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Distribution of the hematozoa of Neotropical birds*

by

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Abstract: The literature pertaining to the prevalence of avian hematozoa in the Neotropics, together with unpublished records from the files of the International Reference Centre for Avian Haematozoa, has been examined with respect to the distribution of parasite genera by host family and region. The blood parasites of 35555 birds of 955 species (80 families) occurring in the Neotropics formed the basis for the comparisons. Only 3743 (10.5%) individuals harbored one or more species of hematozoa. *Haemoproteus* was the most commonly observed form exhibiting a 7.4% prevalence, followed by *Plasmodium* (1.9%), microfilaria (1.2%),*Trypanosoma* (0.6%), and *Leucocytozoon* (0.2%). Hematozoan prevalence varied markedly from region to region and among families. In comparison with a similar review of Nearctic avian hematozoan distribution, the Neotropics demonstrated a much lower prevalence and a near absence of *Leucocytozoon.*

Over the years, the study of the epizootiology of avian hematozoa has frequently been limited to the cataloguing of the hematozoa of the birds of a specific, but localized region. This resulted in checklists such as that of Lucena (1941) which summarized parasite presence or absence, but made no pretense to indicate parasite prevalence, an important tool in any epizootiological study. Although Beltran and Pardiñas (1953) summarized the blood parasite prevalence in Mexican birds, the first major study to analyse published evidence on a continental basis in an epizootiological fashion was that of Greiner *et al.* (1975)**. The latter study attempted to explain the distribution of blood parasites in the birds of North America on the basis of (i) vertebrate-host family, (ii) regional distribution and (iii) distribution of bird nesting sites in a vertical cline.

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Due to the large volume of disparate literature on the Neotropical avian hematozoa and the need to consolidate this information into a more manageable form, this study was undertaken in an attempt to analyse the distribution of blood parasites in the Neotropical region on the basis of the avian-host families and the regions in which they occur.

MATERIAL AND METHODS

The data presented in Table 1 was compiled mainly from primary sources in the literature and from unpublished records in the files of the International Reference Centre for Avian Haematozoa. In some cases, where primary sources were not available, or were difficult to interpret, summaries of such data have been used (e.g. Galindo and Sousa, [1966] summarized the internal reports of the Gorgas Memorial Laboratory). Records from checklists, or publications from which prevalence (defined herein as the proportion of infected birds to the total sample) could not be determined, were included to demonstrate the occurrence of a parasite in a particular avian host when that parasite had not already been reported as a prevalence record. Such records are indicated by (+) in Tables 1, 2 and 4. The "Other" category in Tables 1, 2, 3 and 4 includes haemogregarines, *Atoxoplasma*/*Lankesterella* and *Akiba*. A few published records of avian hematozoans have been omitted as they cite blood parasites of birds of Neotropical origin examined in other countries. It was not possible to determine whether these birds were infected prior to or after importation into the country in which they were examined.

A major attempt was made to check the validity and to cite the authority for each bird species (Tables 1, 2), using the works of the American Ornithologists' Union (1957), Clements (1974), Edwards (1974), Field Museum of Natural History (1918-1949), Meyer de Schauensee (1966), Monroe (1968) and Peters (1931-1970) as the primary reference material.

The Neotropical region was arbitrarily divided into eight regions on the basis of topography. It was clearly recognized that topography would affect the distribution of both hosts and vectors, tending to concentrate certain hosts and (or) vectors into specific regions. In addition to the records of the International Reference Centre for Avian Haematozoa, the following reports of avian hematozoan prevalence or occurrence were used: (References in parentheses were summarized in the paper which immediately precedes them.)

Region 1: Beltrán (1942b), Beltrán and Pardiñas (1953) - (Beltrán [1939, 1940, 1941, 1942a, 1944], Hewitt [1940], Larenas [1945], Pardiñas [1946, 1950]), Clark and Swinehart (1969), Galindo and Sousa (1966), Garnham and Lewis (1959), Huff and Wetmore (1967), Laveran and Pettit (1909), Saunders (1959), and Takos (1947).

Region 2: Augustine (1937), Brown *et al.* (1972), McLaughlin (1968), and Zajicek and Mauri Mendes (1969).

Region 3: Ayala and Varela (1975), Bennett and Borrero (1976), Renjifo *et al.* (1952) - (Renjifo [1950]), and Tello and Tantaleán (1964).

Region 4: Anonymous (1958, 1959), Brimont (1909, 1912), Gabaldon and Ulloa (1976 a,b), Gabaldon *et al.* (1974, 1975, 1976), Iturbe and González (1916), Leger (1918), and Saunders (1961) - (Anonymous [1960]).

Region 5: Lainson *et al.* (1970), and Manwell and Sessler (1971).

Region 6: Aragão (1908, 1911), Carini (1911, 1912, 1920), Carini and Botelho (1914a, b), Carini and Maciel (1916), Cerqueira (1906), Ferraz Franco *et al.* (1954), Giovannoni (1946, 1955), Krettli (1972), Lucena (1938a, b, 1939b, 1949), Lucena (1939a) - (Lucena [1938c, 1939c]), Lutz and Meyer (1908), Muniz and Soares (1954), Muniz *et al.* (1950, 1951), Paraense (1951, 1952), Pessoa (1935), Pessoa and Correa (1929), Pinto (1925), Primio (1925), and Versiani and Gomes (1941).

Region 7: Aragão (1908), Bacigalupo (1941), Carini and Maciel (1916), Cassamagnaghi (1945a, b, 1947, 1950a, b), Jörg (1931), Mazza, Deautier and Steullet (1927, 1930), Mazza, Esteullet and Deautier (1932), Mazza, Franke and Lascano González (1927), Migone (1916), Parodi and Niño (1927), and Petrochi and Zuccarini (1925).

Region 8: Forrester *et al.* (1977), Mazza (1926), Mazza and Fiora (1930a, b, 1932), Mazza, Franke and Alvarado (1928), Mazza, Franke and Lascano González (1927), Mazza, González, Franke, Lascano González and Alvarado (1927), and Romaña *et al.* (1946).

RESULTS AND DISCUSSION

A total of 504 of 955 avian species examined, representing 59 of the 80 families sampled, were infected with blood parasites (Tables 1, 2). Only 3743 of 35555 (10.5%) individuals harbored one or more species of hematozoa. The most commonly encountered parasites were species of *Haemoproteus* (7.4%), representing 70% of all infections found. While species of *Plasmodium* (1.9%) and microfilaria (1.2%) were seen less frequently, infections of *Leucocytozoon, Trypanosoma* and Others (= haemogregarines, *Atoxoplasma/Lankesterella* and *Akiba)* collectively totalled about 10% of the infected birds. Curiously, although 52.7% of the species and 73.8% of the families harbored blood parasites, only 10.5% of the total sample was infected with hematozoans. Why so few individuals of such a diversity of species should be infected is unknown.

A large proportion of the total sample represents birds which are introduced (e.g. *Passer domesticus)* or are domesticated birds (e.g. *Gallus gallus, Meleagris gallopavo,* etc.) commercially reared under conditions that cannot be compared to those under which the natural avifauna exists. These birds (Table 2) comprise 60% of the total sample and have a negligible prevalence of hematozoa (5.6%). The most heavily infected species were *Passer domesticus* (47.1%), primarily with *Atoxoplasma,* and *Columba livia* (29.8%), primarily with *Haemoproteus.* The domesticated birds had a much lower prevalence with some species being virtually parasite-free.

The prevalence of blood parasites in Neotropical birds is much lower (about half) than that reported for the Nearctic (Greiner *et al.*, 1975), the region with the closest avifaunal affinities (Table 3). Although there are statistical differences, the prevalence of *Plasmodium,* microfilaria, haemogregarines, *Atoxoplasma/ Lankesterella* and *Akiba* is virtually similar in both life zones, while the prevalence

of avian trypanosomes in the Neotropics is somewhat lower than that observed in the Nearctic. The prevalence of *Haemoproteus* and *Leucocytozoon* is markedly lower in the Neotropics, especially the latter, which is virtually absent from this region. Presumably the overall low prevalence of hematozoa in the Neotropical avifauna reflects a general lack of suitable vectors and an almost total absence of the ornithophilic simuliid vectors of *Leucocytozoon*.

In the sample (Table 1), at least 477 birds (78 species) are migrants from the Nearctic, over-wintering in the Neotropical region, but not breeding there (Edwards 1974) (designated "W" in Table 1). One hundred one (21.2%) of these birds harbored one or more blood parasites, a figure twice that of the 10.5% overall prevalence recorded for the Neotropical birds (Table 3). The blood parasites occurred in these winter residents with a frequency similar to that in the indigenous Neotropical bird community. However, if one examines the indigenous Neotropical species (which do not also occur and breed in the Nearctic), the overall hematozoan prevalence increases slightly from 10.5% (for all birds) to 19.1%. These species are considered to be endemic (Edwards 1974) and are marked "E" in Table 1.

Distribution of Avian Hematozoa by Bird Family: In Fig. 1, the prevalence of haemosporozoans is presented for families in which 100 or more individuals were sampled. The distribution of hematozoa in the bird families was highly variable and, generally, there is no common pattern evident (Tables 1,2, Fig. 1). Hematozoan prevalence was also examined with respect to avian phylogeny by combining the bird families into their respective avian orders and calculating the hematozoan prevalence in each of the 21 orders represented. The resultant prevalence of blood parasites was highly variable and no evident relationship to avian phylogenetic position was observed. Nor was there a correlation between phylogenetic position and the diversity of parasite genera infecting the various orders of birds. However, birds with a high prevalence of blood parasites in the Nearctic, also have a comparatively high prevalence in the Neotropics. This suggests that either some behavioral aspect or some physiological condition of members of such families as the Columbidae, Fringillidae, Icteridae, Thraupidae, Turdidae, and Vireonidae brings them into closer contact with vectors or makes them more susceptible to hematozoan infection than is the case with members of such families as the Alcedinidae, Apodidae, Charadriidae, Scolopacidae, and Trochilidae.

Not only was the prevalence of blood parasites in the various families highly variable, but the prevalence of hematozoa within the species of one family is equally variable (e.g. Fringillidae: *Carpodacus mexicanus* [56.4%] and *Sicalis luteola* [0.0%], Thraupidae: *Ramphocelus passerini* [61.2%] and *Thraupis ornata* [0.6%]). The reasons for this variability are unknown, but must, as suggested earlier, involve behavioral aspects of the individual species which either enhance or segregate the species from close contact with the vectors. Only detailed studies on both birds and vectors will elicit the reasons.

About 60% of the total prevalence of *Leucocytozoon* in the Neotropics was contributed by five avian families (Bombycillidae, Fringillidae, Parulidae, Thraupidae, and Turdidae); the majority (24/31 = 77.4%) of these infections were found in avian species common to both the Nearctic and Neotropics, either breeding in both, or overwintering in the latter (Table 1). The remaining infections of *Leucocytozoon* are scattered through an additional 14 families resulting in 19 of 80 families harboring this genus of parasite. This further illustrates that while *Leucocytozoon* is being transmitted in the Neotropics, it is transmitted at a very

low rate, especially in comparison to the Nearctic.

Although *Haemoproteus* infections were found in 41 of the examined bird families, 89.7% of these infections occurred in five families (Anatidae, Columbidae, Cracidae, Fringillidae, and Thraupidae). The vast majority of the bird species from these families harboring haemoproteid infections breed in the Neotropics (Table 1). Therefore, the wide distribution of *Haemoproteus* in the endemic Neotropical bird fauna in combination with *Haemoproteus* being the dominant hematozoan genus in the Neotropics, suggests that the vector-complex responsible for the maintenance of haemoproteids is the most highly evolved vector-bird relationship in the Neotropics. Whether biting midges (Ceratopogonidae) or louse flies (Hippoboscidae) or both are responsible for the transmission of *Haemoproteus* in the Neotropics is unknown. However, *Haemoproteus columbae* has been demonstrated to be transmitted to pigeons by louse flies in Brazil (Aragão 1908).

Plasmodium was the most widely distributed genus of blood parasites with respect to number of bird families, since 50 of the 80 families examined were infected with it. However, more than half (58.4%) of all *Plasmodium* infections were found in six families (Columbidae, Fringillidae, Icteridae, Rallidae, Thraupidae, and Turdidae) and most of the *Plasmodium*-infected species included in these families breed in the Neotropics (Table 1). Therefore, while *Plasmodium* prevalence in the Neotropics was very low, it is evident that the vectors transmitting it are either very catholic with respect to their feeding behavior or a wide variety of vector species are functioning there.

Since the remaining blood parasites viz., *Trypanosoma,* microfilaria, haemogregarines, *Atoxoplasma/Lankesterella* and *Akiba,* together comprised only 20.4% of the total infections, it is difficult to meaningfully discuss their individual distribution with respect to the bird families. The same trend is apparent as that experienced with *Leucocytozoon, Haemoproteus* and *Plasmodium* in that a wide range of families was found to be infected with these parasites, but over 60% of the individual prevalence is attributable to 4 families for *Trypanosoma,* haemogregarines, *Atoxoplasma/Lankesterella* and *Akiba,* and 6 families for microfilaria (Tables 1, 2).

When comparing Tables 1 and 2 with Greiner *et al.* (1975), the total prevalence of hematozoa was higher in the Neotropics than in the Nearctic in only 8 of 44 families sampled in both life zones. These included the Alcedinidae, Ardeidae, Caprimulgidae, Ploceidae, Rallidae, Scolopacidae, Sylviidae, and Threskiornithidae. The ploceids, represented only by the introduced *Passer domesticus,* harbored primarily *Plasmodium* and *Atoxoplasma,* but the total prevalence of blood parasites in *P. domesticus* in the Neotropics was more than 4 times that recorded for the Nearctic. However, the Rallidae and Ardeidae have many more endemic species in the Neotropics than in the Nearctic and in the Neotropics possessed 6 times and 3 times respectively, the total prevalence observed in the Nearctic. *Aramides cajanea* accounted for the majority of the high prevalence of hematozoa in the Rallidae. *Nycticorax nycticorax* and *Butorides virescens* contributed nearly all of the total hematozoan prevalence of the Ardeidae. The latter two species were also examined in the Nearctic where they comprised 25% of the infected Ardeidae. The remaining five families differed to a lesser extent between life zones with reference to this point.

A comparison of the prevalence of blood parasites in all galliform birds in the Nearctic (Meleagrididae, Phasianidae and Tetraonidae) and in the Neotropics (Cracidae, Meleagrididae, Numididae and Phasianidae) is of interest. In the Neotro-

pical region, 15163 galliforms (Tables 1, 2) were examined and only 151 (1.0%) individuals harbored blood parasites; 108 (0.7%) with *Haemoproteus,* 43 (0.3%) with *Plasmodium* and none with *Leucocytozoon.* Comparatively, in the Nearctic sample of 8186 galliforms, 4071 (49.7%) individuals harbored blood parasites; 2410 (29.4%) with *Leucocytozoon,* 2408 (29.4%) with *Haemoproteus* and 163 (2.0%) with *Plasmodium;* many birds were infected with two or more genera of blood parasites (Greiner *et al.* 1975). Since all the galliform families under consideration here do not inhabit both regions, the Cracidae, endemic to the Neotropics, should be compared with the Tetraonidae, endemic to the Holarctic. The total prevalence of the Cracidae (26.9%) is still lower than that of the Tetraonidae (61.1%), thus substantiating the differences noted above. It is quite clear that the galliform-vector-parasite relationships in the Nearctic are well established and that a similar relationship has not yet evolved in the Neotropical region.

