

1 Introduction

This document contains the supplementary information for (insert citation here) which includes two tables of supplementary data. The first contains the information on the specimens used in these analyses and which suborder they are a part of. The second is information on the landmarks collected from each specimen and which were included in the three different density landmark subsets.

2 Specimen Information

Table 1: Specimens used in these analyses. The scientific name, which suborder it was assigned to, and the specimen numbers from which data was collected are included. We refer readers to the methods and supplementary information from (Natale and Slater, 2022) for details on the specimens themselves (e.g. the age, sex, location of collection etc... when available) as well as the processing of these specimens to account for missing or damaged skull portions. The surface scans for all specimens from which landmark data was collected are available on the morphosource (morphosource project ID: 00000C909). Under "Specimens Used" FMNH corresponds to the Field Museum of Natural History, ROM corresponds to the Royal Ontario Museum, USNM corresponds to Smithsonian Museum of Natural History, and LACM= Natural History Museum of Los Angeles County.

Species Name	Suborder	Specimens Used
<i>Actitis hypoleucos</i>	Scolopaci	FMNH 368856, FMNH 338296
<i>Actitis macularia</i>	Scolopaci	FMNH 466213, FMNH 379170
<i>Actophilornis africanus</i>	Scolopaci	FMNH 368823, FMNH 93434
<i>Aethia cristatella</i>	Lari	LACM 117830, LACM 117834
<i>Aethia psittacula</i>	Lari	LACM 107192, LACM 102621
<i>Aethia pusilla</i>	Lari	USNM 638874, ROM 0150380
<i>Aethia pygmaea</i>	Lari	USNM 344544, LACM 110691
<i>Alca torda</i>	Lari	LACM 103474, FMNH 376712
<i>Alle alle</i>	Lari	FMNH 105265, FMNH 376328
<i>Anarhynchus frontalis</i>	Charadrii	ROM 141502
<i>Anous minutus</i>	Lari	FMNH 346130, FMNH 346127
<i>Anous stolidus</i>	Lari	LACM 117750, FMNH 346102
<i>Aphriza virgata</i>	Scolopaci	USNM 489303
<i>Arenaria interpres</i>	Scolopaci	FMNH 313996
<i>Arenaria melanocephala</i>	Scolopaci	ROM 115678, FMNH 364720
<i>Attagis gayi</i>	Scolopaci	FMNH 105920
<i>Attagis malouinus</i>	Scolopaci	USNM 490853
<i>Bartramia longicauda</i>	Scolopaci	ROM 110807, FMNH 376174
<i>Brachyramphus brevirostris</i>	Lari	USNM 288086, LACM 110518
<i>Brachyramphus marmoratus</i>	Lari	USNM 557617, FMNH 348355
<i>Burhinus bistriatus</i>	Charadrii	FMNH 289831, LACM 87072

Species Name	Suborder	Specimens Used
Burhinus capensis	Charadrii	LACM 117292, FMNH 390778
Burhinus oediconemus	Charadrii	FMNH 104449
Burhinus senegalensis	Charadrii	FMNH 368869, USNM 553053
Burhinus superciliaris	Charadrii	LACM 109827, ROM 159572
Burhinus vermiculatus	Charadrii	FMNH 342526, ROM 156978
Calidris acuminata	Scolopaci	USNM 638728, ROM 137943
Calidris alba	Scolopaci	FMNH 483004, FMNH 341863
Calidris alpina	Scolopaci	FMNH 351273, FMNH 376252
Calidris bairdii	Scolopaci	FMNH 105040, FMNH 93225
Calidris canutus	Scolopaci	FMNH 376221, FMNH 363893
Calidris ferruginea	Scolopaci	FMNH 368863
Calidris fuscicollis	Scolopaci	FMNH 317851, FMNH 376240
Calidris himantopus	Scolopaci	LACM 114330, ROM 109502
Calidris maritima	Scolopaci	ROM 0141203, ROM 0150964
Calidris mauri	Scolopaci	FMNH 342546, FMNH 360227
Calidris melanotos	Scolopaci	FMNH 85720, FMNH 105111
Calidris minuta	Scolopaci	FMNH 368861, FMNH 363894
Calidris minutilla	Scolopaci	FMNH 105220, FMNH 105218
Calidris ptilocnemis	Scolopaci	USNM 224073, ROM 122452
Calidris pusilla	Scolopaci	FMNH 290821, FMNH 105215
Calidris ruficollis	Scolopaci	ROM 136257, ROM 0152134
Calidris tenuirostris	Scolopaci	ROM 0152163
Catharacta antarctica	Lari	LACM 112533
Catharacta maccormicki	Lari	USNM 430484, LACM 102398
Catharacta skua	Lari	LACM 102400, ROM 157280
Catoptrophorus semipalmatus	Scolopaci	FMNH 106365, FMNH 106237
Cephus carbo	Lari	USNM 347755
Cephus columba	Lari	USNM 612989, LACM 110513
Cephus grylle	Lari	USNM 623291, ROM 126909
Cerorhinca monocerata	Lari	USNM 347760, ROM 119522
Charadrius alexandrinus	Charadrii	FMNH 317849, FMNH 376156
Charadrius asiaticus	Charadrii	ROM 156945, ROM 122588
Charadrius australis	Charadrii	USNM 553593
Charadrius bicinctus	Charadrii	ROM 122588, ROM 0136248
Charadrius collaris	Charadrii	ROM 158366
Charadrius dubius	Charadrii	ROM 158391
Charadrius falklandicus	Charadrii	ROM 158349, ROM 129581
Charadrius hiaticula	Charadrii	FMNH 368834, FMNH 368835
Charadrius leschenaultii	Charadrii	ROM 156970, USNM 621501
Charadrius marginatus	Charadrii	LACM 90217, FMNH 429392
Charadrius melodus	Charadrii	ROM 15084, ROM 150802
Charadrius modestus	Charadrii	ROM 158361, ROM 158348

