

Morphological Characters of Bird Species in Taiwan

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ABSTRACT: We documented body measurements of birds captured during 1987-1995 banding research in Taiwan by Wild Bird Society Taiwan. A total of 223 bird species with measurements of body mass, length of body, head, tail, bill and tarsus, and maximum wing span were compiled for the database. Body mass, length of bill, and length of tarsus of 85 species that had sample sizes > 20 were reported. In addition, we also compared our data with that from Dunning (1993). Among the ten species eligible for further analyses, we found that eight species showed significant differences in body mass between our data and that of Dunning (1993). Our results together with our recent studies (Lee *et al.*, 2004; Ding *et al.*, 2005) showed that compiling banding research data contribute to predict ecological parameters of bird studies in community, ecosystem and landscape levels.

KEY WORDS: Bill length, body mass, geographic variation, Taiwan, tarsus length.

INTRODUCTION

Avian body size (e.g., mass and length) is one of the most accessible factors relevant to physiological processes, life history strategies, behavioral and ecological functions (Peters, 1983; Gaston *et al.*, 2001). The body sizes of birds are frequently used in physiological and ecological studies (Schluter and Repasky, 1991; Dunning, 1993). In addition, body size also plays an important role in predicting the relationships of abundance and density (Griffiths, 1992; Blackburn and Gaston, 1997; Fa and Purvis, 1997; Ding *et al.*, 2005), as well as species richness (Finlay *et al.*, 1996; Gregory, 1998), ecosystem characteristics (Holling, 1992; Cumming and Havlicek, 2002), and macroecology (Gregory, 1998; Gaston and Blackburn, 2000; Cassey and Blackburn, 2004).

Avian body size has been shown to be one of the accurate and less variant measures in birds (Peters, 1983), and is often recorded as mass (weight) or length. Dunning (1993), however, suggested that body mass is more useful and desirable than body length for most physiological and ecological studies. Body mass, unfortunately, could only be measured while birds are alive, and may not be available in many situations, which also explains why bird body length are well documented but body mass are not.

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To our knowledge, a comprehensive report on the body mass of Taiwan's bird species is scanty (Lee *et al.*, 1998). Current body mass data are scattered in various forms, i.e., local reports and articles (e.g., Hachisuka and Udagawa, 1950, 1951), banding research data possessed by private organizations (e.g., Shiu, 1996), and museum collections. It is difficult to compile and pool the data with various qualities from different sources.

In addition to local documents and reports, useful information is also available from review studies on birds. Dunning (1993) compiled body mass data of 6283 bird species primarily by reviewing published literature. The body mass data for over 60 resident species in Taiwan were presented in his work. However, the records were not obtained from the Taiwan specimens. Since body mass may vary with geographic regions, it is a question whether Dunning's data is suitable to be used for Taiwanese ecological studies on birds.

The purposes of this paper are to compile the body size measurements from different local sources, and to evaluate the adequacy of applying Dunning's data in representing the bird species in Taiwan. The results generated by this study regarding body sizes will contribute to community, ecosystem and landscape studies on birds in Taiwan in the future.

MATERIALS AND METHODS

Data sources

We employed body measurements as well as species lists from banding studies conducted between 1987 and 1995 by Wild Bird Society Taiwan. A total of 223 bird species with measurements of body mass, lengths of body, head, tail, bill and tarsus, and maximum wing span were collected. We excluded exotic birds and species captured in remote islands. All measurements were taken from living birds.

Data analyses

We performed an initial descriptive statistics, including mean, standard deviation, minimum, and maximum values. Outliers that showed significant deviations from the means were ignored. Among the 223 species, 138 species has sample size less than 20, and were excluded. Therefore, body mass, and lengths of bill and tarsus were analyzed for the remaining 85 species. We included bill and tarsus lengths because bill length is an important parameter for fruit-feeding species, and tarsus length is important for migratory shorebirds which use shallow water and mudflat habitats. All calculations for 223 species are available on the internet (http://ecology.lifescience.ntu.edu.tw/research_data/bird2004.htm).