Distribution of Avian Hematozoa by Region: The prevalence of avian hematozoa in the eight geographical regions as defined in Fig. 2, was highly variable and the great disparity in sample size (Table 4) makes accurate comparison difficult. The greatest proportion of *Leucocytozoon* occurred in region 1, but the highest prevalence of this genus was in region 8, an area with an inadequate sample size (Table 4). All infections of *Leucocytozoon* were observed in birds from montane regions where presumably the lotic breeding habitats of the simuliid vectors are more abundant. Approximately 30% of the *Haemoproteus* infections occurred in region 1 and 26% in regions 3 and 4, while the highest prevalence occurred in the latter region (Table 4). It is interesting to note that 633 of 679 haemoproteid infections in region 3 were accountable to a study on *Columba livia* by Tello and Tantaleán (1964). If these data were removed from the totals for region 3, the overall prevalence would be 15.6%, a figure more compatible with the other regions. *Haemoproteus* was the most commonly encountered genus in all regions except in region 5, where *Plasmodium* was the most common. The prevalence of *Plasmodium* was highest in regions 1 and 5, but the highest percentage of *Plasmodium* infections occurred in region 1, followed by regions 4 and 6. Microfilaria were relatively abundant in regions 1, 5 and 8. Region 8 contained the highest prevalence of microfilaria, but 64.9% of all microfilaria infections were in birds from region 1. *Trypanosoma* prevalence, although low in all areas in which it was found, was highest in regions 6 and 8 while the greatest proportion of *Trypanosoma*-infected birds were in region 1. Haemogregarines, *Atoxoplasma/Lankesterella* and *Akiba* (= "Other") were observed in only four regions, never exceeding 2.0%. Thus, the influence of sample size can be readily discerned by the fact that in most of the aforementioned relationships, the highest prevalence of a certain parasite genus does not directly relate to the highest proportion of infections of that genus on a regional basis.

CONCLUSIONS

The greater diversity and endemicity of the Neotropical avifauna, in contrast to that of the Nearctic, should offer a greater potential for a higher prevalence of avian hematozoa. However, upon comparison of the hematozoan prevalence of the Neotropics and the Nearctic, that of the Nearctic was substantially higher than that

of the Neotropics. Moreover, 291 of the 388 (75.0%) examined species in the Nearctic harbored at least one hematozoan (Greiner *et al.* 1975) in contrast to 504 of the 955 (52.7%) species examined in the Neotropics (Tables 1,2).

The paucity of infections of *Leucocytozoon* in the Neotropics was of particular interest since this was the dominant avian hematozoan genus encountered in certain regions of the Nearctic (Greiner *et al.* 1975). The distribution of avian hematozoa with respect to regions of the Neotropics was variable, but part of this variability was probably due to the small sample sizes from some regions. Furthermore, certain bird families seem to be predisposed to infection with these parasites, while other families were rarely, if ever, infected. Since no data could be found on several minor avian families restricted to the Neotropics, viz. Dulidae, Phytotomidae, Thinocoridae, and Todidae, it would be of interest to examine members of these families for blood parasites. Unfortunately, due to the dearth of information on ornithophilic biting flies in the Neotropics, little could be said regarding vectors and it is hoped that this paper might stimulate research on this aspect of the biology of the Neotropical avian hematozoa.

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RESUMEN

La literatura sobre la prevalencia de hematozoarios de las aves en el Neotrópico, juntamente con datos inéditos de los archivos del International Reference Centre for Avian Haematozoa, fueron estudiados con relación a la distribución del parásito por huésped y geográficamente. Los parásitos sanguíneos de 35.555 aves del Neotrópico de 955 especies (80 familias) constituyen la base para las comparaciones. Solamente 3.743 (10,5%) individuos hospedaron una o más especies de hematozoarios. *Haemoproteus* fue el más común, con una prevalencia de 7,4% seguido por *Plasmodium,* (1,9%), microfilarias (1,2%), *Trypanosoma* (0,6%) y *Leucocytozoon* (0,2%). La prevalencia de hematozoarios varió notoriamente de región a región y entre familias. En comparación con una revisión similar sobre la distribución de los hematozoarios de las aves en el Neoártico, se demostró que su prevalencia es mucho menor en el Neotrópico y que hay una casi total ausencia de *Leucocytozoon.*

TABLE 1

Prevalence of hematozoa in the Neotropical avifauna, based on surveys recorded in the literature and the files of the International Reference Centre for Avian Haematozoa: ("Regions" refer to those illustrated in Fig. 2; "Reference Numbers" refer to the numerical listing of authors in the LITERATURE CITED).

	Family and species	Total birds	Infected birds	Total birds infected with:						Regions	Reference Numbers
				*L.**	*H.**	*P.**	*T.**	M.*	O.*		
	ACCIPITRIDAE										
	Accipiter striatus Vieillot	1	0							1	16
	Accipiter sp.				+					6	63
E	*Busarellus nigricollis* (Latham)	2	1			1				4	42,43
E	*Buteo leucorrhous* (Quoy & Gaimard)	7	1		1					4	50
E	*Buteo magnirostris* (Gmelin)	6	1		1	1		1		1,3,4,6	17,42,44,100,f
	Buteo nitidus (Latham)	1	0							3	96
W	*Buteo platypterus* (Vieillot)	16	5		3	2				1,3	17,44
E	*Buteo polyosoma* (Quoy & Gaimard)	2	0							7	29
	Buteogallus anthracinus (Lichtenstein)	4	1			1		+		1,4	14,16,42,44,100
E	*Geranospiza caerulescens* (Vieillot)	1	0							3	96
E	*Geranospiza gracilis* (Temminck)	3	3		3					4	50
E	*Harpagus bidentatus* (Latham)	6	3		1			2		1,3,6	44,96,f
E	*Harpia harpyja* (Linné)	2	1				1			4	50
E	*Heterospizias meridionalis* (Latham)	2	0				+			3,4	19,96
E	*Ictinia plumbea* (Gmelin)	6	2			1		1		1,3,4,7	16,42,44,68,96
E	*Leptodon cayanensis* (Latham)	2	1			1				1	16,44
E	*Leucopternis albicollis* (Latham)				+					4	18,19
E	*Leucopternis princeps* Sclater	1	0							1	44
E	*Leucopternis semiplumbea* Lawrence	1	0							1	44
	Parabuteo unicinctus (Temminck)	1	1		1					4	50
E	*Spizaetus ornatus* (Daudin)	1	0							1	16
	Unidentified species	5	0							1,4	42,43,49
	Total:	70	20	–	10	7	1	4	–		
	% infected:		28.6		14.3	10.0	1.4	5.7			

	ALAUDIDAE									
	Eremophila alpestris (Linnaeus)	1	0						1	33
	ALCEDINIDAE									
E	*Ceryle torquata* (Linné)	8	0		+				1,7	16,44,51,100
E	*Chloroceryle aenea* (Pallas)	3	0						6	f
E	*Chloroceryle amazona* (Latham)	1	1			1			1	100
	Chloroceryle americana (Gmelin)	23	0						1,6,7	16,44,f
E	*Chloroceryle inda* (Linné)	4	0						1,6	44,f
	Chloroceryle sp.	1	0						4	50
	Unidentified species	1	0						1	49
	Total:	41	1	–	+	1	–	–	–	
	% infected:		2.4			2.4				
	ANATIDAE									
E	*Anas bahamensis* Linné	1	0						4	42
E	*Anas brasiliensis* Gmelin	62	3			3			4,7	40,42,43
W	*Anas discors* Linné	9	1				+	1	1,4	40,43,44,99,100
	Dendrocygna autumnalis (Linné)	177	1		1			+	4	40,42,43
	Dendrocygna bicolor (Vieillot)	31	0						4	40,42,43
E	*Dendrocygna viduata* (Linné)	123	5		3	3		+	4,7	40,42,43,79
	Dendrocygna sp.	14	0						4	42
E	*Metopiana peposacu* (Vieillot)	?	0						7	79
E	*Neochen jubata* (Spix)	3	0						4	43
E	*Oxyura dominicus* (Linnaeus)	3	0						4	40,42
E	*Sarkidiornis melanotos* (Pennant)	1	0						4	40
	Unidentified species	25	0						4	42,43
	Total:	449	10	–	4	6		+	1	
	% infected:		2.2		0.9	1.3		0.2		
	ANHIMIDAE									
E	*Anhima cornuta* (Linné)	4	0						4	42

TABLE 1 (Continued)

	Family and species	Total birds	Infected birds	Total birds infected with:						Regions	Reference Numbers
				*L.**	*H.**	*P.**	*T.**	M.*	O.*		
	ANHINGIDAE										
	Anhinga anhinga (Linné)	3	1					1		1,4	42,44,100
	APODIDAE										
E	*Chaetura andrei* Berlepsch & Hartert	4	0							6	f
E	*Chaetura cinereiventris* Sclater	28	0							4	42
W	*Chaetura pelagica* (Linné)	6	0							1	16,44
	Chaetura vauxi (J. K. Townsend)	8	0							4	42
E	*Panyptila cayennensis* (Gmelin)	3	0					+		4	19,42
E	*Reinarda squamata* (Cassin)	2	0							3	96
E	*Streptoprocne zonaris* (Shaw)	4	0							1,4,6	16,42,60
	Total:	55	0	–	–	–	–	+	–		
	ARAMIDAE										
	Aramus guarauna (Linnaeus)	2	0							2,4	42,103
	ARDEIDAE										
E	*Agamia agami* (Gmelin)	1	0							1	44
	Ardea cinerea Linné						+			6	93
E	*Ardea cocoi* Linné	16	3			3				4	40,42,43
	Ardea herodias Linné	1	0							1	44
E	*Botaurus pinnatus* (Wagler)	2	1			1				4	43
	Bubulcus ibis (Linné)	66	0							1,3,4	17,40,42,44
E	*Butorides striatus* (Linné)	15	0				+			3,4,6,7	17,40,42,56,79,84,f
	Butorides virescens (Linné)	25	6	2		3	1	1		1,4	40,44
E	*Casmerodius albus* (Linné)	40	2			2				1,4	40,43,44
E	*Cochlearius cochlearius* (Linné)	6	1					1	1	1,3,4	40,42,99,100, f
	Egretta thula (Molina)	2	0				+			1,4,6	42,44,93
	Florida caerulea (Linné)	12	0				+	+		1,4,6	40,42,44,56,63

	Hydranassa tricolor (P.L.S. Müller)	1	0							1	44
	Nyctanassa violacea (Linné)	1	0				+	+		1,4	20,56
	Nycticorax nycticorax (Linné)	47	37				37			6	32
	Nycticorax sp.				+					6	65,93
E	*Syrigma sibilatrix* (Temminck)	?	0							7	79
E	*Tigrisoma lineatum* (Boddaert)	6	1		1			+		3,4,7	40,79,96
E	*Tigrisoma salmoni* Sclater & Salvin	1	0							1	44
	Unidentified species	5	0				+			1,4,6	42,49,93
	Total:	247	51	2	1	9	38	2	1		
	% infected:		20.6	0.8	0.4	3.6	15.4	0.8	0.4		
	BOMBYCILLIDAE										
W	*Bombycilla cedrorum* Vieillot	6	4	3			1			1	16
E	*Ptilogonys cinereus* Swainson	2	1			1				1	16
	Total:	8	5	3	-	1	1	-	-		
	% infected:		62.5	37.5		12.5	12.5				
	BUCCONIDAE										
E	*Chelidoptera tenebrosa* (Pallas)	1	1		?	1				3	96
E	*Hapaloptila castanea* (J. Verreaux)	1	0							3	17
E	*Malacoptila panamensis* Lafresnaye	12	3					3		1	44
E	*Malacoptila striata* (Spix)	2	1					1		6	f
E	*Monasa morphoeus* (Hahn & Kuster)	2	0							1,3	17,44
E	*Notharchus macrorhynchos* (Gmelin)	9	5		3	3		1		1	16,44,100, f
E	*Notharchus tectus* (Boddaert)	2	0							1,3	17,44
E	*Nystalus chacuru* (Vieillot)	13	2		2					6	84, f
E	*Nystalus maculatus* (Gmelin)				+					8	75
E	*Nystalus radiatus* (Sclater)	1	1		1					1	49
	Total:	43	13	–	6	4	–	5	–		
	% infected:		30.2		14.0	9.3		11.6			
	BURHINIDAE										
E	*Burhinus bistriatus* (Wagler)	8	0							4	40,42,43

TABLE 1 (Continued)

	Family and species	Total birds	Infected birds	Total birds infected with:						Regions	Reference Numbers
				*L.**	*H.**	*P.**	*T.**	M.*	O.*		
	CAPITONIDAE										
E	*Capito niger* (P.L.S. Müller)	2	1			1		1		3	96
E	*Eubucco bourcierii* (Lafresnaye)	2	1					1		1,3	17,49
E	*Eubucco richardsoni* (G. R. Gray)	1	0							3	96
	Unidentified species	2	0							1	49
	Total:	7	2	–	–	1	–	2	–		
	% infected		28.6			14.3		28.6			
	CAPRIMULGIDAE										
E	*Caprimulgus rufus* Boddaert	2	0		+					1,4,8	44,50,72
	Caprimulgus vociferus Wilson	6	3			3				1	16
	Chordeiles acutipennis (Hermann)	1	0							1	16
	Chordeiles minor (J. R. Forster)	2	2		1	1	1			1,3	7,44
E	*Hydropsalis brasiliana* (Gmelin)	1	0							6	f
E	*Lurocalis semitorquatus* (Gmelin)	3	0							6	f
	Nyctidromus albicollis (Gmelin)	8	0							1,3,4,6	17,40,44, f
E	*Nyctiphrynus ocellatus* (Tschudi)	3	0							6	f
	Unidentified species	5	0							6	84
	Total:	31	5	–	1	4	1	–	–		
	% infected:		16.1		3.2	12.9	3.2				
	CARIAMIDAE										
E	*Cariama cristata* (Linné)				+					6	65
	CATHARTIDAE										
	Cathartes aura (Linné)	8	4		3			1	+	1,4,6	43,44,94
	Coragyps atratus (Bechstein)	11	0				+	+	+	1,4,6	18,19,40,42,43,44,60,94
E	*Sarcoramphus papa* (Linné)	1	0						+	1,6	26,44
	Unidentified species	1	0							1	49
	Total:	21	4	–	3	–	+	1	+		
	% infected:		19.0		14.3			4.8			