Species Name	Suborder	Specimens Used
<i>Charadrius montanus</i>	Charadrii	LACM 87090, LACM 117334
<i>Charadrius palidus</i>	Charadrii	ROM 156882
<i>Charadrius pecuarius</i>	Charadrii	FMNH 368837, FMNH 368842
<i>Charadrius ruficapillus</i>	Charadrii	ROM 122594, ROM 122621
<i>Charadrius semipalmatus</i>	Charadrii	FMNH 342530, FMNH 106698
<i>Charadrius tricollaris</i>	Charadrii	FMNH 368843, FMNH 368844
<i>Charadrius vociferus</i>	Charadrii	FMNH 390434, FMNH 454807
<i>Charadrius wilsonia</i>	Charadrii	FMNH 360218, FMNH 376171
<i>Chionis albus</i>	Charadrii	USNM 490217, ROM 128919
<i>Chlidonias hybrida</i>	Lari	FMNH 338016
<i>Chlidonias leucopterus</i>	Lari	FMNH 368885, FMNH 368887
<i>Chlidonias nigra</i>	Lari	FMNH 105798
<i>Creagrus furcatus</i>	Lari	USNM 18492, LACM 101442
<i>Cursorius cursor</i>	Lari	USNM 603507, FMNH 368871
<i>Cursorius temminckii</i>	Lari	ROM 156942
<i>Dromas ardeola</i>	Lari	USNM 488404
<i>Elseyaornis melanops</i>	Charadrii	ROM 122710, ROM 122711
<i>Esacus magnirostris</i>	Charadrii	USNM 19649, FMNH 104795
<i>Eudromias morinellus</i>	Charadrii	USNM 603466
<i>Fratercula arctica</i>	Lari	ROM 144107, ROM 144101
<i>Fratercula cirrhata</i>	Lari	ROM 119567, FMNH 364740
<i>Fratercula corniculata</i>	Lari	LACM 117861, LACM 117862
<i>Gallinago gallinago</i>	Scolopaci	FMNH 342533, LACM 93280
<i>Gallinago hardwickii</i>	Scolopaci	USNM 612667, ROM 122701
<i>Gallinago media</i>	Scolopaci	USNM 431836
<i>Gallinago megala</i>	Scolopaci	USNM 621521
<i>Gallinago nigripennis</i>	Scolopaci	USNM 48442, ROM 157621
<i>Gallinago paraguaiae</i>	Scolopaci	USNM 622351, ROM 129620
<i>Gallinago stenura</i>	Scolopaci	USNM 557035
<i>Glareola maldivarum</i>	Lari	USNM 19580
<i>Glareola nordmanni</i>	Lari	USNM 430839
<i>Glareola nuchalis</i>	Lari	USNM 347397
<i>Glareola pratincola</i>	Lari	ROM 156964
<i>Gygis alba</i>	Lari	FMNH 314021, FMNH 314022
<i>Haematopus ater</i>	Charadrii	ROM 128856
<i>Haematopus bachmani</i>	Charadrii	ROM 0146602
<i>Haematopus finschi</i>	Charadrii	LACM 117276, ROM 119646
<i>Haematopus fuliginosus</i>	Charadrii	ROM 122613, ROM 122612
<i>Haematopus leucopodus</i>	Charadrii	USNM 490993, ROM 158356
<i>Haematopus moquini</i>	Charadrii	ROM 144605, USNM 558480
<i>Haematopus ostralegus</i>	Charadrii	FMNH 363899, ROM 118045
<i>Haematopus palliatus</i>	Charadrii	USNM 623506, ROM 123861
<i>Haematopus unicolor</i>	Charadrii	ROM 123067, ROM 146618

Species Name	Suborder	Specimens Used
Heteroscelus brevipes	Scolopaci	ROM 0159634
Heteroscelus incanus	Scolopaci	USNM 612203, LACM 87138
Himantopus himantopus	Charadrii	USNM 431803, ROM 156898
Himantopus melanurus	Charadrii	LACM 109597
Himantopus mexicanus	Charadrii	ROM 114769
Hydrophasianus chirurgus	Scolopaci	USNM 226034
Ibidorhyncha struthersii	Charadrii	USNM 292767
Irediparra gallinacea	Scolopaci	USNM 553360
Jacana jacana	Scolopaci	LACM 87052
Jacana spinosa	Scolopaci	FMNH 105999
Larosterna inca	Lari	FMNH 437527, LACM 107162
Larus argentatus	Lari	FMNH 342553, LACM 117517
Larus atlanticus	Lari	USNM 635816
Larus atricilla	Lari	FMNH 376259, LACM 117558
Larus audouinii	Lari	USNM 488784
Larus bulleri	Lari	ROM 116397, ROM 153422
Larus cachinnans	Lari	LACM 120527, LACM 120528
Larus californicus	Lari	FMNH 105796, ROM 76529
Larus canus	Lari	FMNH 363901, FMNH 398933
Larus cirrocephalus	Lari	LACM 109733, ROM 156972
Larus crassirostris	Lari	USNM 633465
Larus delawarensis	Lari	FMNH 495258, LACM 117501
Larus dominicanus	Lari	USNM 631732, LACM 103871
Larus fuliginosus	Lari	LACM 87185
Larus fuscus	Lari	USNM 631734, USNM 631736
Larus genei	Lari	USNM 500267, LACM 120525
Larus glaucescens	Lari	LACM 100742, USNM 635127
Larus glaucoides	Lari	USNM 637972, ROM 119866
Larus hartlaubii	Lari	USNM 558519, ROM 156844
Larus heermanni	Lari	FMNH 338164, FMNH 338163
Larus hyperboreus	Lari	ROM 0091342, FMNH 105260
Larus ichthyaetus	Lari	USNM 502138
Larus livens	Lari	LACM 103872, LACM 104291
Larus maculipennis	Lari	ROM 129555, ROM 158353
Larus marinus	Lari	FMNH 338219, ROM 91533
Larus melanocephalus	Lari	LACM 120526
Larus minutus	Lari	ROM 124006
Larus modestus	Lari	LACM 110084, ROM 158372
Larus novaehollandiae	Lari	FMNH 390848, ROM 0140609
Larus occidentalis	Lari	FMNH 105459, LACM 101099
Larus pacificus	Lari	ROM 136309, FMNH 338158
Larus philadelphia	Lari	FMNH 376261, ROM 137169
Larus pipixcan	Lari	FMNH 470337, USNM 622198

