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CYCLOPOIDES NOUVEAUX DU CONTINENT INDO-IRANIEN. II.

Par KNUT LINDBERG.

Mesocyclops (Thermocyclops) mahéensis, sp. nov.

Description.—Longueur de la femelle adulte de 922 à 1017 μ (6 animaux mesurés) ; largeur environ 280 μ. Abdomen élancé, à segment génital allongé et peu élargi dans sa partie proximale. Bord postérieur du quatrième segment abdominal muni sur la moitié interne de la face ventrale d'un groupe de 5 à 6 épines extrêmement petites.

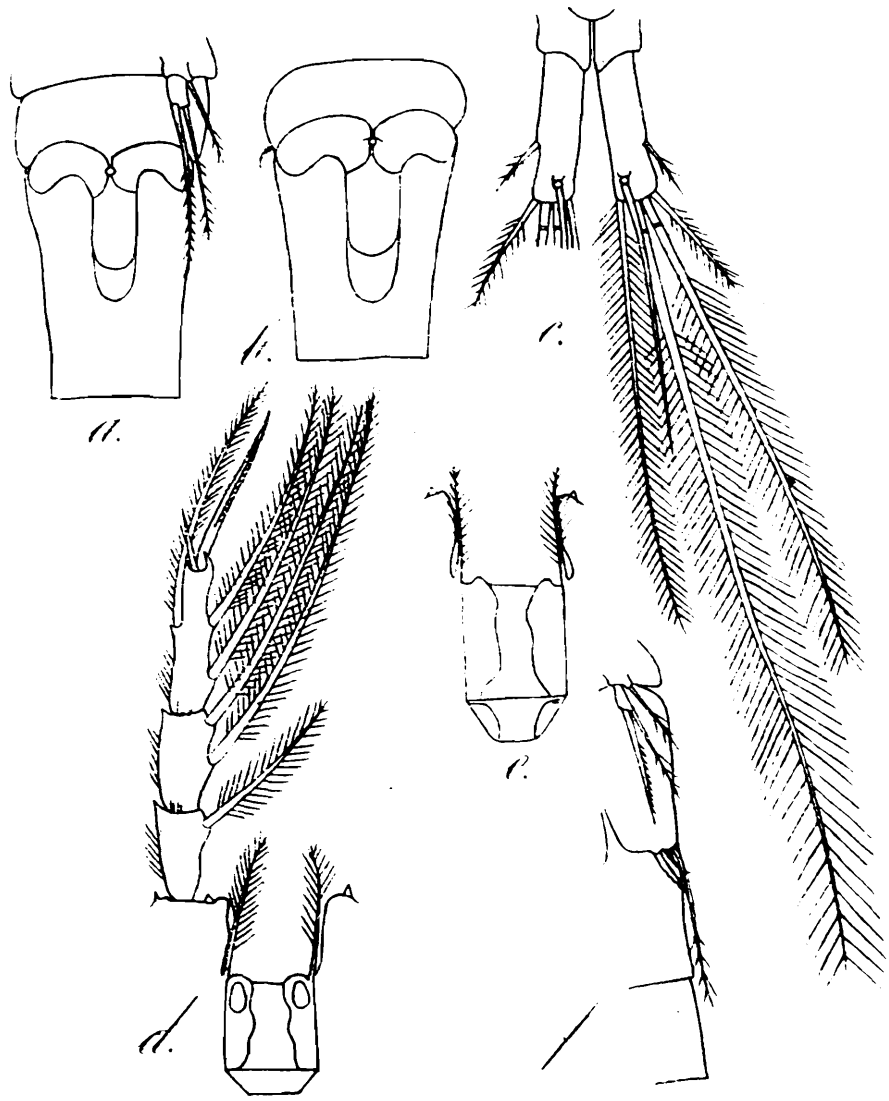

FIG. 1.—*Mesocyclops* (*Thermocyclops*) *mahéensis*, sp. nov.

a. ♀ Segment génital et P5 ; *b*. ♀ Segment génital, autre aspect ; *c*. ♀ Furca, face dorsale ; *d*. ♀ Endopodite de P4 et lamelle basale ; *e*. ♀ Lamelle basale de P4, autre aspect ; *f*. ♂ P5 et P6.

difficiles à distinguer. Furca à branches divergentes de 3·39 à 3·90 fois aussi longues que larges. Soie dorsale sans cils, très longue, mais

inférieure en longueur à celle de la soie apicale interne de la furca (moyennes respectives de 6 individus 135 et 181 μ). Pennation de la soie apicale médiane interne hétéronyme, les cils étant espacés sur la partie terminale, mais très serrés et plus longs ailleurs. Première antenne à 17 articles ; lorsqu'elle est rabattue elle atteint le plus souvent le milieu du troisième segment thoracique ; chez un animal elle atteignait le milieu du quatrième segment thoracique. Article terminal de l'endopodite de P4 plus de 3 fois aussi long que large. Son épine apicale interne dépasse en longueur celle de l'article et elle est environ 2·35 fois aussi longue que l'épine apicale externe. Lamelle basale de la quatrième paire de pattes à éminences latérales arrondies, dépourvues d'épines visibles aux grossissements ordinaires et faisant une très faible saillie au-dessus du rebord libre. Cinquième patte à deuxième article portant une épine interne barbelée, dont la longueur ne surpasse que de peu celle de la soie apicale. Réceptacle séminal à bras latéraux bien recourbés et à concavité proximale très profonde ; sa partie verticale apparaît bien moins allongée qu' elle ne l'est chez la majorité des *Thermocyclops*. Ovisacs petits, renfermant de 6 à 9 gros oeufs.

Mâle. Longueur 637 μ. L'unique spécimen examiné avait les branches de la furca parallèles, de 3·78 fois aussi longues que larges. Sa soie dorsale dépassait en longueur celle de la soie apicale interne. La sixième patte rudimentaire était formée d'une forte épine interne, d'une mince soie médiane plus courte et d'une longue soie externe ciliée, qui atteignait le tiers proximal du troisième segment abdominal.

Habitat.—Un bassin cimenté d'une mosquée à Mahé, côte de Malabar (Inde française) ; récolté au mois de décembre.

Remarques.—L'espèce présente se distingue surtout par sa longue soie dorsale de la furca ; sa lamelle basale de P4 à petites éminences, et par la structure du segment génital et du réceptacle séminal.

Pour autant qu'il me soit connu la seule forme avec laquelle on puisse la comparer est l'espèce africaine *M.* (*Th.*) *emini* (Mrazek). Elle s'en différencie par sa soie dorsale de la furca plus courte que la soie apicale interne, par la longueur plus considérable de l'épine apicale externe de l'article 3 de l'enp. 4 par rapport à celle de l'épine apicale interne et par cette dernière dépassant en longueur celle de l'article.

Mesocyclops (Thermocyclops) tinctus Lindberg.

Espèce décrite en 1936 d'après des spécimens jeunes et mal conservés, provenant de la partie désertique de l'Est du plateau Iranien. En 1940 j'ai trouvé dans plusieurs endroits du Sud-Ouest de l'Iran une forme qui, bien que de dimensions plus fortes, est manifestement identique à celle présentée sous le nom de *M.* (*Th.*) *tinctus*. Comme les figures et la description originales laissent à désirer une rédescription de cette espèce singulière et très remarquable est nécessaire.