	CHARADRIIDAE										
W	*Pluvialis squatarola* (Linnaeus)	1	0							4	3
E	*Vanellus chilensis* (Molina)	15	0						+	3,4,6	40,42,43,63,96
	Unidentified species	1	0							6	84
	Total:	17	0	–	–	–	–	–	+		
	CICONIIDAE										
E	*Euxenura galeata* (Molina)	2	0		+					4,6	26,40
E	*Jabiru mycteria* (Lichtenstein)	3	0							3,4	40,42,99
	Mycteria americana Linné	9	1		+	1	+			1,4,6,7	42,43,44,65,79
	Total:	14	1	–	+	1	+	–	–		
	% infected:		7.1			7.1					
	COEREBIDAE										
E	*Chlorophanes spiza* (Linnaeus)	11	3			1		2		1,4,6	16,42,44,49,f
E	*Coereba flaveola* (Linnaeus)	101	3			2		2		1,3,4,6	16,17,42,44,60,f
E	*Conirostrum cinereum* Lafresnaye & d'Orbigny	4	1					1		8	38
E	*Conirostrum tamarugensis* Johnson & Millie	1	0							8	38
E	*Cyanerpes caeruleus* (Linnaeus)							+		4	99
E	*Cyanerpes cyaneus* (Linnaeus)	5	3			3				4	2
E	*Cyanerpes lucidus* (Sclater & Salvin)	1	0							1	44
E	*Dacnis cayana* (Linnaeus)	31	3		2			2		1,6	44,60,f
E	*Diglossa baritula* Wagler	2	1			1				1	16
E	*Diglossa cyanea* (Lafresnaye)	1	0							4	42
	Total:	157	14	–	2	7	–	7	–		
	% infected:		8.9		1.3	4.5		4.5			
	COLUMBIDAE										
E	*Claravis pretiosa* (Ferrari-Perez)	40	16		15	1				1,4	42,44
E	*Columba cayennensis* Bonnaterre	62	24		18	2		4		1,3,4	42,44,96
	Columba corensis Jacquin	3	0							4	43
	Columba fasciata Say	3	2			2				1	16
	Columba flavirostris Wagler	31	18		11			7		1	98
E	*Columba goodsoni* Hartert	2	0							3	17

TABLE 1 (Continued)

	Family and species	Total birds	Infected birds	Total birds infected with:						Regions	Reference Numbers
				*L.**	*H.**	*P.**	*T.**	M.*	O.*		
E	*Columba maculosa* Temminck				+					7,8	28,75
E	*Columba nigrirostris* Sclater	22	10		10	1		1		1	44
E	*Columba picazuro* Temminck	2	2		2					6,7	63,84
E	*Columba cayennensis* Bonnaterre	36	36		33			+	29	4,6	26,56,57
E	*Columba speciosa* Gmelin	27	5		5					1,3,4	40,42,43,44,96
E	*Columba subvinacea* (Lawrence)	20	2		2					4	40,42,43
	Columba sp.				+				+	4,6	63
E	*Columbina cruziana* (Prévost)	5	1		1					8	38
E	*Columbina minuta* Linné	3	1		1					4,6	42,96
	Columbina passerina (Linnaeus)	7	2		2			+		2,4	8,42
E	*Columbina picui* (Temminck)	6	4		1			3		6,8	57,70
E	*Columbina talpacoti* (Temminck)	225	77		76	3	+	2	2	1,3,4,6	17,40,42,43,44,50,57,84,96,f
E	*Geotrygon albifacies* Sclater	1	0							1	16
E	*Geotrygon chrysia* Bonaparte	1	0							2	103
E	*Geotrygon lawrencii* Salvin	2	2					2		1	44
E	*Geotrygon linearis* (Prévost)	19	0							4	42
E	*Geotrygon montana* (Linnaeus)	14	2		2					1,6	44,f
E	*Geotrygon veraguensis* Lawrence	1	0							1	44
E	*Leptotila plumbeiceps* Sclater & Salvin	1	0							1	f
E	*Leptotila rufaxilla* (Richard & Bernard)	4	0							3,4,6	96,f
	Leptotila verreauxi Bonaparte	259	21		20	4		+	+	1,4,6	16,40,42,43,44,98,100, f
	Leptotila sp.	1	1		1					6	84
E	*Metriopelia ceciliae* (Lesson)	1	0							8	38
E	*Metriopelia melanoptera* (Molina)	3	0							8	38
	Scardafella inca (Lesson)	2	0							1	16,98
E	*Scardafella squammata* (Lesson)	29	11		11					4,6	40,42,43,60,84
	Streptopelia decaocto (Frivaldszky)	12	1		1					4	40
	Zenaida asiatica (Linnaeus)	75	75	2	59	1		33		1,8	16,38,98
E	*Zenaida auriculata* (Des Murs)	62	10		7			3	+	3,4,8,7	40,42,43,60,69,70,96
E	*Zenaida aurita* (Temminck)	3	1		1					2	103
	Zenaida macroura (Linnaeus)	47	44		39			5		1	44,98
	Unidentified species	263	18		18			+		1,4	40,42,43,49
	Total:	1294	386	2	336	14	+	60	31		
	% infected:		29.8	0.2	26.0	1.1		4.6	2.4		

	CONOPOPHAGIDAE									
E	*Conopophaga lineata* (Wied)	93	14			11	4		6	60,f
E	*Conopophaga melanops* (Vieillot)	3	0						6	f
	Total:	96	14	–	–	11	4	–	–	
	% infected:		14.6			11.5	4.2			
	CORVIDAE									
	Aphelocoma ultramarina (Bonaparte)	2	0					+	1	14,16
E	*Aphelocoma unicolor* (DuBus)	10	5			5			1	16
	Cyanocitta stelleri (Gmelin)	7	5	1		4			1	16
E	*Cyanocorax affinis* Pelzeln	12	4		2	1	+	1	1,4	40,42,43,49
E	*Cyanocorax chrysops* (Vieillot)	7	0		+			+	6,7,8	28,29,65,70,72, f
E	*Cyanocorax cristatellus* (Temminck)	1	0						6	f
E	*Cyanocorax violaceus* DuBus	9	2			1		1	3,4	42,43,96
E	*Cyanocorax yncas* (Boddaert)	7	4	1	2	1			1,4	16,42
E	*Cyanolyca pulchra* (Lawrence)	8	6		6				1	16
E	*Psilorhinus morio* (Wagler)	4	3		2		1		1	16,44
	Total:	67	29	2	12	12	1	2	–	
	% infected:		43.3	3.0	17.9	17.9	1.5	3.0		
	COTINGIDAE									
E	*Attila rufus* (Vieillot)	8	0						6	f
E	*Attila spadiceus* (Gmelin)	2	1					1	1	44, f
E	*Carpodectes nitidus* Salvin	7	4				2	2	1	44
E	*Lipaugus unirufus* Sclater	5	0						1,3	17,44
E	*Pachyramphus cinnamomeus* Lawrence	10	3			3	3	2	1,3	17,44
E	*Pachyramphus major* (Cabanis)	3	1			1			1	16
E	*Pachyramphus marginatus* (Lichtenstein)	1	1				1		6	f
E	*Pachyramphus polychopterus* (Vieillot)	11	4		+	1	3	4		26,44, f
E	*Pachyramphus rufus* (Boddaert)				+			+	6	26,89
E	*Pachyramphus viridis* (Vieillot)	1	0						6	f
E	*Platypsaris aglaiae* (Lafresnaye)	3	1		1				1	16, f
E	*Platypsaris rufus* (Vieillot)	3	2		1		1	1	6	f

TABLE 1 (Continued)

	Family and species	Total birds	Infected birds	Total birds infected with:						Regions	Reference Numbers
				*L.**	*H.**	*P.**	*T.**	M.*	O.*		
E	*Procnias averano* (Hermann)	1	0							4	42
E	*Procnias tricarunculata* (J. & E. Verreaux)	4	0							1	44
E	*Pseudattila phoenicurus* (Pelzeln)	4	0							6	f
E	*Querula purpurata* Lawrence	18	2				2			1	44
E	*Rhytipterna holerythra* (Sclater & Salvin)	2	0							1,3	17,44
E	*Rhytipterna simplex* (Lichtenstein)	2	0							6	f
E	*Tityra cayana* (Linnaeus)						+			6	89
E	*Tityra inquisitor* (Lichtenstein)	18	13		1		11	8		1	44
E	*Tityra semifasciata* (Spix)	9	4				3	1		1,3	16,17,44
	Unidentified species	4	0							1	49
	Total:	116	36	–	3	5	26	19	–		
	% infected:		31.0		2.7	4.3	22.4	16.0			
	CRACIDAE										
E	*Aburria aburri* (Lesson)	2	0							4	42
E	*Crax alberti* Fraser	18	3		3					4	40,42,43
E	*Crax nigra* Linné				+					4	19
E	*Crax rubra* Linné	2	1			1				1	16,44
E	*Ortalis canicollis* (Wagler)				+					7,8	69,72
E	*Ortalis garrula* (Humboldt)	3	3		3		1			1	44,100
E	*Ortalis motmot* (Linné)	3	0							4	42
E	*Ortalis ruficauda* Jardine	324	90		90	8		+	+	4	40,42,43
E	*Ortalis vetula* (Wagler)	2	2		1	2			1	1	16
E	*Penelope argyrotis* (Bonaparte)	2	0							4	42
E	*Penelope montagnii* (Bonaparte)						+			6	24
E	*Penelope obscura* Temminck	2	2		1	1				3.6	65,96
E	*Penelope purpurascens* Wagler	7	4		4		1			1,4	40,43,44
E	*Penelope superciliaris* Temminck				+					6	26
E	*Pipile pipile* (Jacquin)	1	1			1				4	43
	Unidentified species	28	0		+					1,4	40,42,43,45
	Total:	394	106	–	102	13	2	+	1		
	% infected:		26.9		25.8	3.3	0.5		0.3		

	CUCULIDAE										
	Coccyzus americanus (Linné)	2	0							1	16
E	*Coccyzus melacoryphus* Vieillot	2	0				+			6,7	74,84
E	*Coccyzus pumilus* Strickland	2	0							3	17
	Crotophaga ani Linné	39	2		2					3,4,6,7	17,42,50,60,84,96, f
E	*Crotophaga major* Gmelin	4	0							1,4,7	42,100, f
	Crotophaga sulcirostris Swainson	49	4		1	1	1	1		1	16,44
E	*Dromococcyx pavoninus* Pelzeln	2	0							6	f
E	*Geococcyx velox* (Wagner)	2	0							1	16
E	*Guira guira* (Gmelin)	11	0							6,7	29,60,84, f
E	*Morococcyx erythropygus* (Lesson)	2	0							1	16
E	*Neomorphus geoffroyi* (Temminck)	1	0							1	44
E.	*Piaya cayana* (Linné)	45	21			4	3	17		1,4,6	16,42,44,84,100
	Piaya sp.				+					6	63
E	*Tapera naevia* (Linné)	2	0							4,6	42, f
	Unidentified species	1	0							1	49
	Total:	164	27	–	3	5	4	18	–		
	% infected:		16.5		0.9	1.5	2.4	5.6			
	DENDROCOLAPTIDAE										
E	*Campylorhampus pusillus* (Sclater)	2	0							1	44
E	*Campylorhampus trochilirostris* (Lichtenstein)	16	2		1		1			4,6	42, f
E	*Dendrocincla fuliginosa* (Vieillot)	36	1			1			1	1,3,4,6	17,44, f
E	*Dendrocincla homochroa* (Sclater)	2	0							1	44
E	*Dendrocolaptes certhia* (Boddaert)	4	1					1		1	44
E	*Dendrocolaptes picumnus* Lichtenstein	2	0							3	17
E	*Dendrocolaptes platyrostris* Spix	12	1		1					6	f
E	*Glyphorhynchus spirurus* (Vieillot)	7	0							1,3	17,44
E	*Lepidocolaptes affinis* (Lafresnaye)	3	0							1,3	16,17
E	*Lepidocolaptes angustirostris* (Vieillot)	2	2		+			2		8	70,75
E	*Lepidocolaptes fuscus* (Vieillot)	45	0							6	f
E	*Lepidocolaptes souleyetii* (Des Murs)	18	3			1		2		1,3	14,44,96
E	*Sittasomus griseicapillus* (Vieillot)	27	1						1	6	f
E	*Xiphocolaptes albicollis* (Vieillot)	5	0							6	f

TABLE 1 (Continued)

	Family and species	Total birds	Infected birds	Total birds infected with:						Regions	Reference Numbers
				*L.**	*H.**	*P.**	*T.**	M.*	O.*		
E	*Xiphocolaptes major* (Vieillot)	1	1		1		1			8	70
E	*Xiphocolaptes promeropirhynchus* (Lesson)	3	2			2				1	16
E	*Xiphorhynchus erythropygius* (Sclater)	2	0							3	17
E	*Xiphorhynchus flavigaster* Swainson	2	0							1	16, f
E	*Xiphorhynchus guttatus* (Lichtenstein)	11	0							1,3	44,96
E	*Xiphorhynchus lachrymosus* (Lawrence)	5	0							1	44
E	*Xiphorhynchus obsoletus* (Lichtenstein)	3	0							4	50
E	*Xiphorhynchus picus* (Gmelin)	1	0							3	96
E	*Xiphorhynchus spixii* (Lesson)	1	0							3	96
E	*Xiphorhynchus triangularis* (Lafresnaye)	1	0							1	44
	Xiphorhynchus sp.	1	0							4	42
	Unidentified species	6	0							1,3	49,96
	Total:	218	14	–	3	4	2	5	2		
	% infected:		6.4		1.4	1.8	0.9	2.3	0.9		
	EURYPYGIDAE										
E	*Eurypyga helias* (Pallas)	1	0							4	40
	FALCONIDAE										
E	*Daptrius americanus* (Boddaert)	3	0							1,3	44,96
	Falco peregrinus Tunstall	1	0							1	16
E	*Falco rufigularis* Daudin	2	0							1	44, f
	Falco sparverius Linné	14	6	1	3	3	1			1,4,6,7,8	16,28,29,42,43,49,56,70,73,84

E	*Herpetotheres cachinnans* (Linné)	1	0							1	44
E	*Micrastur ruficollis* (Vieillot)	7	2		2					1,6	44, f
E	*Milvago chimachima* (Vieillot)	12	5		5			1		1,3,4,6	40,42,43,50,84,96,100
	Polyborus plancus (J.F. Miller)	7	3		3					3,4,6	26,40,42,96
	Unidentified species	2	0							1,4	42,49
	Total:	49	16	1	13	3	1	1	–		
	% infected:		32.7	1.8	26.5	5.5	1.8	1.8			
	FORMICARIIDAE										
E	*Batara cinerea* (Vieillot)	1	0				+			6	24,25, f
E	*Cercomacra nigricans* Sclater	1	0							1	44
E	*Cercomacra tyrannina* (Sclater)	5	1				1			1	44
E	*Chamaeza campanisona* (Lichtenstein)						+	+		6,7	26,68
E	*Cymbilaimus lineatus* (Leach)	3	1				1			1	44
E	*Drymophila malura* (Temminck)	8	0							6	f
E	*Drymophila ochropyga* (Hellmayr)	2	0							6	f
E	*Drymophila squamata* (Lichtenstein)	1	0							6	f
E	*Dysithamnus mentalis* (Temminck)	44	8		2	2	4	1		1,6	44,60, f
E	*Dysithamnus puncticeps* Salvin	3	0							1	44
E	*Dysithamnus xanthopterus* (Burmeister)	1	0							6	f
E	*Formicarius analis* (d'Orbigny & Lafresnaye)	1	1					1		1	44
E	*Formicarius colma* Boddaert	7	0							6	f
E	*Grallaria guatimalensis* Prévost & Des Murs	2	1			1				1	16,44
E	*Grallaria ochroleuca* (Wied)	1	1		1					6	f
E	*Grallaria varia* (Boddaert)	1	0				+			6	24, f
E	*Grallaricula flavirostris* (Sclater)	2	1			1				1	44
E	*Gymnopithys leucaspis* (Sclater)	4	0							1	44
E	*Herpsilochmus rufimarginatus* (Temminck)	1	0							6	f
E	*Hylophylax naevioides* (Lafresnaye)	4	0							1,3	17,44
E	*Mackenziaena leachii* (Such)	2	0							6	60, f
E	*Microrhopias quixensis* (Cornalia)	2	1						1	1,3	16,17