In addition, we evaluated the body mass data of Taiwanese birds recorded in Dunning (1993). A t-test was performed to estimate the differences of the body mass for each species in our database and Dunning's (1993). Of the 64 Taiwanese species with body mass information from Dunning (1993), ten has enough sample sizes for the analyses. Statistical analyses were performed by using SYSTAT for Windows version 9 (SPSS, 1999).

RESULTS

Body mass and lengths of bill and tarsus were documented for a total of 85 Taiwanese species (Tables 1 and 2), including 42 resident species, 36 winter migratory species (transient and visitor), two summer migratory species, and five species with combined status.

Among the ten species of the 64 species from Dunning (1993) (Table 1), eight showed significant differences (seven cases at $p < 0.001$ and one case at $p < 0.05$). Only two species showed no significant difference. A qualitative comparison between these two datasets indicated that most of these differences were rather small for smaller-sized species. As the body mass increased, there tended to be a wider difference.

Table 1. Body mass measurements (g) for 85 species captured in banding research in Taiwan from 1987 to 1995.

Chinese name	Scientific name	Sex ¹⁾	Measurement in Taiwan			Data from CRC handbook ²⁾			t-test ³⁾	Status in Taiwan ⁴⁾
			N	Mean	SD	N	Mean	SD		
雁鴨科	Anatidae									
小水鴨	<i>Anas crecca</i>	B/U	60	301.8	34.5	-	-	-		W
		F	30	297.9	33.0	81	318	-		
		M	19	314.3	35.7	194	364	-		
三趾鶉科	Turnicidae									
棕三趾鶉	<i>Turnix suscitator</i>	B/U	36	62.2	12.5	-	-	-		R
		F	10	72.9	11.3	-	-	-		
		M	17	59.5	10.7	-	-	-		
鬚鶲科	Megalaimidae									
五色鳥	<i>Megalaima oorti</i>	U	62	85.1	10.4	-	-	-		R
翠鳥科	Alcedinidae									
翠鳥	<i>Alcedo atthis</i>	B/U	44	29.3	3.6	15	27	2.35	*	R
		F	25	29.5	3.0	-	-	-		
		M	16	29.5	4.7	-	-	-		
鶲鶲科	Strigidae									
黃嘴角鶲	<i>Otus spilocephalus</i>	U	20	83.8	8.3	16	67.5	-		R
鳩鴿科	Columbidae									
斑頸鳩	<i>Streptopelia chinensis</i>	U	21	148.2	15.1	343	159	11	***	R
紅鳩	<i>Streptopelia tranquebarica</i>	B/U	21	101.5	31.2	-	-	-		R
		F	4	132.9	57.4	-	-	-		
		M	2	96.0	2.8	1	104	-		
鶲科	Scolopacidae									
針尾鶲	<i>Gallinago stenura</i>	B/U	37	115.6	14.7	472	113	-		W
中地鶲	<i>Gallinago megala</i>	U	46	139.9	18.8	7	140	-		W
田鶲	<i>Gallinago gallinago</i>	U	160	94.9	9.6	-	-	-		W
		F	-	-	-	14	116	-		
		M	-	-	-	15	128	-		
中杓鶲	<i>Numenius phaeopus</i>	U	79	361.9	68.1	-	-	-		T/W
		F	-	-	-	36	404	29.1		
		M	-	-	-	29	355	22.1		
赤足鶲	<i>Tringa totanus</i>	B/U	311	125.3	19.3	200	129	-		T/W
小青足鶲	<i>Tringa stagnatilis</i>	B/U	167	72.1	12.4	61	77.5	-		T/W
青足鶲	<i>Tringa nebularia</i>	B/U	129	185.4	32.4	51	174	-		W
鷹斑鶲	<i>Tringa glareola</i>	U	781	69.4	10.9	-	-	-		T/W
		F	-	-	-	11	73	-		
		M	-	-	-	16	62	-		
反嘴鶲	<i>Tringa cinerea</i>	B/U	676	76.9	16.0	33	72	-		T
磯鶲	<i>Tringa hypoleucos</i>	B/U	652	51.5	10.4	38	51.7	-		W
黃足鶲	<i>Tringa brevipes</i>	B/U	1406	123.2	24.3	6	107	-		T

