into large reserves. MBML, 20 specimens from "museum" 38-52 gms, 17 from April 1984, some cases of

sex incorrect; one female ending wing molt. Adults, not young, have the rear vane of the 4th primary from outside abruptly narrowed near the tip. Two are young males, two young females; another young male already has the adult 4th primary; a young female, Aug. has young 4th primary; an Oct. female was with nest even with primary 5 in molt. MNRJ, 3 skins 36-50 gms.

Scardafella squammata – Invader of lowland back yards; singing MBML 22 Feb. 1997 (vagrant?)

Claravis pretiosa – Possible invader of borders, normally in dryer woodlands, Dec.-March 25 (1995). MBML, male Dec. 1961.

Claravis godefrida – Upland forest bird, bamboo zones. No recent records. MBML, male 85 gms and 780 m, in "carurú" 31 Jan. 1943.

Leptotila verreauxi – Native edges lowlands, perhaps invader edges uplands though may have frequented edges of rocky areas. MBML, one from "museum," female 112 gms, males 143 and 178, young male 13 Aug. 1943 (yellowish chest, 129 gms). MNRJ, one in wing molt Dec., other female 180 gms, plus third bird. Male and female have a narrow-tipped outer primary.

Leptotila rufaxilla – Forests and orchards along the Timbuí, even in MBML; never far from water. Registers in NL in Forrester (1993) not confirmed. MBML, male 233 gms. Oct. 1989 and, bird that hit a window Dec. 1994, both "Museum." Petrópolis female, MZUSP (C. Lako).

Geotrygon montana – Upland forests, at times on roads. Once 11 July 1994, SL, but other records 5 Sept. 1994 (SL) to 6 April 1994 (NL). MBML, 4 skins (2 from "museum," Sept.-Oct. 1984; males 128–200 gms, female 137). MNRJ, 3 skins (male 25 Aug. 1940; young female in molt, 100 gms, 10 March 1940).

Propyrrhura maracana – Canopy of lowland woodlots, flying high over open zones.

(*Ara chloroptera*) – Likely extinct, formerly in lowlands and rare or absent uplands. A specimen from "Santa Teresa" 10 June 1975 is noted by Ruschi (1976: 170) as captured 1939 and died in MBML "4/7/75." He says he introduced two pairs from "Bahia" in Sooretama in 1972. MZUSP specimen, Rio S. José in lowlands near Linhares.

Diopsittaca nobilis – MBML, female 175 gms from "forest" at "900 m," molt ending on wing; perhaps vagrant.

Pyrrhura frontalis – Upland forests, noisy groups, at times flying to isolated woodlots but not staying. MBML, 8 skins 75-85 gms (weights 50-68 gms perhaps captives); MNRJ, 5 of 75 gms.

(*Pyrrhura leucotis*) – Lowland species. MBML, specimen "S. Teresa" 2 Sept. 1977, perhaps captive bird. On 3 Sept. 1977 the lowland *Turdus fumigatus* was collected, suggesting labeling errors.

Forpus xanthopterygius – Invader of borders and bushy areas even inside SL reserve, not noted above 650 m. MBML, 13 specimens, 27-31 gms except young of 17 on 6 April 1942; young female 12 March. MNRJ, 6 specimens include young male of 24.5 gms, 17 April, and a Sept. male ending wing molt.

Touit surda – Highland forest canopy and scrub of rocky zones, pairs to small groups; flying over, a weak "tuim" of two syllables. MBML, 3 skins, July and August, 1941 and 1962; one female, 75 gms.

Touit melanonota – Highlands flying over in groups, at times large ones; borders in *Clusia* fruit with begging young 20-21 March 1995 on trail up SL ridge; Loranthaceae in eucalyptus at lab 22 July 1995. Call a "teeleelee" rather like "teelee" of *Pionopsitta*. Bare eye area bright orange, adults.

Pionopsitta pileata – Flying over highlands, pairs or small groups; hard to see in canopy. Even though flies over open areas, rare far from NL, even in SL. MBML, 3 specimens. MNRJ, 3 of 102-130" gms.

Pionus maximiliani – Canopy uplands, pairs or small groups, mostly reserve of NL though flies over open zones. In ST, last record Sept. 1989. UFMG, one specimen.

Amazona rhodocorytha – Over forest or open areas early and late in the day, noisy pairs or groups to 20 birds, even lowlands. Forrester (1993) suggested seasonal migrations up the serra; we have records Dec.-July. MBML, 5 skins, with 2 marked "forest;" males 485 and 600 gms; wing molt one in April. MNRJ, one female with pinioned left wing. A specimen of *A. vinacea* could be a captive. "*A. amazonica*" in Forrester (1993) could have been *rhodocorytha* (B. Whitney, *in litt.*).

Triclaria malachitacea – Isolated pairs in understory of forest reserves; reported to raid bananas near forest. Loud series of "tic" notes fleeing, song thrushlike "teerychee, peerylo" or the like early and late in day. MBML, 5 skins,

perhaps captives; male 120 gms, wing molt in Jan. Two females have red feathers on foreheads.

Coccyzus americanus – MBML, 15 Feb. 1965 and 9 March 1961, both in wing and tail molt. Migrant from North America.

Piaya cayana – Woodlands and borders, less common in wet upland forests. MBML, 5 specimens, 3 from Feb.-March in wing or tail molt; one of 120 gms with fruit and insects in stomach. MNRJ, 3 males 95-120 gms, in molt June (2) and July.

Crotophaga ani – Invader in bushy pastures, even along SL river or low second growth of former clearings in NL. MBML, 4 specimens, one being male 90 gms. MNRJ, 3 males, 95-120 gms, in molt June (2) and July.

Crotophaga major – Lowland river edge (QA). MBML, one 5 Oct. 1942 from "Chácara Anita," maybe vagrant.

Guira guira – Invader of open pastures, once near NL (J. Tobias, *in litt.*). MBML, 4 (wing or tail molt in Jan., April). MNRJ, 6 (molt May, June (3), 130-170 gms).

Tapera naevia – Invader of bushy pastures and marsh edges, rare along SL river and NL abandoned clearings. Registers of *C. ani, G. guira* and *T. naevia* in Forrester (1993) all were outside the NL reserve (various ornithologists, *in litt.*). MZUSP, one specimen.

Tyto alba – Invader, towns and open fields. MBML, two adults, one a mounted female (with "5" young) and 4 young from 240 m, Barra do Rio Perdido, 11-16 June 1941. MNRJ, male 320 gms from tall second growth, 700 m.

Otus atricapillus – Secondary woods of SL, forest overlook, diving past Willis when he imitated a single-note call 3 May 1990. More common in large lowland forests of Linhares.

Otus choliba – Probably invader at upland edges, as lab of SL, though could have been native at edges of rocky zones or rivers, notably in lowlands. MBML, 7 specimens of brown and red phases; females 106 and 126 gms. MNRJ, female 140 gms. UFMG, male ending wing molt in March. Observers in Forrester (1993) do not remember exact localities.

Pulsatrix koeniswaldiana – Woodlots at base and up the serra. Nest in hollow tree at Vale do Canaã, young raised in captivity and photographed by Japanese

visitor (Vera Coccheto, pers. comm.). Seen well in NL (J. Tobias, *in litt.*, Forrester 1993). MBML, 9 specimens, plus others from Linhares; young male 7 Jan. 1986, Tabocas; one female 352 gms, ending wing molt in March, from "football field." MNRJ, young female 550 gms, 8 Jan. 1941, from 800 m. MZUSP, one from S. Lourenço. UFMG, one male. "*P. perspicillata*" of various ornithologists (in Forrester 1993) not confirmed. In MZUSP, there is a specimen of *P. p. pulsatrix*, a rusty form restricted to coastal southeastern Brazil, from Rio S. José near Linhares. In Itabuna and interior Bahia or São Paulo, the normal dark form occurs. Both have toes covered with feathers, unlike *P. koeniswaldiana*.

Ciccaba huhula – Forests and edges NL, often over the road near the guards' house at entrance, 10-20 m up (as noted N. & D. Gardner, in Forrester 1993). MBML, female 470 gms, insects in stomach; specimen Linhares.

Ciccaba virgata – Upland forests, sleeping near ground daytime (Willis and T. de Melo). MBML, one young female with some down on neck and chest, 7 March 1961, and one bird in "bamboo" with caterpillar in stomach, July.

Athene cunicularia – Invader pastures, often on roads leading to NL (explaining records in Forrester 1993) or SL but not in the reserves themselves. MBML, 5 skins, including male 153 gms with insects in stomach and a Feb. bird in molt. UFMG, one specimen.

Glaucidium brasilianum – Invader or vagrant, 5-20 m up in second growth and woodlots in highlands. Lower down, likely native as regular near Linhares. MBML, two red-phase birds, one male "132" (72?) gms. MNRJ, 3 (72-77 gms, two red phase). Register of Parker and Goerck (1997) for NL not really confirmed, though likely to occur at border.

Glaucidium minutissimum – Regular in upland forests and ones at Linhares, disappearing from borders and woodlots where *G. brasilianum* takes its place; can sing in daytime ("too-too" or "too-too-too").

Nyctibius aethereus – Sallying subcanopy at night; lower down on snags by day; only in large forests. MBML, 3 specimens, one female 340 gms with "sepia iris."

Nyctibius griseus – One SL, perhaps invader or vagrant.

Nyctibius grandis – MBML, male 700 gms, Oct. 1945 on Rio Quinze de Agosto, 400 m; "iris black, Coleoptera in stomach." Borders and forests, lowlands.

Lurocalis semitorquatus – Flying at dawn and dusk, 10-30 m up at borders woods or forests; probably at river and rocky edges before humans. Summer, 12 Oct. (1996) to 25 April (1996).

Chordeiles minor – Silent, two flying high over low second-growth at NL road fork, at dusk 28 Dec. 1995 (Willis & A. Antunes). C. Balchin (*in litt.*) registered "*C. acutipennis*" (a restinga bird in Espírito Santo) 26 Dec. (Forrester 1993). Nests North America and reaches Brazil in northern winter.

Podager nacunda – MBML, male 200 gms, 2 Jan. 1942, "flying by day." Vagrant, open zones.

Caprimulgus rufus – MBML, female 60 gms from "Museu" 28 Aug. 1984, vagrant or winter visitor. A bird of dry woodlands, not of humid serras.

Nyctidromus albicollis – Regular lowlands, invader along roads or second growth in humid uplands. Regular at entry of SL, rare NL, all year long but rarely singing. MBML, 3 males, one 65 gms. MNRJ, 3 males 67-75 gms, one in March in wing molt and other in Dec. changing wing band from buff to white. UFMG, male.

Nyctiphrynus ocellatus – Second growth near rocky zones or road fork of NL. Sings all year long, often high in tree. MBML, 4 females Oct.-Nov., one 40 gms. MNRJ, two males 36-40 gms.

Hydropsalis torquata – Invader of edges, eucalyptus, being a cerrado bird. In winter and Oct., even at the road fork in NL. MBML, 2 females Nov.-Dec., the second 43 gms, plus 2 nestlings from 620 m (20 Dec. 1941) and a small young. UFMG, male and female.

Streptoprocne zonaris – 30 above VC, 4 March 1995. Other records (including ones in Forrester 1993) could refer to the next species. MBML, one captive young Jan. and 6 birds June 1975.

Streptoprocne biscutata – In summer drought, early 1995, large groups over serra. Even with brown head, whitish on the forehead and forward edge of the wing, hard to identify high overhead. In highlands more on sunny days, lowlands on rainy ones. MBML, one specimen. *Cypseloides fumigatus* record (Forrester 1993) possible, but not well seen (B. Whitney, *in litt.*).

Chaetura meridionalis – Once SJA. Summer bird of lowland cities and forests. N. & D. Gardner (*in litt.*) could not confirm their possible highland records

(Forrester 1993). In dry forests of Pedra Azul, MG, we found the species even at 900 m, so humidity could be the problem in Santa Teresa.

Chaetura cinereiventris – Common over forests, not woodlots.

Ramphodon naevius – Common SL, in NL only at feeders at Goiapaba-Açu, barely outside the reserve. Nest with eggs, late Dec., SL (Ruschi 1949f). Three paratypes (new subspecies *R. n. freitasi* Ruschi 1978) plus birds from Chaves and S. Leopoldina 540 m, near SL, 7.8-9.5 gms, all on loan to MNRJ from MBML.

Glaucis hirsuta – Regular in riverside understories of RS, ST, SL and SLA. As indicated above, separate population in NL not likely. As indicated by J. F. Pacheco (*in litt.*), Ruschi tried to protect forest areas by describing new forms. MBML, young male March, 2 others, 2 from *Inga* in Patrimônio de Santo Antônio (Oct.) and 2 from S. João de Petrópolis (one a young Dec. male); 6.3-7 gms. MNRJ, two birds, one from "Chácara Anita," 6.2 and 7.6 gms. Other male, plus type of *abrawayae*, 7 gms, on loan from MBML to MNRJ. Nest with 2 eggs, Petrópolis, 16 Sept. 1940 (Ruschi 1949d). Construction in Oct. (Ruschi 1973c) and Sept. (Ruschi 1949f). Nest in SL (idem).

Phaethornis superciliosus – Vagrant captured at MBML feeders, 22 Feb. 1990, 6.1 gms (Oniki, Willis). Described as *P. margarettae* from northeastern lowlands (Ruschi 1972) in almost frustrated attempt to save a part of forests of Fazenda Klabin. 1500 ha were preserved as the Biological Reserve of Córrego Grande, but nearly all burned in 1986; we did not find the species there in brief visits. In Alagoas in 1989, Willis found an active lek in serras of Muricí, of related subspecies *camargoi*. A specimen from S. Teresa (on loan from MBML to MNRJ) is very pale, perhaps an Amazonian bird that died in captivity.

Phaethornis eurynome – Common upland reserves, less so nearby woodlots. MBML, 8 specimens. MNRJ, 3 of 4.7-5.5 gms, this ending molt in Jan. "*P. nigrirostris*," 5 gms (see above). Rare now at ST. Nest, Valley S. Lourenço, April (Ruschi 1949f).

Phaethornis squalidus – Less common, visits *Malvaviscus* sp. and *Grevillea nana* outside forest. Flight call different from "steep" of *eurynome*. Rare at feeders. Nest, with eggs Jan., SL, other March, NL (Ruschi 1949f).

Phaethornis pretrei – Invader, at least in uplands, singing in low second growth, SLP, and visiting edge sites rather than forests. MBML, 10 specimens (young in captivity Dec., Jan. and March; other Jan.); male in wing molt April. Nest, young hatching in Feb. (Ruschi 1949, 1950); nest March, 250 m on Rio Perdido;

other nest March and another with eggs April (Ruschi 1949f). Eggs in 3 nests Jan., 2 in Feb., 2 in April (Ruschi 1950).

Phaethornis idaliae – Lowland bird, possible vagrant 28 Sept. 1993 at MBML feeders (D. Massie, *in litt.*, Forrester 1993). MBML, 16 specimens 1.75-2.6 gms, from 300 m in Patrimônio and 2 from 220 m in Petrópolis. Of 8 others marked "Santa Teresa," one has an original label of "160 m," another of "220 m," and a third died after 10 months in captivity. Of the birds from Patrimônio, 3 were in *Inga* and one in red Convolvulaceae. One male is molting to or from dark-throated form. MNRJ, two 2.1-2.4 gms from Malvaceae flowers, 160 m; two on loan from MBML, from Petrópolis, 2 and 2.4 gms. Ruschi (1949b), visiting *Lantana camara* and *Heliconia* sp. in Patrimônio. Female and nest from there, Oct. (Ruschi 1949f).

Eupetomena macroura – Invader, attacks others at feeders or *Malvaviscus* at borders; more a species of lowlands and less humid regions, where possibly native. MBML, 27 specimens, 7-11 gms, wing molt Jan.-April (*Inga* and *Erythrina* flowers or in "genipapeiro." Nest, eggs and female Petrópolis, Jan. (Ruschi 1949f). Ruschi (1981b) measured specimens; in general, Willis had similar results in 1995. However, in 4 cases where the tail was in molt, Ruschi's measurements are too large (birds no. 7, 9, 16 and 19).

Florisuga mellivora – Vagrant 27-29 March 1994 (and earlier, according to MBML workers), photographed, at ST feeders. Amazonian species, released by someone or flew over the wide cerrado.

Melanotrochilus fuscus – Abundant at upland borders and in the canopy, rare in winter (except July 1994); few Oct. 1996. Less common in NL, especially July, perhaps descends the serra in winter. However, rare in lowland areas of ES and BA. Like many other species, almost disappeared from RS when caretaker stopped cleaning feeders, indicating that Ruschi (1967) and others were correct in worrying that *Candida* fungus attacks tongues and kills hummingbirds at feeders that are not cleaned daily (with change of sugar water). A cat from house of the caretaker at SL killed 2 in our net in Jan. 1996, indicating that introduced predators are dangerous. MBML, 41 specimens (young Feb.-May, wing molt Aug.-Sept.; 6-9 gms; flowers of orange, *Inga*, eucalyptus). MNRJ, 4 specimens. Ruschi (1981c), measuring wings, generally corresponded to Willis study; but for no. 43 and 74, with short wings due to molt, Ruschi raised the measurements 3-5 mm. Bird no. 54, raised in captivity, has small measurements but origin was not indicated. No. 75, a young bird, has too long a tail in Ruschi. Tail measurements of 50 mm or more are perhaps typographical errors in Ruschi, as different from Willis' check of the same specimens.