TABLE 1 (Continued)

	Family and species	Total birds	Infected birds	Total birds infected with:						Regions	Reference Numbers
				*L.**	*H.**	*P.**	*T.**	M.*	O.*		
E	*Myrmeciza immaculata* (Lafresnaye)	2	0							1	44
E	*Myrmoderus squamosus* (Pelzeln)	18	0							6	f
E	*Myrmotherula gularis* (Spix)	8	1			1				6	f
E	*Myrmotherula surinamensis* (Gmelin)	2	0							1,3	17,44
E	*Myrmotherula unicolor* (Ménétriés)	4	0							6	f
E	*Phaenostictus mcleannani* (Lawrence)	1	0							1	44
E	*Pittasoma michleri* Cassin	1	0							1	44
E	*Pyriglena leucoptera* (Vieillot)	44	4		1	1	2			6	60, f
E	*Taraba major* (Vieillot)	4	1					1	+	1,3,6,8	44,70,94,96
E	*Thamnophilus caerulescens* Vieillot	35	1			1				6	60, f
E	*Thamnophilus doliatus* (Linné)	19	7			7	1		2	1,3,4	16,42,96
E	*Thamnophilus multistriatus* Lafresnaye	1	0							3	17
E	*Thamnophilus palliatus* (Lichtenstein)	1	0							3	96
E	*Thamnophilus punctatus* (Shaw)	4	1					1		1,3	17,44,96
E	*Thamnophilus ruficapillus* Vieillot	15	1			1				6	60,f
	Unidentified species	11	0							1	44,49
	Total:	266	31	–	4	15	9	4	3		
	% infected:		11.7		1.5	5.6	3.4	1.5	1.1		
	FREGATIDAE										
	Fregata magnificens Mathews	25	2			1			1	1,2	20,33
	Total:	25	2	–	–	1	–	–	1		
	% infected:		8.0			4.0			4.0		

FRINGILLIDAE

E	*Aimophila strigiceps* (Gould)				+					8	73
E	*Ammodramus aurifrons* (Spix)	6	0							3	96
E	*Ammodramus humeralis* (Bosc)	15	0		+					6,7	28,29,60, f
	Ammodramus savannarum (Gmelin)	1	0							1	16
	Amphispiza bilineata (Cassin)	1	1		1					1	33
E	*Arremon aurantiirostris* Lafresnaye	19	1			1				1,3	17,44
E	*Arremon taciturnus* (Hermann)	8	1		1					3,6	96, f
E	*Arremonops chloronotus* (Salvin)	1	0							1	f
E	*Arremonops conirostris* (Bonaparte)	60	24		1	22		5		1	44
	Arremonops rufivirgatus (Lawrence)	1	1	1						1	16
E	*Atlapetes brunneinucha* (Lafresnaye)	5	1		1					1,3	16,17,44
E	*Atlapetes gutturalis* (Lafresnaye)	1	0							1	16
	Cardinalis cardinalis (Linnaeus)	6	4			4				1	16,33
E	*Cardinalis phoeniceus* Bonaparte	16	12		12					4	42,43
E	*Carduelis notata* DuBus	2	0							1	16
	Carduelis psaltria (Say)	29	2		2					3,4	17,40,42
	Carpodacus mexicanus (Müller)	110	62	4	23	20	17			1	16,33
E	*Caryothraustes canadensis* (Linnaeus)	4	0							1	44
E	*Catamenia analis* (d'Orbigny & Lafresnaye)	2	0							8	38
	Coccothraustes abeillei (Lesson)	2	1			1				1	16
E	*Coryphospingus cucullatus* (Müller)	4	3		1				2	6,8	57,75
E	*Coryphospingus pileatus* (Wied)	1	1			1				4	42
E	*Emberizoides herbicola* (Vieillot)	25	1			1				3,6	64,96, f
E	*Embernagra platensis* (Gmelin)	5	0					+		6,7	26,29,76
E	*Gubernatrix cristata* (Vieillot)					+		+		7	27,28,29,76
E	*Haplospiza unicolor* Cabanis	20	3	1	2					6	f
W	*Melospiza lincolnii* (Audubon)	4	2	1		1				1	16
E	*Oryzoborus angolensis* (Linnaeus)	49	3		3					1,6	44,60
E	*Oryzoborus crassirostris* (Gmelin)	2	0							3,4	17,42
E	*Paroaria capitata* (d'Orbigny & Lafresnaye)								+	6	93,94
E	*Paroaria coronata* (Miller)					+	+	+	+	7	27,28,29,63

TABLE 1 (Continued)

	Family and species	Total birds	Infected birds	Total birds infected with:						Regions	Reference Numbers
				*L.**	*H.**	*P.**	*T.**	M.*	O.*		
E	*Paroaria dominicana* (Linnaeus)								+	6	6
E	*Paroaria gularis* (Linnaeus)	1	0							3	96
	Passerculus sandwichensis (Gmelin)	9	3		3			+		1	14,16,33
W	*Passerina ciris* (Linnaeus)	6	2	1		1	1			1	16
W	*Passerina cyanea* (Linnaeus)	11	1						1	1,3,4,6	16,17,42,43,44,57
E	*Passerina cyanoides* (Lafresnaye)	19	2			2		1	1	1,3	16,17,44
E	*Passerina leclancherii* Lafresnaye	4	0							1	16
E	*Passerina parellina* (Bonaparte)	5	1		1					1	16
	Passerina versicolor (Bonaparte)	4	1	1						1	16
E	*Pheucticus aureoventris* d'Orbigny & Lafresnaye				+					7	88
E	*Pheucticus chrysopeplus* (Vigors)	3	1	1						1,4	16,42
W	*Pheucticus ludovicianus* (Linnaeus)	2	1		1					1	44
	Pheucticus melanocephalus (Swainson)	1	1		1		1	+		1	14,16
E	*Phrygilus fruticeti* (Kittlitz)	4	4	1	4		1	2		8	38
E	*Phrygilus plebejus* Tschudi	4	0							8	38
	Pipilo erythrophthalmus (Linnaeus)	2	0							1	16,33
	Pipilo fuscus Swainson	1	0							1	16
E	*Pitylus grossus* (Linnaeus)	10	2					2		1,3,6	17,44, f
W	*Pooecetes gramineus* (Gmelin)	1	0							1	33
E	*Poospiza nigrorufa* (d'Orbigny & Lafresnaye)	6	0							7	29
E	*Poospiza thoracica* (Nordman)								+	6	63
E	*Rhodothraupis celaeno* (Deppe)	1	1		1					1	16
E	*Saltator albicollis* Vieillot	4	1			1				3,4	17,43
E	*Saltator atriceps* (Lesson)	123	28		18			11		1	44
E	*Saltator atripennis* Sclater	2	0							3	17
E	*Saltator coerulescens* Vieillot	15	1			1				1,4	16,42,43
E	*Saltator maximus* (Müller)	54	2		2	1				1,3,4	16,17,42,44
E	*Saltator orenocensis* Lafresnaye	1	0							4	40
E	*Saltator similis* d'Orbigny & Lafresnaye	34	7		+			6	1	6	57,63, f

	Serinus canaria (Linnaeus)	2	0			+			+	4,6,7	42,63
E	*Sicalis columbiana* Cabanis	27	12		12					4	50
E	*Sicalis flaveola* (Linnaeus)	98	15		7	4		1	3	3,4,6,7	28,29,40,42,43,50, 64,84,96, f
E	*Sicalis luteola* (Sparrman)	116	0					+		7,8	28,29,97
E	*Sicalis uropygialis* (d'Orbigny & Lafresnaye)	6	0							8	38
E	*Spinus magellanicus* (Vieillot)	32	1			1	+			6,7,8	27,28,29,31,38,60, f
E	*Spinus spinescens* (Bonaparte)	2	0							4	42
W	*Spiza americana* (Gmelin)	35	0							1,4	16,42,44
	Spizella atrogularis (Cabanis)	3	2		2					1	33
E	*Sporophila albogularis* (Spix)								+	6	6,63
E	*Sporophila americana* (Gmelin)	361	52		46	5		6		1,3	17,44
E	*Sporophila bouvreuil* (Müller)	1	0							6	64
E	*Sporophila caerulescens* (Vieillot)	50	2			+		+	2	6,7	26,27,28,29,57, f
E	*Sporophila castaneiventris* Cabanis	1	0							4	42
E	*Sporophila intermedia* Cabanis	13	0							3,4	17,40,42,43
E	*Sporophila lineola* (Linnaeus)	2	0							4	40
E	*Sporophila luctuosa* (Lafresnaye)	2	0							3	17
E	*Sporophila minuta* (Linnaeus)	20	1	1						1,3	16,17
E	*Sporophila nigricollis* (Vieillot)	8	0							3,4,6	17,42,64
E	*Sporophila obscura* (d'Orbigny & Lafresnaye)	2	0							3	17
E	*Sporophila plumbea* (Wied)	10	0							3,6	64,96
E	*Sporophila telasco* (Lesson)	6	0							8	38
E	*Sporophila torqueola* (Bonaparte)	3	1			1				1	16,44
	Sporophila sp.	5	0		+					4,6	42,63
E	*Tiaris fuliginosa* (Wied)	8	1			1				6	f
E	*Tiaris olivacea* (Linnaeus)	1	0							3	17
E	*Volatinia jacarina* (Linnaeus)	74	12		8	3		1	1	1,3,4,6,7	16,17,40,42,43,44, 57,96, f
E	*Xenospingus concolor* (d'Orbigny & Lafresnaye)	4	0							8	38
E	*Zonotrichia capensis* (Müller)	316	92		72	17	1	5	3	1,3,4,6,7,8	16,17,27,28,29,38, 42,57,60, f
	Unidentified species	36	0						+	1,3,4,6	42,44,47,49,96
	Total:	1970	373	12	225	89	21	40	14		
	% infected:		18.9	0.6	11.4	4.5	1.1	2.0	0.7		

TABLE 1 (Continued)

	Family and species	Total birds	Infected birds	Total birds infected with:						Regions	Reference Numbers
				*L.**	*H.**	*P.**	*T.**	M.*	O.*		
	FURNARIIDAE										
E	*Anabacerthiaamaurotis* (Temminck)	3	0							6	f
E	*Anabazenops fuscus* (Vieillot)	1	0							6	f
E	*Asthenes dorbignyi* (Reichenbach)	1	0							8	38
E	*Asthenes modesta* (Eyton)	1	0							8	38
E	*Automolus leucophthalmus* (Wied)	57	3		1		2			6	60, f
E	*Automolusochrolaemus* (Tschudi)	5	1			1				1,3	17,44
E	*Automolus rubiginosus* (Sclater)	2	1			1				1	16
E	*Certhiaxis cinnamomea* (Gmelin)	2	1						1	6	57
E	*Cichlocolaptes leucophrys* (Jardine & Selby)	13	0							6	f
E	*Cinclodes fuscus* (Vieillot)	2	0							8	38
E	*Cranioleuca pallida* (Wied)							+		6	26
E	*Furnarius rufus* (Gmelin)	37	0							6,7	29,84, f
E	*Heliobletus contaminatus* Berlepsch	7	0							6	f
E	*Lochmias nematura* (Lichtenstein)	30	2		1			1		6	f
E	*Phacellodomus erythrophthalmus* (Wied)	3	0							6	60, f
E	*Phacellodomus rufifrons* (Wied)	5	0							4,6	42,84
E	*Philydor atricapillus* (Wied)	8	1		1					6	f
E	*Philydor rufus* (Vieillot)	3	0							6	f
E	*Premnoplex brunnescens* (Sclater)	2	0							1	44
E	*Sclerurus guatemalensis* (Hartlaub)	2	0							1	44
E	*Sclerurus mexicanus* Sclater	1	1			1				1	16
E	*Sclerurus scansor* (Ménétriés)	8	0							6	f
E	*Synallaxis brachyura* Lafresnaye	35	2		1		2	1		1,3	17,44
E	*Synallaxis erythrothorax* Sclater	2	2			2				1	16
E	*Synallaxis frontalis* Pelzeln	3	0							6	f
E	*Synallaxis ruficapilla* Vieillot	17	0			+				6	26, f
E	*Synallaxis spixi* Sclater	3	0							6	f
	Synallaxis sp.	2	0							4	42
E	*Syndactyla rufosuperciliata* (Lafresnaye)	41	2		1			1		6	f

E	*Synallactyla subalaris* (Sclater)	2	0							3	17
E	*Thripadectes ignobilis* (Sclater & Salvin)	1	0							3	17
E	*Upucerthia validirostris* (Burmeister)	1	0							8	38
E	*Xenops minutus* (Sparrman)	15	2					2		1,6	44, f
E	*Xenops rutilans* Temminck	2	0							6	f
	Unidentified species	2	0							1	49
	Total:	319	18	–	5	5	4	5	1		
	% infected:		5.6		1.6	1.6	1.3	1.6	0.3		
	GALBULIDAE										
E	*Galbula ruficauda* Cuvier	5	1		1					1,3	16,17,44
E	*Galbula tombacea* Spix	1	0							3	96
E	*Jacamerops aurea* (P. L. S. Müller)	1	0							1	44
	Total:	7	1	–	1	–	–	–	–		
	% infected:		14.3		14.3						
	HIRUNDINIDAE										
E	*Alopochelidon fucata* (Temminck)	6	0							6	84, f
	Hirundo rustica Linnaeus	30	0							1,2	44,103
E	*Notiochelidon cyanoleuca* (Vieillot)	11	0			+			+	4,6	6,50,63, f
	Petrochelidon pyrrhonota (Vieillot)	4	2			2				1	44
E	*Progne chalybea* (Gmelin)	53	3	2				1		1,4	42,44
E	*Progne tapera* (Linnaeus)	1	0					+		3,7	69,96
	Stelgidopteryx ruficollis (Vieillot)	25	1						1	3,6	17, f
	Unidentified species	11	0							1	44,49
	Total:	141	6	2	–	2	–	1	1		
	% infected:		4.3	1.4		1.4		0.7	0.7		
	HYDROBATIDAE										
	Oceanodroma melania (Bonaparte)	5	1						1	1	33

TABLE 1 (Continued)