紅尾伯勞	<i>Lanius cristatus</i>	B/U	244	32.1	3.5	14	28	-	T/W
鴉科	Corvidae								
大卷尾	<i>Dicrurus macrocercus</i>	U	26	57.2	5.0	3	49.8	-	R
黑枕藍鶺鴒	<i>Hypothymis azurea</i>	B/U	21	12.4	2.2	21	11.1	-	R
		F	9	11.0	1.6	-	-	-	
		M	10	13.7	2.1	-	-	-	
鶺鴒科	Muscicapidae								
白腹鶺鴒	<i>Turdus pallidus</i>	B/U	86	70.4	6.5	7	72.7	-	W
		F	28	69.8	7.1	-	-	-	
		M	13	72.7	4.9	-	-	-	
赤腹鶺鴒	<i>Turdus chrysolaus</i>	B/U	55	65.2	8.0	-	-	-	W
		F	16	64.4	6.9	-	-	-	
		M	10	64.7	9.3	-	-	-	
黃胸青鶺鴒	<i>Ficedula hyperythra</i>	B/U	61	8.5	0.8	19	8.2	-	R
		F	18	8.6	1.0	-	-	-	
		M	29	8.4	0.7	-	-	-	
野鶺鴒	<i>Luscinia calliope</i>	B/U	161	22.4	2.8	20	18.5	-	W
		F	28	21.6	2.4	-	-	-	
		M	114	22.8	2.8	-	-	-	
白眉林鶺鴒	<i>Tarsiger indicus</i>	B/U	26	14.1	1.0	6	14.6	-	R
		F	10	14.0	0.9	-	-	-	
		M	4	13.8	0.6	-	-	-	
栗背林鶺鴒	<i>Tarsiger johnstoniae</i>	B/U	163	14.5	1.0	-	-	-	R
		F	53	14.3	1.1	-	-	-	
		M	68	14.6	0.9	-	-	-	
白尾鶺鴒	<i>Cinclidium leucurum</i>	B/U	90	25.1	1.9	6	-	-	R
		F	35	23.8	1.4	-	-	-	
		M	43	25.9	1.5	-	-	-	
山雀科	Paridae								
青背山雀	<i>Parus monticolus</i>	U	68	12.3	1.0	-	-	-	R
		F	-	-	-	14	-	-	
		M	-	-	-	24	-	-	
燕科	Hirundinidae								
棕沙燕	<i>Riparia paludicola</i>	U	982	9.8	0.8	61	13.4	1	*** R
家燕	<i>Hirundo rustica</i>	U	1512	17.5	2.3	-	-	-	S/T
		F	-	-	-	994	15.8	-	
		M	-	-	-	1337	16.2	-	
洋燕	<i>Hirundo tahitica</i>	U	35	14.9	1.5	-	13.1	-	R
赤腰燕	<i>Hirundo striolata</i>	U	55	21.9	2.2	-	-	-	R
		F	-	-	-	1	22	-	
鶇科	Pycnonotidae								
白頭翁	<i>Pycnonotus sinensis</i>	U	1172	29.9	3.1	-	-	-	R
紅嘴黑鶇	<i>Hypsipetes leucocephalus</i>	U	58	50.7	4.8	-	-	-	R
鷓鴣科	Cisticolidae								
錦鷓	<i>Cisticola juncidis</i>	U	36	8.4	1.2	-	-	-	R
		F	-	-	-	8	-	-	
		M	-	-	-	9	-	-	
灰頭鷓鴣	<i>Prinia flaviventris</i>	U	131	7.6	0.8	-	-	-	R
		M	-	-	-	1	7	-	
褐頭鷓鴣	<i>Prinia inornata</i>	U	243	8.3	0.8	-	-	-	R