Species Name	Suborder	Specimens Used
<i>Larus ridibundus</i>	Lari	LACM 120522, LACM 120523
<i>Larus schistisagus</i>	Lari	USNM 500777
<i>Larus serranus</i>	Lari	USNM 645298, LACM 110060
<i>Larus thayeri</i>	Lari	USNM 347252, ROM 119860
<i>Leucophaeus scoresbii</i>	Lari	USNM 345119, LACM 103815
<i>Limnodromus griseus</i>	Scolopaci	LACM 109401
<i>Limnodromus scolopaceus</i>	Scolopaci	USNM 630671, LACM 117431
<i>Limosa fedoa</i>	Scolopaci	FMNH 23510, USNM 557584
<i>Limosa haemastica</i>	Scolopaci	USNM 489609, ROM 79406
<i>Limosa lapponica</i>	Scolopaci	LACM 87092, USNM 555156
<i>Limosa limosa</i>	Scolopaci	USNM 320129, ROM 157287
<i>Lymnocyptes minimus</i>	Scolopaci	LACM 89975
<i>Metopidius indicus</i>	Scolopaci	USNM 343995
<i>Microparra capensis</i>	Scolopaci	ROM 117587
<i>Numenius americanus</i>	Scolopaci	FMNH 106289, ROM 146877
<i>Numenius arquata</i>	Scolopaci	USNM 553828, FMNH 363888
<i>Numenius madagascariensis</i>	Scolopaci	ROM 127514, USNM 500255
<i>Numenius minutus</i>	Scolopaci	USNM 347648
<i>Numenius phaeopus</i>	Scolopaci	FMNH 385840, USNM 638835
<i>Numenius tahitiensis</i>	Scolopaci	USNM 289233, LACM 103118
<i>Oreopholus ruficollis</i>	Charadrii	FMNH 104122
<i>Pagophila eburnea</i>	Lari	ROM 127323, ROM 147098
<i>Phaetusa simplex</i>	Lari	USNM 345828, FMNH 105560
<i>Phalaropus fulicarius</i>	Scolopaci	LACM 100444, LACM 113112
<i>Phalaropus lobatus</i>	Scolopaci	FMNH 317852, FMNH 106365
<i>Philomachus pugnax</i>	Scolopaci	FMNH 104299, FMNH 104265
<i>Pluvialis apricaria</i>	Scolopaci	ROM 158379
<i>Pluvialis dominica</i>	Charadrii	FMNH 105252, ROM 155330
<i>Pluvialis fulva</i>	Scolopaci	USNM 632112
<i>Pluvialis squatarola</i>	Charadrii	FMNH 376148, LACM 87074
<i>Pluvianus aegyptius</i>	Charadrii	FMNH 379122, FMNH 378793
<i>Ptychoramphus aleuticus</i>	Lari	FMNH 364729, LACM 117815
<i>Recurvirostra americana</i>	Scolopaci	FMNH 364175, FMNH 364177
<i>Recurvirostra andina</i>	Charadrii	ROM 159573
<i>Recurvirostra avosetta</i>	Scolopaci	FMNH 338433, USNM 429088
<i>Rhinoptilus africanus</i>	Lari	USNM 431520, LACM 117298
<i>Rhinoptilus chalcopterus</i>	Lari	USNM 321515, ROM 114357
<i>Rhinoptilus cinctus</i>	Lari	ROM 114395, ROM 114393
<i>Rhodostethia rosea</i>	Lari	USNM 491608, USNM 491609
<i>Rissa brevirostris</i>	Lari	USNM 643045, ROM 150523
<i>Rissa tridactyla</i>	Lari	FMNH 105263, ROM 150453
<i>Rostratula benghalensis</i>	Scolopaci	FMNH 393178, USNM 613014