	Family and species	Total birds	Infected birds	Total birds infected with:						Regions	Reference Numbers
				*L.**	*H.**	*P.**	*T.**	M.*	O.*		
	ICTERIDAE										
E	*Agelaius icterocephalus* (Linnaeus)	1	0							3	17
	Agelaius phoeniceus (Linnaeus)	1	0							2	103
E	*Agelaius thilius* (Molina)	9	0			+	+	+		6,7	26,27,28,29
E	*Amblyramphus holosericeus* (Scopoli)	3	0							7	29
E	*Cacicus cela* (Linnaeus)	43	3		2	1				4	40,42,43,50
E	*Cacicus haemorrhous* (Linnaeus)	2	0							6	f
E	*Cacicus holosericeus* (Deppe)	18	5			4		1		1	16,44, f
E	*Cacicus melanicterus* (Bonaparte)	5	3			3				1	16
E	*Cacicus uropygialis* (Lafresnaye)	4	2	1		1		2		1,3	17,44
	Cassidix mexicanus (Gmelin)	6	1			1				1	16,100
E	*Dives atroviolacea* (d'Orbigny)	1	0							2	103
E	*Dives dives* (Deppe)	1	1				1			1	16
W	*Dolichonyx oryzivorus* (Linnaeus)	6	1		1	1	1			1,4	42,44
E	*Gnorimopsar chopi* (Vieillot)	19	6		+	6	+	+	+	6,7	26,28,84,85, f
E	*Gymnomystax mexicanus* (Linnaeus)	8	1			1				3,4	42,43,96
E	*Icterus cayanensis* (Linnaeus)	4	1		1					6,7	f
E	*Icterus chrysater* (Lesson)	1	0							1	16
	Icterus cucullatus Swainson	3	1		1	1				1	16
E	*Icterus dominicensis* (Linnaeus)	16	4		1	3				1	16,44
W	*Icterus galbula* (Linnaeus)	13	7		2	4	1	1		1	16,44
	Icterus graduacauda Lesson	1	1		1					1	16
N	*Icterus gularis* (Wagler)	6	2		2			+		1	14,16
E	*Icterus icterus* (Linnaeus)	65	3		2	1				4,6	40,42,43,63
E	*Icterus mesomelas* (Wagler)	14	2			2				1	44
E	*Icterus nigrogularis* (Hahn)	20	1			1		+		4	42,44, f
E	*Icterus pectoralis* (Wagler)	1	0							1	16
E	*Icterus pustulatus* (Wagler)	6	0							1	16
W	*Icterus spurius* (Linnaeus)	13	11		2	5	4	+		1	14,16,44
	Icterus sp.	1	0							1	16
E	*Leistes militaris* (Linnaeus)	3	1					1		3	96

	Molothrus aeneus (Wagler)	7	5			4	1			1	16,49
E	*Molothrus badius* (Vieillot)				+	+	+	+	+	7,8	27,28,29,74,75,97
E	*Molothrus bonariensis* (Gmelin)	42	8		2	5		+	2	3,4,6,7,8	29,42,43,57,60,64, 72,84,96, f
	Molothrus sp.	65	12	1		4	7			1	16
E	*Pezites militaris* (Linnaeus)	4	0							7	29
E	*Psarocolius angustifrons* (Spix)	6	2			1		1		3	17,96
E	*Psarocolius decumanus* (Pallas)	6	2			1		1		3,4	42,96
E	*Psarocolius montezuma* (Lesson)	13	3		1			3		1	44,49
	Psarocolius sp.	1	1			1				4	42
E	*Pseudoleistes guirahuro* (Vieillot)	3	1		1					6,7	84, f
E	*Pseudoleistes virescens* (Vieillot)					+				7	27,28,29
E	*Quiscalus lugubris* Swainson	109	17		4	17				4	40,42,43
E	*Quiscalus niger* (Boddaert)	2	1		1					2	103
	Sturnella magna (Linnaeus)	3	1			1		+		1,4	16,42
E	*Zarhynchus wagleri* (Gray & Mitchell)	8	2			2				1	16,44
	Unidentified species	4	0							1	49
	Total:	567	112	2	24	71	15	10	2		
	% infected:		19.8	0.4	4.2	12.5	2.6	1.8	0.4		
	JACANIDAE										
E	*Jacana jacana* (Linnaeus)	43	2			2		+		3,4	40,42,43,96
E	*Jacana spinosa* (Linné)	5	0							1,2,6	44,60,103
	Total:	48	2	–	–	2	–	+	–		
	% infected:		4.2			4.2					
	LANIIDAE										
	Lanius ludovicianus Linnaeus	2	0							1	16
	LARIDAE										
E	*Anous stolidus* (Linné)	2	0							1	33
W	*Larus californicus* Lawrence	1	0							1	33
	Larus heermanni Cassin	1	0							1	33
	Larus occidentalis Audubon	23	0							1	16,33

TABLE 1 (Continued)

	Family and species	Total birds	Infected birds	Total birds infected with:						Regions	Reference Numbers
				*L.**	*H.**	*P.**	*T.**	M.*	O.*		
W	*Larus philadelphia* (Ord)	1	0							1	33
	Sterna fuscata Linné	50	0							1	33
	Sterna maxima Boddaert	1	0							1	44
	Sterna sp.	1	0							4	42
	Unidentified species	4	0							4	42
	Total:	84	0								
	MIMIDAE										
W	*Dumetella carolinensis* (Linnaeus)	29	1					1		1	44
	Dumetella sp.	5	1			1				1	16
E	*Melanotis caerulescens* (Swainson)	2	1	1		1				1	16
E	*Mimodes graysoni* (Lawrence)	1	1				1			1	33
E	*Mimus gilvus* (Vieillot)	21	1			1				1,4	16,40,42,43
	Mimus polyglottos (Linnaeus)	1	0					+		1	14,16
E	*Mimus saturninus* (Lichtenstein)	23	7		2	5				6,7	27,28,29,60,84, f
	Toxostoma longirostre (Lafresnaye)	2	0							1	16,33
	Total:	84	12	1	2	8	1	1	–		
	% infected:		14.3	1.2	2.4	9.5	1.2	1.2			
	MOMOTIDAE										
E	*Aspatha gularis* (Lafresnaye)	1	0							1	16
E	*Baryphthengus ruficapillus* (Vieillot)	7	6				3	5		1	44
E	*Eumomota superciliosa* (Sandbach)	4	1	1						1	16
E	*Momotus momota* (Linné)	6	3	1		1		1		1,3	16,96
	Total:	18	10	2	–	1	3	6	–		
	% infected:		55.6	11.2		5.6	16.7	33.3			
	MOTACILLIDAE										
W	*Anthus spinoletta* (Linnaeus)	1	1	1		1				1	33

	NYCTIBIIDAE										
E	*Nyctibius griseus* (Gmelin)	1	0							1	16
	OPISTHOCOMIDAE										
E	*Opisthocomus hoazin* (P. L. S. Müller)	10	2				1	1		3,4	40,96
	PARIDAE										
W	*Auriparus flaviceps* (Sundevall)	2	2				2			1	33
W	*Parus bicolor* Linnaeus	1	0							1	16
	Total:	3	2	–	–	–	2	–	–		
	PARULIDAE										
E	*Basileuterus coronatus* (Tschudi)	2	0							3	17
E	*Basileuterus culicivorus* (Deppe)	11	0							1,6	16,f
E	*Basileuterus hypoleucus* Bonaparte	24	1			1				6	f
E	*Basileuterus leucoblepharus* (Vieillot)	15	0							6	f
E	*Basileuterus nigrocristatus* (Lafresnaye)	1	0							3	17
E	*Basileuterus rivularis* (Wied)	13	1						1	1,3,6	17,44,f
E	*Basileuterus rufifrons* (Swainson)	2	0							1	16
W	*Dendroica coronata* (Linnaeus)	1	0							1	44
W	*Dendroica dominica* (Linnaeus)	1	0							1	16
W	*Dendroica pensylvanica* (Linnaeus)	3	0							1	44
	Dendroica petechia (Linnaeus)	26	6		3	1	2	+		1,2,3	14,16,17,44,49,96, 103
W	*Dendroica striata* (Forster)	1	0							3	96
W	*Dendroica townsendi* (Townsend)	1	0							1	16
	Dendroica sp.	1	0							4	42
E	*Ergaticus ruber* (Swainson)	1	0							1	16
E	*Euthlypis lachrymosa* (Bonaparte)	3	1			1				1	16
E	*Geothlypis aequinoctialis* (Gmelin)	19	2		1			1		6,7	26,f
E	*Geothlypis formosa* (Wilson)	2	0							1	44
E	*Geothlypis semiflava* Sclater	6	1		1					1,3	17,44
E	*Granatellus sallaei* (Bonaparte)	1	1			1				1	16
W	*Helmitheros vermivorus* (Gmelin)	1	0							1	44
	Icteria virens (Linnaeus)	5	0							1	16,44,f
W	*Limnothlypis swainsonii* (Audubon)	1	0							1	f

TABLE 1 (Continued)

	Family and species	Total birds	Infected birds	Total birds infected with:						Regions	Reference Numbers
				*L.**	*H.**	*P.**	*T.**	M.*	O.*		
W	*Mniotilta varia* (Linnaeus)	1	0							1	16
E	*Myioborus brunniceps* (Lafresnaye & d'Orbigny)				+					8	72
E	*Myioborus miniatus* (Swainson)	4	2	1	1					1,3	16,17,49
E	*Myioborus torquatus* (Baird)	1	1			1				1	49
W	*Oporornis philadelphia* (Wilson)	6	0							1,3	17,44
W	*Oporornis tolmiei* (Townsend)	1	0							1	16
E	*Parula pitiayumi* (Vieillot)	8	2	1			1			1,6,7	33,60,f
W	*Protonotaria citrea* (Boddaert)	1	0							1	44
W	*Seiurusaurocapillus* (Linnaeus)	3	1			1				1	16,44
W	*Seiurus motacilla* (Vieillot)	3	0							1	16,44
W	*Seiurus noveboracensis* (Gmelin)	24	3	1		1	1			1	44
	Setophaga picta Swainson	1	1			1				1	16
W	*Setophaga ruticilla* (Linnaeus)	1	0					+		1,4	44,99
W	*Vermivora chrysoptera* (Linnaeus)	1	0							1	44
W	*Vermivora peregrina* (Wilson)	3	0					+		1	14,16,44
W	*Vermivora pinus* (Linnaeus)	1	0							1	44
W	*Vermivora ruficapilla* (Wilson)	2	1		1	1				1	16
W	*Wilsonia canadensis* (Linnaeus)	1	0							1	44
W	*Wilsonia citrina* (Boddaert)	1	0							4	f
	Unidentified species	9	1					1		1	44,49
	Total:	213	25	3	7	9	4	2	1		
	% infected:		11.7	1.4	3.3	4.2	1.9	0.9	0.5		
	PELECANIDAE										
	Pelecanus occidentalis Linné	31	0							1	16,33,44
	PHAETHONTIDAE										
E	*Phaethon aethereus* Linné	1	0							1	33

	PHALACROCORACIDAE										
W	*Phalacrocorax auritus* (Lesson)	5	0							1	16,33
	Phalacrocorax olivaceus (Humboldt)	8	0							1,4	40,42,43,44
W	*Phalacrocorax penicillatus* (Brandt)	2	0							1	16
	Total:	15	0								
	PHALAROPODIDAE										
W	*Lobipes lobatus* (Linné)	1	0							1	33
	PHASIANIDAE										
E	*Colinus cristatus* (Linné)	79	0					+		4	40,42,43
	Colinus virginianus (Linné)	4	0							1	16
E	*Odontophorus capueira* (Spix)				+			+		6	26,65
E	*Odontophorus gujanensis* (Gmelin)							+		4	19
E	*Odontophorus hyperythrus* Gould	1	0							3	17
	Unidentified species	1	0							1	49
	Total:	85	0	–	+	–	–	+	–		
	% infected:										
	PICIDAE										
E	*Celeus castaneus* (Wagler)	8	0							1	44
E	*Celeus flavus* (P. L. S. Müller)	1	1			1				4	40
E	*Centurus superciliaris* (Temminck)	1	0							2	103
W	*Centurus uropygialis* Baird	1	0							1	33
E	*Chrysoptilus melanochloros* (Gmelin)	5	1			1				6	84,f
E	*Chrysoptilus punctigula* (Boddaert)	5	1					1	1	3,4	17,42,43,96
	Colaptes cafer (Gmelin)	4	3			3				1	16
E	*Colaptes campestris* (Vieillot)	13	1		1	+		+	1	6	26,84,f
	Dendrocopos scalaris (Wagler)	3	0							1	16,33
E	*Dryocopus lineatus* (Linné)	9	3			1		2		1,3,4	16,42,44,96
E	*Leuconerpes candidus* (Otto)	6	0							7	29
E	*Melanerpes aurifrons* (Wagler)	1	0							1	f
E	*Melanerpes cruentatus* (Boddaert)	3	0							3,4	42,96
	Melanerpes formicivorus (Swainson)	3	0							1	16

TABLE 1 (Continued)

	Family and species	Total birds	Infected birds	Total birds infected with:						Regions	Reference Numbers
				*L.**	*H.**	*P.**	*T.**	M.*	O.*		
E	*Melanerpes hypopolius* (Wagler)	4	0							1	16
E	*Melanerpes pucherani* (Malherbe)	56	1			1				1	44
E	*Melanerpes rubricapillus* (Cabanis)	2	0							4	42
E	*Phloeoceastes guatemalensis* (Hartlaub)	19	3				1	2		1	44,49
E	*Phloeoceastes melanoleucos* (Gmelin)	10	0							3,4	50,96
E	*Piculus aeruginosus* (Malherbe)	3	1			1				1	16
E	*Piculus aurulentus* (Temminck)	1	●							6	f
E	*Piculus rubiginosus* (Swainson)	3	0							1	16
E	*Piculus simplex* (Salvin)	1	0							1	44
E	*Picumnus granadensis* Lafresnaye	2	0							3	17
E	*Picumnus squamulatus* Lafresnaye	1	●							3	96
E	*Picumnus temminckí* Lafresnaye	21	0							6	60,f
E	*Veniliornis fumigatus* (d' Orbigny)	1	0							3	17
E	*Veniliornis spilogaster* (Wagler)	2	0							6	f
	Veniliornis sp.	2	●							4	42
E	*Xiphidiopicus percussus* (Temminck)	22	1		1					2	103
	Unidentified species	17	0							1,4	42,43,44,49
	Total:	230	16	–	2	8	1	5	2		
	% infected:		7.0		0.9	3.5	●.4	2.2	0.9		
	PIPRIDAE										
E	*Chiroxiphia caudata* (Shaw & Nodder)	327	3		2			1		6	60,f
E	*Chloropipo holochlora* Sclater	2	2		2					3	17
E	*Corapipo leucorrhoa* (Sclater)	4	2		2			1		1	44
E	*Ilicura militaris* (Shaw & Nodder)	33	0							6	f
E	*Manacus candei* (Parzudaki)	2	0							1	16,f
E	*Manacus manacus* (Linnaeus)	64	2		1		1			3,4,6	17,f
E	*Manacus vitellinus* (Gould)	37	2			1		1		1,3	17,44
E	*Neopelma aurifrons* (Wied)	45	1			1		+		6	26,f
E	*Pipra coronata* Spix	4	0							3	17