繡眼科	Zosteropidae									
綠繡眼	<i>Zosterops japonicus</i>	U	345	9.0	0.9	-	10	-		R
鶯科	Sylviidae									
短翅樹鶯	<i>Cettia canturians</i>	U	161	16.2	4.5	-	-	-		T/W
北蝗鶯	<i>Locustella ochotensis</i>	U	34	18.5	2.8	19	18.5	-		T
大葦鶯	<i>Acrocephalus arundinaceus</i>	U	384	27.8	4.3	12	27.2	-		W
棕面鶯	<i>Abroscopus albogularis</i>	U	46	5.9	0.8	-	-	-		R
金翼白眉	<i>Garrulax morrisonianus</i>	U	54	75.5	7.7	-	-	-		R
藪鳥	<i>Liocichla steerii</i>	U	428	31.6	2.9	-	-	-		R
小彎嘴畫眉	<i>Pomatorhinus ruficollis</i>	U	64	39.6	5.2	-	-	-		R
		F	-	-	-	5	30.2	-		
		M	-	-	-	8	33.1	-		
山紅頭	<i>Stachyris ruficeps</i>	U	260	10.5	1.3	19	10.3	-		R
紋翼畫眉	<i>Actinodura morrisoniana</i>	U	79	32.1	2.6	-	-	-		R
灰頭花翼畫眉	<i>Alcippe cinereiceps</i>	U	89	10.1	0.9	-	-	-		R
		M	-	-	-	2	10	-		
頭烏線	<i>Alcippe brunnea</i>	U	20	18.7	1.1	-	-	-		R
		M	-	-	-	-	-	-		
繡眼畫眉	<i>Alcippe morrisonia</i>	B/U	443	14.3	1.3	37	14.4	0.89	NS	R
白耳畫眉	<i>Heterophasia auricularis</i>	U	188	47.6	5.1	-	-	-		R
冠羽畫眉	<i>Yuhina brumeiceps</i>	U	301	12.4	1.1	-	-	-		R
粉紅鸚嘴	<i>Paradoxornis webbianus</i>	U	197	10.0	1.1	73	10.9	1.5	***	R
黃羽鸚嘴	<i>Paradoxornis verreauxi</i>	U	24	5.9	0.3	-	-	-		R
文鳥科	Passeridae									
麻雀	<i>Passer montanus</i>	B/U	73	21.2	2.4	136	22	1.17	***	R
白鵲鴿	<i>Motacilla alba</i>	U	146	20.1	1.7	-	-	-		R/W
	<i>M. alba alba</i>	U	-	-	-	93	21	2.1		
	<i>M. alba personata</i>	B	-	-	-	21	24.4	-		
黃鵲鴿	<i>Motacilla flava</i>	U	337	18.5	1.8	-	-	-		W
	<i>M. flava beema</i>	B	-	-	-	20	16.9	-		
	<i>M. flava flava</i>	B	-	-	-	162	17.6	-		
	<i>M. flava tschutschensis</i>	F	-	-	-	61	13.9	-		
		M	-	-	-	129	14.9	-		
白腰文鳥	<i>Lonchura striata</i>	U	24	10.6	0.8	11	12.3	-		R
斑文鳥	<i>Lonchura punctulata</i>	B/U	334	12.8	1.3	13	13.6	-		R
雀科	Fringillidae									
酒紅朱雀	<i>Carpodacus vinaceus</i>	B/U	200	22.7	1.8	-	-	-		R
		F	66	22.7	1.9	-	-	-		
		M	100	22.6	1.7	-	-	-		
灰鶯	<i>Pyrrhula erythaca</i>	B/U	30	21.7	1.3	1	20	-		R
		F	13	21.7	1.6	-	-	-		
		M	16	21.8	1.0	-	-	-		
黑臉鵪	<i>Emberiza spodocephala</i>	B/U	413	16.5	1.4	-	-	-		W
		F	166	16.3	1.4	-	-	-		
		M	139	17.1	1.2	1	18	-		

¹⁾ B = data for both sexes grouped into a single mean, F = female, M = male, U = unknown.

²⁾ Dunning, Jr., J. B. (ed.) 1993. CRC handbook of avian body masses. CRC Press, Boca Raton, USA.

³⁾ * $p < 0.05$, *** $p < 0.001$, NS = non-significant.