Colibri serrirostris – Invader of bushy pastures and at feeders, from dry interior, rarely to SL feeders; reports from "NL" (Forrester 1993) are all from MBML (various ornithologists, *in litt.*). Perhaps it was native on rocky "montane campo" patches, however. MBML, 13 specimens (one, Aug., in molt from juvenal; flowers of lime tree, *Erythrina, Inga*). MNRJ, 8 (5-7.7 gms, with 3 young Sept. and one adult in wing molt Aug.; flowers orange tree). Nest and female, Dec., Alto Santo Antônio near NL (Ruschi 1949f).

Anthracothorax nigricollis – Rare at feeders, MBML, summer. Common in lowlands north into Bahia. MBML, 7 skins from 10 Nov. (1941) to 26 April (1973); 6-7.5 gms, flowers of "independência." MNRJ, one male (26 May 1940 in "genipapeiro") and 3 young, including male still in female plumage, "orange tree," 18 Aug. 1940. Ruschi (1961) reports species in winter. Nest, eggs, Santa Teresa in May (Ruschi 1949f).

Chrysolampis mosquitus – A vagrant young male at *Inga* flowers, NL headquarters, 5 March 1995; eventually driven off by *Hylocharis sapphirina* without visiting feeders below. Rare on coast, perhaps more common in dry interior. MBML, specimens Feb. 1972 and March 1962. Ruschi (1961) registered captures in ST in Oct. and Jan.

Lophornis chalybea – Vagrant female seen well, MBML feeders, 28 July 1987 (Forrester 1993 and *in litt.*)

Lophornis magnifica – Common at feeders and 3-10 m up at forest edges, highlands. MBML, 31 specimens (1.2-2.8 gms; 8 young March-Oct.; orange, lime, eucalyptus, *Lantana*). MNRJ, 6 specimens 2.3-3.1 gms (one young male, April, in female plumage). Nest, eggs, female Valley of S. Pedro, just W town, Sept. (Ruschi 1949f). Nest June, Penha, between ST and SL (idem).

Popelairia langsdorffii – MBML, young male, 5 gms, 30 May 1969, in eucalyptus. Nest Alto S. Antônio, in Japanese plum, Jan. 1943 (Ruschi 1949); other with first egg in May, perhaps captive (photo Ruschi 1949e). Sept. and April at MBML (Ruschi 1961). One at MBML feeders (D. Massie, *in litt.*) Sept. 1993, other at NL (Parker and Goerck 1997), not confirmed.

Chlorostilbon aureoventris – As *P. squalidus*, rare at competitive feeders and more at *Malvaviscus* or other low flowers in edge zones uplands, as on rocky areas; may be invader. Probably "*Chlorestes notatus*" of A. Greensmith (*in litt.*; Forrester 1993) was *aureoventris*. MBML, 27 specimens (2.8-3.6 gms, young March-Sept., *Lantana* and eucalyptus). MNRJ, 28 specimens (2.7-3.4 gms, young March-Sept.; lime, orange and eucalyptus flowers). Valsugana and S.

Teresa, at times pendent on wire in building, eggs March (Ruschi 1949b). Young in nest, MBML, Aug. (Ruschi 1973l); triple nest March, Alto de Tabocas; Jan., Vale do Canaã, and female with other nest May (Ruschi 1949f).

Chlorestes notatus – MBML, male Oct. 1961. MNRJ, male 4 gms May, 160 m in Malvaceae. Captured 1935-41 in MBML, Aug.-Sept. (Ruschi 1961). Lowland species, likely only vagrant in highlands.

Thalurania furcata – Male in molt, banded VC feeders 11 March 1995, likely vagrant (Oniki 1996).

Thalurania glaucopis – Common highland forest and borders, or at nearby feeders (mostly winter, except ones at NL). MBML, 64 specimens (3.4-6 gms, in eucalyptus, orange, *Inga, Fuchsia*, "independência"). MNRJ, 75 (3.9-5.3 gms, in papaya, "genipapeiro," orange, eucalyptus; female 1 March 1941 on nest with 2 young). MZUSP, 2 males and a female. Nest and eggs April, Valsugana (Ruschi 1949f).

Hylocharis sapphirina – Lowland species; vagrant male high in *Inga* at NL headquarters, 5 March 1995. MBML, two in orange trees, Sept. and Nov. (4 gms), plus Petrópolis 215 m, Nov. MNRJ, 2 from 160 m, and 2 females 700 m in lime trees, Aug. Nest, eggs Oct., S. Roque (Ruschi 1949f). Captured MBML in Aug. and April (Ruschi 1961).

Hylocharis cyanus – Lowland species; in hot dry summer 1995, several at flowering bushes uplands. Regular to 450 m in SJA and SJP. At MBML, 5 Aug. 1988 (M. Pearman, *in litt.*; Forrester 1993) and 17 May 1996 (banded). MBML, 11 specimens including one from 300 m in Patrimônio, other 230 m (6 in Sept., 2 Oct., 1 March; *Inga*, *Erythrina*, lime orange, 3.5-4 gms; Sept. female in wing molt). MNRJ, 3 from 160-220 m (Malvaceae, genipapeiro) and 7 from 700 m in orange trees Aug.-Sept.; one Sept. male ending wing molt.

Leucochloris albicollis – Possible invader of bushy pastures and borders highlands; or could have been native in rocky scrub. Singing mostly in bushy zones of RS. MBML, 6 specimens, 5.6-6 gms. MZUSP, one male. Nest building NL Jan., two young left Feb. (Ruschi 1949c). Descends to Petrópolis in Sept. (Ruschi 1961).

Polytmus guainumbi – MBML, one without date, perhaps vagrant from lowlands. Ruschi (1949) captured it at MBML in July-Aug., 1930's.

Amazilia versicolor – The green-throated nominate subspecies sings a single repeated note in woodlots at MBML and RS in summer, perhaps an invader

from the interior; but it may have been present along rivers and rocky areas. The white-throated form *brevirostris* sings 4 double notes for each song at borders and in second growth of lowlands, and appears at MBML feeders more in winter. Few enter upland reserves, except in dry 1995 summer. Birds of intermediate plumage occur. MBML, 4 *brevirostris* (2 with some green on throat, 3.3-4 gms, orange tree; young female Dec.; male 3.2 gms) and 10 *versicolor* (young male 300 m, Nov. and other 690 m, June). MNRJ, 4 *versicolor* (3.5-4.9 gms, *Fuchsia* and orange; one female in wing molt, Sept.) MZUSP, 2 *brevirostris*.

Amazilia lactea – Vagrant in hibiscus at NL, 5 March 1995; MBML feeders 15 Dec. 1993 and 11 July 1994; seems regular at VC feeders, perhaps an invading species. M. Pearman, 5 Aug. 1988, and G. Dobbs *et al.*, 6-7 Aug. 1989, recorded at MBML feeders (*in litt.*; Forrester 1993). MBML, male 300 m Patrimônio, Oct., in *Inga*. MNRJ, male Nov. from "Santa Teresa," on loan from MBML. First registered in state in 1953 (Ruschi 1953). Captured March 1953, held captive to 1957 and 1958 (Ruschi 1961).

Amazilia fimbriata – Lowland species, vagrant at feeders RS 21 Oct. 1996. Registers in Forrester (1993) not confirmed, as species easily confused with preceding two. MNRJ, two *tephrocephala* from 160 m (female 5.6 gms 18 April 1940 on nest, 2 young; June male 6.5 gms, Malvaceae). Native mainly on coast.

Aphantochroa cirrochloris – More at edges along river, mostly upland, seemingly an invader from dryer forests though may have been native; uncommon NL. MBML, 16 specimens (5.7-8 gms; young Sept; orange, eucalyptus, fuchsia, "independência;" one 312 m, Aug., *Inga*); MNRJ, 6 (to 8.1 gms, wing molt April and Sept.; male and young male 320 m, Dec., "genipapeiro"). Nest MBML, Dec. (Ruschi 1949, 1949f). Captured to Petrópolis in Nov. (Ruschi 1961).

Clytolaema rubricauda – Canopy and edges uplands, descending to MBML and SL mainly in winter. With sharp claws, perches even on vertical wires, likely an adaptation for stems of flowering canopy epiphytes. MBML, 32 specimens (6.3-9 gms; 2 young males in molt Nov., two others – called "female" – in June and July; eucalyptus, orange, lime, *Inga*, banana). MNRJ, 15 (6-9.1 gms, including two females in molt, March and April). Nest (nests?) Museum, collected Feb. 1941, had two young in Oct. (Ruschi 1949b).

Heliothryx aurita – Lowland forest and borders, one vagrant in forest on Timbuí in SL, 20 Feb. 1990. MBML, 3 specimens (one 5.4 gms, 480 m, orange tree) July-Aug., perhaps winter vagrants. At MBML feeders (Ruschi 1949), captured only May and June (Ruschi 1961).

Heliomaster squamosus – Vagrant at MBML feeders 29 Jan. 1994. MBML, 2 in worn plumage (captives?). MNRJ, on loan from MBML, a captive. Three captured ST, March 1958 (Ruschi 1961). Ruschi (1953) notes vagrants from Serra in July 1953, 8 May 1954 from Vitória.

Calliphlox amethystina – Borders and bushy zones uplands, perhaps even invader from dryer zones. Forrester (1993) indicates migration but MBML present all year; other areas only summer. MNRJ, 3 specimens (2.3-2.8 gms, one young male April in female plumage). 3 others, on loan from MBML, 2.3-2.6 gms. MZUSP, one male. Nest being built at ST, 29 Jan. 1944, two young left 4 April (Ruschi 1949c).

Trogon viridis – Forest interior, even uplands, though commoner in Linhares. MBML, male 115 gms.

Trogon surrucura – Upland, canopy and edges, even second growth at times. This yellow-bellied form may be a mimic of *T. viridis*, which only lives in uplands northward, not in southern uplands with the red-bellied *T. s. surrucura*. MBML, 5 specimens (one a female of 67 gms). MNRJ, 3 (66 and 75 gms). UFMG, 2 males (one March bird in wing molt).

Trogon rufus – Upland forest understory, even to irregular forests RS. MBML, female. MNRJ, two specimens 60 and 65 grams. UFMG, a male.

Ceryle torquata – Rio Timbuí mostly, flying early and late to and from fishing grounds. MBML, male 400 gms and young female 320.

Chloroceryle amazona – Rio Timbuí and likely others. MNRJ, female 127 gms.

Chloroceryle americana – Rio Timbuí and small forest streams, rare in NL. MBML, 7 specimens (female ending wing and tail molt, March; one Santo Antonio hit a house and one of 34 gms hit the town church; fourth 32 gms). MNRJ, 5 (32-58 gms, three from 280-400 m lowlands). UFMG, 1.

Galbula ruficauda – Invaded uplands with 1995 drought, earlier mainly slopes and lowlands; perhaps upland rains make burrow nesting difficult. MBML, 3 specimens (females 21 and 24 gms, from 300 m).

Baryphthengus ruficapillus – MBML, male and female; perhaps lowland and slope species. MZUSP has from Ibiraçu and Rio S. José.

Notharchus macrorhynchus – Canopy and edges, hard to see, sings rarely. MBML, 5 specimens (70-80 gms, male in wing and tail molt May).

Malacoptila striata – Borders and second growth along Timbuí, seeming invader from lowlands. MBML, 3 males (two, 38 and 40 gms). MNRJ, 4 ("pair with 1 young" 12 Jan. 1941). MZUSP, one male.

Chelidoptera tenebrosa – Another burrow-nesting invader from lowlands, mainly along Timbuí, high at edges. One, 11 July 1997, atop bare tree at NL headquarters. MBML, female. MNRJ, female 127 gms. MZUSP, from Rio S. José near Linhares.

Baillonius bailloni – Tall second growth, perhaps native as occurs in natural low woods on rocky soil, uplands. Eating avocados by SL lab, banded. MBML, 2 males, one "300" gms. MNRJ, 3 females (160-175 gms).

Pteroglossus aracari – Lowland woods, orchards, edges. Vagrants in NL (Forrester 1993) not confirmed. MBML, male and female specimens.

Selenidera maculirostris – Midlevels and borders upland forests, not small woodlots. Eating avocados at SL lab, banded. MBML, 5 specimens (two males of 180 gms; "female" in male plumage in wing molt, Feb.) MNRJ, 3 males and 1 female 185-190 gms.

Ramphastos vitellinus – Canopy and borders, even flying over town to isolated woods. MBML, 10 specimens (female 450 gms, male 340 gms from Rancho Fundo 200 m; two marked "female" have long beak of male, and others have yellow chests and worn feathers of captives). MNRJ, 9 (3 with female beak; 310-400 gms). Narrow tips to two outer primaries.

Picumnus cirratus – More riverside and rock-edge low woods than in tall forest. MBML, 4 specimens (females Aug. and Nov. dull-crowned, probably young).

Colaptes campestris – Invader of pastures, rarely sítio of André Ruschi just inside SL. MBML, 5 specimens (young male, 110 gms, Nov. 1941; young female, 200 gms, Nov. 1942; male; 180 gms). MNRJ, 3 specimens to 215 gms (one female of 173 in molt, April).

Colaptes melanochloros – Rare, recent report (Parker and Goerck 1997) not verified. MBML, 3 specimens, 1940's (female 115, males 125-30 gms; male 1 and female ending wing molt, May).

Piculus flavigula – Inside forest, often in mixed flock. MBML, 2 males.

Piculus aurulentus – Inside upland forest, at times in mixed flock. MBML, 4 specimens (female ending wing molt, April; Feb. female with red feathers on

nape and mustache, maybe young). MNRJ, 4 (54-80 gms; female in molt, Feb. some red on nape mustache). UFMG, one male. "*P. chrysochloros*," a lowland bird, was really *aurulentus* (Forrester *in litt.*).

Celeus flavescens – Forests, borders and second growth lowlands and slopes; 7 July 1993 and twice July 1997, edges of NL, vagrants. MBML, female from S. Júlia. MNRJ, male 130 gms, in wing molt Feb., 180 m.

Dryocopus lineatus – Lowland forests and borders, likely an invader along upland edges. MBML, 4 specimens (male 250 gms).

Melanerpes candidus – Invader borders and pastures or orchards. July 1993, visited NL headquarters. MBML, male 128 gms, wasps in stomach.

Melanerpes flavifrons – MBML, 3 from Petrópolis, 1968-69. MNRJ, 3 males 700-850 m (64.5-66.5 gms, two from Alto Tabocas in wing molt in April). Mostly a canopy and edge lowland species, not recorded recently.

Veniliornis maculifrons – Second-growth, borders and forest lower levels; in small woodlots also. MBML, 7 specimens (male 35 gms; male Feb. and 2 March with few red head feathers; Dec. female with red nape feathers, other March quite red). MNRJ 6 (one in wing molt Jan., two in Feb., 30-39 gms; July female with much red on crown, perhaps young as collected with normal male).

Campephilus robustus – Midlevels of forests and second growth, rare uplands. MBML, "male" of 300 gms in female plumage; other is female. MNRJ, 3 (215-255 gms, with the male in molt Dec.)

Dendrocincla turdina – In near absence of ant swarms in highlands, follows under *Cebus apella* groups in forest and second growth, once a coati (*Nasua nasua*) snuffling in palm crown. Even to MBML, 16 July 1997, but does not stay in small woodlots. MBML, 4 specimens (April female in tail and wing molt). MNRJ, 3. UFMG, 3 with Feb. female molting.

Sittasomus griseicapillus – Common low in upland reserves, less so woodlots. MBML, 2 specimens (one 13 gms). MNRJ a male. UFMG, 16 (male in molt Dec., female March).

Dendrocolaptes platyrostris – Rare in forest understory, commoner near Linhares. MBML, 2 specimens; MNRJ, 3 (60-70 gms). UFMG, one male.

Xiphocolaptes albicollis – Forest understory, even to ground, often in bird flock. Rare outside reserves. MBML, 5 specimens (2 females, 100 and 125 gms). UFMG, 4 (one female in molt, Dec.)

Lepidocolaptes squamatus – Under subcanopy limbs, forest flocks; absent from small woodlots. MBML, 2 specimens (one Aug. 1942 from "Chácara Anita"). MNRJ, male 32 gms. UFMG, 7 (molt ending 1 May for one female).

Lepidocolaptes fuscus – Trunks low to midlevels, even woodlots; often mixed flock. Two types of rapid song, one resembling *D. platyrostris*. MBML, 12 specimens. MNRJ, 3 females (one 22 gms; other in molt March). UFMG, 13 (molt two in March, one Feb., and one April; female 16 Jan. 1966, with short beak, may be fledgling). "*X. guttatus*" (Gardners, 28 June 1990), probably was *L. fuscus*.

Campylorhamphus falcularius – Low to midlevels, upland forests; rare small woodlots, although in São Paulo disperses to some distant woodlots without staying. MBML, 7 specimens (one 29 gms; March female and Dec. male in wing molt, the male with tiny new central tail feathers). MNRJ, female and short-billed Nov. young (called "*Nasica longirostris*" on the label; on loan from MBML). UFMG, 2 males.