E	*Pipra erythrocephala* ((Linnaeus)	7	0							4	f
E	*Pipra mentalis* Sclater·	7	0							1	16,44
E	*Schiffornis turdinus* (Wied)	3	1			1				3	17
E	*Schiffornis virescens* (Lafresnaye)	62	1				1			6	f
E	*Teleonema filicauda* (Spix)	1	0							3	96
	Unidentified species	4	0							1	49
	Total:	602	14	–	7	3	2	3	–		
	% infected:		2.3		1.2	0.5	0.3	0.5			
	PODICIPEDIDAE										
	Podiceps dominicus (Linnaeus)	5	1					1		1,4	44,100
	Unidentified species	2	0							1	49
	Total:	7	1	–	–	–	–	1	–		
	% infected:		14.0					14.0			
	PROCELLARIDAE										
	Puffinus opisthomelas Coues	10	0							1	16
	Puffinus puffinus (Brünnich)	2	0							1	33
	Total:	12	0								
	PSITTACIDAE										
E	*Amazona aestiva* (Linné)	1	0					+		7,8	70, f
E	*Amazona amazonica* (Linné)	2	0							3,4	40,96
E	*Amazona autumnalis* (Linné)	1	0							1	44
E	*Amazona barbadensis* (Gmelin)	44	0							4	40
E	*Amazona farinosa* (Boddaert)	8	0							1	44
E	*Amazona leucocephala* (Linné)	1	0							2	103
E	*Amazona ochrocephala* (Gmelin)	140	0							1,3,4	16,40,42,43,96
E	*Ara chloroptera* G. R. Gray	7	2		1	1				4	40,42
E	*Ara macao* (Linné)	1	0							1	16
E	*Ara manilata* (Boddaert)	2	0							3	96
E	*Ara militaris* (Linné)	2	1				1			1	16
E	*Ara nobilis* (Linné)	2	0							4	42
E	*Ara severa* (Linné)	1	0							4	40

TABLE I (Continued)

	Family and species	Total birds	Infected birds	Total birds infected with:						Regions	Reference Numbers
				*L.**	*H.**	*P.**	*T.**	M.*	O.*		
	Ara sp.	24	0							4	42,43
E	*Aratinga acuticaudata* (Vieillot)						+			7	63
E	*Aratinga astec* (Souancé)	1	0							1	44
E	*Aratinga canicularis* (Linné)	1	0							1	16
E	*Aratinga euops* (Wagler)	1	0							2	103
E	*Aratinga finschi* (Salvin)	14	0							1	44
E	*Aratinga pertinax* (Linné)	214	1		1					3,4	40,42,43,96
E	*Aratinga strenua* (Ridgway)	1	1			1				1	16
E	*Aratinga wagleri* (G.R. Gray)	5	1		1					3,4	17,42
	Aratinga sp.	2	0							4	42
E	*Bolborhynchus lineola* (Cassin)	1	1			1				1	16
E	*Brotogeris cyanoptera* (Salvadori)	1	0							3	96
E	*Brotogeris jugularis* (P.L.S. Müller)	125	1		1					1,4	16,40,42,43,100
E	*Brotogeris versicolurus* (P.L.S. Müller)	2	0							6	84
E	*Cyanoliseus patagonus* (Vieillot)	2	0							7	29
E	*Forpus conspicillatus* (Lafresnaye)	6	0							3	17,96
E	*Forpus passerinus* (Linné)	24	0							4,6	40,42,43,64
	Melopsittacus undulatus (Shaw)	8	0							7	29
E	*Pionopsitta haematotis* (Sclater & Salvin)	51	23		2	3		21		1,3	17,44
E	*Pionus menstruus* (Linné)	46	3		3	1		1		1,3	17,44
E	*Pionus senilis* (Spix)	2	2			2				1	16
E	*Pionus sordidus* (Linné)	3	0							4	42
E	*Pyrrhura hoematotis* Souancé	23	0							4	42
E	*Touit batavica* (Boddaert)	3	0							4	42
	Unidentified species	427	0					+		1,4	40,42,43,44,49
	Total:	1199	36		9	9	1	22	–		
	% infected:		3.0		0.8	0.8	0.1	1.8			
	PSOPHIIDAE										
E	*Psophia crepitans* Linné	2	0		+			+		4	19,42

	RALLIDAE										
E	*Aramides cajanea* (P. L. S. Müller)	126	57		1	49		11	3	1,3,4,6	40,42,43,44,57,60, 96,100, f
E	*Laterallus albigularis* (Lawrence)	30	0							1	44
E	*Laterallus melanophaius* (Vieillot)	1	1					1		6	f
E	*Micropygia schomburgkii* (Richard Schomburgk)	1	0							6	f
	Porphyrula martinica (Linné)	30	4		1	3				1,4	40,42,43,44,100
V	*Porzana carolina* (Linné)	1	0							1	44
	Rallus longirostris Boddaert							+		4	56
	Unidentified species	14	0							4	42
	Total:	203	62	–	2	52	+	12	3		
	% infected:		30.5		1.0	25.6		5.9	1.5		
	RAMPHASTIDAE										
E	*Aulacorhynchus haematopygus* (Gould)	1	0							3	17
E	*Aulacorhynchus prasinus* (Gould)	3	0							1	16
E	*Aulacorhynchus sulcatus* (Swainson)	2	0							4	42
E	*Pteroglossus castanotis* Gould	4	1			1		1		3	96
E	*Pteroglossus torquatus* (Gmelin)	38	6			2		4		1	16,44, f
E	*Pteroglossus viridis* (Linné)	1	0							3	96
	Pteroglossus sp.	1	0							4	42
E	*Ramphastos dicolorus* Linné							+		6	26
E	*Ramphastos sulfuratus* Lesson	35	19		1	13	1	10		1	44
E	*Ramphastos swainsonii* Gould	9	3				2	1		1,3	17,44
E	*Ramphastos toco* P. L. S. Müller	4	2		1	1				4,6	50,81,83
E	*Ramphastos tucanus* Linné	2	0							3,4	42,96
E	*Ramphastos vitellinus* Lichtenstein							+		4	19,99
E	*Selenidera spectabilis* Cassin	2	1					1		1	44
	Unidentified species	3	0							1,4	40,43,49
	Total:	105	32	–	2	17	3	17	–		
	% infected:		30.5		1.9	16.2	2.9	16.2			
	RECURVIROSTRIDAE										
	Himantopus himantopus (Linné)	1	0							4	40

TABLE 1 (Continued)

	Family and species	Total birds	Infected birds	Total birds infected with:						Regions	Reference Numbers
				*L.**	*H.**	*P.**	*T.**	M.*	O.*		
	RHEIDAE										
E	*Rhea americana* (Linné)					+				6	26
	RHINOCRYPTIDAE										
E	*Merulaxis ater* Lesson	1	0							6	f
	ROSTRATULIDAE										
E	*Nycticryphes semicollaris* (Vieillot)				+					4	56
	SCOLOPACIDAE										
W	*Actitis macularia* (Linné)	5	0							4	2
W	*Arenaria interpres* (Linné)	1	0							4	2
W	*Calidris melanotos* (Vieillot)	3	0							4	.42
W	*Calidris minutilla* (Vieillot)	4	0							4	42
W	*Calidris pusilla* (Linnaeus)	1	0							4	2
W	*Capella gallinago* (Linné)	1	0							1	44
W	*Limnodromus griseus* (Gmelin)	1	0							4	2
W	*Micropalama himantopus* (Bonaparte)	1	0							4	42
W	*Numenius phaeopus* (Linné)	1	0							1	100
W	*Tringa flavipes* (Gmelin)	2	0							4	2
W	*Tringa solitaria* Wilson	13	1			1				1,3	44,96
	Unidentified species	1	0							4	43
	Total:	34	1	–	–	1	–	–	–		
	% infected:		2.9			2.9					
	STEATORNITHIDAE										
E	*Steatornis caripensis* Humboldt	2	0							3	17

	STRIGIDAE										
W	*Aegolius acadicus* (Gmelin)	2	1			1				1	16
	Asio flammeus (Pontoppidan)				+					6	65
E	*Ciccaba nigrolineata* Sclater	1	0							4	42
E	*Ciccaba virgata* (Cassin)	2	1			1				1	16
	Glaucidium brasilianum (Gmelin)	9	0		+					1,6,7	16,51, f
E	*Otus choliba* (Vieillot)	12	3		3	1				1,3,4,6,8	43,60,73,96,100, f
E	*Otus guatemalae* (Sharpe)	2	2	+	2		+			1,4,6	23,44,56,63,65
	Otus trichopsis (Wagler)	4	1			1				1	16
E	*Pulsatrix perspicillata* (Latham)	2	2		2			1		1	44
E	*Rhinoptynx clamator* (Vieillot)				+					6	63
	Speotyto cunicularia (Molina)	6	0		+					4,6,7,8	40,42,43,65,92,97, f
	Unidentified species	1	0							4	42
	Total:	41	10	+	7	4	+	1	–		
	% infected:		24.4		17.1	9.8		2.4			
	SULIDAE										
	Sula leucogaster (Boddaert)	1	0							1	33
E	*Sula nebouxii* Milne-Edwards	19	0							1	33
	Total:	20	0								
	SYLVIIDAE										
E	*Microbates cinereiventris* (Sclater)	3	0							1,3	17,44
	Polioptila caerulea (Linnaeus)	2	0							1	33
E	*Polioptila dumicola* (Vieillot)					+				7	29
	Polioptila melanura Lawrence	4	2					2		1	33
	Polioptila sp.	1	0							4	43
E	*Ramphocaenus melanurus* Vieillot	1	1			1				1	16
	Unidentified species	1	0							4	42
	Total:	12	3	–	–	1	–	2	–		
	% infected:		25.0			8.3		16.7			

TABLE 1 (Continued)

	Family and species	Total birds	Infected birds	Total birds infected with:						Regions	Reference Numbers
				*L.**	*H.**	*P.**	*T.**	M.*	O.*		
	THRAUPIDAE										
E	*Chlorophonia cyanea* (Thunberg)	46	31		30	1				4,6	42,50, f
E	*Chlorophonia occipitalis* (DuBus)	1	0							1	16
E	*Chlorospingus flavigularis* (Sclater)	1	0							3	17
E	*Chlorothraupis olivacea* (Cassin)	2	1		1					3	17
E	*Chlorothraupis stolzmanni* (Berlepsch & Taczanowski)	1	0							3	17
E	*Cissopis leveriana* (Gmelin)	2	1					1		3	96
E	*Eucometis penicillata* (Spix)	1	1			1		1		1	49
E	*Euphonia affinis* (Lesson)	1	1			1		1		1	16
E	*Euphonia anneae* Cassin	1	0							1	44
E	*Euphonia gouldi* Sclater	12	0							1	44
E	*Euphonia hirundinacea* Bonaparte	1	0							1	16
E	*Euphonia laniirostris* d'Orbigny & Lafresnaye	2	1		1					1,4	42,44
E	*Euphonia luteicapilla* (Cabanis)	3	1		1	1				1	44
E	*Euphonia minuta* Cabanis	1	0							1	44
E	*Euphonia pectoralis* (Latham)	28	1		1					6	f
E	*Euphonia violacea* (Linnaeus)	72	27		27	+		+		4,6	50,99, f
E	*Euphonia xanthogaster* (Sundevall)	1	0							4	42
E	*Habia cristata* (Lawrence)	1	0							3	17
E	*Habia fuscicauda* (Cabanis)	6	4				1	3		1	44
E	*Habia rubica* (Vieillot)	22	1					1		6	f
E	*Hemithraupis guira* (Linnaeus)	1	0							6	f
E	*Hemithraupis ruficapilla* (Vieillot)	3	1		1					6	f
E	*Heterospingus xanthopygius* (Sclater)	2	2		2		2			1	44
E	*Mitrospingus cassinii* (Lawrence)	8	1				1	1		1,3	17,44
E	*Pipraeidea melanonota* (Vieillot)	6	0							3,6	17, f
E	*Piranga bidentata* (Swainson)	1	1			1				1	16
	Piranga flava (Vieillot)	4	4	2	4		2	+		1,8	16,70,71,72
E	*Piranga leucoptera* (Trudeau)	1	1		1					4	42
W	*Piranga ludoviciana* (Wilson)	1	1		1					1	16
W	*Piranga olivacea* (Gmelin)	10	5		3	2				1	44

W	*Piranga rubra* (Linnaeus)	24	16		12	1	2	4	1	1	16,44
E	*Ramphocelus bresilius* (Linnaeus)	21	5					5	+	6	6, f
E	*Ramphocelus carbo* (Pallas)	18	1				1			3,4	40,42,43,96, f
E	*Ramphocelusdimidiatus* Lafresnaye	1	0							3	17
E	*Ramphocelus flammigerus* (Jardine & Selby)	8	0							3	17
E	*Ramphocelus passerinii* Bonaparte	707	433		386	110	4	49		1	44
E	*Ramphocelus sanguinolentus* (Lesson)	9	4			3	1	1		1	16,44
E	*Rhodinocichla rosea* (Lesson)	1	0							4	42
E	*Schistochlamys melanopis* (Latham)	2	0							3,6	96, f
E	*Schistochlamys ruficapillus* (Vieillot)	18	2				+	2		6	60,63,93, f
E	*Stephanophorus diadematus* (Temminck)	44	0					+	+	6,7	28,29,63
E	*Tachyphonus coronatus* (Vieillot)	21	16			2	2	11	1	6	57, f
E	*Tachyphonus cristatus* (Linnaeus)	1	0							6	f
W	*Tachyphonus delatrii* Latresnaye	10	2		1				1	3	17
E	*Tachyphonus rufus*((Boddaert)	35	7			5	+	2	+	1,3,4,6	17,42,43,44,63, f
E	*Tachyphonus surinamus* (Linnaeus)	1	1					1		3	96
	Tachyphonus sp.	1	0			+				4,5	42,66
E	*Tangara arthus* Lesson	2	0							4	42
E	*Tangara cabanisi* (Sclater)	1	0							1	16
E	*Tangara cayana* (Linnaeus)	32	1					1		4,6	42,43, f
E	*Tangara cyanocephala* (Müller)	5	2		2					6	f
E	*Tangara cyanoptera* (Swainson)	21	11		11					4,6	50,89
E	*Tangaradesmaresti* (Vieillot)	14	4		4					6	f
E	*Tangara florida* (Sclater & Salvin)	1	0							1	44
E	*Tangara guttata* (Cabanis)	3	0							4	42
E	*Tangara gyrola* (Linnaeus)	2	2			2				4	42
E	*Tangara heinei* (Cabanis)	1	0							4	42
E	*Tangara icterocephala* (Bonaparte)	1	0							1	44
E	*Tangara inornata* (Gould)	3	1					1		1	44,49
E	*Tangara larvata* (DuBus)	14	0							1	44
E	*Tangara mexicana* (Linnaeus)							+		4	99
E	*Tangara nigrocincta* (Bonaparte)	5	1		1					1,3	16.17
E	*Tangara ruficervix* (Prévost & Des Murs)	1	1	1						3	17

TABLE 1 (Continued)