Species Name	Suborder	Specimens Used
<i>Rostratula semicollaris</i>	Scolopaci	USNM 612032
<i>Rynchops flavirostris</i>	Lari	FMNH 368889, FMNH 313056
<i>Rynchops niger</i>	Lari	FMNH 398882, ROM 153490
<i>Scolopax minor</i>	Scolopaci	FMNH 438027, LACM 113134
<i>Scolopax rusticola</i>	Scolopaci	USNM 292760, LACM 120516
<i>Steganopus tricolor</i>	Scolopaci	FMNH 106235, FMNH 106234
<i>Stercorarius longicaudus</i>	Lari	FMNH 105258, FMNH 105259
<i>Stercorarius parasiticus</i>	Lari	LACM 87186, LACM 117483
<i>Stercorarius pomarinus</i>	Lari	LACM 117477, FMNH 360238
<i>Sterna albifrons</i>	Lari	FMNH 443603
<i>Sterna aleutica</i>	Lari	USNM 561252
<i>Sterna anaethetus</i>	Lari	FMNH 360250, ROM 118653
<i>Sterna antillarum</i>	Lari	FMNH 376281, LACM 117649
<i>Sterna bengalensis</i>	Lari	USNM 488347
<i>Sterna bergii</i>	Lari	USNM 558526, USNM 559819
<i>Sterna caspia</i>	Lari	FMNH 368884, FMNH 360641
<i>Sterna dougallii</i>	Lari	LACM 92016, FMNH 360247
<i>Sterna elegans</i>	Lari	USNM 612541, LACM 110168
<i>Sterna forsteri</i>	Lari	LACM 117642
<i>Sterna fuscata</i>	Lari	FMNH 364607, FMNH 376277
<i>Sterna hirundinacea</i>	Lari	ROM 129623, LACM 117621
<i>Sterna hirundo</i>	Lari	FMNH 432821, LACM 117627
<i>Sterna lunata</i>	Lari	FMNH 338042, LACM 104037
<i>Sterna maxima</i>	Lari	FMNH 376285, FMNH 379033
<i>Sterna nilotica</i>	Lari	FMNH 368882, FMNH 368883
<i>Sterna paradisaea</i>	Lari	FMNH 317854, LACM 100318
<i>Sterna sandvicensis</i>	Lari	FMNH 313439, LACM 117725
<i>Sterna striata</i>	Lari	USNM 15428, ROM 125713
<i>Sterna sumatrana</i>	Lari	FMNH 104716, FMNH 346071
<i>Sterna superciliaris</i>	Lari	USNM 345825
<i>Sterna trudeaui</i>	Lari	USNM 614631, ROM 159579
<i>Sterna vittata</i>	Lari	ROM 129621
<i>Stiltia isabella</i>	Lari	ROM 149448
<i>Synthliboramphus antiquus</i>	Lari	FMNH 364725, USNM 561925
<i>Synthliboramphus craveri</i>	Lari	LACM 87297, LACM 87296
<i>Synthliboramphus hypoleucus</i>	Lari	USNM 291879, LACM 87299
<i>Thinocorus orbignyianus</i>	Scolopaci	USNM 637907, USNM 645613
<i>Thinocorus rumicivorus</i>	Scolopaci	ROM 128899, ROM 128902
<i>Thinornis rubricollis</i>	Charadrii	ROM 122636, ROM 122635
<i>Tringa flavipes</i>	Scolopaci	FMNH 290820, FMNH 376180
<i>Tringa glareola</i>	Scolopaci	FMNH 368854, FMNH 368852
<i>Tringa melanoleuca</i>	Scolopaci	FMNH 379041

Species Name	Suborder	Specimens Used
<i>Tringa nebularius</i>	Scolopaci	USNM 620113, ROM 156936
<i>Tringa ochropus</i>	Scolopaci	USNM 345515, FMNH 368850
<i>Tringa solitaria</i>	Scolopaci	FMNH 395650, FMNH 363458
<i>Tringa stagnatilis</i>	Scolopaci	ROM 156883, FMNH 106354
<i>Tringa totanus</i>	Scolopaci	USNM 623276, ROM 157255
<i>Tryngites subruficollis</i>	Scolopaci	ROM 151467, ROM 122461
<i>Turnix suscitator</i>	Lari	FMNH 515266
<i>Turnix sylvaticus</i>	Lari	FMNH 289566, FMNH 291238
<i>Turnix varius</i>	Lari	FMNH 338535
<i>Uria aalge</i>	Lari	FMNH 337986, LACM 100702
<i>Uria lomvia</i>	Lari	USNM 488674, FMNH 105266
<i>Vanellus albiceps</i>	Charadrii	FMNH 313288, FMNH 313055
<i>Vanellus armatus</i>	Charadrii	FMNH 503731, ROM 156886
<i>Vanellus cayanus</i>	Charadrii	FMNH 291736
<i>Vanellus chilensis</i>	Charadrii	LACM 117310, FMNH 106242
<i>Vanellus coronatus</i>	Charadrii	FMNH 368825, LACM 117308
<i>Vanellus crassirostris</i>	Charadrii	USNM 291429
<i>Vanellus duvaucelii</i>	Charadrii	USNM 429213
<i>Vanellus indicus</i>	Charadrii	USNM 645821, USNM 645981
<i>Vanellus leucurus</i>	Charadrii	USNM 645956
<i>Vanellus miles</i>	Charadrii	FMNH 106376, FMNH 105363
<i>Vanellus resplendens</i>	Charadrii	USNM 620756, USNM 645378
<i>Vanellus senegallus</i>	Charadrii	USNM 430408
<i>Vanellus spinosus</i>	Charadrii	FMNH 93433, FMNH 368832
<i>Vanellus tectus</i>	Charadrii	FMNH 104512
<i>Vanellus tricolor</i>	Charadrii	USNM 490657, ROM 111951
<i>Vanellus vanellus</i>	Charadrii	LACM 117304, FMNH 105495
<i>Xema sabini</i>	Lari	USNM 553905
<i>Xenus cinereus</i>	Scolopaci	USNM 633448, ROM 0159633

3 Landmark Descriptions

The landmark datapoints collected from the species noted above for our analyses. The table contains the number ('Num') used to uniquely identify each landmark, whether or not it was included in the full ('FLL'), intermediate ('INT'), and small ('LOW') density dataset, and the description of that landmark. Inclusion in each of the three different density datasets is noted with an 'x'. Under description, we also included the source with which we took inspiration to include that landmark. If no source is included, there was no direct source from which this landmark point was suggested. This table is adapted with permission from Natale and Slater (2022).

Table 2: Landmarks Used in this Study.