Furnarius rufus – Invader of pastures and lawns. MBML, 45 and 52 gms. MNRJ, 51 gms. MZUSP and UFMG, one female each.

Furnarius figulus – Invader of pastures and lawns. MBML, recent specimen 34 gms. "*F. leucopus*" at the MBML (G. Dobbs *et al.*) must have been *figulus*.

Synallaxis ruficapilla – Low in dense second growth or understory scrub near rivers and rocky zones, uplands. MBML, 2 specimens. MNRJ, one 16 gms, nest and eggs 16 Aug. 1940. UFMG, 4 (molt in March, one male).

Synallaxis frontalis – Invader of dense scrub at base of serra. Register NL (Forrester 1993) likely was young *Cranioleuca pallida* (M. Pearman, *in litt.*)

Synallaxis spixi – Scrub and borders of rocky zones, probably native but commoner with clearings. MBML, 4 specimens (one, 14 gms). MNRJ, female 15 gms. MZUSP, male. UFMG, 11 (3 young with single red crown feathers each, Nov., Jan., March; wing molt in March and May, two adults).

Certhiaxis cinnamomea – River, marshes, perhaps more common with clearing. MBML, 4 specimens (female, 19 gms, with nest and 3 eggs, 15 Jan. 1941;

young 16 gms, April 1990; male, 17 gms). MZUSP, female; UFMG, male. From Interlagos (Linhares), short-tailed young in Feb.

Cranioleuca pallida – Borders, tall scrub, rarely canopy (dispersing?), likely an invader but perhaps native at natural river and rocky edges. MBML, 3 specimens (female, 13 gms, with nest 7 Nov. 1941 and nestling 15 gms, already red on crown; young 2 Aug. 1952 molting crown feathers; a Forno Grande young, Feb., has only one red feather on crown). UFMG, a female.

Phacellodomus rufifrons – Bushy pastures, to city plaza, invader from cerrado up to borders of reserves.

Lochmias nematura – Wet sites beside creeks and rivers, in woods or second growth. MBML, 4 specimens (25 and 26 gms; Feb. and March ending wing molt). MNRJ, a male. UFMG, 6 specimens.

Anabacerthia amaurotis – MBML, male in tail molt, 5 April 1973. Upland forest understory.

Philydor lichtensteini – Upland forest, trunks and limbs 5-25 m up, mixed flocks; not woodlots. MBML, 3 specimens (March male in central tail molt). MNRJ, a male. UFMG, 4 (one in wing molt, April).

Philydor rufus – Upland forest, foliage gleaning; mixed flocks; nests in road banks NL. Not in small woodlots. MBML, 3 skins. MNRJ, one. Nest and eggs in bank, SL, 1964 (Ruschi 1981).

Philydor atricapillus – Understory palm and other foliage, usually with *Habia rubica*; absent from woodlots. MBML, 9 specimens (Feb., central tail molt). MNRJ, one; UFMG, 8. A female, 15 March 1961 in MBML is marked "nest in bank;" Ruschi (1981) noted a road-bank nest Oct. 1961, but it is not clear how he determined incubation or nestling period.

Cichlocolaptes leucophrus – Noisy in mid-level forest bromeliads, often in mixed flock; absent from woodlots. MBML, 3 specimens (2 March in wing molt). UFMG, one.

Anabazenops fuscus – Noisy in dense understory, especially with bamboos, even RS; sometimes in mixed flock. MBML, 7 specimens (male 43 gms; 2 March in wing molt). UFMG, 9 (2 March ones in wing molt).

Automolus leucophthalmus – Understory, with *Habia rubica*. MBML, 6 specimens (2 in wing molt, March). UFMG, 5 (wing molt in Jan.).

Xenops minutus – Forest and second-growth understory, often in mixed flock; also in SLA small woodlot but commoner in Linhares lowlands. MBML, 2 specimens. MNRJ, one (molt in Feb., 10.5 gms). UFMG, one.

Xenops rutilans – Canopy and edge of forest and woods, usually in mixed flock; occurs in small woodlots. MBML, 13 gms. UFMG, 4 skins. "*Heliobletus contaminatus*" in Forrester (1993) likely was *rutilans*.

Sclerurus scansor – Tossing leaves on forest floor; seems uncommon SL and NL. MBML, one ending wing molt March. MNRJ, two.

Scytalopus indigoticus – MBML, female. UFMG, adult and barred young (16 Jan. 1966). Once on trail to NL waterfall (1996, A. Aleixo, *pers. comm.*). Understory and on ground.

Psilorhamphus guttatus – UFMG, male 22 Nov. 1965. Dense bamboo or scrub understory, uplands.

Hypoedaleus guttatus – Canopy tangles, upland reserves. MBML, a male; UFMG too.

Batara cinerea – Scrub around upland rock faces. MNRJ, female 135 gms and young male 121, 20 Jan. 1941 (in molt to adult, snail and frog in stomach). UFMG, a female.

Mackenziaena severa – Upland second growth, often near rock faces; like preceding, at SL and just E of NL in Goiapaba-Açu. Rare after 1995 drought. MBML, 5 specimens (April male and May female ending wing molt; young male 16 Feb. 1961 with beige wing and neck spots as in female; pointed tail feathers). MNRJ, 52 gms.

Thamnophilus palliatus – Lowlands, invader of riverside second growth in SL. MNRJ, male 28.5 gms.

Thamnophilus ambiguus – Common lowlands. MNRJ, male 25 gms and "720 m," perhaps vagrant or error.

Thamnophilus caerulescens – Tall second growth or borders of rock zones, not inside forest. MBML, 5 specimens (male in tail molt, May; young "male," white-

spotted back and female plumage, 10 Feb. 1961. From Forno Grande, young male Jan., barred belly, some barred feathers on back, remiges as in female; another young "female," same date, seems male with black cap, beige scaling above, pale with scaling below, remiges as in female; young female has beige spots above). MNRJ, male 27 gms. UFMG, 22 (molt, Jan., Feb. 2, March; the Jan. bird is a young male changing to adult remige color; 3 other young males, June and Dec. 2).

Thamnophilus ruficapillus – Invader in bushy pastures (or native at edges rock faces?). MBML, male 25 gms. MNRJ, male 26 gms. UFMG, a male.

Dysithamnus mentalis – Understory of upland forests and woodlots; can join mixed flock or *D. stictothorax*. MBML, 5 specimens. UFMG, 10 (two, Jan. and March, wing molt; young male, Nov., some rusty crown and back feathers).

Dysithamnus stictothorax – Understory upland forests. MBML, 8 skins (3 sexed incorrectly; wing molt and starting tail molt, Jan; wing molt, March). MNRJ, 4 ("10.5"-18.5 gms). UFMG, 19 (wing molt Jan., March, April; possible young males Jan., June, females March and April).

Dysithamnus plumbeus – Lowland understory, up to NL along river 1 km from E edge, flying up with white shoulders out if one whistles the song.

Myrmotherula gularis – Dense understory by upland forest creeks. A pair just E of the *plumbeus* site disappeared 1995-96 because people cleared the forest understory over 5 m either side of the road, without any need. MBML, a male.

Myrmotherula minor – Scattered pairs upper understory, uplands; a pair at the *gularis* site survived the excessive understory clearing. "*M. unicolor*" (Forrester 1993) likely was *minor*. MBML, male 7 gms; MNRJ, idem.

Myrmotherula axillaris – Understory of lowland woodlots.

Herpsilochmus rufimarginatus – A few in canopy high in SL, once NL (B. Forrester *in litt*). More common Linhares.

Terenura maculata – Subcanopy to edges, usually in mixed flock; rarely in small woodlot. MBML, one male.

Drymophila ferruginea – Dense forest borders near rivers, rocky areas or clearings, at times in mixed flock. One pair still survives in bamboos at MBML.

MBML, 3 skins (one a male of 11.5 gms). MNRJ, 1 (male 16 gms, ending wing molt in April). UFMG, 14 (wing molt Jan. 2 and Feb.).

Drymophila ochropyga – Rare low bamboos and edges uplands. MBML, female 12.5 gms. UFMG, 10 (young male May, molting from female plumage, except for white hidden in back; 2 in molt April; 2 other young males, Jan. and July, still with brown forehead feathers).

Drymophila squamata – Lowland understory, a few pairs up to SLA, SL and NL. MNRJ, female (10 gms, starting wing molt, of "pair feeding 1 fledgling" 8 Jan. 1941).

Pyriglena leucoptera – Travels in understory, especially where dense at edges; rare as few army ants. More in lowlands, as Linhares. MBML, male 30 gms. MNRJ, female of 23, labeled "male." UFMG, 6 (2 young females Dec., young male, March).

Formicivora serrana – Pairs in scrub patches on rocky uplands, SL, and bushy second growth at RS.

Myrmeciza loricata – Hopping near or on ground in forests and woodlots, often in pairs. MBML, 4 skins (male, March, in wing molt). MNRJ, male 18 gms (March, wing molt). UFMG, 15 (male, female wing molt, Feb.).

Chamaeza meruloides – Walks on ground in upland forests. MBML, 3 specimens.

Chamaeza campanisona – Walks on ground in upland forests. Not heard with the other species, perhaps interspecific territories. MBML, 2 skins.

Grallaria varia – Hops near ground in upland forests. MBML, 3 females (one 125 gms, second 150 gms. "On nest with 2 eggs" 5 Nov. 1941, years before the "first" nests of the species reported from the Amazon). UFMG, one (wing molt, March).

Conopophaga melanops – Lowland forest understory, a few to SLA and rare in NL. MBML, 3 specimens (male 16 gms, male and female in wing molt April). MNRJ, male (21.5 gms, 800 m). UFMG, one male.

Conopophaga lineata – Low in river second growth and borders. Song a slow "tree-tree-tree-tree-tree-tree," very different from most São Paulo birds and like *Malacoptila striata*. MBML, 12 specimens (male 24.5 gms, on nest with 2 eggs

8 Nov. 1941; female with nest 17 Nov. 1942). MZUSP, one male. UFMG, 9 (2 in wing molt, plus young Jan., Feb. 2, and March).

Laniisoma elegans – Described well A. Greensmith (*in litt.*) 7 Sept. 1979, later register by Parker (Parker and Goerck 1997). MBML, male (song recorded 26 Sept. 1964, insects in stomach) and other (48 gms, 20 April 1972). Perhaps extirpated; sings high in canopy and checks down to the ground level in upland forests in summer, migrating lower in winter.

Phibalura flavirostris – Four 24 March 1995, fruiting bush edge of NL clearings, perhaps migrants from higher mountains to the south. Forrester (1993) record. MBML, female (4 March 1941, wing molt). MNRJ, male (same date, molt).

Carpornis cucullatus – Ridgetop forests when sings, in midlevels. MBML, 5 birds 65-83 gms. MNRJ, 4 of 69-80. UFMG, 2 females.

Lipaugus lanioides – Forest midlevels, large reserves (not along Rio Timbuí, only uphill). MBML, 4 skins (male 80 gms). UFMG, 2 males. Several lowland Cotinginae seem to have disappeared.

Pyroderus scutatus – MBML, female (300 gms, 10 Jan. 1941, ending wing molt). MZUSP, lowlands Rio S. José. Birds seen NL in June 1990 (N. and D. Gardner, *in litt.*), by D. Trent (*in litt.*) and by T. Parker (Parker and Goerck 1997); individuals wander, so not certain these were not vagrants.

Procnias nudicollis – Upland forest canopy, feeding midlevels; even MBML (female April and Oct., maybe attracted by captive birds). Song some years and not others. Too many are captured as cage birds. MBML, 13 specimens April-Oct. (3 males 250 gms each, female 170). MNRJ, 14 (July-Dec.; males 177-225 gms, females 150-180; 4 white males and 4 with little white all were "singing in forest").

Oxyruncus cristatus – Midlevels upland forests, song "falling bomb;" at times in mixed flock; can sit atop eucalyptus in sun, warming up early in day in midwinter, at SL lab. MBML, 4 birds (male, March, ending wing molt). MNRJ, 3 females. UFMG, 3 females (one red-crowned).

Iodopleura pipra – High near SL lab, 6 Sept. 1989 (one) and 30 July 1993 (pair). Canopy bird, hard to see.

Pachyramphus castaneus – Upland subcanopy and borders, at times lowlands off N in winter, and in mixed flocks. MBML, male (20.7 gms, on nest 16 Nov. 1952). UFMG, 2 (female wing molt, March).

Pachyramphus polychopterus – Canopy of secondary woods and borders, likely invader uplands and native in lowlands along rivers. Summer, except two records July in mixed flocks on edge of NL, 10 July 1994 at MBML, and May records in lowlands. MBML, male.

Pachyramphus marginatus – Canopy and subcanopy, mixed flocks; absent woodlots. Common Linhares forests.

Pachyramphus viridis – Upland borders and subcanopy edges, at times in mixed flock; rare in forests but likely native. MBML, 5 specimens (female 24 gms, on nest and 3 eggs 11 Nov. 1941; one male from MBML). UFMG, a male.

Pachyramphus validus – Lowland edges and woodlands. Males from NL headquarters 8-10 Aug. 1988 (M. Pearman, *in litt.*; Forrester 1993) perhaps winter vagrants; also Parker & Goerck (1997).

Piprites chloris – Forest midlevels, especially dense vines, often in mixed flocks; not woodlots. UFMG, 2 males (one wing molt, Feb.).

Tityra inquisitor – 25 March 1994 SL, perhaps migrant. Sept., Dec., Jan. in NL, perhaps invader from dryer forests. MBML, male 24 July 1941.

Tityra cayana – Canopy and borders of large forests, summer (to 6 April 1994), nest in snag by NL headquarters 1994 and 1995. MBML, 2 specimens (male 75 gms, nest in hole 25 m up 30 Sept. 1941). UFMG, female labeled "male."

Chiroxiphia caudata – Common understory, especially low woods near rocks or edges; sometimes in woodlots. MBML, 42 skins (2 from NL, one hit house; male in wing molt April; male 25 gms, females 25-29; two young males with yellow foreheads of captives. Green males April (2) and Sept., red foreheads April to Nov., almost adult April-Oct., adult April-Dec.. One May "female" has a red feather on forehead; other nest and 2 eggs 14 Dec. 1970). MNRJ, 9 (female 23 gms, wing molt July; males 24-27, with one Sept. and Oct. molting from green plumage). UFMG, 5 (male ending wing molt April).

Ilicura militaris – Upland understory, even woodlots and low growth near rocks or clearings. MBML, 20 skins (2 males ending wing molt in March; two others young, April and March, the latter molting tail, back and wings to adult). MNRJ, 6 (12.5-15 gms). UFMG, 9 (female ending wing molt, April; young male 27 Feb. with red feather forehead and some rusty back feathers).

Pipra rubrocapilla – SLA woodlot, lowlands, in understory. A record from NL (Forrester 1993) could be in error or a vagrant. MBML, 3 specimens (female 12 Feb. 1972, young males 21 Jan. 1963 – in molt to adult – and 24 Oct. 1961 – molt to adult, but plumage bad, maybe captive). The 1972 bird has a date almost like Linhares specimens, perhaps was mislabeled; others could be captives.

Machaeropterus regulus – Vagrant male banded, SL headquarters, 14 Jan. 1995 in drought. MBML, female 21 Aug. 1961. Lowland-understory bird, as unexpected in uplands as *Phaethornis superciliosus*.

Neopelma aurifrons – Songs from 10 m up, upland understory, not on Timbuí or in woodlots. MZUSP, specimen Santa Cruz, near coast. MNRJ, male 17 gms, starting wing molt Dec.

Schiffornis virescens – Common understory upland forest and second growth, rare in woodlots. MBML, 5 specimens (female in tail molt, April). UFMG, 9 (male in wing molt, Nov.). Lowland *S. turdinus* in NL (Forrester 1993) must be error.

Phyllomyias fasciatus – Common winter, rare summer, borders and canopy along river, perhaps invader; often eats fruit or, insects near flowers. Song a weak "weed weed weed weed." MNRJ, female 13 gms "Chácara." MZUSP, a male.

Phyllomyias griseocapillus – Canopy and borders uplands, to riverine second growth. Song "veer veer veer veer" or long "tooooee." At times in mixed flocks. "*P. virescens*" in Forrester (1993) not certain (D. Massie, *in litt.*). MNRJ, female 10.2 gms.

Phyllomyias burmeisteri – Subcanopy and borders uplands, even to woodlots or planted *Pinus*; pecks small insects from trunks and limbs. Calls "spee" (or series) resemble *Myiozetetes similis*. In mixed flocks at times. Short tail, plump, rather yellow. MBML, a female.

Camptostoma obsoletum – Invader of second growth and borders, more regular lowlands and dry inland. MBML, male 7.5 gms, nest 5 Oct. 1940.

Myiopagis caniceps – Pairs in canopy flocks, male sings "tea-e-e-e-e-e-e-e" and female responds repeated "teepeetitee."

Elaenia flavogaster – Upland borders and second growth, perhaps native along rivers. MBML, 5 specimens (24.5 gms; other called "*E. parvirostris*"). MZUSP, 2. UFMG, 4. "*E. chiriquensis*" from NL in Dec., likely was *flavogaster* (C. Balchin, *in litt.*), as were those seen by B. Whitney (*in litt.*).

Elaenia albiceps – Borders in fall migration, usually eating *Trema micrantha* fruit: 8 March 1995 (MBML) to 1 May 1990 (SL). UFMG, male 2 April 1965 could be this but has a small white crest.