	Family and species	Total birds	Infected birds	Total birds infected with:						Regions	Reference Numbers
				*L**	*H**	*P**	*T**	M*	O*		
E	*Tangara seledon* (P. L. S. Müller)	10	5		4			4		6	f
E	*Tangara xanthogastra* (Sclater)	5	1					1		3	17
E	*Thraupis abbas* (Deppe)	3	0							1	16
E	*Thraupis bonariensis* (Gmelin)	3	0		+	+			+	7,8	27,28,29,38,75
E	*Thraupis cyanocephala* (d'Orbigny & Lafresnaye)	2	1			1				4	40
E	*Thraupis cyanoptera* (Vieillot)	13	1		1					6	f
E	*Thraupis episcopus* (Linnaeus)	144	16		10		3	5		1,3,4	16,17,40,42 43,50,96, f
E	*Thraupis ornata* (Sparrman)	328	2		1		1	1		6	32, f
E	*Thraupis palmarum* (Wied)	34	6		5			2	+	1,3,4,6	6,17,42,44,50 63,84,96, f
E	*Thraupis sayaca* (Linnaeus)	85	13		12			1	+	6	26,90, f
	Thraupis sp.	2	2		2					6	57
E	*Trichothraupis melanops* (Vieillot)	86	1					1		6	f
	Unidentified species	14	1			1				1,4	42,49
	Total:	1999	645	3	525	132	20	99	3		
	% infected:		32.3	0.2	26.3	6.6	1.0	5.0	0.2		
	THRESKIORNITHIDAE										
	Ajaia ajaja (Linné)	1	0							4	40
E	*Eudocimus ruber* (Linnaeus)	17	0							4	42,43
E	*Guara rubra* (Linné)	1	1			1				3	96
E	*Mesembrinibis cayennensis* (Gmelin)	11	2			2				4	40,42,43
E	*Phimosus infuscatus* (Lichtenstein)	2	1			1				3	96
E	*Theristicus caudatus* (Boddaert)	4	0				+			3,4,7	40,43,79,96
	Total:	36	4	–	–	4	+	–	–		
	% infected		11.1			11.1					

	TINAMIDAE										
E	*Crypturellus cinereus* (Gmelin)						+	+		4	19,56
E	*Crypturellus cinnamomeus* (Lesson)	1	0							1	f
E	*Crypturellus obsoletus* (Temminck)				+					6	65
E	*Crypturellus parvirostris* (Wagler)	3	1					1		6	f
E	*Crypturellus soui* (Hermann)	19	0							1,3,4	44,96,100,
	Cryturellus sp.	11	2		2					4	42
E	*Nothura maculosa* (Temminck)			+		+				7	27,28,29
E	*Tinamus major* (Gmelin)	3	1		1		1			1,4	19,44
E	*Tinamus solitarius* (Vieillot)				+					6	65
	Tinamus sp.				+					6	63
	Unidentified species	1	0							1	49
	Total:	38	4	+	3	+	1	1	–		
	% infected:		10.5		7.9		2.6	2.6			
	TROCHILIDAE										
E	*Aglaiocercus kingi* (Lesson)	1	0							3	17
E	*Amazilia beryllina* (Lichtenstein)	5	2			2				1	16
E	*Amazilia chionopectus* (Gould)	1	0							4	f
E	*Amazilia cyanura* Gould	1	0							1	16
E	*Amazilia franciae* (Bourcier & Mulsant)	1	0							3	17
E	*Amazilia tobaci* (Gmelin)	5	0							4	f
E	*Amazilia tzacatl* (de la Llave)	71	0							1	44
E	*Amazilia violiceps* (Gould)	5	0							1	16
	Amazilia yucatanensis (Cabot)	1	0							1	16
E	*Anthracothorax nigricollis* (Vieillot)	2	0							4	f
E	*Anthracothorax prevostii* (Lesson)	3	0							1	16
W	*Calypte costae* (Bourcier)	1	0							1	33
E	*Campylopterus curvipennis* (Lichtenstein)	1	0							1	16
E	*Campylopterus hemileucurus* (Lichtenstein)	7	1			1				1	16
E	*Clytolaema rubricauda* (Boddaert)	2	0							6	60, f
E	*Coeligena coeligena* (Lesson)	1	0							3	17
E	*Coeligena wilsoni* (De Lattre & Bourcier)	1	1					1		3	17

TABLE 1 (Continued)

	Family and species	Total birds	Infected birds	Total birds infected with:						Regions	Reference Numbers
				*L.**	*H.**	*P.**	*T.**	M.*	O.*		
E	*Colibri thalassinus* (Swainson)	2	1			1				1	16
E	*Eupetomena macroura* (Gmelin)	2	2		2					6	84
E	*Eutoxeres aquila* (Bourcier)	9	2		1			1		1,3	17,44
E	*Glaucis hirsuta* (Gmelin)	5	0							1	44, f
E	*Heliodoxa jacula* Gould	1	0							1	44
E	*Heliomaster longirostris* (Audebert & Vieillot)	1	1			1				1	16
E	*Hylocharis chrysura* (Shaw)	1	0							7	f
E	*Hylocharis eliciae* (Bourcier & Mulsant)	1	0							1	16
E	*Lampornis amethystinus* Swainson	1	1	1						1	16
E	*Lampornis viridipallens* (Bourcier & Mulsant)	4	0							1	16
E	*Metallura tyrianthina* (Loddiges)	1	0							3	17
E	*Phaethornis guy* (Lesson)	2	0							3	17
E	*Phaethornis hispidus* (Gould)	1	0							3	96
E	*Phaethornis longuemareus* (Lesson)	1	0							3	17
E	*Phaethornis superciliosus* (Linné)	5	0							1	44
E	*Phaethornis syrmatophorus* Gould	1	0							3	17
E	*Phaethornis yaruqui* (Bourcier)	5	0							3	17
E	*Thalurania furcata* (Gmelin)	2	0							3	17
E	*Threnetes ruckeri* (Bourcier)	14	1		1					1,3	17,44
E	*Tilmatura dupontii* (Lesson)	3	1						1	1	16
	Unidentified species	31	0							1,3,4	43,44,49,96
	Total:	202	13	1	4	5	–	2	1		
	% infected:		6.4	0.5	2.0	2.5		1.0	0.5		
	TROGLODYTIDAE										
E	*Campylorhynchus griseus* (Swainson)	4	0							1	16
E	*Campylorhynchus zonatus* (Lesson)	4	1			1				1	16,44
	Cistothorus platensis (Latham)	1	1			1				1	16
E	*Cyphorhinus aradus* (Hermann)	13	1					1		1	44
E	*Cyphorhinus thoracicus* Tschudi	1	0							3	17

E	*Henicorhina leucophrys* (Tschudi)	1	0							1	16
E	*Henicorhina leucosticta* (Cabanis)	11	5			5				1	16,44
E	*Microcerculus marginatus* (Sclater)	1	0							3	17
	Salpinctes obsoletus (Say)	2	0							1	33
E	*Thryothorus atrogularis* Salvin	13	0							1	44
E	*Thryothorus longirostris* Vieillot	8	1					1		6	f
E	*Thryothorus modestus* Cabanis	7	1			1				1	16,44,49
E	*Thryothorus nigricapillus* Sclater	7	2			1			1	1,3	17,44
E	*Thryothorus pleurostictus* Sclater	4	1			1				1	16
E	*Thryothorus rutilus* Vieillot	12	1					1		1,3,4	49,50,96
E	*Thryothorus thoracicus* Salvin	6	0							1	44
	Thryothorus sp.	6	0							1	44
	Troglodytes aedon Vieillot	29	2		1	1				1,3,4	16,17, f
W	*Troglodytes troglodytes* (Linnaeus)	1	0							3	17
	Unidentified species	11	0							1,3	49,96
	Total:	142	16	–	1	11	–	3	1		
	% infected:		11.3		0.7	7.7		2.1	0.7		
	TROGONIDAE										
E	*Pharomachrus mocino* de la Llave	1	1	1						1	49
E	*Priotelus temnurus* (Temminck)	2	0							2	103
E	*Trogon clathratus* Salvin	9	4		2			3		1	44
E	*Trogon elegans* Gould	1	0							1	16
E	*Trogon massena* Gould	9	0							1	44
E	*Trogon mexicanus* Swainson	1	1			1				1	16
E	*Trogon rufus* Gmelin	12	2		2					1,4	44,50
E	*Trogon surrucura* Vieillot	1	0							7	f
E	*Trogon violaceus* Gmelin	9	3		1			2		1	44
	Unidentified species	1	0							1	49
	Total:	46	11	1	5	1	–	5	–		
	% infected:		23.9	2.2	10.9	1.1		10.9			
	TURDIDAE										
E	*Catharus dryas* (Gould)	1	0							1	16
W	*Catharus fuscescens* (Stephens)	2	0							1	44
W	*Catharus guttatus* (Pallas)	2	2			1			1	1	16

TABLE 1 (Continued)

	Family and species	Total birds	Infected birds	Total birds infected with:						Regions	Reference Numbers
				*L.**	*H.**	*P.**	*T.**	M.*	O.*		
E	*Catharus mexicanus* (Bonaparte)	11	2		1	1				1	16,44
W	*Catharus minimus* (Lafresnaye)	4	1	1						1	44
E	*Catharus occidentalis* Salvin & Godman	1	0							1	16
W	*Catharus ustulatus* (Nuttall)	127	19	7	1	3	2	8		1,3	17,44
W	*Hylocichla mustelina* (Gmelin)	11	4	3				2		1	44
E	*Mimocichla plumbea* (Linnaeus)	1	0							2	103
E	*Myadestes obscurus* Lafresnaye	1	0							1	16
E	*Myadestes ralloides* (d'Orbigny)	7	2		1			1		1,3,4	17,42,44
E	*Platycichla flavipes* (Vieillot)	47	7		2			5		4,6	42,50, f
E	*Turdus albicollis* Vieillot	102	18		5	2	4	9		1,3,4,6	16,42,96, f
E	*Turdus amaurochalinus* Cabanis	48	8		3	1		4		6,7	27,28,29, f
E	*Turdus chiguanco* Lafresnaye & d'Orbigny	6	1			1				8	38,71
E	*Turdus fumigatus* Lichtenstein	15	5		4			1		1,4	43,44,50, f
E	*Turdus fuscater* Lafresnaye & d'Orbigny	3	3	1	3					4	42
E	*Turdus grayi* Bonaparte	55	5		2	1	1	3		1	16,44,49
E	*Turdus ignobilis* Sclater	11	0							3	17,96
E	*Turdus leucomelas* Vieillot	38	11		4	5	2	1		3,4,6,7	50,57,60,96, f
E	*Turdus nudigenis* lafresnaye	18	2					2		4	42,43, f
E	*Turdus olivater* (Lafresnaye)	1	0							4	42
E	*Turdus rufitorques* Hartlaub	1	1			1				1	16
E	*Turdus rufiventris* Vieillot	116	16		1	7	1	8	+	6,7	26,27,28,29,57,60, f
E	*Turdus rufopalliatus* Lafresnaye	3	2			2				1	16
E	*Turdus serranus* Tschudi	2	1	1						1,3	16,17
	Turdus sp.	2	0							6	60,84
	Unidentified species	4	0							1,4	42,43,49
	Total:	640	110	13	27	25	10	44	1		
	% infected:		17.2	2.0	4.2	3.9	1.6	6.9	0.1		

TYRANNIDAE

E	*Agriornis montana* (d'Orbigny & Lafresnaye)					+		8	70
E	*Anairetes flavirostris* Sclater & Salvin	4	0					8	38
E	*Arundinicola leucocephala* (Linnaeus)	1	0					6	60
E	*Camptostoma obsoletum* (Temminck)	6	0					3,6	17, f
E	*Capsiempis flaveola* (Lichtenstein)	11	3	3				4	50
E	*Colonia colonus* (Vieillot)	5	2	1		1		1,3	17,44,96
E	*Contopus cinereus* (Spix)	1	0					6	f
E	*Contopus fumigatus* (Lafresnaye & d'Orbigny)	1	0					4	50
	Contopus sordidulus Sclater	5	0					1	44
W	*Contopus virens* (Linnaeus)	4	1	1				1,2,3	16,17,103
	Contopus sp.	1	0					3	17
E	*Elaenia albiceps* (Lafresnaye & d'Orbigny)	2	1			1	+	6,8	26,38
E	*Elaenia chiriquensis* Lawrence	29	0					6	f
E	*Elaenia cristata* (Pelzeln)	24	0					6	f
E	*Elaenia flavogaster* (Thunberg)	26	1		1			1,3,4,6	16,17,60, f
E	*Elaenia mesoleuca* Cabanis & Heine	38	2	2				6	f
E	*Elaenia obscura* (Lafresnaye & d'orbigny)	54	1			1		6	f
E	*Elaenia parvirostris* (Pelzeln)	4	0					4,6	42, f
	Elaenia sp.	4	0					6	f
	Empidonax difficilis Baird	1	0					1	16
E	*Empidonax euleri* (Cabanis)	30	1	1				6	f
W	*Empidonax flaviventris* (Baird & Baird)	1	1	1				1	16
	Empidonax fulvifrons (Giraud)	1	0					1	16
W	*Empidonax minimus* (Baird & Baird)	2	1	1				1	16
W	*Empidonax traillii* (Audubon)	4	0					1	44
W	*Empidonax virescens* (Vieillot)	2	0					3	17
E	*Empidonomus varius* (Vieillot)	2	0					6	f
E	*Fluvicola nengeta* (Linnaeus)			+				6	26
E	*Fluvicola pica* (Boddaert)	1	0					4	42
E	*Gubernetes yetapa* (Vieillot)	2	0					6	f
E	*Hemitriccus diops* (Temminck)	6	0					6	f
E	*Idioptilon nidipendulum* (Wied)	3	0					6	f

TABLE 1 (Continued)

	Family and species	Total birds	Infected birds	Total birds infected with:						Regions	Reference Numbers
				*L.**	*H.**	*P.**	*T.**	M.*	O.*		
E	*Idioptilon orbitatum* (Wied)	1	0							6	f
E	*Knipolegus nigerrimus* (Vieillot)	5	0							6	84
E	*Legatus leucophaius* (Vieillot)	1	0							1	44
E	*Leptopogon amaurocephalus* Tschudi	12	0							6	f
E	*Leptopogon rufipectus* (Cabanis)	1	0							3	17
E	*Leptopogon superciliaris* Tschudi	2	0							3	17
E	*Machetornis rixosus* (Vieillot)	7	0		+					7,8	29,72
E	*Megarhynchus pitangua* (Linnaeus)	66	20		12	3	4	7		1	16,44
E	*Mionectes olivaceus* Lawrence	9	1		1					1,3,4	17,42,44
E	*Muscipipra vetula* (Lichtenstein)	1	0							6	f
W	*Muscivora forficata* (Gmelin)	2	1			1				1	16,44
E	*Muscivora tyrannus* (Linnaeus)	32	3		2	1	+	+		1,3,4,6,7	42,43,49,69,96, 100, f
	Myiarchus cinerascens (Lawrence)	1	0							1	33
W	*Myiarchus crinitus* (Linnaeus)	3	0							1	16
E	*Myiarchus ferox* (Gmelin)	1	0							3	96
E	*Myiarchus stolidus* (Gosse)	1	0							2	103
E	*Myiarchus swainsoni* Cabanis & Heine	2	0							6	f
	Myiarchus tuberculifer (d'Orbigny & Lafresnaye)	4	1			1				1,4	16,33,42
	Myiarchus tyrannulus (Müller)	16	3	1		2				1,3,6	16,17,33, f
	Myiarchus sp.	4	0							3	96
E	*Myiobius atricaudus* Lawrence	21	1						1	3,6	17, f
E	*Myiobius barbatus* (Gmelin)	4	0							1	44
E	*Myiobius villosus* (Sclater)	2	0							3	17
E	*Myiodynastes luteiventris* Sclater	3	1		1					1	16,44
E	*Myiodynastes maculatus* (Müller)	3	0							4,6	42, f
E	*Myiophobus fasciatus* (Müller)	26	0							6	f
E	*Myiotriccus ornatus* (Lafresnaye)	1	0							3	17
E	*Myiozetetes cayanensis* (Linnaeus)	19	1		1					3,6	17, f
E	*Myiozetetes granadensis* Lawrence	1	0							1	100
E	*Myiozetetes similis* (Spix)	96	36		35			1		1,4,6	16,50,84, f
W	*Nuttallornis borealis* (Swainson)	6	2		1		1			1	16,44
E	*Onychorhynchus mexicanus* (Sclater)	1	0							1	44