Num	FLL	INT	LOW	Description
1	x	x	x	Most anterior point on basisphenoid along the midline (Olsen, 2016)
2	x	x	x	Most posterior point on basisphenoid along the midline (Olsen, 2016)
3	x	x		Medial point along occipital crest (Olsen, 2016)
4	x	x	x	Most posterior point on foramen magnum along the midline (Olsen, 2016)
5	x	x	x	Point where jugal meets quadrate, left side (Olsen and Westneat, 2016)
6	x	x	x	Point where jugal meets quadrate, right side (Olsen and Westneat, 2016)
7	x	x	x	Point where jugal meets upper beak, right side (Olsen and Westneat, 2016)
8	x	x	x	Point where jugal meets upper beak, left side (Olsen and Westneat, 2016)
9	x	x	x	Left quadrate: lateral mandibular condyle (Olsen and Westneat, 2016)
10	x	x	x	Right quadrate: lateral mandibular condyle (Olsen and Westneat, 2016)
11	x	x	x	Right quadrate: medial mandibular condyle (Olsen and Westneat, 2016)
12	x	x	x	Left quadrate: medial mandibular condyle (Olsen and Westneat, 2016)
13	x	x	x	Left quadrate; lateral condyle of otic process (Olsen and Westneat, 2016)
14	x	x	x	Right quadrate: lateral condyle of otic process (Olsen and Westneat, 2016)
15	x	x	x	Right quadrate: medial condyle of otic process (Olsen and Westneat, 2016)
16	x	x	x	Left quadrate: medial condyle of otic process (Olsen and Westneat, 2016)
17	x	x	x	Center of occipital condyle at anterior opening of foramen magnum (Olsen, 2016)
18	x	x	x	Left quadrate: most dorsal part of the orbital process (Olsen and Westneat, 2016)
19	x	x	x	Right quadrate: most dorsal part of the orbital process (Olsen and Westneat, 2016)
20	x	x	x	Most posterior point along left opisthotic process (aka paraoccipital process), in groove (Olsen, 2016)

Num	FLL	INT	LOW	Description
21	x	x	x	Most posesterior point along right opisthotic process (aka paraoccipital process), in groove (Olsen, 2016)
22	x	x		Left palatine: anterior most point on the lateral crest of the palatine (Olsen and Westneat, 2016)
23	x	x		Right palatine: anterior most point on the lateral crest of the palatine (Olsen and Westneat, 2016)
24	x	x	x	Right palatine: posterior most point on the lateral crest of the palatine (Olsen and Westneat, 2016)
25	x	x	x	Left palatine: posterior most point on the lateral crest of the palatine (Olsen and Westneat, 2016)
26	x	x	x	Left palatine; anterior most point on the medial palatine crest (Olsen and Westneat, 2016)
27	x	x	x	Right palatine; anterior most point on the medial palatine crest (Olsen and Westneat, 2016)
28	x	x	x	Right palatine; posterior most point on the medial palatine crest (Olsen and Westneat, 2016)
29	x	x	x	Left palatine; posterior most point on the medial palatine crest (Olsen and Westneat, 2016)
30	x	x	x	Left side: where palatine meets pterygoid (Olsen and Westneat, 2016)
31	x	x	x	Right side; where palatine meets pterygoid (Olsen and Westneat, 2016)
32	x	x	x	Most dorsal point on left orbit
33	x	x	x	Most dorsal point on left orbit
34	x	x	x	Most posterior point on right orbit
35	x	x	x	Most posterior point on left orbit
36	x	x	x	Point where palatine meets pterygoid, left side (Olsen and Westneat, 2016)
37	x	x	x	Point where palatine meets pterygoid, right side (Olsen and Westneat, 2016)
38	x	x		Most distal point on the beak (Olsen and Westneat, 2016)
39	x	x	x	Left side, point where beak joins braincase on frontal bones
40	x	x	x	Right side, point where beak joins braincase on frontal bones
41	x	x	x	Right side, most rostral point along frontal or prefrontal bones in front of orbit

Num	FLL	INT	LOW	Description
42	x	x	x	Left side, most rostral point along frontal or prefrontal bones in front of orbit
43	x	x	x	Semilandmarks running along the sagittal plane from the frontal-nasal hinge to the medial point on the occipital crest (Olsen, 2016)
44	x			Semilandmarks running along the sagittal plane from the frontal-nasal hinge to the medial point on the occipital crest (Olsen, 2016)
45	x	x		Semilandmarks running along the sagittal plane from the frontal-nasal hinge to the medial point on the occipital crest (Olsen, 2016)
46	x		x	Semilandmarks running along the sagittal plane from the frontal-nasal hinge to the medial point on the occipital crest (Olsen, 2016)
47	x	x		Semilandmarks running along the sagittal plane from the frontal-nasal hinge to the medial point on the occipital crest (Olsen, 2016)
48	x			Semilandmarks running along the sagittal plane from the frontal-nasal hinge to the medial point on the occipital crest (Olsen, 2016)
49	x	x	x	Semilandmarks running along the sagittal plane from the frontal-nasal hinge to the medial point on the occipital crest (Olsen, 2016)
50	x			Semilandmarks running along the sagittal plane from the frontal-nasal hinge to the medial point on the occipital crest (Olsen, 2016)
51	x	x		Semilandmarks running along the sagittal plane from the frontal-nasal hinge to the medial point on the occipital crest (Olsen, 2016)
52	x		x	Semilandmarks running along the sagittal plane from the frontal-nasal hinge to the medial point on the occipital crest (Olsen, 2016)
53	x	x		Semilandmarks running along the sagittal plane from the frontal-nasal hinge to the medial point on the occipital crest (Olsen, 2016)
54	x			Semilandmarks running along the sagittal plane from the frontal-nasal hinge to the medial point on the occipital crest (Olsen, 2016)
55	x	x	x	Semilandmarks running along the sagittal plane from the frontal-nasal hinge to the medial point on the occipital crest (Olsen, 2016)
56	x			Semilandmarks running along the sagittal plane from the frontal-nasal hinge to the medial point on the occipital crest (Olsen, 2016)