Description.—Forme robuste. Longueur de la femelle ovigère (sans soies apicales) de 920 à 1254 μ ; largeur de 304 à 418 μ. Les bords postérieurs des trois premiers segments thoraciques apparaissent indistinctement découpés sur les parties latérales ; au lieu de découpure les

ailes latérales du cinquième segment thoracique et surtout celles du quatrième, offrent l'aspect d'être garnies d'excroissances verruqueuses de dimensions inégales. Cinquième segment thoracique surpassant en largeur celle du segment génital. Celui-ci, en général plus large que

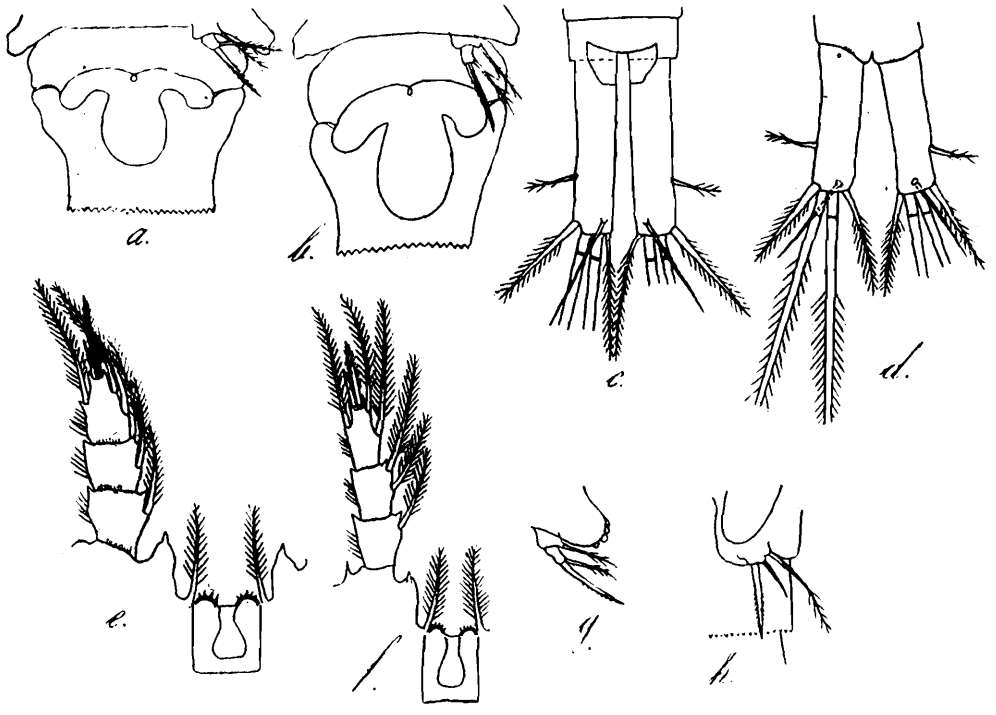

FIG. 2.—*Mesocyclops* (*Thermocyclops*) *tinctus* Lindberg.

a. ♀ Segment génital et P5 (Djam) ; *b*. ♀ Segment génital et P5, autre aspect (Djam) : *c*, ♀ Furca, face dorsale (Béhbéhan) ; *d*. ♀ Furca, face ventrale (Djam) ; *e*. ♀ Endopodite de P4 et lamelle basale (Béhbéhan) ; *f*. ♀ Endopodite de P4 et lamelle basale, autre aspect (Djam) ; *g*. ♀ Aile latérale cinquième segment thoracique et P5 (Djam) ; *h*. ♂ P6 (Béhbéhan).

long, se rétrécit assez notablement du côté distal. Bords postérieurs des trois premiers segments abdominaux découpés en dentelure. Celui du quatrième segment abdominal porte sur la moitié interne de la face ventrale un groupe de 5 à 8 petites épines. Furca à branches divergentes ou parallèles. Des 12 femelles adultes examinées elles étaient bien divergentes chez 6, légèrement divergentes chez 2 ; les 4 animaux restants avaient les branches de la furca parallèles. Leur rebord interne est glabre. Elles sont de 3·42 à 4·75 fois aussi longues que larges. Rapport moyen, longueur : largeur, chez 12 spécimens 4·08 : 1. Soie latérale externe insérée à peu près vers l'union du tiers distal avec les deux tiers proximaux, mais elle peut se trouver à l'union du quart distal avec les trois quarts proximaux chez animaux à furca très allongée. Soie dorsale dépourvue de cils, le plus souvent égale ou un peu inférieure en longueur à celle de la soie apicale externe. Chez deux échantillons elle surpassait celle-ci légèrement. Soie apicale interne plus longue que la soie apicale externe. Rapport moyen, soie apicale interne. : soie apicale externe, chez 12 individus 1·30 : 1. Pennation des soies apicales médianes paraît homonyme. Première antenne à 17 articles, rabattue elle atteint le milieu ou le bord postérieur du deuxième segment thoracique. Article terminal de l'endopodite de la

quatrième paire de pattes toujours moins de deux fois aussi long que large, le rapport variant de 1·40 : 1 à 1·95 : 1, avec une moyenne de 1·58 : 1, chez 11 spécimens étudiés. Epine apicale interne considérablement plus longue que l'article (rapport moyen 1·22 : 1) et surpassant de beaucoup la longueur de l'épine apicale externe (rapport moyen, épine apicale interne : épine apicale externe, 1·77 : 1). Lamelle basale de la quatrième paire de pattes pourvue de chaque côté d'une éminence arrondie, peu élevée, garnie de quelques petites épines. Cinquième patte à deuxième article trapu ; épine interne de cet article dépassant légèrement en longueur celle de la soie apicale. La configuration du réceptacle séminal se voit sur les figures. Ovisacs de dimensions très variables, contenant le plus souvent de 6 à 12 oeufs. Chez un animal d'un étang de la région de Béhbéhan ils dépassaient l'extrémité de la furca et renfermaient 26 et 28 oeufs. Coloration rouge intense.

Mâle. Longueur de 836 à 955 μ (cinq animaux examinés). Bords postérieurs des trois premiers segments abdominaux découpés en petites dents ; celui du quatrième segment abdominal semble porter une rangée continue de petites épines sur la face ventrale, au lieu d'en être muni d'un petit groupe comme chez la femelle. Branches de la furca parallèles ou légèrement divergentes, de 3·77 à 4·55 fois aussi longues que larges. Soie dorsale considérablement plus longue que chez la femelle. Article terminal de l'enp. 4 et ses appendices ressemblant à ceux de la femelle. Sixième patte rudimentaire formée d'une épine interne assez forte, le plus souvent dépassant un peu le bord postérieur du deuxième segment abdominal, d'une soie médiane beaucoup plus courte et d'une soie externe qui est l'appendice le plus long.

Habitats.—Béhbéhan, petit étang dans les montagnes à 24 kilomètres au sud-est de la ville et mare de rivière à environ 20 kilomètres de la ville dans la même direction ; Djam, citerne naturelle dans un rocher à environ 12 kilomètres au nord du village ; Makkou, citerne cimentée couverte ; Tang-Gaz, rivière ; Tang-Qil, mare de rivière. Saghand (environ 100 kilomètres au nord-est de Yezd), bassin, octobre 1935.