Elaenia parvirostris – River border, SL, 2-3 May 1990, in fall migration. Here called "invader," as the preceding species, but migrants could have visited river edges long ago.

Elaenia obscura – Dense scrub near upland rivers, rocky zones and marshes at NL and SL entrances; more in winter, SL. MBML, male 24.5 gms.

Elaenia mesoleuca – A few in summer at upland edges, mainly NL, with records March onward, MBML and SL, of migrants. Likely an invader, but could have summered along rocky areas before humans. MBML, female 9 May 1973 (called "*E. parvirostris*"). UFMG, female 21 May 1966.

Serpophaga nigricans – Pair SL waterfall, 16 Dec. 1974, never seen again. 10 Feb. 1995, one just below, near SLP. MZUSP, a male.

Serpophaga subcristata – Invader of bushy pastures and borders. MBML, 5 "females" (2 with white crowns, 2 not). UFMG, 3.

Mionectes rufiventris – Upland understory, even of second growth, at times in mixed flock or woodlots. MBML, 6 skins (one, from Museum, May 1943, 13 gms). MNRJ, male 16 gms. UFMG, 3 males (one in wing molt, Jan.).

Leptopogon amaurocephalus – Understory, especially woods or borders, often mixed flocks but surviving in woodlots where flocks small. MBML, 3 specimens (male in wing and tail molt, March). UFMG, male in tail molt, Feb.

Phylloscartes oustaleti – Midlevels upland forests, pairs or small families in mixed flocks; not in woodlots. In dry 1995 summer, a family regularly visited a bromeliad for baths until it dried up.

Phylloscartes sylviolus – Family of 4 seen well by Forrester (1993; *in litt.*) in trees of deep valley just E of NL. MZUSP, specimen Rio S. José in lowlands. Southward, a canopy and border species.

Capsiempis flaveola – Scrub by river, rocks, or borders, pairs or small families. MBML, male (8.5 gms, tail molt, near nest where female incubating 12 Nov. 1941). UFMG, a female.

Myiornis auricularis – Common dense sites at borders or in forest, entering semi-open areas more early morning. Rare SL, despite good habitat. MBML, 2 males (one 6 gms).

Hemitriccus nidipendulus – Native bushes of rock faces, to secondary scrub also. MBML, male (8 gms, white eye, violet beak and feet). UFMG, 3 (female in wing molt, Feb.). "*H. margaritaceiventer*" (Forrester 1993) not confirmed (M. Pearman, *in litt.*), likely was *nidipendulus*.

Hemitriccus diops – Upland understory, especially dense or bamboos. MBML, 3 skins. MNRJ males 7-11 gms. UFMG, 6 (wing molt Dec. and Feb.).

Hemitriccus orbitatus – Lowland understory. Record NL must be of *diops* (M. Pearman, *in litt.*; Forrester 1993).

Todirostrum cinereum – Invader of upland borders, perhaps native along lowland rivers. Absence SL hard to explain.

Todirostrum poliocephalum – Borders and dense woods, upper understory, especially along rivers. Occurs woodlots and at base serra, even though absent on coast. MBML, female. MNRJ, pair 5.2-5.3 gms. UFMG, male.

Todirostrum plumbeiceps – Dense scrub or understory near rivers and rocky zones, uplands. MBML, male 5.8 gms. UFMG, 3 males.

Tolmomyias sulphurescens – Midlevels forests, second growth, in mixed flocks but survives in woodlots, down to base of serra even though not a lowland bird. MBML, 4 females ("cri-cri-da-mata," one with nest and eggs 3 Oct. 1961; other 19 gms). UFMG, 4 (two males in wing molt, Dec.).

Tolmomyias poliocephalus – Lowlands, midlevels forest and edges. Upland records (Forrester 1993) unlikely.

Tolmomyias flaviventris – Lowlands, upper understory and edges of second growth. MBML, female 26 Jan. 1976. However, birds of this date are *Columbina minuta, Tangara velia, T. mexicana, Cacicus haemorrhous, Trogon surrucura* and *Selenidera maculirostris*, lowland birds with only last two more common in uplands. Probably they were collected in lowlands, perhaps even in Linhares.

Platyrinchus leucoryphus – Upland forest understory, not next to Timbuí, nor in woodlots.

Platyrinchus mystaceus – Understory, even woodlots. MBML, 12 specimens (9 gms, one from Museu; one male with yellow crown, called "female"). UFMG, 3 (female in wing molt, Feb.).

Myiobius barbatus – Midlevels, single birds in mixed flocks. MBML, 2 (yellow crests but marked female) plus 5 females (no yellow crests).

Myiobius atricaudus – Understory, near creeks or in second growth, especially entrance SL, lateral road RS, and road fork NL; golden rump, yellow chest (reverse of *M. barbatus*). MBML, 6 (2 males with yellow crown called "female;" one male in tail molt, Jan.). MNRJ, 3 (of 8-"14" gms). UFMG, 5 (one "female" with yellow crest).

Myiophobus fasciatus – Low in bushy pastures and borders, but perhaps a few present at river and rock borders before humans. MBML, 4 (male, 11 gms; one female yellow crowned, two orange crowned). MNRJ, 3 (male, 11 gms; two rusty short-tailed fledglings, 25 Oct. 1940). MZUSP, 3. UFMG, 7 males (one ending molt, May; crown yellow or orange, body rusty or brown).

Contopus cinereus – High at edges or locally in forest or woodlot, often in bird flock. MBML, one. MNRJ, young male 19 gms ("in forest with adults," 20 July 1940).

Lathrotriccus euleri – Understory forest and second-growth, less common winter; in woodlots too. MBML, 4 (female 11.6 gms, incubating 3 eggs 19 Nov. 1942; male 11 gms with nest and eggs 9 Dec. 1942; female ending wing molt April). UFMG, 3 (one called "*M. fasciatus*").

Knipolegus lophotes – MBML, male 24 Jan. 1961, tail and wing molt; invader or vagrant.

Knipolegus nigerrimus – Open areas near rocks, W of NL entrance 10 July 1997 and Goiapaba-Açu 12 July. MNRJ, "male" (24 gms, 580 m, 14 May 1940; throat streaked brown). Perhaps winter visitor, highlands.

Knipolegus cyanirostris – Few along edges, winter; 3 May (1990, SL) to 5 Sept. (1994, SL). MBML, 3 males (14-15 gms, May 1941, two with fruit in stomach).

Pyrocephalus rubinus – MBML, "female" 26 Sept. 1943 (12.5 gms, some red on face). Winter vagrant.

Fluvicola nengeta – Invader of house tops and streets, from semideserts northward. Once atop tree in center of NL forest, soon moving on. MBML, young male 3 April 1947. UFMG, 2 females (molt Nov. and Jan.).

Arundinicola leucocephala – One SJA, marsh-edge bird. MBML, 2 specimens (young male, 16 gms, near nest 676 m on 10 May 1941). MNRJ, a male (15 gms, 300 m). MZUSP, male.

Colonia colonus – Borders, high to low, especially by rivers; survives in woodlots. MBML, 4 (female 19 gms; male in wing and tail molt, Jan.). MNRJ, 5 of 19-20 gms. UFMG, 4 (female in molt, March).

Satrapa icterophrys – Near Valsugana former marsh, in bushes, perhaps invader from lowlands.

Hirundinea ferruginea – Rocky-zone bird, now at entrances NL and SL and above VC. MBML, female 23 gms. UFMG, 2.

Machetornis rixosus – Invader of pastures and towns, not inside reserves yet. MBML, young Dec. and Jan., Linhares.

Muscipipra vetula – Scrub of rocky zones, also second growth, SL and RS only July-Sept., but NL all year long. MBML, male (28 gms, July) and female (30 gms, 9 Nov. 1942, building nest in scrub). MNRJ, two of 27-28 gms. UFMG, 4 (two March birds in molt).

Attila rufus – Low or midlevels forests, second growth; seldom woodlots. MBML, 2 (female in molt, March). UFMG, 3 (male in molt, March).

Rhytipterna simplex – Borders and tall woods, or canopy in forest; few in woodlots. UFMG, 2. MBML, young from Linhares, 19 Jan. 1972.

Sirystes sibilator – Midlevels forests, at times borders, in mixed flocks (Willis 1995); few in woodlots. MBML, 3 (28 gms; others in wing and tail molt, Feb.) MNRJ, female 28.5 gms.

Myiarchus ferox – Borders, especially Rio Timbuí. MBML, 5 (female 35 gms, 3 eggs in nest 1 Nov. 1942; other, 4 eggs 24 Oct. 1941; third in molt, March). MNRJ, young (reddish edges wings and tail; called "*swainsoni*" but black beaked), 26 gms, 24 Nov. 1940. MZUSP, a female. UFMG, 2 (young female, 7 Dec. 1964).

Myiarchus swainsoni – Invader at edges; summer bird, 9 Sept. 1994 to 6 March 1995.

Myiarchus tyrannulus – Lowland borders. Report NL (Forrester 1993) not confirmed (N. & D. Gardner, *in litt.*).

Myiarchus tuberculifer – Canopy, lowlands and uplands, often in mixed flock, here not in woodlots.

Pitangus sulphuratus – Borders, probably native along rivers; perhaps invader highlands. MBML, 9 (56-66 gms; female in wing and tail molt, March; young male Museum 10 Feb. 1989 still scalloped white above; female 5 Oct. 1940 with nest). MNRJ, 2 of 75-85 gms. UFMG, a male.

Megarynchus pitangua – Borders, probably native along rivers. MBML, male in molt, Feb. Young Linhares 21 Feb. 1972, yellowish scaled above, reddish edges wing, venter pale.

Myiozetetes cayanensis – Borders of rivers, rarely to edges rocky zones. MNRJ, male 33 gms. UFMG, female (some tail molt, Nov.).

Myiozetetes similis – Borders of rivers and woodlands, likely rare before clearings. MBML, 4 (32-35 gms; female on nest and male near, 10 Nov. 1941; other starting wing and tail molt in March). MNRJ, male 31.5 gms. UFMG, female in tail molt, Feb.

Myiodynastes maculatus – Canopy and edges, summer (12 Oct. 1996, SL, to 17 March 1994, ST). MBML, male. UFMG, male and female.

Legatus leucophaius – Borders, especially rivers; summer, 5 Sept. 1992 to Jan.; commoner in drought 1995.

Empidonomus varius – Borders, likely invader in uplands. Summer, 12 Oct. 1996 to 17 March 1995. MNRJ, male 33 gms.

Tyrannus melancholicus – Borders, especially along river; perhaps invader uplands. In NL, RS and ST, usually absent winter; absent SL too in July 1994. MBML, 12 (37-43 gms; 3 in wing and tail molt March; male near nest 9 Nov. 1941 and female on four days later; young 4 March 1943), other young from elsewhere in state Jan. (4), Feb. (7), March (1) and April (2). UFMG, 3 (female ending molt 2 May).

Tyrannus savana – MBML, young 4 March 1968, likely vagrant in northward migration.

Tachycineta albiventer – Rare, lowland rivers.

Progne tapera – High over on sunny days, perhaps even wander up from lowlands. Summer, except 1 July 1993 (SL) and 5 birds 3 July 1993 (NL).

Progne subis – Male seen well, sunny day, 26 Jan. 1994 (NL). Migrant from North America to lowlands, as Porto Seguro (BA).

Progne chalybea – High over on sunny days, from cities or buildings (EA, Goiapaba-Açu) where nest. Could be invaders, but birds like these fly over distant forests, and in the past nested in dead snags (lowlands only?). Mostly summer, 6 Sept. 1994 to 2 May 1990, but also 12 July 1997 arriving to sleep in house at Goiapaba-Açu. MBML, female (45 gms, wing molt March).

Notiochelidon cyanoleuca – Likely an invader, flying from cities or houses nowadays; may have been present on cliffs earlier. Almost disappeared NL with 1995 heat and drought.

Stelgidopteryx ruficollis – Over open zones and borders near rivers, likely an invader in uplands. Disappeared NL entrance with 1995 drought. UFMG, a male.

Thryothorus genibarbis – Understory lowlands, especially dense tangles near rivers; invader uplands, SL and RS and Goiapaba-Açu, where dense scrub. MBML, female. UFMG, male in molt, March.

Troglodytes aedon – Invader from dryer zones, edges or bushy pastures. MBML, two ("Museum," 7.5-14.3 gms). MNRJ, male (14 gms, molting in Jan.) UFMG, a male.

Donacobius atricapillus – MBML, 3 males (45 gms, 392 m, ending wing molt Feb.; other in wing and tail molt Aug.; third from Petrópolis). MNRJ, 4 (30-50 gms, including females from Jan. and July with "3 young"). Lowland marshes.

Mimus saturninus – Invader of bushy pastures from cerrados inland; NL headquarters only July 1997. MBML, 4 (female 65 gms). UFMG, 3 (young Nov.; female very stained either by introduced grass or by red soil that before humans would not have been exposed).

Cichlopsis leucogenys – Only Dec.-Jan. NL, upper understory, rare. T. Parker (LNS, Cornell) recorded songs. MBML, 5 specimens (1942-1963, 45-52 gms; 3 Feb. 1942 male in forest with fledgling 33 gms, fruit in stomach; female SL, Jan., in wing and tail molt). MNRJ, 4 (1940-1941, 50-65 gms; male ending wing molt, March; July and Aug. specimens indicate wintering). UFMG, 2 males.

Platycichla flavipes – Midlevels uplands, scattered singers, summer. In migration and winter into woodlots, even SLA (May 1996). Many in *Euterpe edulis* fruits to July. MBML, 14 (3 from Museum, 1 from NL; 48-75 gms; 2 males with buff spots on wing coverts, Sept. and April; Aug. female with buff wing spots; two such birds weigh 40 and 42 gms). MNRJ, 4 of 55-79 gms. UFMG, 3 birds.

Turdus rufiventris – Ground and understory at borders; in forest by river. MBML, 11 (4 from Museum; spotted young Oct., Dec., Feb. 2, May; female 64 gms, males 75-78, young 70-78; one male with crown partly white). MNRJ, 4 (male 95 gms; young males 73-76, Jan. and April). UFMG, young Nov.

Turdus leucomelas – Invader from dryer zones, favoring eucalyptus and second growth lower levels; entered SL in recent years; reaching the NL headquarters July 1997 after several years on nearby farms. MBML, skins 1961 and 1987. MNRJ, spotted young, 13 Nov. 1940, maybe *amaurochalinus*.

Turdus amaurochalinus – Low at borders, especially May-Sept., could be invader, except as migrant from the south. MBML, 6 (55-65 gms, May-Aug., except one Nov. and other Dec.; male ending wing molt June). MNRJ, male (68 gms, July). UFMG, 4 (spotted young Nov. and Feb.)

Turdus albicollis – Forest understory; woodlots rare, mainly winter. MBML, 7 (one from "orchard" in May; 72 and 75 gms; spotted young 12 Nov. 1941). MNRJ, 74 and 80 gms. UFMG, female (molting in March).

Turdus fumigatus – MBML, Petrópolis and female 3 Sept. 1977 (latter one day after *Pyrrhura leucotis*, another lowland forest species).

Cyclarhis gujanensis – Canopy and edges, even woodlots, at times mixed flock. MBML, 8 (March bird in molt; 2 Feb. males and 1 March with dull crowns, perhaps young). UFMG, 4 (one in molt, March).

Vireo chivi – Slope and lowland woods, middle to upper levels; uplands a few silent birds, March and July-Sept.; some song SLA and MBML Oct. 1996. MBML, only specimens from lowlands (Colatina, etc.)

Hylophilus thoracicus – Second-growth by Timbuí, perhaps invader from lowlands.

Hylophilus poicilotis – Dense upland woods and scrub, edges rocky zones or rivers, also second growth, low to high. MBML, 2. MZUSP, 1. UFMG, 3.

Passer domesticus – Invader in cities and farm buildings. MBML, 2 young males (27-30 gms; wing molt Jan.) A specimen of *Estrilda astrild*, May 1952, likely captive.

Icterus jamacaii – MBML, 3 specimens may be captives; lowland river-edge species.

Icterus cayanensis – MBML, 2 specimens may be captives; lowland edge and canopy bird.

Molothrus bonariensis – Invader of pastures, to reserve edges. MBML, female (40 gms, nest of *Zonotrichia*, 1 Nov. 1941).

Scaphidura oryzivora – Oct. at nests oropendolas, SLA; lowland river species, now using pastures. MBML, 2 males (one labeled "female," other 190 gms).

Psarocolius decumanus – Colony SLA wanders all over orange orchards nearby; once NL, east border, one bird. Lowland canopy and edge. MBML, female (121 gms, 700 m, 9 Aug. 1941). MNRJ, male (360 gms, 720 m "pasture," 14 July 1940).

Cacicus haemorrhous – QA, lowland river canopy and edges. MBML, 3 (male 115 gms, nest with nestling at 220 m, 21 May 1973; female 75 gms, nest at 215 m, 5 Jan. 1941; female S. Roque). Male and female 26 Jan. 1976, perhaps lowlands (as same date *Tolmomyias flaviventris* (see), *Tangara mexicana* and *T. velia*). MNRJ, male (110 gms, 275 m, called "japira").