Num	FLL	INT	LOW	Description
57	x	x		Semilandmarks running along the sagittal plane from the frontal-nasal hinge to the medial point on the occipital crest (Olsen, 2016)
58	x		x	Semilandmarks running along the sagittal plane from the frontal-nasal hinge to the medial point on the occipital crest (Olsen, 2016)
59	x	x		Semilandmarks running along the sagittal plane from the frontal-nasal hinge to the medial point on the occipital crest (Olsen, 2016)
60	x			Semilandmarks running along the sagittal plane from the frontal-nasal hinge to the medial point on the occipital crest (Olsen, 2016)
61	x	x	x	Semilandmarks running along the sagittal plane from the frontal-nasal hinge to the medial point on the occipital crest (Olsen, 2016)
62	x			Semilandmarks running along the sagittal plane from the frontal-nasal hinge to the medial point on the occipital crest (Olsen, 2016)
63	x	x		Semilandmarks running along the sagittal plane from the frontal-nasal hinge to the medial point on the occipital crest (Olsen, 2016)
64	x		x	Semilandmarks running along the sagittal plane from the frontal-nasal hinge to the medial point on the occipital crest (Olsen, 2016)
65	x	x		Semilandmarks running along the sagittal plane from the frontal-nasal hinge to the medial point on the occipital crest (Olsen, 2016)
66	x			Semilandmarks running along the sagittal plane from the frontal-nasal hinge to the medial point on the occipital crest (Olsen, 2016)
67	x	x	x	Semilandmarks running along the sagittal plane from the frontal-nasal hinge to the medial point on the occipital crest (Olsen, 2016)
68	x			Semilandmarks running along the sagittal plane from the frontal-nasal hinge to the medial point on the occipital crest (Olsen, 2016)
69	x	x		Semilandmarks running along the sagittal plane from the frontal-nasal hinge to the medial point on the occipital crest (Olsen, 2016)
70	x	x	x	Semilandmarks running along the sagittal plane from the frontal-nasal hinge to the medial point on the occipital crest (Olsen, 2016)
71	x	x	x	Semilandmarks running along proximal curve on the left palatine (Olsen, 2016)

Num	FLL	INT	LOW	Description
72	x			Semilandmarks running along proximal curve on the left palatine (Olsen, 2016)
73	x	x		Semilandmarks running along proximal curve on the left palatine (Olsen, 2016)
74	x		x	Semilandmarks running along proximal curve on the left palatine (Olsen, 2016)
75	x	x		Semilandmarks running along proximal curve on the left palatine (Olsen, 2016)
76	x			Semilandmarks running along proximal curve on the left palatine (Olsen, 2016)
77	x	x	x	Semilandmarks running along proximal curve on the left palatine (Olsen, 2016)
78	x			Semilandmarks running along proximal curve on the left palatine (Olsen, 2016)
79	x	x		Semilandmarks running along proximal curve on the left palatine (Olsen, 2016)
80	x		x	Semilandmarks running along proximal curve on the left palatine (Olsen, 2016)
81	x	x		Semilandmarks running along proximal curve on the left palatine (Olsen, 2016)
82	x			Semilandmarks running along proximal curve on the left palatine (Olsen, 2016)
83	x	x	x	Semilandmarks running along proximal curve on the left palatine (Olsen, 2016)
84	x			Semilandmarks running along proximal curve on the left palatine (Olsen, 2016)
85	x	x		Semilandmarks running along proximal curve on the left palatine (Olsen, 2016)
86	x		x	Semilandmarks running along proximal curve on the left palatine (Olsen, 2016)
87	x	x		Semilandmarks running along proximal curve on the left palatine (Olsen, 2016)
88	x			Semilandmarks running along proximal curve on the left palatine (Olsen, 2016)
89	x	x	x	Semilandmarks running along proximal curve on the left palatine (Olsen, 2016)
90	x			Semilandmarks running along proximal curve on the left palatine (Olsen, 2016)
91	x	x		Semilandmarks running along proximal curve on the left palatine (Olsen, 2016)
92	x	x	x	Semilandmarks running along proximal curve on the left palatine (Olsen, 2016)
93	x	x	x	Semilandmarks running along proximal curve on the right palatine (Olsen, 2016)

Num	FLL	INT	LOW	Description
94	x			Semilandmarks running along proximal curve on the right palatine (Olsen, 2016)
95	x	x		Semilandmarks running along proximal curve on the right palatine (Olsen, 2016)
96	x		x	Semilandmarks running along proximal curve on the right palatine (Olsen, 2016)
97	x	x		Semilandmarks running along proximal curve on the right palatine (Olsen, 2016)
98	x			Semilandmarks running along proximal curve on the right palatine (Olsen, 2016)
99	x	x	x	Semilandmarks running along proximal curve on the right palatine (Olsen, 2016)
100	x			Semilandmarks running along proximal curve on the right palatine (Olsen, 2016)
101	x	x		Semilandmarks running along proximal curve on the right palatine (Olsen, 2016)
102	x		x	Semilandmarks running along proximal curve on the right palatine (Olsen, 2016)
103	x	x		Semilandmarks running along proximal curve on the right palatine (Olsen, 2016)
104	x			Semilandmarks running along proximal curve on the right palatine (Olsen, 2016)
105	x	x	x	Semilandmarks running along proximal curve on the right palatine (Olsen, 2016)
106	x			Semilandmarks running along proximal curve on the right palatine (Olsen, 2016)
107	x	x		Semilandmarks running along proximal curve on the right palatine (Olsen, 2016)
108	x		x	Semilandmarks running along proximal curve on the right palatine (Olsen, 2016)
109	x	x		Semilandmarks running along proximal curve on the right palatine (Olsen, 2016)
110	x			Semilandmarks running along proximal curve on the right palatine (Olsen, 2016)
111	x	x	x	Semilandmarks running along proximal curve on the right palatine (Olsen, 2016)
112	x			Semilandmarks running along proximal curve on the right palatine (Olsen, 2016)
113	x	x		Semilandmarks running along proximal curve on the right palatine (Olsen, 2016)
114	x	x	x	Semilandmarks running along proximal curve on the right palatine (Olsen, 2016)
115	x	x	x	Semilandmarks running along top of the beak (Olsen, 2016)