Remarques.—Le *M.* (*Th.*) *tinctus* est remarquable surtout par l'ornementation des bords latéraux du quatrième et du cinquième segments thoraciques, par son segment génital le plus souvent plus large que long, son article terminal de l'endopodite de P4 court et élargi, moins que deux fois aussi long que large, et par la configuration assez distinctive de la cinquième patte.

M. (Th.) mahéensis, sp. nov.

Longueur μ.	Furca.	Soie dorsale.	Soies apicales.	Art. 3 enp. 4 Long. : larg.	Art. 3 enp. 4 Ep. ap. int. : ép. ap. ext.	Ep. ap. int. : long. art. 3.	P6 Epine : soie méd. : soie ext.
♀ 969	(46+32) : 23=3·39 : 1	125	63 : 242 : 392 : 167	..	..	..	..
♀ 969	(47+30) : 22=3·50 : 1	133	68 : 225 : 342 : 187	..	..	..	..
♀ 940	(46+32) : 20=3·90 : 1	143	67 : 233 : 384 : 178	62 : 18=3·44 : 1	67 : 28=2·39 : 1	67 : 62=1·08 : 1	..
♀ 922	(43+30) : 19=3·84 : 1	142	62 : 222 : 347 : 187	57 : 18=3·17 : 1	62 : 25=2·48 : 1	62 : 57=1·09 : 1	..
♀ 1017	(48+30) : 20=3·90 : 1	135	70 : 234 : 384 : 185	58 : 19=3·05 : 1	62 : 27=2·29 : 1	62 : 58=1·07 : 1	..
♀ 931	(50+27) : 22=3·50 : 1	133	63 : 225 : 342 : 184	62 : 20=3·10 : 1	65 : 28=2·32 : 1	65 : 62=1·05 : 1	..
♂ 637	(30+23) : 14=3·78 : 1	108	38 : 153 : 229 : 100	45 : 15=3 : 1	47 : 22=2·14 : 1	47 : 45=1·04 : 1	23 : 17 : 83

M. (*Th.*) *tinctus* Lindberg, ♀.

Localité.	Longueur μ.	Furca.	Soie dorsale.	Soies apicales.	Art. 3 enp. 4 Long. : larg.	Art. 3. enp. 4 Ep. ap. int. : ép. ap. ext.	Ep. ap. int. : long. art. 3.	P6 Epine : soie méd. : soie ext.
Béhbéhan	1187	(80+50) : 32=4·06 : 1	75	77 : 277 : 369 : 110	43 : 30=1·43 : 1	57 : 32=1·78 : 1	57 : 43=1·33 : 1	..
Petit étang	1206	(92+50) : 35=4·06 : 1	92	92 : 303 : 420 : 120	53 : 32=1·65 : 1	68 : 36=1·89 : 1	68 : 53=1·28 : 1	..
	988	(70+38) : 25=4·32 : 1	77	83 : 292 : 371 : 97	43 : 22=1·95 : 1	52 : 30=1·73 : 1	52 : 43=1·21 : 1	..
Béhbéhan	1216	(88+45) : 33=4·03 : 1	95	90 : 310 : 469 : 130	50 : 30=1·67 : 1	62 : 33=1·89 : 1	62 : 50=1·24 : 1	..
Mare de rivière	1092	(91+42) : 28=4·75 : 1	70	80 : 280 : 364 : 102	45 : 32=1·40 : 1	60 : 33=1·82 : 1	60 : 45=1·33 : 1	..
	1245	(91+42) : 32=4·16 : 1	70	83 : 304 : 427 : 103	47 : 32=1·47 : 1	55 : 35=1·57 : 1	55 : 47=1·17 : 1	..
Djam	950	(67+38) : 25=4·20 : 1	67	68 : 237 : 350 : 87	..	..	..	..
	941	(71+37) : 27=4 : 1	70	65 : 222 : 339 : 83	42 : 26=1·62 : 1	52 : 30=1·73 : 1	52 : 42=1·24 : 1	..
	920	(83+30) : 26=4·35 : 1	58	67 : 250 : 344 : 83	45 : 26=1·73 : 1	50 : 30=1·67 : 1	50 : 45=1·11 : 1	..
Makkou	988	(70+33) : 26=3·96 : 1	67	78 : 242 : 359 : 92	40 : 27=1·48 : 1	50 : 27=1·85 : 1	50 : 40=1·25 : 1	..
Tang-Gaz	1254	(80+33) : 33=3·42 : 1	75	75 : 292 : 439 : 108	43 : 28=1·53 : 1	50 : 27=1·85 : 1	50 : 43=1·16 : 1	..
Tang-Qil	1007	(73+40) : 29=3·89 : 1	73	80 : 264 : 381 : 100	45 : 28=1·60 : 1	50 : 29=1·72 : 1	50 : 45=1·11 : 1	..

M. (*Th.*) *tinctus* Lindberg, ♂.

Béhbéhan	884	(67+33) : 22=4·55 : 1	100	62 : 275 : 409 : 87	47 : 42=1·12 : 1	55 : 33=1·67 : 1	55 : 47=1·17 : 1	58 : 30 : 67
Petit étang	..	..	..	..	..	..	..	..
Béhbéhan	955	(71+32) : 23=4·48 : 1	92	68 : 302 : 477 : 85	45 : 28=1·60 : 1	62 : 43=1·44 : 1	62 : 45=1·38 : 1	53 : 30 : 67
Mare de rivière	..	..	..	..	..	..	..	52 : 33 : 77
Djam	836	..	..	..	43 : 22=1·95 : 1	50 : 33=1·52 : 1	50 : 43=1·16 : 1	47 : 20 : 70
Tang-Qil	846	(53+30) : 22=3·77 : 1	80	58 : 230 : 371 : 63	40 : 25=1·60 : 1	53 : 37=1·43 : 1	53 : 40=1·32 : 1	50 : 33 : 75

A BIBLIOGRAPHY OF THE MELOLONTHINE GENUS *ECTINOHOPLIA* (SCARABAEIDAE).

By L. B. Boyer, *San Francisco, California, U. S. A.*

The fascinating asiatic melolonthine genus *Ectinohoplia* has been studied exclusively by Europeans, except for scattered observations written by Nipponese. Consequently, the literature concerning *Ectinohoplia* is confined to European and Japanese entomological journals.

Perhaps a bibliography of that literature, published in an Indian journal, will serve a two-fold purpose: first, that of presenting an adequate bibliology, for none exists; second, that of inciting interest in one of the most colorful and attractive scarabaeid genera, among entomologists who know the beetles in their indigenous habitat.

Since the publication of Junk's Catalogue of the Coleoptera, much information has accrued. Some of the insects which had been considered to belong to another group have been consigned to this genus; three of the beetles[1] which were described as *Ectinohoplia* have been found to be representatives of the *Hoplia*. Several new species have been named and a complete revision of the genus has appeared.

Policy.

According to the present author's interpretation of the International Rules of Zoological Nomenclature, the term "variety" commands no nomenclatorial respect. As expressed elsewhere,[2] he feels that the usage of varieties is both unnecessary and an impediment to Linnean systematics. However, in a bibliography it is exigent to include all literature of the subject chosen, within certain limits. In compliance with these opinions, the following rule is adhered to in this bibliology: Synonymy of varieties before they have been promoted to species or subspecies will be ignored.