Gnorimopsar chopi – Invader of pastures, rare uplands. MBML, 9 (65-68 gms females from rice field, molting in March of 1942 and 1943; male 76 gms from corn field in 1941; 64 and 69 gms Alto Caldeirão, 1995; male in wing molt, Jan. 1972).

Agelaius ruficapillus – Lowland marsh SJA, invading species.

Leistes superciliaris – Lowland pastures, invading species. MBML, 4 (2 from Petrópolis, other in molt April). UFMG, 2 males 1965-66.

Geothlypis aequinoctialis – Marshes, likely native. MBML, male 9.6 gms. MNRJ, 3 "gaturamos-do-brejo" 11.5-19 gms. MZUSP, male. UFMG, 5.

Parula pitiayumi – Subcanopy lowlands, invading small woodlots uplands; not in reserves. MBML, 2 males (one 6.8 gms).

Dendroica fusca – Parker (1983); vagrant, migrant from North America.

Basileuterus rivularis – UFMG, female 28 May 1967. Lowland stream-edge species, in forests.

Basileuterus culicivorus – Borders dense woods, second growth, near streams; commoner downhill. MBML, 3 (two 9.5-10 gms). UFMG, 5.

Coereba flaveola – Edges, planted flowers, hummingbird feeders, mainly along rivers; perhaps invader. MBML, 3 (young of 13 gms, 15 Jan. 1990). UFMG, 3 (young 17 March 1966).

Conirostrum speciosum – Lowland canopy and edges, perhaps invader from dryer regions.

Cyanerpes cyaneus – SLA, vagrant 10 Feb. 1995. Lowland and edges, but must invade uplands at times. MBML, 18 (12, April-Nov. 1954; 3, May-Sept. 1955; Feb., July 1961; 16.5 gms, Aug. 1990). UFMG, 4 (Oct.-Dec. 1966, with 2 ending wing molt in Oct.).

Chlorophanes spiza – Rare canopy and edges, at times mixed flock or in flowering or fruiting tree. MBML, 8 (7 April-Sept., one Dec.; April bird ending molt; 19 and 21 gms).

Dacnis cayana – Canopy and edges, pairs or small groups. MBML, 6 (2 of 15 gms; young males with few blue feathers, March and Aug.). MNRJ, 5 (14.5-17.5 gms; male starting molt, Nov.; female ending molt, March).

Dacnis nigripes – Parker and Goerck (1997), NL. MBML, 3 males (9-10 Nov. 1941, 14-14.5 gms, 850 m – "capoeira"). MNRJ, female 9 Nov. 1941, "fruit tree in forest;" see Gonzaga (1983). Canopy edge off S, migrating N in winter.

Tersina viridis – Canopy and edge, even eucalyptus, small groups; likely invader; checks holes in banks SL (Sr. J. L. Molino, pers. comm.). MBML, 3 (one ending wing molt, March). UFMG, female (molt Feb.).

Chlorophonia cyanea – Upland forest canopy and edge, pairs and families in Japanese plum in winter SL. MBML, 5 (May-Sept., 11-14 gms, male July molting to adult). MNRJ, male April ("verdinho").

Euphonia chlorotica – Vagrant individuals, invader of borders uplands, perhaps native lower down. Canopy and edges. MBML, 4 (3 young males).

Euphonia violacea – Subcanopy and edge, even orchard SL after plums. MBML, 4 males. UFMG, one male.

Euphonia cyanocephala – MBML, male 26 Sept. 1961. Linhares, May and June, perhaps winter visitor. Canopy and edges.

Euphonia pectoralis – Subcanopy; in winter even MBML. MBML, 7 (2 males 15 and 17.5 gms). MNRJ, pair (male in molt tail and left wing, Aug.). UFMG, 4 (young male ending molt to adult, March; female molting, Dec.).

Pipraeidea melanonota – Rare, mostly winter, 1 May 1990 (SL) to 29 Sept. 1989 (NL, B. Whitney, *in litt.*; Forrester 1993), mostly upland borders or orchards. MBML, 8 (6, Sept. 1962; one Sept. 1969; one Jan. 1963; male 20 gms). UFMG, male Feb.

Tangara seledon – Subcanopy or edges SL and below, even SLA woodlot. MBML, 15 (one 15 gms; other "chácara"). MNRJ, male (17.5 gms, "verdezinho," 700 m). UFMG, 2 males (one wing molt, Jan.)

Tangara velia – MBML, 6 (Oct.-Feb., including 26 Jan. 1976). Lowland canopy and edges, see *Tolmomyias flaviventris* for possibility that specimens are mislabeled.

Tangara mexicana – MBML, 3 (one 26 Jan. 1976, see *T. flaviventris*; Sept. 1953 and 1956). Lowland canopy and edges. Linhares specimens, 22 and 28 gms.

Tangara cyanocephala – Pairs or small groups, upland canopy and edges, uncommon. MBML, 6. UFMG, 3 (male in wing molt, Jan.; young male, May).

Tangara cyanoventris – Pairs, with large groups in winter, upland scrub, edges and canopy, even woodlots. MBML, 10 (13 and 16 gms). MNRJ, 4 (16-20 gms; young female March; male in tail molt March). MZUSP, male. UFMG, 6 (male in molt, plus young male, Jan.).

Tangara cayana – Invader of borders and second growth, likely native in lowlands; plums in SL, bananas NL. Possibly native along rivers and rocky zones? MBML, 7 (16-20 gms; male ending molt, April). UFMG, 5 (female ending molt June; young male Sept.; other 16 gms).

Thraupis sayaca – Wandering pairs common edges, likely invader from lowlands; but perhaps was at river and rock borders long ago. MBML, 20 (36-41 gms, not including 32 for dead bird nor 50 for one with bad plumage, likely

captive; wing molt, Jan.; young in dull plumage, 6 in Jan. and 1 each Feb., June, July, Sept. and Nov.). MNRJ, 4 (to 44 gms; dull male, July). UFMG, 9 (4 in molt, Jan.; 5 others dull plumage, Jan.).

Thraupis cyanoptera – Pairs in upper levels and edges upland forests, rare in woodlots. MBML, 5 (one from Museum, in 1942; 40-45 gms). MNRJ, 3 (40-45 gms; female ending molt, March; young male, March).

Thraupis ornata – Pairs in upland canopy and edge, even woodlots and orchards. MBML, 27 (32-46 gms; two in wing molt, Jan. and one in March). MNRJ, 4 males (35-39 gms). UFMG, male.

Thraupis palmarum – Wandering pairs at edges, orchards; likely invader from lowlands, where canopy and edge. MBML, 5 (wing molt March, April). MNRJ, 4 males (37-46 gms; one wing molt; young bird, March). UFMG, 3 Jan. (2 in molt).

Ramphocelus bresilius – Two vagrants, SL, 11 July 1994. Lowland, borders rivers and second growth. MBML, 5 (April-Aug.; one from 700 m). UFMG, males May, July.

Piranga flava – MBML, 2 males (one Petrópolis "600 m") and female in worn plumage (captive?). Invader along borders.

Habia rubica – Groups understory, center of mixed flocks there. MBML, 5 (male, 38 gms). MNRJ, 3 (45-46 gms). UFMG, 5 (Aug. male in female plumage).

Orthogonys chloricterus – MBML, female (40 gms, 12 July 1941, 700 m). B. Whitney (*in litt.*) does not remember the one he registered in NL, 29 Sept. 1989 (Forester 1993). Groups in upper levels, upland forests, but *Caryothraustes* takes its place nowadays. Santa Leopoldina (Pinto 1944) at lower elevation.

Tachyphonus coronatus – Pairs common borders and scrub, rivers or rocky areas or secondary. Similar *T. rufus* unlikely, not confirmed (Forrester 1993). MBML, 10 (27-33 gms; young male in molt, April; adult male ending wing molt, March). MNRJ, 2 males (one young, Feb.). UFMG, 5 (one young male, March; young female, Oct.; male 28 gms).

Tachyphonus cristatus – Small groups canopy and borders, often in mixed flocks. MBML, 6 (male 17 gms; male ending wing molt, March, and female in May; Aug., young male in molt). UFMG, 2 (male in molt, April).

Orchesticus abeillei – MBML, one (12 Oct. 1941, 45 gms, 850 m, forest, with others). UFMG, female 30 May 1965. More in mountains southward, canopy and borders where mimic of and follows *Philydor rufus*.

Trichothraupis melanops – Uncommon understory, mixed flocks, as army ants rare. MBML, 20 (one 27 gms; wing molt Feb. and, 3 birds, April). MNRJ, 4 (23-27 gms; one young male molting, Feb.; other still like female, April). MZUSP, male. UFMG, 10 (two in molt Jan., one April; young male Nov.; other still like female, Feb.).

Nemosia pileata – Lowland canopy and edges. MBML, 2 (618 and 676 m, perhaps invading uplands).

Nemosia rourei – Seen between entrance and headquarters NL, Oct. 1995 (Scott 1997).

Hemithraupis ruficapilla – Canopy and borders, pairs often in mixed flocks; also woodlots. MBML, 6 (13-15 gms; also one Linhares, June, perhaps winter bird; May "female" with some rusty feathers rump and one on throat). MNRJ, male 13 gms. UFMG, one male. *H. guira* from Chaves, S. Leopoldina (MZUSP).

Hemithraupis flavicollis – Small groups upper levels and borders lowlands; once, 10 Feb. 1995 at edge just above SLA. J. Tobias (*in litt.*; Forrester 1993) also noted near Santa Teresa.

Thlypopsis sordida – Invader at edges and in second growth, entrance SL 16 Dec. 1974 and at MBML 5 Dec. 1993 (pair). MBML, 3 (since 1946). UFMG, 4 (yellow young, March; young male in molt, Oct.; adult male in tail molt, March).

Cissopis leveriana – MBML, 3 (male in wing molt, Dec.; worn female, perhaps cage bird). Another specimen, Colatina. Borders and edges, not obvious why no longer present (perhaps was more a lowland species).

Schistochlamys ruficapillus – Bushes of rocky areas, to orchards and edges. MBML, 7 (42 and 37 gms, latter hit house). MNRJ, 3 (39-45 gms). UFMG, 5 (Jan., young still green; molt in Jan., Feb.)

(*Paroaria* sp.) – MBML, many of 3 species labeled "Santa Tereza," certainly captives. This sort of labeling is a real problem in Ruschi's collections.

Saltator maximus – Borders, likely invader from lowlands where native. MBML, 2 females, 1963.

Saltator similis – Borders of rivers and rocky areas, to second growth, but vanished MBML after 1989 when became a popular cage bird. Outside city, still in woodlots or reserves. MBML, 6 (male, 50 gms; 2 with fruit in stomach). MNRJ, 2 females ("tempera-viola," 48-55 gms). UFMG, female and young female in molt, March; young male, March, not molting.

Caryothraustes canadensis – Groups of up to 32 noisy birds, canopy and edges, more in winter on the Timbuí. Occur in some woodlots, perhaps cross open zones. MBML, 8 (2 from "Chácara Anita," 1942, where no longer present; 38-48 gms). UFMG, 4 (female in molt, Feb.).

Pitylus fuliginosus – Subcanopy and edges, uplands; not in woodlots. MBML, 4 (female, 55 gms; male in wing molt, June; female 54 gms, encountered dead in NL). UFMG, 2 (male in molt, Feb; young female, in March).

Passerina brissonii – MBML, 3 (April-Aug.; April male in wing molt; perhaps captives). UFMG, Sept. female. MZUSP, one from Ibiraçu.

´ *Volatinia jacarina* – Invader, singing all year at borders of bushy pastures; not common. MBML, 3 (male, 8.5 gms).

Tiaris fuliginosa – Borders or understory, Rio Timbuí, more common 1993-94 when bamboo seeded. T. Parker (Parker and Goerck 1997) recorded it in NL.

Sporophila frontalis – Small numbers understory with bamboo seeding in 1994; often captured for cage bird. MBML, 4 (12-17 gms, 3 from Aug. 1990, other Aug. 1976).

Sporophila falcirostris – MBML, 25 April 1942 in "capoeira." Upland bamboo understory, now probably extinct as not recorded 1994 bamboo seeding.

Sporophila nigricollis – Vagrants Sept. (Forrester 1993, observed A. Greensmith *in litt.* along with hybrids with next species, "*S. ardesiaca*," just W of NL entrance). On 10 July 1997, male "*ardesiaca*" with *S. caerulescens* same clearing (Willis). More a bird of lowland bushy areas. MBML, hybrid male with a little white mustache (no. 6246), other with gray-green back (6250), both close to *nigricollis*. Linhares, similar male (6257), another nearly white below (6252), two others also but with gray backs (6251 and 6254, "*ardesiaca*"), fifth (6256) similar but with faint moustache and collar, sixth (6255) similar that but with well-marked moustache and collar (rather green-backed), and a seventh (6249) is *nigricollis*. One from Forno Grande (6253) is "*ardesiaca*" but has gray-green back (as 6252).

Sporophila caerulescens – Borders and bushy pastures, more common summer; "invader," but small numbers perhaps near marshes earlier. MBML, 10 (7.5-11 gms; two males a bit green above, one of these in molt April). A third male has yellow moustache, collar, and belly, plus green back ("coleira-baiana"). Fourth male yellow like female, near nest 14 March 1973; fifth in female plumage; sixth albino, in "capoeira" with others 1 Nov. 1941. Many males from Linhares are of the "baiana" type. MNRJ, 2 males of 11 gms. UFMG, 2 females.

Sporophila bouvreuil – MBML, male (captive?). Seen between Vitória and ST 2 Oct. 1989, with other seedeaters (M. Kessler, *in litt.*; Forrester 1993).

Sporophila lineola – MBML, tailless male, 17 Feb. 1964, perhaps captive. Should occur Nov.-Dec., in migration southbound.

Oryzoborus angolensis – One sang near lab of SL several weeks in Jan. 1995; but such birds are worth lots of money and are usually captured. Invader, edges and bushy areas, would be common except for illegal captures. MBML, partial albino; almost all skins are from Linhares. Two female *O. maximiliani* could have been captives.

Sicalis flaveola – Invader of pasture edges, much captured, almost extirpated; now at base serra. MBML, 5 males and a female (12-13 gms, 1984-89; female 18 gms 1942, perhaps wild bird).

Haplospiza unicolor – Many 1993-94 in understory edge with bamboo seeding, to 6 April 1994. MBML, 3 males (17 gms one; March one in wing molt). UFMG, male. Young females from Forno Grande almost no streaks below (greenish above, pale greenish below), while young males different (greenish above, pale gray below).

Coryphospingus pileatus – Bushy edges, lowlands and slopes; less common uplands, but present Goiapaba-Açu just E of NL. Reports from NL (Forrester 1993) not confirmed. MNRJ, male 20 gms. UFMG, 2 males.

Arremon semitorquatus – Ground and nearby, secondary river woods. MBML, 3 (Feb. and March ones in molt; male 28 gms, insects and seeds in stomach). UFMG, male.

Ammodramus humeralis – Invader of lowland pastures.

Zonotrichia capensis – Invader in bushy edges, possibly native along rocky zones or rivers. Rare lowlands, except in coffee. MBML, 12 (20-23 gms). Two young Feb. (Forno Grande).

(*Carduelis yarellii*) – MBML, male, perhaps captive.

Analyses

A. Upland Reserve (NL)

257 species have been found in NL (above and Appendix), plus 14 others in semi-open zones nearby. Of the 257 reserve species, 19 were registered only in the literature, so that we noted 238. Of the 14, 10 species (2 only in Forrester 1993) are "invaders," probably not present before humans cleared large areas.

Of the 257 species, we estimate that 42 were invading (1 only in Parker and Goerck 1997), while 7 were vagrants (3 seen by others). Thirteen species that probably were present in the past ("–" in the Appendix) seem to have been lost, while 4 invading species should be present ("+" in the Appendix) but have not been registered. Four native species are registered only near the reserve, but should occur or have occurred in the past. Three other native birds (*Harpia, Laniisoma, Pyroderus*) lack recent records and could be extinct. Other species, perhaps present in the past, are uncertain.

Including 13 + 4 species that must have been present, and subtracting 7 vagrants and 42 "invaders," there were probably 225 species in NL, before humans cleared nearby zones. The clearings added 42 + 10 (nearby) + 4 ("+") species or 25% of the 225 originally present. Species lost are 13 + 4 (nearby) + 3 or 9%. In this case, humans added 1 new species for every 6 in the original avifauna (Table 1). The numbers are approximate, of course, probably favoring humans; other native species may have been present, as well as some of the supposed "invaders" at natural edges, as we have tried not to exaggerate the "ecological" side of the later discussion of Morris (1995). Below (Section J and Table 2), we perform an alternate analysis that considers likely the presence of certain "invaders" at natural edges.

B. Riverside and Upland Reserve (SL)

We ourselves encountered 250 species in this reserve, which adjoins private forests that extend to NL. In MBML, a specimen of *Cichlopsis leucogenys* is from SL, and in MNRJ, one of *Cochlearius cochlearius*. (One *Ramphodon naevius*, on loan from MBML to MNRJ, is the only other specimen definitely marked as from SL; it is common in field studies). In semi-open areas just up the Timbuí River, we registered 18 other species (2 water birds, 16 invaders).