Num	FLL	INT	LOW	Description
116	x			Semilandmarks running along top of the beak (Olsen, 2016)
117	x	x		Semilandmarks running along top of the beak (Olsen, 2016)
118	x		x	Semilandmarks running along top of the beak (Olsen, 2016)
119	x	x		Semilandmarks running along top of the beak (Olsen, 2016)
120	x			Semilandmarks running along top of the beak (Olsen, 2016)
121	x	x	x	Semilandmarks running along top of the beak (Olsen, 2016)
122	x			Semilandmarks running along top of the beak (Olsen, 2016)
123	x	x		Semilandmarks running along top of the beak (Olsen, 2016)
124	x		x	Semilandmarks running along top of the beak (Olsen, 2016)
125	x	x		Semilandmarks running along top of the beak (Olsen, 2016)
126	x			Semilandmarks running along top of the beak (Olsen, 2016)
127	x	x	x	Semilandmarks running along top of the beak (Olsen, 2016)
128	x			Semilandmarks running along top of the beak (Olsen, 2016)
129	x	x		Semilandmarks running along top of the beak (Olsen, 2016)
130	x		x	Semilandmarks running along top of the beak (Olsen, 2016)
131	x	x		Semilandmarks running along top of the beak (Olsen, 2016)
132	x			Semilandmarks running along top of the beak (Olsen, 2016)
133	x	x	x	Semilandmarks running along top of the beak (Olsen, 2016)
134	x			Semilandmarks running along top of the beak (Olsen, 2016)
135	x	x		Semilandmarks running along top of the beak (Olsen, 2016)
136	x		x	Semilandmarks running along top of the beak (Olsen, 2016)
137	x	x		Semilandmarks running along top of the beak (Olsen, 2016)

Num	FLL	INT	LOW	Description
138	x			Semilandmarks running along top of the beak (Olsen, 2016)
139	x	x	x	Semilandmarks running along top of the beak (Olsen, 2016)
140	x			Semilandmarks running along top of the beak (Olsen, 2016)
141	x	x		Semilandmarks running along top of the beak (Olsen, 2016)
142	x		x	Semilandmarks running along top of the beak (Olsen, 2016)
143	x	x		Semilandmarks running along top of the beak (Olsen, 2016)
144	x			Semilandmarks running along top of the beak (Olsen, 2016)
145	x	x	x	Semilandmarks running along top of the beak (Olsen, 2016)
146	x			Semilandmarks running along top of the beak (Olsen, 2016)
147	x	x		Semilandmarks running along top of the beak (Olsen, 2016)
148	x		x	Semilandmarks running along top of the beak (Olsen, 2016)
149	x	x		Semilandmarks running along top of the beak (Olsen, 2016)
150	x			Semilandmarks running along top of the beak (Olsen, 2016)
151	x	x	x	Semilandmarks running along top of the beak (Olsen, 2016)
152	x			Semilandmarks running along top of the beak (Olsen, 2016)
153	x	x		Semilandmarks running along top of the beak (Olsen, 2016)
154	x		x	Semilandmarks running along top of the beak (Olsen, 2016)
155	x	x		Semilandmarks running along top of the beak (Olsen, 2016)
156	x			Semilandmarks running along top of the beak (Olsen, 2016)
157	x	x	x	Semilandmarks running along top of the beak (Olsen, 2016)
158	x			Semilandmarks running along top of the beak (Olsen, 2016)
159	x	x		Semilandmarks running along top of the beak (Olsen, 2016)

Num	FLL	INT	LOW	Description
160	x		x	Semilandmarks running along top of the beak (Olsen, 2016)
161	x	x		Semilandmarks running along top of the beak (Olsen, 2016)
162	x			Semilandmarks running along top of the beak (Olsen, 2016)
163	x	x	x	Semilandmarks running along top of the beak (Olsen, 2016)
164	x	x	x	Semilandmarks running along the right side of the beak (Olsen, 2016)
165	x			Semilandmarks running along the right side of the beak (Olsen, 2016)
166	x	x		Semilandmarks running along the right side of the beak (Olsen, 2016)
167	x		x	Semilandmarks running along the right side of the beak (Olsen, 2016)
168	x	x		Semilandmarks running along the right side of the beak (Olsen, 2016)
169	x			Semilandmarks running along the right side of the beak (Olsen, 2016)
170	x	x	x	Semilandmarks running along the right side of the beak (Olsen, 2016)
171	x			Semilandmarks running along the right side of the beak (Olsen, 2016)
172	x	x		Semilandmarks running along the right side of the beak (Olsen, 2016)
173	x		x	Semilandmarks running along the right side of the beak (Olsen, 2016)
174	x	x		Semilandmarks running along the right side of the beak (Olsen, 2016)
175	x			Semilandmarks running along the right side of the beak (Olsen, 2016)
176	x	x	x	Semilandmarks running along the right side of the beak (Olsen, 2016)
177	x			Semilandmarks running along the right side of the beak (Olsen, 2016)
178	x	x		Semilandmarks running along the right side of the beak (Olsen, 2016)
179	x		x	Semilandmarks running along the right side of the beak (Olsen, 2016)
180	x	x		Semilandmarks running along the right side of the beak (Olsen, 2016)
181	x			Semilandmarks running along the right side of the beak (Olsen, 2016)