This bibliography includes references only to descriptions and revisions. Travel notes are not included.

Explanatory Note.

Brenske, in 1895, considered *variegata* de Borre and *variolosa* Waterhouse to be the same species. In 1903, Reitter synonymized *variegata* and *variolosa* with *obducta* Motschulsky. However, Arrow judged *variegata* to be identical with *faivae* Wollaston; he confirmed Reitter's consideration of *variolosa*. Arrow's adjudication is here held to be correct.

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[1] *E. mus* and *E. hüttenbacheri* Nonfried and *E. latesurata* Fairmaire.

[2] Boyer, L. B., *Microentomology* V, part 1, pp. 1, 2 (1940).

Generic Description.

Redtenbacher, L., *Reise d. Novara, Zool.* II, Coleoptera, 1868, p. 63.

Generic Revisions.

de Borre, A. P., *Ann. Soc. Ent. Belg.*, 1886, p. 83.
Reitter, E., *Verh. Nat. Ver. Brünn.*, 1902 (1903), XLI, p. 108.
Arrow, G. J., *Proc. Zool. Soc. London*, 1921, p. 267

Description of the Species.[1]

affinis Arrow, *Proc. Zool. Soc. London*, 1921, p. 273, pl. i, fig. 9. Reported from India : Assam (Khasi Hills) ; S. W China : Yunnan.

arrowi Miwa, *Rep. Dept. Agri., Govt. Res. Inst. Taihoku*, 1931, p. 359, *formosana* Arrow, *Proc. Zool. Soc. London* 1921, p. 269. (*non* Moser). Reported from Formosa.

auriventris Moser, *Deut. Ent. Zeit.*, 1915, p. 150. Reported from China : Fukien.

davidis Fairmaire,* *Ann. Soc. Ent. France*, 1889, (6) IX, p. 15. Reported from Moupin.

dombrovskii Nonfried,* *Berl. Ent. Zeit.*, 1895, XL, p. 284 (*Hoplia*).
Moser, *Deut. Ent. Zeit*, 1912, p. 325, relegated to *Ectinohoplia*.
Reported from India : Raliang.

flavicauda Arrow, *Proc. Zool. Soc. London*, 1921, p. 273, pl. i, fig. 7. Reported from Tonkin : Chapa.

formosana Moser,* *Stett. Ent. Zeit.*, 1919, LXXX, p. 362. Reported from Formosa : Tainan.

gracilipes Lewis, *Ann. Mag. Nat. Hist.*, 1895, (6) XVI, p. 389. (*Hoplia*).
Arrow, *Proc. Zool. Soc. London*, 1921, p. 268, lists with *Ectinohoplia*. Reported from Japan : Oshima.

hieroglyphica Moser,* *Deut. Ent. Zeit.*, 1912, p. 307. Reported from Tonkin : Montes Mauson.

hispidula Reitter, *Verh. Nat. Ver., Brünn*, 1902 (1903), XLI, p. 110. Reported from China : Kiu Kiang, Chang Yang and Ichang.

imitatrix Nonfried,* *Berl. Ent. Zeit.*, 1895, XL, p. 285. (*Hoplia*).
Moser, *Deut. Ent. Zeit.*, 1912, p. 325, relegated to *Ectinohoplia*.
Reported from India : Raliang.

indica Moser, *Deut. Ent. Zeit.*, 1912, p. 305. Reported from India : Himalaya.

inscripta Arrow, *Proc. Zool. Soc. London*, 1921, p. 269, pl. i, fig. 12. Reported from China : Fukien.

latipes Arrow, *ibid.*, p. 271, pl. i, fig. 5. Reported from Tonkin : Chapa, Paklay.

nitidicauda Arrow, *ibid.*, p. 275, pl. i, fig. 10. Reported from Tonkin : Chapa.

nitidiventris Arrow, *ibid.*, p. 274, pl. i, fig. 6. Reported from India : Assam (Shillong and Gauhati).

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[1] References marked with an asterisk are not included in Arrow's revision.

obducta Motschulsky, *Etudes Entomol.*, 1857, VI, p. 33 (*Hoplia*).

Reitter, *Verh. Nat. Ver. Brünn.*, 1902 (1903), XLI, p. 108, includes with *Ectinohoplia*.

Yokoyama, *Coleoptera of Japan*, Nishigihara Publishing Ass., 1937, p. 97, pl. xii, fig. 6, descibes in Japanese.

Takeuchi, *Monog. Beetles Iwate Prefect. Japan*, 1940, # 1, p. 112, describes in Japanese.

sabulicola Motschulsky, *Etudes Entomol.*, 1857, VI, p. 34 (*Hoplia*).

Reitter, *Verh. Nat. Ver. Brünn.*, 1902 (1903), XLI, p. 108, synonymized ; considered a variety.

variolosa Waterhouse, *Trans. Ent. Soc. London*, 1875, (4) VIII, p. 99, pl. iii, fig. 2.

Reitter, *Verh. Nat. Ver. Brünn.*. 1902 (1903), XLI, p. 108, synonymized.

var. *caminaria* Reitter, *ibid.*, p. 108.

Takeuchi, *Monog. Beetles Iwate Prefect. Japan*, 1940, # 1, p. 112, describes in Japanese.

obducta has been reported from Japan : Karafuto, Hokaido, Honshu and Shikoku.

oculicauda Arrow, *Proc. Zool. Soc. London*, 1921, p. 272, pl. i, fig. 4. Reported from Tonkin : Chapa.

paivae Wollaston, *Ann. Mag. Nat. Hist.*, 1859, (3) IV, p. 430 (*Hoplia*).

de Borre, *Ann. Soc. Ent. Belg.*, 1886, XXX, p. 85, relegated to *Ectinohoplia*.

guttaticollis Fairmaire, *Ann. Soc. Ent. France*, 1899, LXVIII, p. 620.

Arrow, *Proc. Zool. Soc. London*, 1921, p. 268, synonymized.

nigrotincta Fairmaire, *Notes Leyden Museum*, 1897, XIX, p. 243.

Arrow, *Proc. Zool. Soc. London*, 1921, p. 268, synonymized.

tonkinensis Moser, *Deut. Ent. Zeit.*, 1912, p. 306.

Arrow, *Proc. Zool. Soc. London*, 1921, p. 268, synonymized.

variabilis Reitter, *Verh. Nat. Ver. Brünn.*, 1902 (1903), XLI, p. 110.

Arrow, *Proc. Zool. Soc. London*, 1921, p. 268, synonymized.

variabilis var. *ichangensis* Reitter, *Verh. Nat. Ver. Brünn.*, 1902 (1903), XLI, p. 110.

variegata de Borre, *Ann. Soc. Ent. Belg.*, 1886, XXX, p. 84.

Arrow, *Proc. Zool., Soc. London*, 1921, p. 268, synonymized.

paivae has been reported from China : Shanghai, Ichang, Chang Yung and Sze-chouen ; Tonkin : Montes Mauson.

pictipes Fairmaire,* *Ann. Soc. Ent. France*, 1889, (6) IX, p. 15. Reported from Moupin.

quadrituberculata de Borre, *Ann. Soc. Ent. Belg.*, 1886, XXX, p. 86.

quadrituberculata Brenske, *Mem. Soc. Ent. Belg.*, 1894, II, p. 34.