Of the 252 SL birds, 44 probably moved in with local clearing; vagrant species are 3. Six water birds, 34 forest birds, and 13 invaders should be present. Including the 40 water and forest species, and subtracting 44 + 3, some 245 species were probably "native" in SL before clearings. The clearings added 44 + 16 (nearby) + 13 ("+") species or 29.7% of the 246 originally present, lost

Table 1. Birds of ten areas at Santa Teresa, ES, if few edge especies present originally.

Area	Registered	Native	Invaders	%	Lost	%	Bottom Line
NL	257	225	42 + 10[a] + 4[b]	25	20	9	+ 36
SL	252	245	44 + 16 + 13	30	42	17	+ 31
RS	147	227	37 + 1 + 28	29	119	52	− 53
ST	129	244	38 + 3 + 32	30	174	71	− 101
SLA	121	208+	19 + 13 + 31	31	104	50	− 41
SLP	79	211+	37 + 0 + 28	31	169	80	− 104
VC	32	282	16 + 1 + 60	27	265	94	− 188
EA	72	287	25 + 1 + 48	26	239	83	− 165
SJA	83	285	20 + 26 + 28	26	214	75	− 140
QA	61	285	10 + 13 + 51	26	233	82	− 159
Township	405	384	79 + 0 + 10	23	83	22	+ 6

[a]Invaders of nearby zones; [b]Invaders that should occur

Table 2. Species almost certainly added (J, Appendix) or lost by human activity at Santa Teresa.

Area	Registered	Native	Invaders	%	Lost	%	Bottom Line
NL	257	264	9 + 5 + 2	6	22	8	− 6
SL	252	295	10 + 9 + 4	8	51	17	− 28
RS	147	272	9 + 0 + 12	8	135	50	− 114
ST	129	295	10 + 1 + 12	8	194	66	− 171
SLA	121	251+	2 + 8 + 10	8	125	50	− 101
SLP	79	256+	12 + 0 + 8	8	189	74	− 169
VC	32	318	8 + 1 + 30	12	294	92	− 255
EA	72	322	9 + 1 + 27	11	260	81	− 223
SJA	83	320	3 + 21 + 15	12	227	71	− 188
QA	61	320	0 + 8 + 31	12	253	79	− 214
Township	405	432	31 + 0 + 10	9	83	19	− 42

birds are 40 + *Cichlopsis* and *Cochlearius* or 17.1%. Optimistically, humans added 12.6% to the local avifauna, or 1 species for every 8 originally present.

C. Upland Patchy Forest (RS)

Originally montane forest with small creeks, like Nova Lombardia, there are now only patches and corridors of forest, with pine, banana and coffee plantations. Some 147 species were registered, 37 probably invaders along forest edges. *Spizaetus tyrannus*, once a resident, was a vagrant; *Amazilia fimbriata* was a vagrant. Other invading species that should be present number 28; forest species missing are 118 (plus *Spizaetus*).

Adding 118 and removing 37 species plus 1 vagrant, some 227 species were probably present originally. Invaders are 37 + 1 (*Falco femoralis* nearby) + 28 or 29% of the total. Missing are 118 and *Spizaetus* or 52% of the birds originally

present. Human activity has removed 23% of the species, nearly 1 in 4. With more time in the field, some of these missing birds might be encountered (as in the following areas); but one runs the risk of adding vagrants or "sink" species that would move on or die rather than reproduce locally (Pulliam 1988).

D. City Park (ST)

The MBML, originally "Chácara Anita" of the Ruschi family, still has second-growth and wooded areas by scattered buildings, next to the polluted creek of the narrow town. It is near woodlots that extend to the reserve of Nova Lombardia. Feeders for hummingbirds attract many species, but not birds of other families, as at SL and RS. We registered 129 species (including 10 only as specimens, plus 2 from Forrester 1993, and 5 species, now vagrants, that once were resident – *Elanoides, Spizaetus, Ramphastos*, *Dendrocincla* and *Procnias*), plus 3 invading species in pastures nearby.

Of the 129 recorded, 38 are probably invaders; 14 are vagrants, all except the 5 listed above, *Caprimulgus* and *Pyrocephalus* being hummingbirds attracted by sugar water. Missing are 162 forest species. Subtracting 9 vagrants not present in the past, and 38 species of invaders, some 244 species were probably present before human settlement. Of this total, 38 + 3 (nearby) + 32 ("+") invading species add 29.9%; but the 5 + 162 lost species (plus collected *Accipiter, Micrastur ruficollis, Crotophaga major, Lepidocolaptes squamatus*, *Tangara seledon, Thraupis cyanoptera*, and *Caryothraustes canadensis* as species no longer present) are a loss of 71.3%. Some 41% of the original fauna, nearly half, has not been replaced by any invading bird.

E. Mid-Elevation Woodlot (SLA)

A small forest and tall second-growth woodlot, with eucalyptus and orange groves or pastures about, seems warmer and dryer than the cloud forests of the Santa Teresa uplands; tall trees have Spanish moss (*Tillandsia* sp.) and rather few bromeliad epiphytes. The 120 species registered, plus 15 nearby (including *Ceryle* on the river, and *Hemithraupis flavicollis* in a woodlot), are an avifauna somewhat different from that of the uplands, with many lowland species. We suggest that 6 species, considered invaders or vagrants higher in the serra, are here (and lower down) part of the normal avifauna: *Glaucidium brasilianum, Hylocharis cyanus, Galbula, Thryothorus, Cyanerpes,* and *Saltator maximus*. Not counting these 6, there are 19 "invaders."

At a minimum, 104 forest species are absent; 31 invading species that were not recorded should be present. Since we know little about the original elevational distribution, some lowland forest birds that once reached here could now be gone (see Section G, Vale do Canaã). With 104 species, *Ceryle* and *H.*

flavicollis, minus 19 invaders, at least 208 species were once present. Invaders (19 + 13 + 31) are a maximum of 31% of the original avifauna, lost species are a minimum of 104 or 50%. At least 1 species in 5 has not been replaced.

F. Mid-Elevation Clearings (SLP)

The nearby Timbuí bridge area of low second-growth and open plantations, including a second-growth scrub patch destroyed in 1996 to plant beans and corn, had 79 species (37 invading, plus 5 along the river). Absent forest species were 169 or more, and 28 invaders that should have been present. Adding 169 and subtracting 37, at least 211 species were present originally. A minimum of 169 or 80% were lost, against a maximum of 65 or 31% added. At least 1 lost species in every 2 has not been replaced by invaders.

G. Lowland Orchard (VC)

At the north base of the range, the ranch house and orchards of the Coccheto family were visited mainly to band hummingbirds attracted by feeders. Only 32 species were recorded, *Pulsatrix* only via photographs, plus 3 species in the area. Some 16 were invaders of cleared zones; but 3 other species, considered invaders higher up (*Thamnophilus palliatus, Pachyramphus polychopterus,* and *Stelgidopteryx*) are here and below considered part of the original avifauna. *Amazilia lactea* is here considered an invader (in the uplands, a vagrant), while *Thalurania furcata* is probably a vagrant.

Some 50 other invading species of the lowlands, plus 198 forest and water species of lowlands and uplands, should have been present. In the lowlands of Espírito Santo, judging by our observations, specimens in the MZUSP and Pinto (1944) from Ibiraçu (Pau Gigante), Colatina and Rio São José plus lists of birds observed by Parker and Goerck (1997) and various ornithologists in the Linhares reserves of Sooretama and CVRD (Companhia Vale do Rio Doce; kindly provided by J. F. Pacheco and P. S. de Fonseca), occur many other native species not registered in the cutover lowlands of Santa Teresa. We think that at least 53 such species were present in the lowlands north of Santa Teresa before deforestation: *Crypturellus noctivagus, Harpagus bidentatus, Buteogallus urubitinga, Asturina nitida, Micrastur gilvicollis, Crax blumenbachii, Ortalis araucuan, Columba speciosa, Geotrygon violacea, Ara chloroptera, Aratinga aurea, A. leucophthalmus, A. auricapilla, Pyrrhura cruentata, P. leucotis, Brotogeris tirica, Pionus menstruus, Amazona amazonica, A. farinosa, A. aestiva, Neomorphus geoffroyi, Panyptila cayennensis, Trogon collaris, Monasa morphoeus, Veniliornis affinis, Piculus chrysochloros, Celeus torquatus, Xiphorhynchus guttatus, Glyphorynchus spirurus, Thripophaga macroura* (Ibiraçu, Colatina, MZUSP), *Sclerurus mexicanus, S. caudacutus,*

Thamnomanes caesius, Myrmotherula urosticta, Formicarius colma, Carpornis melanocephalus, Lipaugus vociferans, Xipholena atropurpurea, Cotinga maculata, Pipra pipra, Chiroxiphia pareola, Schiffornis turdinus, Ornithion inerme, Mionectes oleagineus, Rhynchocyclus olivaceus, Attila spadiceus, Laniocera hypopyrrha, Conopias trivirgata, Corythopis delalandid (Santa Cruz, Rio S. José, MZUSP), *Campylorhynchus turdinus, Ramphocaenus melanurus, Euphonia xanthogaster*, and *Arremon taciturnus*. At the moment, these 53 birds seem to have been extirpated near Santa Teresa, although some may yet be rediscovered.

Some 14 water birds should have been present in the Santa Teresa lowlands: *Anhinga anhinga* (Rio S. José, MZUSP), *Pilherodius pileatus, Nycticorax nycticorax, Dendrocygna viduata, Cairina moschata, Heliornis fulica, Amaurolimnas concolor, Aramides cajanea, Neocrex erythrops* (Ibiraçu, MZUSP), *Laterallus exilis, Chloroceryle inda* (Rio S. José, MZUSP), *Philohydor lictor, Agelaius cyanopus* and *Sporophila collaris*. Some 10 invading species, not yet recorded in the Santa Teresa lowlands, should also occur: *Bubulcus ibis, Coccyzus melacoryphus, Pseudoscops clamator, Celeus flavus, Formicivora rufa, F. grisea, Cnemotriccus fuscatus, Anthus lutescens, Sporophila leucoptera*, and *Emberizoides herbicola*. They are not species that would disappear with human activities of the types now present in the area.

For VC, subtracting 16 invaders and 1 vagrant from the 32 species registered and adding 198 (plus 53 + 14 of the lowlands, also *Hirundinea* and *Streptoprocne zonaris* of nearby areas), gives 282 native species. Human activity added 77 or 27% (16 + *Falco sparverius* nearby + 50 + 10), but removed 265 or 94% (198 + 53 + 14), a net loss of two-thirds.

H. Three Lowland Woodlots (EA, SJA and QA)

The dry ridge woods behind the agricultural school (EA), with orchards, eucalyptus and valley pastures, produced 72 species, plus 2 nearby. Of these, 26 are invading species (including *Leistes superciliaris* nearby). Thirty-eight other invaders and 170 water or forest birds should have occurred (plus the 53 forest, 16 water, and 10 invading species listed in "G"). 287 species should have occurred, 74 or 26% replaced by invading species, but 239 or 83% lost due to human activity (Table 1), a net loss of over half.

At the north end of the Santa Teresa area (separated in 1995 in the new township of São Roque), the last ridges sometimes have woodlots. Most of the region is in coffee, pastures, fish ponds, or orchards. In the SJA ridge woodlot, 83 species were registered, plus 34 in open areas and ponds; 20 and 26, respectively, were invaders. Of 285 original species, 74 or 26% were replaced by invaders while 214 or 75% were lost, so that 1 species in every 2 was not replaced by birds of cleared zones.

In the QA woodlot, at the northwest corner of the former Santa Teresa township, next to small rivers of the Fazenda do Pontal, Willis encountered 61 species, plus 14 in pastures and coffee areas nearby. 10 and 13 of these were invading species. Of some 285 original species, 74 or 26% were replaced by invaders but 233 or 82% lost, more than half without replacement by invaders.

I. Santa Teresa Region

Some 405 species are registered, 46 only as specimens plus 4 in recent literature (Forrester 1993, Parker 1983, Scott 1997: *Lophornis chalybea, Phylloscartes sylviolus, Dendroica fusca, Nemosia rourei*). Seven species, not seen by us, were registered both in museums and the literature. Thus, we ourselves registered 348 species.

In the MBML, we found 318 species. Many Thamnophilidae and Tyrannidae observed by us are lacking, but some water birds and hawks, parrots and Emberizinae not observed in the field were present. Several species labeled "Santa Tereza," however were not counted as they were probably cage birds. In the MNRJ, we found 13 more species; in MZUSP, 2 others; and UFMG, 6 more.

Vagrant species are 9, invaders 79 (plus 10 unregistered species that should occur in the lowlands, see "G"). Some 67 other species should live or have lived in the lowlands (see "G"). Five others that could have occurred are *Morphnus guianensis, Glaucis dohrnii* (MZUSP, Rio S. José), *Myrmeciza ruficauda* (MZUSP, Ibiraçu), *Phylloscartes paulistus* (Pinto 1944, Chaves) and *Neochelidon tibialis* (idem).

Besides the 67 probable lost lowland species, 16 registered species seem gone: 9 upland ones (*Harpia, Claravis godefrida, Anabacerthia amaurotis, Laniisoma, Pyroderus, Orthogonys, Orchesticus, Passerina, Sporophila falcirostris*), 5 lowland ones (*Crypturellus variegatus, Spizaetus ornatus, Diopsittaca, Nyctibius grandis, Cissopis*) and 2 from both zones (*Pipile, Melanerpes flavifrons*). These are 22% of the original avifauna, about equal the 23% added by invading species.

If the region were deforested, with human invasions in private reserves and those of SL and NL, we estimate that some 188 species ("P" in Appendix) of borders, rivers, second growth and pastures would survive, plus 10 species that should have invaded the lowlands (Section "G"). This would be 49% of the 384 species present originally. Lost species would be some 207 (plus the 67 lost lowland species), or 71% of the original species; only some lost species would be replaced by invading species.

With complete urbanization plus intensive or "productive" cultivation, of the type seen in Kyushu, Japan (*pers. obs.*), not all the 188 + 10 species would survive. *Passer domesticus* and a few other species might survive.

J. Were Many "Invaders" Already Present?

In preceding sections, we have been very kind to Morris (1995), by supposing that many edge-living species are "invaders." Actually, one often does not know if certain species were really completely absent before humans started to cut the forests around Santa Teresa, and in southern Brazil in general. The analyses above (Table 1) are at best estimates that mark what we consider a reasonable upper limit of what human activity has added to beta-diversity of birds in Santa Teresa. There are many natural edges and "clearings" even in natural or primary (virgin) forests and other habitats. River edges, marshes, and (at Santa Teresa) the numerous rocky cliffs, slopes and "morros" provide edges and scrub habitats in many natural areas. Species of such habitats are frequently ones that move about readily, nesting or passing even in tiny and isolated edge or scrub areas, such as the *Fluvicola nengeta* that called from a treetop in NL one day. They can move warily in sunlight in the canopy or over the canopy, while forest birds or ones of natural vegetation often hesitate to cross open sunlit and dangerous areas. Open-area birds often survive as scattered or "metapopulation" remnants; they are adapted to patchy habitats.

Here and in Table 2, we propose what seems to us a reasonable lower limit for the species added by human activity in Santa Teresa. Obviously, *Passer domesticus* was added by humans. Two *Furnarius* species, one from the south and one from the north, probably invaded southeastern Brazil in the last 50 or 150 years. *Columba picazuro* and *Fluvicola nengeta* are known to have invaded southeastern Brazil recently. Probably, birds of grasslands or pastures were not present in Santa Teresa before clearings; rock slopes rarely support grassy or herbaceous habitats, except bromeliads. Such species, almost certainly added by human activity, are marked "J" in the Appendix, and analysed in Table 2.

If one assumes that many edge species were present in the township long ago, only 31 species seem invaders, so there is a net loss of 42 species (Table 2). Net losses occur even near reserves, and lowland net losses are often near 200 species, even in and around private reserves.

K. "Comparing Oranges and Apples"

Actually, by comparing each lost species with one invading species, we have probably been too kind to developmentalists like Morris (1995). Comparing loss of Harpy Eagles with gain of House Sparrows is like, in economic terms, equating loss of 1 dollar with 1 Japanese yen, or a Picasso replaced by a Coca-Cola bottle. Lost forest species in southeastern Brazil tend to be rare, invading species tend to be what the visiting bird-watchers call "trash birds," such as House Wrens.