Num	FLL	INT	LOW	Description
182	x	x	x	Semilandmarks running along the right side of the beak (Olsen, 2016)
183	x			Semilandmarks running along the right side of the beak (Olsen, 2016)
184	x	x		Semilandmarks running along the right side of the beak (Olsen, 2016)
185	x		x	Semilandmarks running along the right side of the beak (Olsen, 2016)
186	x	x		Semilandmarks running along the right side of the beak (Olsen, 2016)
187	x			Semilandmarks running along the right side of the beak (Olsen, 2016)
188	x	x	x	Semilandmarks running along the right side of the beak (Olsen, 2016)
189	x			Semilandmarks running along the right side of the beak (Olsen, 2016)
190	x	x		Semilandmarks running along the right side of the beak (Olsen, 2016)
191	x		x	Semilandmarks running along the right side of the beak (Olsen, 2016)
192	x	x		Semilandmarks running along the right side of the beak (Olsen, 2016)
193	x			Semilandmarks running along the right side of the beak (Olsen, 2016)
194	x	x	x	Semilandmarks running along the right side of the beak (Olsen, 2016)
195	x			Semilandmarks running along the right side of the beak (Olsen, 2016)
196	x	x		Semilandmarks running along the right side of the beak (Olsen, 2016)
197	x		x	Semilandmarks running along the right side of the beak (Olsen, 2016)
198	x	x		Semilandmarks running along the right side of the beak (Olsen, 2016)
199	x			Semilandmarks running along the right side of the beak (Olsen, 2016)
200	x	x	x	Semilandmarks running along the right side of the beak (Olsen, 2016)
201	x			Semilandmarks running along the right side of the beak (Olsen, 2016)
202	x	x		Semilandmarks running along the right side of the beak (Olsen, 2016)
203	x		x	Semilandmarks running along the right side of the beak (Olsen, 2016)

Num	FLL	INT	LOW	Description
204	x	x		Semilandmarks running along the right side of the beak (Olsen, 2016)
205	x			Semilandmarks running along the right side of the beak (Olsen, 2016)
206	x	x	x	Semilandmarks running along the right side of the beak (Olsen, 2016)
207	x			Semilandmarks running along the right side of the beak (Olsen, 2016)
208	x	x		Semilandmarks running along the right side of the beak (Olsen, 2016)
209	x	x	x	Semilandmarks running along the right side of the beak (Olsen, 2016)
210	x	x	x	Semilandmarks running along the left side of the beak (Olsen, 2016)
211	x			Semilandmarks running along the left side of the beak (Olsen, 2016)
212	x	x		Semilandmarks running along the left side of the beak (Olsen, 2016)
213	x		x	Semilandmarks running along the left side of the beak (Olsen, 2016)
214	x	x		Semilandmarks running along the left side of the beak (Olsen, 2016)
215	x			Semilandmarks running along the left side of the beak (Olsen, 2016)
216	x	x	x	Semilandmarks running along the left side of the beak (Olsen, 2016)
217	x			Semilandmarks running along the left side of the beak (Olsen, 2016)
218	x	x		Semilandmarks running along the left side of the beak (Olsen, 2016)
219	x		x	Semilandmarks running along the left side of the beak (Olsen, 2016)
220	x	x		Semilandmarks running along the left side of the beak (Olsen, 2016)
221	x			Semilandmarks running along the left side of the beak (Olsen, 2016)
222	x	x	x	Semilandmarks running along the left side of the beak (Olsen, 2016)
223	x			Semilandmarks running along the left side of the beak (Olsen, 2016)
224	x	x		Semilandmarks running along the left side of the beak (Olsen, 2016)
225	x		x	Semilandmarks running along the left side of the beak (Olsen, 2016)

Num	FLL	INT	LOW	Description
226	x	x		Semilandmarks running along the left side of the beak (Olsen, 2016)
227	x			Semilandmarks running along the left side of the beak (Olsen, 2016)
228	x	x	x	Semilandmarks running along the left side of the beak (Olsen, 2016)
229	x			Semilandmarks running along the left side of the beak (Olsen, 2016)
230	x	x		Semilandmarks running along the left side of the beak (Olsen, 2016)
231	x		x	Semilandmarks running along the left side of the beak (Olsen, 2016)
232	x	x		Semilandmarks running along the left side of the beak (Olsen, 2016)
233	x			Semilandmarks running along the left side of the beak (Olsen, 2016)
234	x	x	x	Semilandmarks running along the left side of the beak (Olsen, 2016)
235	x			Semilandmarks running along the left side of the beak (Olsen, 2016)
236	x	x		Semilandmarks running along the left side of the beak (Olsen, 2016)
237	x		x	Semilandmarks running along the left side of the beak (Olsen, 2016)
238	x	x		Semilandmarks running along the left side of the beak (Olsen, 2016)
239	x			Semilandmarks running along the left side of the beak (Olsen, 2016)
240	x	x	x	Semilandmarks running along the left side of the beak (Olsen, 2016)
241	x			Semilandmarks running along the left side of the beak (Olsen, 2016)
242	x	x		Semilandmarks running along the left side of the beak (Olsen, 2016)
243	x		x	Semilandmarks running along the left side of the beak (Olsen, 2016)
244	x	x		Semilandmarks running along the left side of the beak (Olsen, 2016)
245	x			Semilandmarks running along the left side of the beak (Olsen, 2016)
246	x	x	x	Semilandmarks running along the left side of the beak (Olsen, 2016)
247	x			Semilandmarks running along the left side of the beak (Olsen, 2016)

Num	FLL	INT	LOW	Description
248	x	x		Semilandmarks running along the left side of the beak (Olsen, 2016)
249	x		x	Semilandmarks running along the left side of the beak (Olsen, 2016)
250	x	x		Semilandmarks running along the left side of the beak (Olsen, 2016)
251	x			Semilandmarks running along the left side of the beak (Olsen, 2016)
252	x	x	x	Semilandmarks running along the left side of the beak (Olsen, 2016)
253	x			Semilandmarks running along the left side of the beak (Olsen, 2016)
254	x	x		Semilandmarks running along the left side of the beak (Olsen, 2016)
255	x	x	x	Semilandmarks running along the left side of the beak (Olsen, 2016)

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