⁴⁾ R = resident, S = summer visitor, T = transient, W = winter visitor.

Table 2. Length of bills and tarsus (in mm) for 85 species collected in the banding research in Taiwan from 1987 to 1995.

Chinese name	Scientific name	Sex ¹⁾	Bill length (mm)			Tarsus length (mm)		
			N	Mean	SD	N	Mean	SD
雁鴨科	Anatidae							
小水鴨	<i>Anas crecca</i>	B/U	63	35.7	2.4	62	30.5	1.8
		F	30	35.5	1.9	30	29.8	1.4
		M	20	36.0	3.2	20	31.0	1.6
三趾鶉科	Turnicidae							
棕三趾鶉	<i>Turnix suscitator</i>	B/U	37	13.6	1.2	37	26.2	1.5
		F	10	14.2	1.1	10	27.3	1.5
		M	17	13.2	1.0	17	25.7	1.0
鬚鶉科	Megalaimidae							
五色鳥	<i>Megalaima oorti</i>	U	64	23.9	2.1	64	29.0	3.2
翠鳥科	Alcedinidae							
翠鳥	<i>Alcedo atthis</i>	B/U	47	38.7	2.5	45	10.1	1.0
		F	25	39.3	2.6	24	10.0	1.0
		M	17	38.9	2.0	16	10.2	1.2
鷓鴣科	Strigidae							
黃嘴角鷓	<i>Otus spilocephalus</i>	U	21	14.3	2.9	21	32.9	4.3
鳩鴿科	Columbidae							
斑頸鳩	<i>Streptopelia chinensis</i>	U	22	15.6	2.4	22	26.9	1.4
紅鳩	<i>Streptopelia tranquebarica</i>	B/U	21	13.6	1.8	20	20.7	2.1
		F	4	13.3	1.7	4	19.7	0.5
		M	2	14.7	0.5	2	21.1	1.8
鶉科	Scolopacidae							
針尾鶉	<i>Gallinago stenura</i>	U	37	61.2	3.0	37	34.2	2.8
中地鶉	<i>Gallinago megala</i>	U	45	63.8	3.6	46	35.1	2.1
田鶉	<i>Gallinago gallinago</i>	U	163	64.9	3.6	162	33.0	1.9
中杓鶉	<i>Numenius phaeopus</i>	U	80	73.5	6.2	80	61.7	3.9
赤足鶉	<i>Tringa tetanus</i>	U	301	43.9	2.4	302	50.1	2.7
小青足鶉	<i>Tringa stagnatilis</i>	U	164	40.0	1.8	162	52.9	2.8
青足鶉	<i>Tringa nebularia</i>	U	127	54.5	2.9	127	62.1	4.2
鷹斑鶉	<i>Tringa glareola</i>	U	771	29.3	1.4	776	38.8	2.3
反嘴鶉	<i>Tringa cinerea</i>	U	678	47.3	3.1	677	30.1	2.3
磯鶉	<i>Tringa hypoleucos</i>	U	652	25.2	1.5	650	25.9	2.0
黃足鶉	<i>Tringa brevipes</i>	U	1393	38.3	1.8	1393	34.3	2.5
翻石鶉	<i>Arenaria interpres</i>	B/U	145	22.1	1.0	146	26.6	1.8
		F	14	22.6	1.1	14	26.8	1.7
		M	25	22.2	1.0	25	26.5	1.4
蛇鶉	<i>Calidris tenuirostris</i>	U	56	43.7	2.2	56	36.8	2.1
漂鶉	<i>Calidris canutus</i>	U	43	33.1	3.4	43	31.7	2.0
釋鶉	<i>Calidris ruficollis</i>	U	1920	17.7	1.3	1913	20.3	1.4
丹氏釋鶉	<i>Calidris temminckii</i>	U	27	18.0	1.5	27	22.0	1.8
雲雀鶉	<i>Calidris subminuta</i>	U	313	18.3	0.9	313	22.7	1.1
尖尾鶉	<i>Calidris acuminata</i>	U	791	25.2	1.6	786	31.2	2.2
濱鶉	<i>Calidris alpina</i>	U	3875	35.7	2.7	3871	27.7	2.0
游鶉	<i>Calidris ferruginea</i>	B/U	521	38.1	2.6	523	31.5	2.0