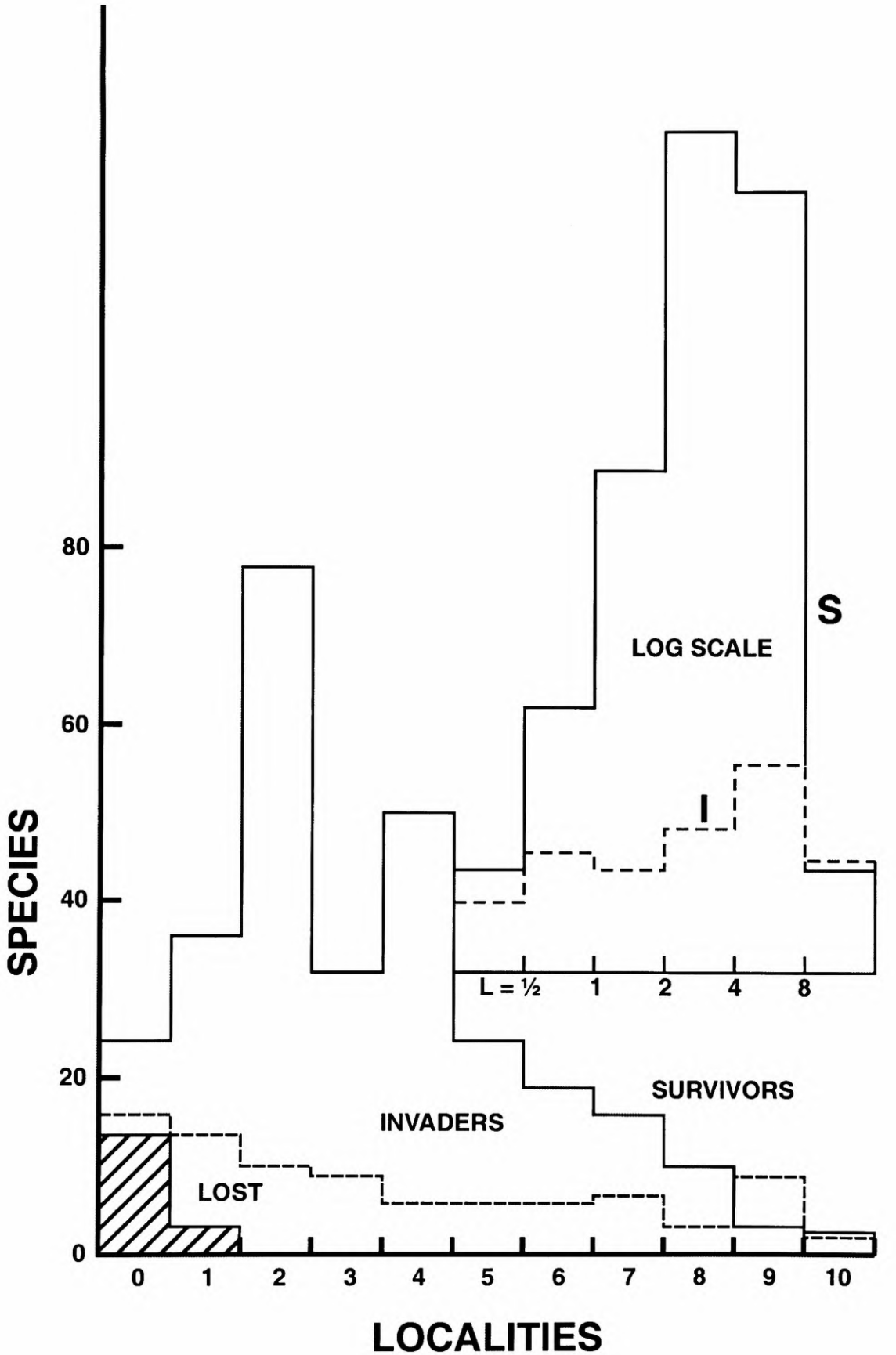

Fig. 1. Birds of Santa Teresa: lost, surviving, and invading (inset, log scale).

To compare species, we are now using numbers of locality records (Willis 2000). From an atlas or the like, a species with 10 locality records is "trashier" than one with 1. The median number of localities for all species is lower, if there are more rare species present. No atlas is yet available for Espírito Santo, but one can use the 10 localities in the Appendix as a local approximation.

For 79 invaders and 10 unregistered "invaders" (Section "J"), the median Appendix number of localities is 3. For the 83 lost native species, the median number of localities is zero. Fig. 1 shows the number of species for each number of localities, for invaders, for lost species, and for surviving (nonvagrant) species. Invaders clearly occupy much space and are more regularly present than are persisting native species, with a side peak above 7 localities in 10. (This peak would have been even higher, had Willis randomly sampled the many open-zone localities in the township). The peak is even more obvious when one uses the usual log scale of abundance (inset).

Discussion

While humans have not yet created a "new species" as Morris (1995) suggested, the Santa Teresa situation at the moment is, roughly speaking, that some or most lost species have been replaced by a similar number of "invading" species; but the process is biased toward common or widespread forms that are replacing rare or localized forms, "Coca-Cola bottles" taking the place of "Picassos." It is not quite correct to assume that artificially greater biodiversity is good, if one measures only beta-diversity in several habitats and does not check alpha-diversity in each habitat or gamma-diversity over large regions.

A detailed analysis, locality by locality, further indicates that natural reserves play a major part in making the result of human settlement even this reasonable. Where a reserve is present, human activity has subtracted little or added slightly to local species totals; not many native species have been lost, while almost all the invading species move in nearby. As a result, totals go up about 1 species for every 6-8 originally present (Table 1) or drop only slightly (Table 2).

Where only small reserves are preserved, or none, Morris' "new species" are a disaster. So many native species are lost that the 30-80 or so invaders replace only part of the lost birds, and it is common to lose 50% of the local species without any replacement by invaders. In the lowlands of Santa Teresa, the process has clearly been unfortunate; it would have been better to have set aside a lowland reserve in the region years ago. Distant lowland reserves (Linhares) help, but not locally.

We can, therefore, understand Morris' idea as a moderate addition of open-area and similar species when humans first start to occupy a region. If no reserves are set aside and protected, the invading species are unable to replace

even half the lost species, and Morris' barge quickly sinks. Theoretically, Morris and similar persons should favor setting aside reserves everywhere, even in lowland Santa Teresa.

FURTHER DEVELOPMENT – While the current situation in Santa Teresa is only moderately bad for Morris' thesis (too much loss of lowland birds, due to lack of large reserves, plus losses of certain rare species even in the upland reserves; invading species cancel some losses, but are like "Coca-Cola bottles"), future developments raise still other questions.

Specifically, people are destroying habitats outside reserves in Santa Teresa. The Valsugana marsh at the SL entrance, and bushy second growth of SLP, went under in 1996. In the 1995 drought, large areas burned, even private forest areas. Even invading species lose their places with "progress." As crops and houses move in, one ends up with a "Kyushu World," where at most a House Sparrow or two survive.

The few small fragments of vegetation that remain often, instead of providing a "metapopulation," set up many small "sinks" where birds move in but die, draining off productivity even of "source" areas (Pulliam 1988). Such artificial predators as kids, cats and dogs make the situation worse. One remembers the female bitch that killed 900 kiwis in New Zealand (Diamond 1989), and the lighthouse keeper's cat that exterminated a nearby native wren. Forest reserves are imperfect; they are often subject to predatory dogs and hunters even near Santa Teresa, while in Bahia off north (Monte Pascoal National Park) and São Paulo (Ilha do Cardoso and Intervales State Parks) off south, anthropologists have sponsored invasions by landless Indian groups. Increased ecotourism with recent plans to put private firms in Brazilian national parks could affect avifaunas, too.

In Brazil, "unproductive" land (where many invading birds live) is taxed heavily (20% of its value, each year) and can be turned over to "sem-terra," poor farmers, using tax money from the rest of society. The Catholic Church favors this process, as do various political groups. Theoretically, intensive use of an area is better, reducing pressure on nearby areas that can be set aside as natural reserves. However, "productivity" is difficult to define, and shunting uneducated poor from city slums to small farm plots where they barely survive (much less "produce") is one result. In Bahia, next to the Bralanda (Guaraní) forest, such a settlement is resulting in illegal hunting, pollution of the only creek, and remarkably little food production (pers. obs.). Such settlements require schools, roads, etc. and can seem remarkably expensive and expansive for what they "produce."

Constant regrowth and cutting forces birds to move, resulting in territorial battles or attack by predators. Both "invading" and "native" species are

subject to many negative factors not considered by Morris, nor by those who favor Indians or "landless poor."

Perhaps the idea of taxing lack of "productivity" could be extended in other directions, while we wait to see if rich and poor farmers or Indians will try to eliminate invading birds or invade biological reserves. Governments often have difficulty returning money from rich members of society to programs to protect forest reserves or to help poor people. Recently, outside charges for toll booths on highways and in national parks have allowed unchanged taxes to pass more to poor people or (perhaps) to conservation. Coffee, a common crop around Santa Teresa, is certainly not a necessary product, but a "luxury drug." Perhaps it could be subject to a "luxury tax," which could then go to conservation or family planning programs and other ways to really help environments or city or rural poor. ("Luxury taxes" were common in Second World War, when Willis was a child; they could be used in the curent "Third World War," where money from richer persons is often passed to poorer ones for better education, health, and food supplies.) Sale of land for luxurious summer homes near Santa Teresa could be taxed, at least for nonresidents. Alcohol, tobacco, perfumes, cosmetics, silicon for breast implants, luxury cars, dozens of other possible "luxury taxes" come to mind once one starts to think like the "sem-terra," of "productivity." Those who teach esoteric cults and religions are producing luxuries, not necessities, and could well be taxed. Movies, fiction, sports, beach vacations, fat people, beef eaters, pets, more than one child, big lawns or mansions are other possible sources of luxury taxes. Alternatively, such people or businesses could contribute via "voluntary aid programs," though luxury or other taxes are more efficient at preventing selfish individuals from not helping in a "war". The subject merits extensive and intensive analysis, for land areas are not being put to really "productive" use in many cases, resulting in unusually limited reserves, plus mistreatment of poor people and other organisms.

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Appendix

Species	Locality and number observed									
	NL	SL	RS	ST	SLA	SLP	VC	EA	SJA	QA
Tinsol	28	12	–	–	–	–	–	–	–	–
Cryobs	273	290	11	–	9	–	–	–	–	–
Cryvar – M							–	–	–	–
Crysou							–	–	–	3
Crytat – P					–	2	–	5	8	1
Crypar – IJP							+	+	(3)	(1)
Rhyruf – IJP					+	2	+	+	(1)	+
Podpod – PM						–	–	–	–	–
Tacdom – PM				–	–	–	–	–	–	–
Ardalb – PM							–	–	–	–
Egrthu – P							–	–	(1)	–
Butstr – P	B	12	–	1	–	–	–	–	(1)	–
Coccoc – M		M		–	–	–	–	–	–	–
Tiglin	B	1	–	–	–	–	–	–	–	–
Ixoexi – PM		–		–	–	–	–	–	–	–
Amabra – P		2		–	–	–	–	–	(34)	–
Denaut – PM							–	–	–	–
Nomdom – PM							–	–	–	–
Sarpap	4	–	–	–	–	–	–	–	–	–
Coratr – IP	282	379	58	664	16	14	+	65	125	18
Cataur	36	31	5	–	–	2	–	3	4	2
Catbur – IP							+	+	(1)	+
Lepcay	7	4	2	–	–	–	–	–	–	1
Chounc – M	BV						–	–	–	–
Elafor – S	26	–	–	1–V	–	–	–	–	–	–
Hardio – S	23	2	–	1	2	–	–	–	–	–
Ictplu – S	6	–	–	–	–	–	–	–	–	–
Gercae – V	1									
Accstr – P	8	–	2	M						
Leulac		1			–	–	–	–	–	–
Leupol	3	15	–	–	–	–	–	–	–	–
Butalb – IP			+	3	(2)	+	+	+	(1)	+
Butnot					1	–	–	–	1	–
Butbra – I	3	+	2	1	+	+	+	+	+	+
Rupmag – IP	66	84	12	23	7	3	+	5	7	4
Harhar – M	B	–	–	–	–	–	–	–	–	–
Spimel	6	1	–	–	–	–	–	–	–	–
Spityr	22	8	1–V	1–V	–	–	–	–	–	–
Spiorn – M					–	–	–	–	–	–
Carpla – IP	1	14	1	+	+	+	+	+	(1)	(1)
Milchi – IP	13	4	3	2	5	+	+	2	5	(1)
Hercac	3	6	–	–	1	–	–	–	1	3
Micruf	54	11	–	M	–	–	–	–	1	–
Micsem	17	4	–	–	–	–	–	–	–	–
Falruf – iP	1	+		7	1	+	–	–	1	–
Falfem – IP		+	(1)	+	+	1	+	+	+	+

Continued

Species	Locality and number observed									
	NL	SL	RS	ST	SLA	SLP	VC	EA	SJA	QA
Falspa – IJP		+	+	+	+	+	(1)	+	(1)	+
Pipjac – M		–		–	–	–	–	–	–	–
Penobs	–	7?	2	–						
Pensup – P	B	–	–	–	–	–	–	–	3	–
Odocap	8	3	–	–	–	–	–	–	–	–
Ralnig – P	53	143	3	–	–	3	–	–	(1)	–
Arasar	28	174	–	1	1	–	–	–	(1)	–
Poralb – P		13		–		–	–	–	–	–
Latmel – P	B	(15)		–		–	–	–	–	–
Latvir – IP					1	+	+	+	+	+
Galchl – P								–	(18)	–
Paormar – PM								–	–	–
Carcri – IJP							+	+	(1)	+
Jacjac – P							–	–	(17)	3
Vanchi – IP	(1)	(8)	+	(2)	+	+	+	5	(67)	(6)
Galpar – PM		–		–	–	–	–	–	–	–
Trisol – NP		–		–	–	–	–	–	(1)	–
Colcay – IP		(14)	+	+	+	2				
Colpic – IJP		+		+	+	+	+	1	(1)	(2)
Colplu	113	79	2	–	1	–				
Colcui – IJP							+	+	(8)	+
Colmin – IJPM							+	+	+	+
Coltal – IP	66	177	23	16	6	12	6	7	23	6
Scasqu – IJP		+		1	+	+	3	1	(5)	+
Clapre – SP	16	44	–	–	1	–	–	–	–	–
Clagod – M	–	–	–	–						
Lepver – P	53	82	8	–	2	3	–	1	3	2
Lepruf		48	–	19	1	–	–	–	–	–
Geomon	41	6	–	–						
Dionob – M							–	–	–	–
Promar							–	6	16	2
Pyrfro	1657	699	72	39	33	–				
Forxan – IP		111		+	+	4	2	+	3	5
Tousur	91	51	–	–	–	–	–	–	–	–
Toumel	27	45	3	–	–	–	–	–	–	–
Piopil	263	32	–	–	–	–				
Piomax	245	47	11	1	24	–	–	4	10	4
Amarho	111	22	–	–	–	–	–	–	31	8
Trimal	21	2	–	–						
Cocame – MNP		–	–	–	–	–	–	–	–	–
Piacay – P	69	104	14	14	6	–	–	2	6	2
Croani – IP	7	97	8	(4)	(11)	18	+	7	(1)	4
Cromaj		–		M	–	–	–	–	–	8
Guigui – IJP	(B)	(3)	+	(2)	(7)	+	+	3	(6)	(19)
Tapnae – IP	2	46	6	1	4	2	+	1	3	2
Tylalb – IJPM							+	+	+	+
Otuatr		2		–	–	–	–	–	–	–
Otucho – iP	+	1	+	+	+	+	–	–	–	–

Continued

Species	Locality and number observed									
	NL	SL	RS	ST	SLA	SLP	VC	EA	SJA	QA
Pulkoe	B	–	–	–	–	–	B	3	1	–
Cichuh	18	1?	–	–	–	–	–	–	–	–
Cicvir	3	–	–	–	–	–	–	–	–	–
Athcun – IJP		(4)	+	+	+	+	+	+	(1)	+
Glabra – iP	B	3	1	+	2	–	–	–	–	–
Glamin	34	8	–	–	–	–	–	–	–	–
Nycaet	2	1	–	–	–	–	–	–	–	–
Nycgri		1	–	–	–	–	–	–	–	–
Nycgra – M							–	–	–	–
Lursem – PS	8	23	–	–	–	–	–	–	–	–
Chomin – NP	2	–	–	–						
Podnac – MV										
Capruf – M				MV			–	–	–	–
Nycalb – iP	1	16	+	+	+	1	–	–	2	2
Nycoce	7	14	–	–	–	–	–	–	1	–
Hydtor – IP	13	(4)	+	+	+	+	+	+	+	+
Strzon – P	–	–	–	–	–	–	(30)	–	–	–
Strbis – P	1065	600	8	115	100	20	–	(5)	–	–
Charid – P							–	–	1	–
Chacin	559	514	–	–	–	–	–	–	–	–
Ramnae	(7)	464	–	–	–	–	–	–	–	–
Glahir	B	5	24	191	2	–	1	–	–	–
Phasup				1–V	–	–	–	–	–	–
Phaeur	374	228	10	3						
Phasqu	16	26	3	6						
Phapre – IP	1	4	51	102	1	6	15	+	4	+
Phaida				BV			–	–	2	1
Eupmac – IP	3	49	45	289	+	+	35	1	2	+
Flomel – V				3–V						
Melfus	407	1207	371	2546	6	–	54			
Colser – IP		10	1	265	+	+	30	1	+	(1)
Antnig		–	–	3	–	–	–	–	–	–
Chrmos – IP	1–V						+	+	+	+
Lopcha – V				B–V						
Lopmag – P	180	44	33	79	–	2				
Poplan – M	–	–	–	–						
Chlaur – IP	3	25	4	25	+	4	2			
Chlnot – PM							–	–	–	–
Thafur – V							1–V			
Thagla	663	506	160	321	1	–	15	–	–	–
Hylsap	1–V						–	–	–	–
Hylcya		2–V		1–V	3	1	–	–	–	–
Leualb – IP	50	49	126	209						
Polgua – PM							–	–	–	–
Amaverver – P	7	11	69	268						
Amaverbre – P		4	1	44	–	–	1	–	–	–
Amalac – IJP	1–V			2–V			5	+	+	+
Amafim – IP			1–V				+	+	+	+