Brenske, *Ann. Soc. Ent. Belg.*, 1895, XXXIX, p. 119, synonymized.

Reitter, *Verh. Nat. Ver. Brünn.*, 1902 (1903), XLI, p. 109, described.

quadrituberculata has been reported from Shanghai.

rufipes Motschulsky, *Reisen u. Forsch. Amur-Lande, Schrenk.*, 1860, II, p. 133 (*Decamera*).

Reitter, *Deut. Ent. Zeit.*, 1890, p. 375, listed with *Ectinohoplia*.

Reitter, *Verh. Nat. Ver. Brünn.*, 1902 (1903), XLI, p. 110. Reported from East Siberia ; Gensan ; Daurien.

scutellata Arrow, *Proc. Zool. Soc. London*, 1921, p. 275, pl. i, fig. 11. Reported from Tonkin : Chapa.

sinuaticollis Moser, *Deut. Ent. Zeit.*, 1912, p. 305. Reported from India : Assam.

soror Arrow, *Proc. Zool. Soc. London*, 1921, p. 270, pl. i, fig. 2. Reported from China : Fukien.

sulphuriventris Redtenbacher, *Reise d. Novara, Zool. II, Coleoptera*, 1868, p. 63, pl. ii, fig. 10.

de Borre, *Ann. Soc. Ent. Belg.*, 1886, XXX, p. 84.

Fairmaire, *Ann. Soc. Ent. France*, 1899, LXVIII, p. 619.

Reitter, *Verh. Nat. Ver. Brünn.*, 1902 (1903), XLI, p. 109.

sulphuriventris has been reported from Hong Kong ; China : Shanghai ; Japan : Fou Tcheon.

suturalis de Borre, *Ann. Soc. Ent. Belg.*, 1886, XXX, p. 85.

Arrow, *Proc. Zool. Soc. London*, 1921, p. 267, pl. i, figs. 1 and 3 (male and female).

crysura Reitter, *Verh. Nat. Ver. Brünn.*, 1902 (1903), XLI, p. 109.

Arrow, *Proc. Zool. Soc. London*, 1921, p. 268, synonymized.

var. *diabolica* Reitter, *Verh. Nat. Ver. Brünn.*, 1902 (1903), XLI, p. 109.

luteostriata Brenske, *Mem. Soc. Ent. Belg.*, 1894, II, p. 34.

Brenske, *Ann. Soc. Ent. Belg.*, 1895, XXXIX, p. 119, synonymized.

suturalis has been reported from India : Khasi Hills.

tibialis Arrow, *Proc. Zool. Soc. London*, 1921, p. 271, pl. i, fig. 8. Reported from India : Assam.

trichota Jacobson,* *Rev. Russe. Entom.* 1914, XIV, p. 1. Reported from China : Pekin.

triplagiata Fairmaire, *Notes Leyden Museum*, 1897, XIX, p. 211. Reported from Tibet : Hoang-Ho.

yunnana Moser,* *Stett. Ent. Zeit.*, 1919, LXXX, p. 361. Reported from Yunnan.

STUDIES ON CESTODE PARASITES OF FISHES. II. THE NERVOUS SYSTEM OF *TYLOCEPHALUM DIERAMA* SHIPLEY AND HORNELL.[1]

By M. K. SUBRAMANIAM, *M.A., D.Sc., Research Assistant, Department of Zoology, University of Madras.*

CONTENTS.

INTRODUCTION.

The present work is the outcome of some fundamental problems which arose when I had to describe a Monozootic Cestode whose features appeared to be different from those of Gyrocotylidae. Fuhrmann's account of the Cestoda in Kükenthal's Handbuch der Zoologie (1930) does not mention the nervous system in the definition of Cestodaria, The definition takes into account only the disposition of the generative organs and the character of the larva. It is a well-known fact that in the case of many fish parasites the proglottides are capable of living freely in the alimentary tract after having become detached from the proglottid chain. The problem thus reduces itself to the question: How can one distinguish a free living proglottid from a monozootic Cestode ? I have seen in several cases immature free living proglottides and so, if the larva is not available, the differentiation of a free living proglottid from a monozootic Cestode becomes virtually impossible. It appeared to me that the only definite evidence that one could rely on for differentiation is the nervous system. Theoretically therefore a monozootic Cestode should have a closed nervous system consisting of a brain and a system of nerve cords while in the free living proglottid the brain should be absent. It was because I found a closed nervous system in *Biporophyllaeus* (Subramaniam 1939) that I described it as

[1] An abstract of this paper was read before the 28th Session of the Indian Science Congress held at Benares in January 1941.

belonging to a new order of Cestodaria. And it was on the same ground that I suggested that the Caryophyllaeidae should be included among the Cestodaria.

I have to state, however, that descriptive accounts of the nervous system of representative members of the various families of Cestode parasites of fishes are not available in the few papers published on the subject. Very little is known about the arrangement of the nerves in the proglottides and nothing about the changes in the nervous system following the separation of a proglottid from the chain. It has also to be mentioned here that very few of the older workers used any of the typical neurological technique so that even to-day the study of the nervous system of cestodes remains the step-child of Helminthologists.

I thought that investigations of the nervous system of Cestodes of fishes belonging to the various families would offer a solution to the difficulties mentioned above. The choice of material for an investigation of this sort is not, however, at the command of the investigator. Nothing is known about the extent, the rate and the time of incidence of the various fish parasites. It will be obvious, therefore, that one has to take his chance with the material available. Often it is likely that the investigator may not obtain another lot of material during the year. A systematic neurological investigation of representative members of the various families is therefore not possible. The only possible alternative is an investigation of such specimens belonging to different families as may be available, and arrive at some definite conclusions after a survey of the whole field when a sufficient number of representatives of the different families have been investigated. The following is a preliminary attempt in the direction outlined above.

Material and Methods.

In the present paper is recorded the investigations carried out on specimens of *Tylocephalum dierama* Shipley and Hornell, collected in July 1939 from *Rhynchobatus djeddensis*. About 250 specimens were available, out of which 50 were fixed in ammonia alcohol and chloral hydrate alcohol, 30 in Golgi's osmo-bichromate mixture, and the rest in 5 per cent formalin. Part of the material fixed in chloral hydrate alcohol and ammonia alcohol was treated with pyridine before transfer to silver nitrate. Golgi's rapid method and Cajal's methods were thorough failures. Material fixed in 5 per cent formalin was then treated according to the Bielchowsky method. For about 6 months the attempts to impregnate the fibrils and nerve cords were without success. It was then discovered that treatment with pyridine was essential. Finally, by manipulating the time in pyridine, silver bath and ammoniacal silver bath, some very good impregnations were obtained. It was found that in light impregnations the nerve cords were brownish while the nerve fibres proceeding in various directions from the cord were yellow. The vitelline glands being argentophile, obscured, in deeper impregnations, the finer details of the origin and direction of the fibrils leaving the nerve cords. Naturally, therefore, all the descriptions are based on examination of preparations impregnated in varying grades of intensity. Almost all workers on the nervous system