E	*Phaeomyias murina* Spix	7	0							3	17
E	*Phyllomyias fasciatus* (Thunberg)	12	1		1					6	f
E	*Phyllomyias griseiceps* (Sclater & Salvin)	1	0							6	f
E	*Phyllomyias griseocapillus* (Sclater)	1	0							6	f
E	*Phylloscartes ventralis* (Temminck)	4	0							6	f
E	*Pipromorpha oleaginea* (Lichtenstein)	8	2	1				1		1,4	44, f
E	*Pipromorpha rufiventris* (Cabanis)	171	1				1			6	f
	Pitangus sulphuratus (Linnaeus)	55	5	+	2	1	1	1	+	1,3,4,6, 7,8	16,17,26,28,29,42,43, 44,50,60,71,72,76,96., f
E	*Platyrinchus coronatus* Sclater	1	0							1	44
E	*Platyrinchus leucoryphus* (Wied)	1	0							6	f
E	*Platyrinchus mystaceus* Vieillot	63	2		1		1			6	60,f
E	*Platyrinchus platyrhynchos* (Gmelin)	1	0							6	f
	Platyrinchus sp.	1	0							6	f
	Pyrocephalus rubinus (Boddaert)	3	0							3,4,6	17,43, f
E	*Rhynchocyclus brevirostris* (Cabanis)	2	0							1,3	16,17
E	*Satrapa icterophrys* (Vieillot)	1	0							6	f
	Sayornis nigricans (Swainson)	4	1			1				1	16
E	*Serpophaga subcristata* (Vieillot)	7	0							6	f
E	*Sublegatus modestus* (Wied)	1	0							6	f
E	*Todirostrum cinereum* (Linnaeus)	5	1			1			1	1,3	16,17,44
E	*Todirostrum plumbeiceps* (Lafresnaye)	2	0							6	f
E	*Todirostrum poliocephalum* (Wied)	1	0							6	f
E	*Tolmomyias sulphurescens* (Spix)	10	0							6	f
E	*Tyranniscus vilissimus* (Sclater & Salvin)	41	6		5	1				1	44
E	*Tyranniscus viridiflavus* (Tschudi)	1	0							3	17
E	*Tyrannulus elatus* (Latham)	1	0							1	44
E	*Tyrannus caudifasciatus* d'Orbigny	1	0							2	103
	Tyrannus melancholicus Vieillot	40	4		2	1	1	2		1,3,4,6,8	16,17,42,44,49,75, f
W	*Tyrannus tyrannus* (Linnaeus)	2	0							1	87
E	*Xanthomyias virescens* (Temminck)	14	0							6	f
E	*Xolmis cinerea* (Vieillot)	9	4		4					6,7	84, f
E	*Xolmis irupero* (Vieillot)	1	0							7	f
	Unidentified species	141	9		3	1	2	5		1,4	42,43,44,49
	Total:	1242	120	2	81	15	11	20	2		
	% infected:		9.7	0.2	6.5	1.2	0.9	1.6	0.2		

TABLE 1 (Continued)

	Family and species	Total birds	Infected birds	Total birds infected with:						Regions	Reference Numbers
				*L.**	*H.**	*P.**	*T.**	M.*	O.*		
	TYTONIDAE										
	Tyto alba (Scopoli)	3	1		1					1,2,4	16,50,103
	VIREONIDAE										
E	*Cyclarhis gujanensis* (Gmelin)	22	6			1	1	4		1,4,6,7	29,49,99, f
E	*Hylophilus decurtatus* (Bonaparte)	1	1				1			1	16
E	*Hylophilus poicilotis* Temminck	29	0					+		6	26, f
	Vireo bellii Audubon	2	1		1			+		1	14,16,33
W	*Vireo flavifrons* Vieillot	1	1		1		1			1	44
	Vireo gilvus (Vieillot)	5	5		2	3				1	16,49
	Vireo griseus (Boddaert)	1	0							1	f
E	*Vireo gundlachii* Lembeye	1	1		1					2	103
	Vireo olivaceus (Linnaeus)	35	14	1	9	4	2	2		1,3,4,6	16,17,44,49,60, f
E	*Vireo pallens* Salvin	1	0							1	f
	Vireo solitarius (Wilson)	1	0							1	16
E	*Vireolanius pulchellus* Sclater & Salvin	3	1			1	1				16
	Unidentified species	1	0							1	49
	Total:	103	30	1	14	9	6	6	–		
	% infected:		29.1	1.0	13.6	8.7	6.0	6.0			
	Total of all birds:	14396	2482	54	1457	609	196	440	73		
	% infected:		17.2	0.4	10.1	4.2	1.4	3.1	0.5		

L. = *Leucocytozoon*, *H.* = *Haemoproteus*, *P.* = *Plasmodium*, *T.*=*Trypanosoma*, M. = Microfiliaria, O. = Others (haemogregarines, *Atoxoplasma*/*Lankesterella* and *Akiba*); + = positive records cited in the literature but for which no prevalence data are available. As a result of multiple infections in a single bird, the total of infections listed may exceed the total number of infected birds.
E = species endemic to the Neotropics, W = Nearctic species which overwinter in the Neotropics.
f = files of the International Reference Centre for Avian Haematozoa.

TABLE 2

Prevalence of haematozoa in introduced and domesticated avifauna of the Neotropics

Family and species	Total birds	Infected birds	Total birds infected with:						Regions	Reference Numbers
			*L.**	*H.**	*P.**	*T.**	M.*	O.*		
ANATIDAE										
** *Anas platyrhynchos* Linné	203	4		1	3				4,6	36,40,42,43
Anser anser (Linné)	34	1		1					4,6	36,40,43
Cairina moschata (Linné)	2875	188		187	5	+	+	1	3,4,6	36,40,42,43,96
Total:	3112	193		189	8	+	+	1		
% infected:		6.2		6.1	0.3			0.03		
COLUMBIDAE										
Columba livia Gmelin	3224	967		967	8			+	1,2,3,4,6,7	5,9,10,21,36,40,42,43 46,77,93,101
% infected:		29.8		29.8	0.2					
MELEAGRIDIDAE										
Meleagris gallopavo Linné	3731	12		6	9			1	1,3,4,6	10,36,40,42,43,96
% infected:		0.3		0.2	0.2			0.03		
NUMIDIDAE										
Numida meleagris (Linné)	302	0							4,6	36,40,42,43
PHASIANIDAE										
Coturnix coturnix (Linné)	3	0							4	40,43
Gallusgallus Linné	10640	33			21			12	1,2,3,4, 6,7	10,27,28,29,36,40 42,43,57,60,96,103
Perdix perdix (Linné)	1	0							4	40
Phasianus colchicus Linné	7	0							4	40,43
Total:	10651	33	–	–	21	–	–	12		
% infected:		0.3			0.2			0.1		
PLOCEIDAE										
Passer domesticus (Linnaeus)	119	56		+	15		+	41	1,6,7,8	16,27,28,29,38,60 92,f
% infected:		47.1			12.6			34.5		
Total of all birds:	21159	1261	–	1162	61	+	+	55		
% infected:		5.6		5.5	0.3			0.3		

* See footnotes of Table 1.

** The sample of *Anas platyrhynchos* undoubtedly includes migrants overwintering in the Neotropics as well as domesticated stock; but they could not be distinguished.

TABLE 3

Comparison of the hematozoan prevalences between winter residents and endemic species in the Neotropics and total prevalences between the Neotropics and the Nearctic (Nearctic data from Greiner et al. 1975)

	Total birds	Infected birds	Total birds infected with:					
			*L.**	*H.**	*P.**	*T.**	M.*	O.*
NEOTROPICS								
Winter Residents	477	101	18	32	28	17	16	4
% infected:		21.2	3.8	6.7	5.9	3.6	3.4	0.8
Endemics	10907	2083	19	1189	490	102	361	65
% infected:		19.1	1.7	10.9	5.0	9.4	3.3	6.0
Total infected	35555	3743	54	2619	670	196	440	128
% infected:		10.5	0.2	7.4	1.9	0.6	1.2	0.4
NEARCTIC								
Total infected	57026	21048	10093	11112	2185	2247	1777	357
% infected:		36.9	17.7	19.5	3.8	3.9	3.1	0.6

* See footnotes of Table 1.

X^2 contingency tables (Woolf, C.M. 1968. *Principles of Biometry*. Van Nostrand Co., 359 pp.) were used to test for significant differences in prevalence between (i) Winter Residents and Endemics, and (ii) Neotropical and Nearctic fauna. Statistically significant differences ($\alpha = 0.05$) were found between all comparisons with the exception of Winter Residents vs. Endemics: (a) Total Infected, (b) *Plasmodium*, (c) Microfilaria, and (d) Others.

TABLE 4

Prevalence of avian hematozoa in 8 regions (see Fig. 1) of the Neotropics. Note that the summation of the totals in Tables 1 and 2 differ slightly from the totals in Table 4 due to the fact that certain papers could not be used to determine prevalence at the avian species level (Tables 1, 2)

Region	Total birds	Infected birds	Total birds infected with:					
			*L.**	*H.**	*P.**	*T.**	M.*	O.*
1	5337	1446	45	797	398	116	289	54
		27.1%	0.8%	14.9%	7.5%	2.2%	5.4%	1.0%
2	330	31	–	28	3	–	+	–
		9.4%	–	8.5%	0.9%	–	–	–
3	1713	744	3	679	28	1	38	4
		43.4%	0.2%	36.9%	1.6%	0.1%	2.2%	0.2%
4	22186	800	1	694	135	3	3	+
		3.6%	0.005	3.1%	0.6%	0.01%	0.01%	–
5	100	15	–	3	7	1	5	2
		15.0%	–	3.0%	7.0%	1.0%	5.0%	2.0%
6	5049	617	2	330	104	71	96	70
		12.1%	0.04%	6.5%	2.1%	3.0%	1.9%	1.4%
7	807	79	–	78	+	+	1	+
		9.8%	–	9.7%	–	–	0.1%	–
8	135	27	3	13	2	5	13	–
		20.0%	2.2%	9.6%	1.5%	3.7%	9.6%	–
Totals	35657	3759	54	2622	677	197	445	130

* See footnotes of Table 1.

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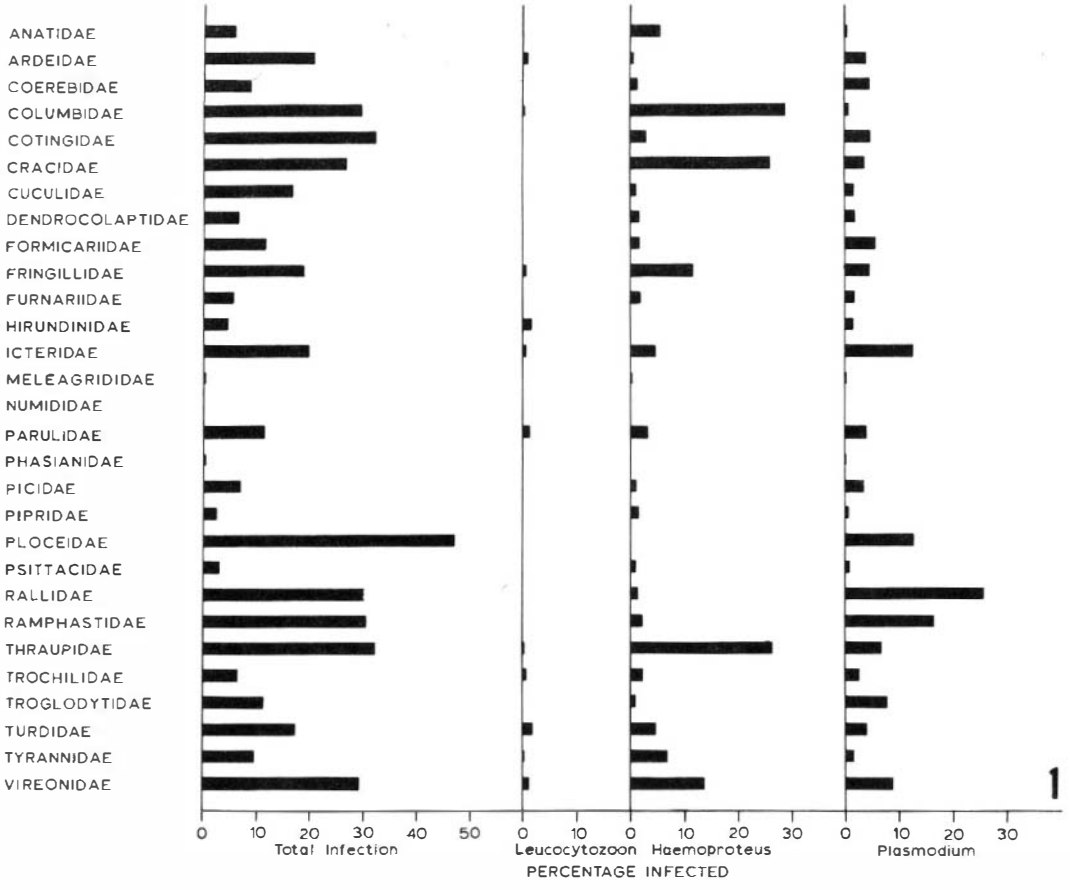
Fig. 1. Distribution and frequency of avian hematozoa by host families. Note: families illustrated are represented by samples of 100 or more individuals.


ANATIDAE
ARDEIDAE
COEREBIDAE
COLUMBIDAE
COTINGIDAE
CRACIDAE
CUCULIDAE
DENDROCOLAPTIDAE
FORMICARIIDAE
FRINGILLIDAE
FURNARIIDAE
HIRUNDINIDAE
ICTERIDAE
MELEAGRIDIDAE
NUMIDIDAE
PARULIDAE
PHASIANIDAE
PICIDAE
PIPRIDAE
PLOCEIDAE
PSITTACIDAE
RALLIDAE
RAMPHASTIDAE
THRAUPIDAE
TROCHILIDAE
TROGLODYTIDAE
TURDIDAE
TYRANNIDAE
VIREONIDAE
0 10 20 30 40 50
Total Infection
0 10
Leucocytozoon
0 10 20 30
Haemoproteus
0 10 20 30
Plasmodium
PERCENTAGE INFECTED
1

83. **Muniz, J., R. Soares, & S. Batista**
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Fig. 2. Regionalization of the Neotropics. 1, Central American; 2, Caribbean Islands; 3, Northern Andean; 4, Guinea Highlands; 5, Amazon Basin; 6, Brazilian Highlands; 7, Pampas; and 8, Southern Andean. Note: This figure defines the regions cited in Tables 1,2 and 4.

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