Continued

Species	Locality and number observed									
	NL	SL	RS	ST	SLA	SLP	VC	EA	SJA	QA
Aphcir – IP	165	917	180	363	+	2	6			
Clyrub	350	273	79	31						
Helaur		1–V			–	–	–	–	–	–
Helsqu – V				1–V						
Calame – P	9	19	2	68						
Trovir	135	30	–	–	–	–	–	–	–	–
Trosur	101	78	5	–	1	–	–	–	–	–
Troruf	32	12	4	–	–	–	–	–	–	–
Certor – P		46		–	(1)	–	–	–	–	–
Chlama – P		8		–	–	1		–	–	–
Chlame – P	2	18	1	–	–	–	–	–	–	–
Barruf – M							–	–	–	–
Galruf – i	(1)	41			30	–	1	2	–	–
Bucmac	8	4	–	–	–	–	–	–	–	–
Malstr – P		49	1	12	6	–	–	1	–	–
Cheten – iP	1	77	+	+	–	–	–	–	–	–
Baibai	12	14	–	–						
Pteara – P					4	–	2	3	–	4
Selmac	54	14	–	–	–	–	–	–	–	–
Ramvit	283	155	11	1–V	16	–	–	–	–	3
Piccir – P	20	63	–	9	7	–	–	2	1	4
Colcan – IJP	(6)	22	9	+	(11)	3	1	4	(4)	(4)
Colmel – M	–	–	–	–						
Picfla	51	21	–	–	–	–	–	–	–	–
Picaur	26	5	–	–						
Celfla	3–V				3	–	–	–	2	2
Drylin – i	10	12	4	+	–	–	–	–	2	(2)
Melcan – IJP	4	(4)	8	1	3	+	1	+	(1)	+
Melfla – M	–	–	–	–	–	–	–	–	–	–
Venmac	107	83	5	11	2	–	–	1	7	2
Camrob	12	2	–	–	–	–	–	1	4	–
Dentur	142	35	2	1–V	–	–	–	–	–	–
Sitgri	497	168	11	–	–	–	–	–	–	–
Denpla	12	2	–	–	–	–	–	–	–	–
Xipalb	102	40	2	–	–	–	–	–	–	–
Lepsqu	61	16	–	M	–	–	–	–	–	–
Lepfus	414	170	11	3	9	–	–	1	2	–
Camfal	84	16	–	–	1	–				
Furruf – IJP	58	34	9	16	(8)	20	1	3	(9)	+
Furfig – IJP	(1)	7	+	43	(1)	18	+	2	(11)	+
Synruf	108	141	18	–						
Synfro – IP							+	1	4	2
Synspi – P	133	159	23	2	–	1				
Cercin – P		(5)	–	–	–	4	–	1	–	–
Cerpal – IP	46	151	15	43	+	1				
Pharuf – IJP	47	(11)	+	+	(1)	10	2	+	(2)	(2)
Locnem	83	103	6	–	–	–				
Anama – M	–	–	–	–						

Continued

Species	Locality and number observed									
	NL	SL	RS	ST	SLA	SLP	VC	EA	SJA	QA
Philic	223	45	–	–						
Phiruf	496	22	–	–						
Phiatr	254	55	–	–	–	–	–	–	–	–
Cicleu	116	11	–	–	–	–	–	–	–	–
Anafus	125	107	24	–						
Autleu	127	48	–	–	9	–	–	–	–	–
Xenmin	19	11	–	–	3	–	–	–	–	–
Xenrut	85	73	8	7	7	–	–	2	–	2
Sclsca	4	3	–	–						
Scyind – M	B	–	–	–						
Psigut – M	–	–	–	–						
Hypgut	147	25	–	–						
Batcin – P	(3)	64	–	–	–	1				
Macsev	(2)	172	–	–						
Thapal – iP		80		+	2	8	1	1	–	1
Thaamb – P							–	16	80	19
Thacae	88	132	14	8	1	–				
Tharuf – IP		(1)	1	+	(1)	2	2			
Dysmen	234	89	–	1	8	–				
Dyssti	387	223	24	–	35	–				
Dysplu	2	–			–	–	–	–	–	–
Myrgul	22	8	–	–						
Myrmin	10	1	–	–						
Myraxi							–	–	21	6
Herruf	B	14	–	–	–	–	–	–	–	–
Termac	352	154	–	–	11	–	–	–	–	–
Dryfer	25	137	27	8	23	–				
Dryoch	6	5	3	–						
Drysqu	9	2	–	–	2	–	–	–	–	–
Pyrleu	19	171	33	–	21	–	–	–	–	–
Forser – P	(5)	36	10	–	–	2				
Myrlor	259	102	2	–	13	–				
Chamer	107	71	–	–						
Chacam	189	9	–	–						
Gravar	20	3	–	–						
Conmel	6	–	–	–	6 (1)	–	–	–	–	–
Conlin – P	58	106	4	1						
Lanele – M	B	–	–	–	–	–	–	–	–	–
Phifla – W	4	–	–	–						
Carcuc	66	39	–	–						
Liplan	269	16	–	–						
Pyrscu – M	B	–	–	–						
Pronud	74	15	–	2–V	–	–	–	–	–	–
Oxycri	145	61	2	–	1					
Iodpip	–	3	–	–						
Paccas	399	328	28	–	9	–				
Pacpol – iP	10	9	+	5	1	1	–	2	1	2
Pacmar	108	23	–	–	–	–	–	–	–	–

Continued

Species	Locality and number observed									
	NL	SL	RS	ST	SLA	SLP	VC	EA	SJA	QA
Pacvir	53	147	15	7	3	3	–	–	–	–
Pacval – P	BV						–	–	1	–
Pipchl	68	23	–	–						
Titinq	8	1	–	–	–	–	–	–	–	–
Titcay	36	2	–	–	–	–	–	–	–	
Chicau	891	409	45	–	14	–				–
Ilimil	236	131	28	2	–	–				
Piprub					1	–	–	–	–	–
Manman – P	11	113	8	–	44	–	–	1	6	3
Macreg		1–V					–	–	–	–
Neoaur	109	6	–	–						
Schvir	225	127	5	2	–	–				
Phyfas – IP	60	225	21	10	1	+	+	+	+	1
Phygri	59	35	–	–						
Phybur	38	25	3	5						
Camobs – IP	33	72	5	16	9	4	+	1	13	5
Myican	101	6	–	–	–	–	–	–	1	3
Elafla – P	65	188	20	16	6	17	–	1	2	3
Elaalb – IPW	4	3	+	1						
Elapar – IPW	1?	2	+	+						
Elaobs – P	42	38	–	–						
Elames – IPS	10	4	+	1						
Sernig		2			–	1				
Sersub – IP	24	5	3	+	2	+				
Mioruf	66	79	3	1	5	–				
Lepama – P	303	95	13	8	17	–	–	2	4	–
Phyous	323	55	–	–						
Capfla – P	20	148	20	–	2	–				
Physyl	B	–	–	–						
Myiaur – P	107	16	10	–	11	–	–	5	24	10
Hemnid – P	65	50	1	–						
Hemdio	46	28	–	–						
Hemorb							–	1	8	–
Todcin – IP		+		5	+	+	+	1	3	3
Todpol – P	64	193	34	36	6	8	2	4	1	1
Todplu – P	53	93	16	–	2	–				
Tolsul	396	296	41	35	17	–	–	4	6	1
Tolpol							–	–	2	2
Tolfla – P							–	5	13	5
Eusmel – IP						1	+	+	+	+
Plaleu	22	1	–	–						
Plamys – P	148	44	2	9	9	–				
Myibar	132	30	1	–	1	–	–	–	–	–
Myiatr – P	8	22	4	–	–	–				
Myifas – IP	62	131	17	3	(3)	12	+	+	2	+
Concin	82	102	2	–	–	–	–	1	1	2
Lateul	208	148	6	10	1	–	–	2	–	1
Knilop – IJMP				+						

Continued

Species	Locality and number observed									
	NL	SL	RS	ST	SLA	SLP	VC	EA	SJA	QA
Kninig	2	–	–	–						
Knicya – PW	4	4	–	–						
Pyrrub – MVW				M–V						
Flunen – IJP	1	23	5	16	(1)	10	+	6	(13)	(5)
Aruleu – P		–	–	–	–	–	–	–	1	–
Colcol	48	101	6	9	2	–	–	2	–	–
Satict – iP		(7)		+	+	+	–	–	1	–
Hirfer – JP	23	20	2	–	5	–	(1)			
Macrix – IP	(9)	(2)	+	3	+	+	+	2	7	+
Musvet – P	42	13	4	–						
Attruf	128	166	1	–	1	–	–	–	–	–
Rhysim	70	25	2	–	5	–	–	–	–	–
Sirsib	311	142	10	2	8	–	–	1	–	–
Myifer – P	27	83	16	13	3	8	–	1	–	–
Myiswa – IPS	8	25	+	1						
Myityr – P							–	3	15	4
Myitub	22	15	–	–	–	–	–	–	–	–
Pitsul – P	146	323	48	63	14	13	2	4	10	7
Megpit – P	154	268	28	37	11	9	2	4	2	3
Myicay – P	28	168	6	–	–	2	–	–	–	–
Myisim – P	128	380	35	42	18	16	–	2	2	2
Myimac – PC	35	52	11	13	6	1	–	–	1	–
Legleu – iS	10	5	+	+	+	+	–	–	–	–
Empvar – PS	20	65	6	10	3	–	–	–	–	–
Tyrmel – P	120	160	24	15	15	15	–	–	12	2
Tyrsav – MSV										
Tacalb – P							–	–	–	1
Protap – P	33	16	15	–	2	14	–	–	1	–
Prosub – NP	1	–	–	–	–	–	–	–	–	–
Procha – P	212	64	13	23	1	3	–	10	–	–
Notcya – IP	209	56	32	49	+	11	+	+	+	+
Steruf – iP	50	66	17	+	10	22	–	4	6	–
Thrgen – iP	(2)	(3)	4	+	10	8	–	8	20	11
Troaed – IJP	50	105	26	23	(5)	9	1	5	(1)	(2)
Donatr – PM		–		–		–	–	–	–	–
Mimsat – IJP	10	(30)	2	+	(3)	10	+	+	(2)	+
Cicleu	3	M	–	–						
Plafla	76	29	3	9	1	–				
Turruf – P	265	429	48	112	18	16	1	4	–	–
Turleu – IJP	9	87	11	52	6	2	1	1	6	+
Turama – P	65	79	10	18	3	7				
Turalb	257	139	5	1	–	–	–	–	–	–
Turfum – M						–	–	–	–	–
Cycguj – P	344	348	35	40	14	9	1	3	–	4
Virchi – P	9–W	9–W		2	4	–	–	2	9	–
Hyltho – P		86			5	4	–	2	–	1
Hylpoi – P	87	245	18	–	1	1				
Pasdom – IJP			+	96	+	5	+	9	+	+

Continued

Species	Locality and number observed									
	NL	SL	RS	ST	SLA	SLP	VC	EA	SJA	QA
Ictjam – PM								–	–	–
Ictcay – PM							–	–	–	–
Molbon – IJP	4	(4)	4	2	+	5	+	+	(1)	+
Scaory					2	–	–	–	–	–
Psadec	1				121	2	–	–	1	–
Cachae							–	–	–	1
Gnocho – IJP		(3)				9	+	+	(7)	(4)
Ageruf – IJP							+	+	(25)	+
Leisup – IJP							+	(3)	(11)	+
Geoaeq – P	44	58	4	–	–	5	–	–	–	–
Parpit – P			1	1	7	–	–	3	16	6
Denfus – NV	BV									
Basriv – M						–	–	–	–	–
Bascul – P	59	47	33	2	23	–				
Coefla – P	39	152	40	79	4	1	1	–	2	–
Conspe – P							–	–	9	12
Cyacya – iP		+	+	M	1?	–	–	–	–	–
Chlspi	8	7	–	–	–	–	–	–	–	–
Daccay – P	34	112	14	6	10	–	–	–	–	6
Dacnig – M	B	–	–	–	–	–	–	–	–	–
Tervir	11	60	3	–	1	–	–	–	–	–
Chlcya	69	47	–	1	–	–				
Eupchl – IP	+	+	+	5	2	+	+	+	+	+
Eupvio	21	57	–	–	–	–	–	–	4	2
Eupcya – M	–	–	–	–	–	–	–	–	–	–
Euppec	208	147	6	1	8	–	–	–	–	–
Pipmel – W	1	3	–	–						
Tansel		159		M	10	–	–	–	–	–
Tanvel – M					–	–	–	–	–	–
Tanmex – M					–	–	–	–	–	–
Tancya	79	10	–	–	2	–				
Tanven	412	322	12	53	23	–				
Tancay – P	57	47	18	12	2	2	–	–	2	–
Thrsay – P	152	254	33	79	15	18	1	4	10	–
Thrcya	110	13	–	M						
Throrn – P	148	176	21	24	2					
Thrpal – P	35	30	9	28	2	6	–	–	2	–
Rambre – iP		2			+	+	–	–	–	–
Pirfla – IJMP	+	+	+	+						
Habrub	246	87	–	–	17	–	–	–	–	–
Ortchl – M	–	–	–	–	–					
Taccor – P	246	322	45	40	4	5				
Taccri	165	54	7	–	14	–	–	–	–	–
Orcabe – M	–	–	–	–						
Triops	264	79	15	2	1	–	–	–	2	–
Nempil							–	–	1	4
Nemrou	B	–	–	–						
Hemruf	362	144	13	–	12	–	–	4	1	–

Continued

Species	Locality and number observed									
	NL	SL	RS	ST	SLA	SLP	VC	EA	SJA	QA
Hemfla					(1)	–	–	–	–	4
Thlsor – IJP		(1)	+	2	+	+	+	+	+	+
Cislev – M							–	–	–	–
Schruf – P	80	42	3	–	–	8				
Salmax – iJP	65	198	+	+	15	7	–	–	–	–
Salsim – P	330	332	23	5	1	2				
Carcan	258	288	10	M	–	–	–	14	12	15
Pitful	37	118	–	–						
Pasbri – IM		+	+	+						
Voljac – IP	(5)	(30)	4	+	(2)	18	+	2	27	(8)
Tiaful	B	40	–	–	–	1	–	–	1	–
Spofro	3	1	–	–						
Spofal – M	–	–	–	–						
Sponig – IMP	(B)						+	+	+	+
Spocae – IP	254	275	66	1	8	45	+	2	9	+
Spobou – M							–	–	–	–
Spolin – IMP	+	+	+	+	+	+				
Oryang – IP		3	+	+	+	+	+	+	+	+
Sicfla – IP							+	+	1	+
Hapuni	51	17	–	–						
Corpil – IP	(1)	+	2	+	+	9	+	+	8	+
Arrsem		4			–	–				
Ammhum – IJP							+	+	2	+
Zoncap – IP	248	122	42	20	11	6	+	+	6	+
Days	107	90	17	36	8	8	3	2	5	2
Hours (day)	721.2	561.2	36.6	72	25.2	5	6	6.6	17.3	6.7
Hours (night)	26.3	10.1							1.6	0.7

B = bibliography;
I = invader (Table 1);
i = invader in highlands only;
J = invader (Table 2);
M = museum;
N = migrant from North America;
P = probably would survive general clearing;
S = summer only;
V = vagrant;
W = winter or fall migration;
– = native bird should be present;
+ = invading bird should be present;
( ) = on nearby area, not in reserve or forest tract.

CREDENCIAMENTO E APOIO FINANCEIRO DO
PROGRAMA DE APOIO AS PUBLICAÇÕES CIENTÍFICAS PERIÓDICAS DA USP
COMISSÃO DE CREDENCIAMENTO

Papéis Avulsos de Zoologia

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The text of articles should be arranged in the following order: title page, abstract, body of text, literature cited, tables, appendices, and figure captions. Each of these sections should begin on a new page. All typescript pages must be double-spaced.

(1) *Title page:* This should include the title, author(s) name(s), institutions, and key words in English as well as in the language of the manuscript, and a short running title in English. The title should be concise and, where appropriate, should include mention of families and/or higher taxa. Names of new taxa should not be included in titles.

(2) *Abstract:* All papers should have an abstract in English, regardless of the original language. The abstract is of great importance as it may be reproduced elsewhere. It should be in a form intelligible if published alone in conjunction with the title and should summarize the main facts, ideas, and conclusions of the article. Indicative abstracts are strongly discouraged. Include all new taxonomic names for referencing purposes. Abbreviations should be avoided. It should not include references. Abstracts should not exceed 350 words.

(3) *Body of text:* The main body of the text should include the following sections: Introduction, Materials and Methods, Results, Discussion and Acknowledgments at end. Primary headings in the text should be in capital letters and centered; the following text should begin on the next line, indented. Secondary headings should be in capital and lowercase letters and flush left; the following text should begin on the next line, indented. Tertiary headings should be in capital and lower case letters, in italics and indented; the following text should be on the same line and separated from the heading by a hyphen.

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Articles in Books – Silva, H. R. Year. Article title; pp. 000-000. In: H. Oliveira & S. Rangel (Eds.), Book Title. Publisher, Place.

Articles in Larger Works – Silva, H. R. Year. Article title; pp. 000-000. In: H. Oliveira & S. Rangel (Eds.), Title of Larger Work. Serial Publication 00. Publisher, Place.

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