of tapeworms describe ganglia and commissures especially at the posterior end of the mature segments. No ganglionic thickenings were observed in the nerve cords of *Tylocephalum*, but the commissure at the posterior end of the segments was prominent. Since the ganglionic cells were indistinct in these preparations, a re-investigation with the Bielchowsky technique was found essential. Material silvered without previous treatment with pyridine was, in the majority of cases, useless. But, in a few, the ganglionic cells were impregnated. In such preparations the peripheral fibrils were unstained. There was also the question of the nature of arrangement of the muscles in the segments. Southwell (1925) in his Monograph on the Tetraphyllidea figures a row of longitudinal muscles in the parenchyma. The first few series of Bielchowsky preparations suggested that what Southwell took for muscle bundles were nerve cords. Therefore material preserved in 5 per cent formalin was fixed in Susa and Bouin Duboscq, sections were cut, and part of the Susa material was stained with Mallory's triple stain. An examination of the Mallory-stained sections revealed a subcuticular muscle system composed of outer circular and inner longitudinal fibres. The bundles of fibres which stained positively with Bielchowsky were light violet while the muscle fibres were light red. In such Susa-Mallory preparations, the fibrils proceeding to the various tissues, the circular commissures and the posterior plate commissure were light violet in colour.

The Bouin Duboscq and Susa material, when stained with iron haematoxylin, showed the subcuticular muscles blue, while the nerves were unstained and structureless in appearance. Counterstaining with eosin or orange G did not improve the appearance. When the Bielchowsky material was mordanted for 2-3 days in iron alum and stained in haematoxylin for 4-5 days the ganglionic cells could be seen in the nerve cords. In such slides the ganglionic cells themselves are deep black while the fibres to the various organs are brownish yellow. In some cases such preparations are found more suitable for photomicrography than the Bielchowsky preparations. The muscle fibres in these preparations are blue black and in those regions of the worms where the outer layers are slightly macerated, the longitudinal and circular fibres together give a lattice-work-like appearance (Pl. X, fig. 1). Thus in *Tylocephalum dierama* there is no medullary longitudinal or circular muscle layer.

The histological details were confirmed by Vom Rath preparations stained with iron haematoxylin by the long process. In spite of the large quantity of material available, the histology of the brain could not be investigated satisfactorily, probably due to the long treatment of the parasites with tap water. The worms occurred firmly attached to the folds of the spiral valve and they released their hold only after having been in tap water for 30-45 minutes. Attempts to remove them by force resulted in the proglottid chains snapping near the neck region. As repeated examinations for the past one year of the spiral valve of *Rhynchobatus* and other allied rays have failed to reveal any *Tylocephalum dierama*, a more detailed histological study of the brain has to wait till further material is available.

THE BRAIN.

The brain lies in the middle of the myzorhynchus (Pl. X, figs. 2, 3). In well expanded specimens the myzorhynchus is egg shaped and the brain lying in it has the shape of an arc. This is but a plane view. If reconstructed from serial longitudinal and transverse sections it is seen to have the shape of a conical cap. The posterior half of the brain presents a vacuolated appearance in Bielchowsky and Vom Rath longitudinal sections. In Vom Rath slides each of these vacuoles presents the appearance of a nucleus (Pl. X, fig. 4, *nc.*). Some of these show distorted nucleoli while in others a tangled mass of chromophile threads may be seen. The cytoplasm covering these nuclei is thin and not very clear and small bundles of fibres could be seen running antero-posteriorly between the nuclei. Plate X, figure 3 shows the innumerable bundles proceeding from the brain fan-wise to the anterior edge of the myzorhynchus.

A transverse section of the brain shows that it is a plate-like structure. In Bielchowsky preparations (Pl. X, fig. 5) radiating fibres could be seen proceeding in a radial direction all round. Careful examination of the section under oil immersion shows innumerable very minute nuclei. These occur in rows. A Vom Rath transverse section gives a slightly better idea of the histology of the brain (Pl. X, figs. 6, 7, *nc.*). The nuclei appear to be of two types : (1) large ones as seen in longitudinal sections and (2) small ones arranged in a linear manner. These rows of nuclei separated from one another by small bundles of fibres are arranged in the shape of concentric arcs. Plate X, figure 7 gives a very good idea of the arrangement. As in the case of the larger ganglion cells these minute nuclei have only a very thin cytoplasmic coat. A nucleolus is present in many of these nuclei. Nerves to suckers arise separately from the brain. From transverse and longitudinal sections it appears that the sucker is constituted by one layer of cells. The outer half of the cells in Bielchowsky iron haematoxylin preparations appears darkly stained. The basal half is unstained and nuclei occur about the middle of the clear half.

In silvered preparations the nerve proceeding from the brain is observed to touch the anterior inner border of the sucker. The base of the sucker has an investment of fibrils and from this meshwork fine fibres could be seen proceeding between the cells.

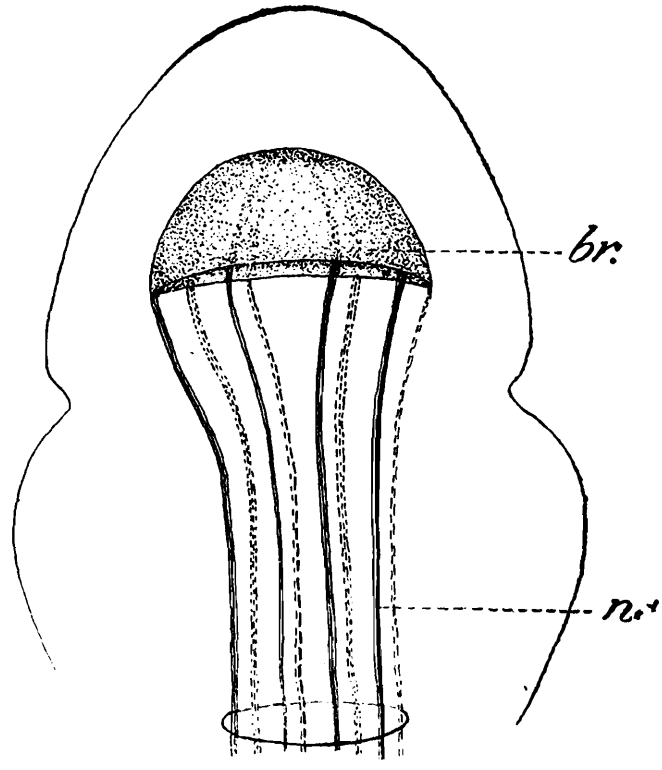
To sum up : It is observed that the brain is not constituted by a system of ganglia but is plate-like, the slight differences in shape depending on the degree of contraction of the head and myzorhynchus. The nerve cords take their origin from the posterior margin of the brain. Bundles of fibres proceed anteriorly and get distributed at the anterior edge of the myzorhynchus. There are large and small ganglion cells in the brain.

NERVES IN THE DILATED PORTION OF THE HEAD AND THE NECK.

The number of nerves starting from the brain could not be definitely mentioned as the bundles lie close together and merge into one another near the brain. In transverse sections (Pl. X, fig. 8) 8-14

bundles of nerves could be seen in the region of the sucker, each bundle being composed of 2 or more nerves. In some bundles it is possible to count the number of nerves constituting the bundle but in others they are so closely packed as to present the appearance of a single nerve.