		F	22	39.9	1.6	22	31.3	1.7
		M	20	36.2	2.5	21	31.0	3.0
寬嘴鵲	<i>Limicola falcinellus</i>	U	165	31.2	2.1	163	23.7	1.3
紅領瓣足鵲	<i>Phalaropus lobatus</i>	B/U	1040	21.0	1.1	1034	21.0	1.2
		F	181	21.3	0.9	180	21.1	1.1
		M	175	21.0	0.9	173	20.9	1.2
彩鵲科	Rostratulidae							
彩鵲	<i>Rostratula benghalensis</i>	B/U	224	46.3	2.4	225	45.0	3.1
		F	77	47.4	2.3	77	46.5	2.4
		M	121	45.7	2.2	121	44.6	2.8
鵲科	Charadriidae							
金斑鵲	<i>Pluvialis fulva</i>	U	256	23.5	1.3	255	45.3	2.4
灰斑鵲	<i>Pluvialis squatarola</i>	U	69	32.2	1.6	69	50.3	2.9
小環頸鵲	<i>Charadrius dubius</i>	U	288	13.5	1.1	279	25.5	1.3
東方環頸鵲	<i>Charadrius alexandrinus</i>	B/U	2467	17.8	1.5	2469	29.6	2.0
		F	310	18.2	1.6	308	29.8	1.8
		M	378	17.9	1.5	369	29.8	1.8
蒙古鵲	<i>Charadrius mongolus</i>	B/U	774	17.1	1.3	774	33.4	2.4
		F	74	17.0	0.8	76	32.3	1.3
		M	147	17.2	1.2	146	32.8	2.0
鐵嘴鵲	<i>Charadrius leschenaultia</i>	B/U	1330	23.5	1.5	1329	38.1	2.3
		F	50	23.5	1.2	50	38.2	2.0
		M	63	23.9	1.3	63	38.7	1.6
鷗科	Laridae							
小燕鷗	<i>Sterna albifrons</i>	U	92	26.6	5.8	88	17.4	1.3
鷺科	Ardeidae							
小白鷺	<i>Egretta garzetta</i>	U	81	73.8	8.3	79	91.9	10.2
黃頭鷺	<i>Bubulcus ibis</i>	U	110	51.1	4.6	110	80.5	6.9
夜鷺	<i>Nycticorax nycticorax</i>	U	107	64.6	5.9	107	73.9	5.5
伯勞科	Laniidae							
紅尾伯勞	<i>Lanius cristatus</i>	U	304	16.3	1.0	301	25.3	1.8
鴉科	Corvidae							
大卷尾	<i>Dicrurus macrocercus</i>	U	28	21.9	3.0	28	22.7	1.3
黑枕藍鵲	<i>Hypothymis azurea</i>	B/U	23	12.2	1.2	23	17.4	1.9
		F	10	12.6	1.1	10	16.9	0.8
		M	11	11.8	1.3	11	17.2	1.3
鶇科	Muscicapidae							
白腹鶇	<i>Turdus pallidus</i>	B/U	96	20.1	1.4	97	32.5	1.4
		F	34	20.2	1.3	34	32.5	1.2
		M	14	20.2	1.1	14	32.4	1.5
赤腹鶇	<i>Turdus chrysolaus</i>	B/U	57	19.2	1.2	57	31.3	1.1
		F	17	18.8	1.4	17	31.0	1.0
		M	10	19.3	1.0	10	31.7	0.8
黃胸青鶇	<i>Ficedula hyperythra</i>	B/U	60	8.6	1.0	59	17.7	0.9
		F	18	8.4	1.0	18	17.6	1.2
		M	28	8.6	1.1	27	18.0	0.7
野鶇	<i>Luscinia calliope</i>	B/U	161	12.9	0.9	163	30.5	1.4
		F	27	12.3	1.1	29	29.8	2.1
		M	115	13.1	0.8	117	30.7	1.4