In text-figure 1 is given a diagrammatic representation of the brain and the arrangement of the nerves in the dilated portion of the head.



TEXT-FIG. 1.—A diagrammatic representation of the brain and the nerves in the neck region of *Tylocephalum dierama* Shipley & Hornell.
br., brain ; *n.*, nerve cords.

The neck region is very short and transverse sections show a variable number of nerves ranging from 32 to 42.

NERVES IN THE EARLY SEGMENTS.

The nerve cords in the early segments are oval in transverse sections and have a diameter varying from 8·3 μ to 18·3 μ along their longest axis which has a radial direction. In frontal and sagittal sections passing near the surface, where in a single section several nerve cords may be observed lying side by side, fine fibres are seen running from one cord to another (Pl. X, fig. 9) at irregular intervals presenting a ladder-like appearance. At the hind end of the early segments the commissure is virtually absent. But in segments about 4 mm. from the posterior border of the head, the commissure could be observed as a few fibres.

In Bielchowsky iron haematoxylin material the neurones are deeply stained. A differentiation of such cells into nucleus and cytoplasm is however impossible. Either the whole neurone is yellow or it is stained blue black. The ganglionic cells appear to be of three types. Most of them are bipolar but what look like unipolar and multipolar ones are also met with (Pl. X, fig. 10, *mg.*).

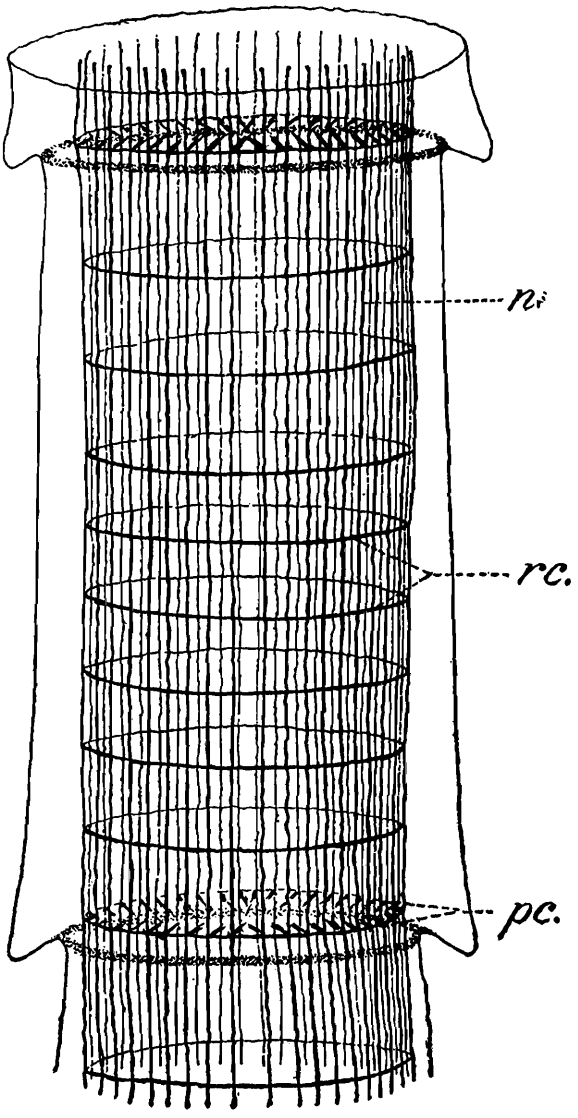
Compared to the maturing proglottides (Pl. XI, fig. 1), the neurones in the early segments seem to be more closely packed together. Though in general there is no marked concentration of ganglionic cells in any particular region of the nerve cord in a segment, occasionally cells are concentrated in particular regions, as for instance, near the posterior margin of the segments. Here unipolar and multipolar cells are found to be present. These cell aggregations do not, however, touch the posterior wall of the segment. Rarely aggregations are seen in the nerve cord about the middle of the segment.

In some regions of the nerve cords unipolar ganglion cells dominate. They are thinner than the bipolar ones, but longer. The nerve cord has a yellowish appearance in Bielchowsky iron haematoxylin preparations due to the large number of brownish nerve fibrils. Some of the ganglionic cells have a curved contour, one of the ends of the cell body touching the lateral margin of the nerve (Pl. XI, fig. 2, *nc.*). From this end the fibre could be traced to the tissue or organ innervated. The fibre from the portion of cell body parallel to the nerve cord gets mingled with the other fibres. The fibres of some of the bipolar ganglion cells which are disposed lengthwise in the nerve cord could be seen leaving the latter at some distance. Binding cells are absent and therefore the nerve cords are loose in structure. Scattered ganglion cells are often found outside the nerve cord running parallel to the nerves, between them and the cuticle. The longest diameter of the nerves in early segments varies from 8 μ to 18 μ, the body of the bipolar neurones measure from 7 μ to 15 μ in length and 1·66 μ to 3·3 μ in width and the multipolar neurones vary from 5-17 μ in length and 2-4 μ in width. In the early segments the main nerve cords do not give rise to nerve branches. Innervation is by nerve fibrils which leave the cords at irregular intervals. In the very early segments succeeding the neck region few of the organs are differentiated and one does not see the complicated tangle of nerve fibrils observed in maturing segments.

It is surprising to find on examination of several series of sections that the number of nerves is always even, if not constant and varies from 32 to 42. The usual number, however, is 38. It will be observed that while dealing with the nerves of the neck and the very early segments the same variation in number was mentioned. What strikes one in a transverse section is the constant occurrence of commissures connecting the nerve cords (Pl. XI, figs. 3, 4). This has actually the appearance of a circle of tangled fibres, the nerves forming knots in this circle. The most prominent commissure is at the hind end of each segment near the septum (Pl. XI, fig. 5).

The ring commissure appears to be formed by fibres from one nerve cord passing on to those on either side of it. The number and complexity of these ring commissures increase with the maturity of the segments, and in a mature segment itself the circular commissures are more abundant in the posterior half. The plate commissure at the posterior end of the segment is formed by a meshwork of fibrils. The meshwork is loose in the middle segments and compact in the later and mature ones. The lateral margins are strongly salient or imbricated and overlap the anterior end of the succeeding segment. Therefore the nerve cords occur at different depths from the cuticular margin

in different regions of the same proglottid. At the anterior end of each proglottid there appear to be very few layers of subcuticular cells between the nerve cord and the cuticle, and passing backward they have a deeper disposition especially near the posterior margin. Near the imbricated edge one bundle of fibres leaves each of the nerve cords to the cuticle at the level of the posterior plate commissure (Pl. XI, fig. 6). Nerve cells are not found in this branch which appears to correspond to the marginal nerve described by Tower (1900). This nerve does not proceed even half way up the segment but its fibres separate fan-wise and come into contact with the sense cells lying midway between the nerve cords and the cuticle in the subcuticular layer. Due to the salient posterior margin the septa between the segments are not exactly transverse but are semi-circular. In sections therefore we see only portions of the plate commissure (Pl. XI, fig. 5, *pc.*).



TEXT-FIG. 2.—A diagrammatic representation of the nerves and commissures in a mature segment of *Tylocephalum dierama* Shipley & Hornell.
n., nerve cords; *pc.*, plate commissure; *rc.*, ring commissure.