白眉林鴿	<i>Tarsiger indicus</i>	B/U	26	11.3	0.8	26	28.4	1.1
		F	10	11.2	0.5	10	28.1	0.8
		M	4	12.0	1.3	4	28.7	0.8
栗背林鴿	<i>Tarsiger johnstoniae</i>	B/U	162	10.9	0.7	157	27.3	1.0
		F	53	10.9	0.7	51	27.5	1.2
		M	68	11.1	0.8	67	27.3	0.9
白尾鴿	<i>Cinclidium leucurum</i>	B/U	92	13.9	1.0	90	29.1	1.7
		F	37	13.7	1.0	38	28.7	1.8
		M	41	14.0	1.0	39	29.6	1.6
山雀科	Paridae							
青背山雀	<i>Parus monticolus</i>	U	68	9.0	0.9	65	17.9	0.9
燕科	Hirundinidae							
棕沙燕	<i>Riparia paludicola</i>	U	1041	5.7	0.7	1009	11.0	1.1
家燕	<i>Hirundo rustica</i>	U	1740	8.1	0.9	1612	11.1	1.1
洋燕	<i>Hirundo tahitica</i>	U	38	8.5	0.7	38	10.5	0.8
赤腰燕	<i>Hirundo striolata</i>	U	55	8.3	0.7	55	14.7	1.0
鶇科	Pycnonotidae							
白頭翁	<i>Pycnonotus sinensis</i>	U	1242	15.2	1.3	1202	21.4	1.3
紅嘴黑鶇	<i>Hypsipetes leucocephalus</i>	U	58	22.8	1.5	58	19.0	1.3
鷓鴣科	Cisticolidae							
錦鴿	<i>Cisticola juncidis</i>	U	38	9.9	0.9	38	20.1	1.5
灰頭鷓鴣	<i>Prinia flaviventris</i>	U	136	11.2	0.8	136	21.1	1.0
褐頭鷓鴣	<i>Prinia inornata</i>	U	270	11.0	0.8	268	21.5	1.0
繡眼科	Zosteropidae							
綠繡眼	<i>Zosterops japonicus</i>	U	377	11.3	1.1	367	16.2	1.4
鶯科	Sylviidae							
短翅樹鶯	<i>Cettia canturians</i>	U	166	12.8	1.5	164	25.2	2.2
北蝗鶯	<i>Locustella ochotensis</i>	U	36	14.1	1.4	36	23.4	1.5
大葦鶯	<i>Acrocephalus arundinaceus</i>	U	406	18.2	1.6	407	28.4	1.6
棕面鶯	<i>Abroscopus albogularis</i>	U	46	7.4	0.7	46	16.8	1.0
金翼白眉	<i>Garrulax morrisonianus</i>	U	54	19.7	1.1	52	39.6	1.6
藪鳥	<i>Liocichla steerii</i>	U	421	14.1	0.9	421	29.8	1.3
小彎嘴畫眉	<i>Pomatorhinus ruficollis</i>	U	68	24.3	1.2	67	32.5	1.2
山紅頭	<i>Stachyris ruficeps</i>	U	265	13.8	1.0	260	19.8	0.8
紋翼畫眉	<i>Actinodura morrisoniana</i>	U	80	15.7	0.6	81	29.1	1.2
灰頭花翼畫眉	<i>Alcippe cinereiceps</i>	U	89	9.9	0.6	89	22.3	1.0
頭烏線	<i>Alcippe brunnea</i>	U	22	13.4	0.9	22	23.2	0.7
繡眼畫眉	<i>Alcippe morrisonia</i>	U	471	11.6	1.0	461	21.2	1.0
白耳畫眉	<i>Heterophasia auricularis</i>	U	198	18.8	1.2	193	30.8	1.2
冠羽畫眉	<i>Yuhina brunneiceps</i>	U	309	11.7	0.7	304	18.3	0.8
粉紅鸚嘴	<i>Paradoxornis webbianus</i>	U	210	8.8	0.9	210	21.1	1.0
黃羽鸚嘴	<i>Paradoxornis verreauxi</i>	U	24	7.4	0.3	24	17.6	0.6
文鳥科	Passeridae							
麻雀	<i>Passer montanus</i>	U	78	11.8	1.0	75	17.9	1.2
白鵪鶉	<i>Motacilla alba</i>	U	150	13.7	0.8	151	22.8	1.2
黃鵪鶉	<i>Motacilla flava</i>	U	337	12.7	0.8	319	25.2	1.6
白腰文鳥	<i>Lonchura striata</i>	U	26	10.8	0.7	26	13.8	1.0
斑文鳥	<i>Lonchura punctulata</i>	U	375	11.2	0.8	364	14.5	1.0
雀科	Fringillidae							

酒紅朱雀	<i>Carpodacus vinaceus</i>	B/U	198	11.9	0.7	200	22.2	0.8
		F	65	12.0	0.7	66	22.2	0.7
		M	99	11.8	0.8	100	22.2	0.9
灰鶯	<i>Pyrrhula erythaca</i>	B/U	30	11.3	0.8	29	17.8	0.7
		F	13	11.3	0.7	12	17.9	0.6
		M	16	11.3	0.8	16	17.8	0.7
黑臉鵒	<i>Emberiza spodocephala</i>	B/U	405	10.9	0.8	402	19.5	0.9
		F	161	10.8	0.7	161	19.5	1.0
		M	136	11.1	0.8	135	19.6	1.0

¹⁾ B = data for both sexes lumped into a single mean, F = female, M = male, U = unknown.

DISCUSSION

The significant differences between our data and Dunning's data for two of the ten species suggests that combining body mass across geographic areas may result in inaccurate interpretations. It has been shown that avian body mass varies according to the time of a day, season, and sex (Clark, 1979), and many bird species show a variation of body sizes across geographic ranges (Dunning, 1993). These variations may reduce the adequacy of using data sets from different geographical origins to generate ecological models, such as species richness patterns.

In addition, it may result in problems regarding accuracy of using few measurements from Dunning (1993), since three-fourths of the Taiwan resident bird data in Dunning (1993) has sample size less than 30 (Lee *et al.*, 1998). Apparently more qualified data are in urgent demands in the future to generate better understanding and hypotheses.

In addition to bill length, it may be worthwhile to incorporate the height and width of bird bodies into the ecological studies on birds. In this study, we reported bill length data that could be used to investigate ecological relationships of food and bill; however, the height and width of the body may affect movement and behaviors for species inhabit forests (Hedenström and Rosén, 2003; Fisher *et al.*, 2004). Furthermore, we suggest that repeated measurements may provide more accurate assessments of body sizes (Rising and Somers, 1989; Piersma and Davidson, 1991) to reduce measurement errors in living birds.

Compiling all the available body measurements from various local sources is a worthwhile endeavor that might contribute to ecological studies on birds. In this study, scattered information were collected and pooled (Hachisuka and Udagawa 1950, 1951; Lee *et al.* 1998), and these data could be and have been further employed to explore interesting ecological questions, such as the relationship between species richness and energy flux along an elevational gradient in Taiwan (Lee *et al.*, 2004; Ding *et al.*, 2005).

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台灣鳥類之形態特徵彙整與初探

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摘 要

本文整理 1987-1995 年間由中華鳥會，執行鳥類繫放計畫，所得之鳥類形態測量值，建立其形態測量資料庫，以做為台灣鳥類基本資料庫之內容。共得 223 種鳥類之形態測量值，包括體重、體長、尾長、喙長、跗骨長等，由於樣本數量之限制，本研究僅報導樣本數量大於 20 之 85 種鳥類之體重、喙長、跗骨長。本研究並比較 10 種鳥類形態測量值與 Dunning (1993) 於其他地區測量之數值，結果發現，進行比較的種類中，有 8 種呈現區域性變異。綜合以上，本研究的資料將對於鳥類群聚生態、生態系和景觀生態之研究範疇有相當程度的貢獻。

關鍵詞：喙長、體長、地理變異、台灣、跗骨長。

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