NERVES IN THE MATURE SEGMENTS.

As the generative organs mature and the segments increase in size and thickness, the nerve cords, which had their longest axes disposed

in a radial direction in transverse sections, become thinner, lose their oval shape, and assume an irregular appearance. Even the thickness of a nerve cord varies from region to region in the same segment.

Binding cells are absent and most of the ganglion cells are bipolar. Multipolar cells are present but unipolar ones are scarce. The measurements of these cells fairly agree in their range with those in the early segments. Here also very large ganglion cells, 17 μ by 3 μ, are occasionally met with. In Bielchowsky iron haematoxylin preparations the ganglionic cells stain blue black, and in many longitudinal sections single ganglionic cells lying outside, but parallel to the nerve cords, may be observed.

From Vom Rath preparations it appears that the nuclei of multipolar ganglion cells are almost round and have a diameter of 2·0 μ. The round nuclei of bipolar cells measure 0·83 μ to 1·66 μ and the oblong nuclei of the large bipolar cells 6·6 μ by 4·2 μ.

In Bielchowsky preparations the nuclei of the neurones are dark brown while the cytoplasm is yellow. The nucleus in bipolar cells is slightly oval, and the biggest measures 2·0 μ. The biggest unipolar ganglion cells is 10 μ long and 1·7 μ wide. The average size of nuclei in multipolar cells is 2·5 μ.

Text-figure 2 is a diagrammatic representation of the arrangement of the nerves and commissures in a mature segment.

INNERVATION OF THE VARIOUS ORGANS.

It will be seen from the foregoing account that the nerves form a cylinder enclosing the various organs in the medulla. Separate nerves to groups of organs or tissues were not observed and each organ is innervated by nerve fibrils having their origin in different nerve cords lying in the same sector containing the organ. In order to give a clear idea of the mode of innervation I shall describe first the distribution of nerve fibrils to the ovary.

(*a*) *The Ovary.*—The ovary is a globular organ, $\frac{1}{6}$ to $\frac{1}{8}$ as long as the mature segment, occupying the hinder end of the segment. It is really composed of two lobes which lie touching each other. The bilobed appearance, however, is very marked in the centre of the organ where the two lobes are caved in to lodge the shell gland. The organ is composed of radiating acini which differ in size among themselves. Owing probably to the removal of fat in the oocytes, during fixation and dehydration, these acini show only irregular scattered nuclei inside, which, with bits of cytoplasm sticking to them, represent the oocytes.

Plate XI, figure 7 is a longitudinal section showing the fibres leaving one of the nerve cords. A number of separate fibres leave the nerve cord near the junction between two acini and running along the junction either terminate in the acinus itself or proceed to the tissues and organs in the interior. As the nerve fibrils seem to take a wavy course and as there is a mingling of the fibres having their origin in different nerves or different portions of the same nerve, very few of the fibres proceeding to the inner regions could be traced along their entire course. Though no ganglionic cells occur in the posterior plate commissure,

yet in longitudinal sections nerve fibrils could be seen leaving the commissure and running between two acini.

Plate XI, figure 5 is a transverse section from a Bielchowsky preparation. It shows the fibres leaving the various nerve cords and their course in the ovary. In the dorso-ventral space between the two lobes of the ovary large numbers of fibres may be seen proceeding towards the middle. These fibres start from nerves lying near that region. The fibres from the nerves not directly above the space between the two halves of the ovary take a curved course and are joined by fibrils from the nerves lying just above it.

(*b*) *The Testicular Vesicles.*—The above description makes it easy to understand the mode of innervation of the other organs, as it is identical in all organs.

The segments of the middle region of the worms are packed with testicular vesicles ; the vitelline glands and ovary have not, however, begun to develop. Most of the testicular vesicles show fully developed sperms. Plate XI, figure 8 from a Bielchowsky preparation shows how irregular is the course of the nerve fibres from the nerve cords. The testicular vesicles are matted over with nerves fibrils, which, are shown by transverse sections, to arise from all the nerve cords.

Complex networks of fibrils occur also in regions where vitelline glands and ovary develop later. In segments where the vitelline glands and ovary are well developed the testicular vesicles are pushed into the middle owing to the development of the vitelline glands at the two sides. Some of these testicular vesicles extrude their contents and then degenerate, and in a mature segment one of the testicular vesicles lying near the cirrus pouch is considerably bigger than the others. Transverse sections show that these vesicles lying in the medulla are innervated by fibrils originating from the nerve cords lying in the same arc as the vesicle. In many cases it was observed that the bundle proceeding to the testicular vesicles was composed of many fibres, though coming from different cords.

(*c*) *The Vitelline Glands.*—After the completion of the spermatogenesis in most of the testicular vesicles, the vitelline glands begin to develop. In the mature segments they are well developed and massive and extend in some cases along the sides of the ovary to the few acini which occur in almost all segments behind the ovary.

Plate XI, figure 9 shows the innervation of the vitelline glands. It is a longitudinal section and shows the fibrils leaving a single nerve cord, while Plate XI, figure 4 shows how fibrils from a number of nerve cords take part in the innervation of an acinus.

SENSE ORGANS.

In deep impregnations many of the fibrils leaving the nerve ring or nerve cords seem to end near nuclei lying midway between the nerve cords and the cuticle. These nuclei appear to be those of the sense cell as shown previously by Blochmann (1895). Under an oil immersion, fibrils from these nuclei could be seen taking a wavy course and ending in knob-like swellings on the inner edge of the cuticle. Irregular precipitation of silver occurs on the cuticle in deep impregnations and if

most cases these end knobs are indistinct. In light impregnations they could be seen as triangular or egg-shaped structures yellowish brown in colour. Due to the wavy course of the fibrils from the sense cells, the whole fibril is not in the same plane and hence more than one photograph is required to show the fibril connections of the sense cell to the nerve ring on the one hand and the cuticle on the other. Plate XI, figure 10 shows this relation. The cytological structure of the sense cells is not very clear. Fibres going directly to the cuticle without any contact with sense cells have also been observed.

DISCUSSION.

In order to compare the nervous system of *Tylocephalum dierama* described above, a knowledge of the systematic position of the worm is essential. *Tylocephalum* possesses a typical Cyclophyllidean head, but the genitalia resemble in arrangement those of the Tetraphyllidea. This mixture of the Tetraphyllidean and Cyclophyllidean characters has led to its being included in either of the above orders. Meggitt (1924) and Fuhrmann (1930) included *Tylocephalum* in the order Tetraphyllidea, and separated the Cyclophyllidea from all the other orders on account of the compact and unpaired nature of the vitelline glands. Southwell (1925) on the other hand included it among the Cyclophyllidea arguing that if the globular portion of the head in *Tylocephalum* has arisen as a result of the fusion of the bothridia one might also assume that a similar process has occurred in the whole of the Cyclophyllidea. The various species of the genus itself show variation. In *Tylocephalum dierama* the vitelline glands occur as two massive organs whose acini extend on either side up to the anterior end of the ovary, and in many cases even to the posterior end of the segment. But in *T uarnak* the vitelline glands are single and very small and placed behind the ovary. From the above it would appear that *Tylocephalum* may possibly be a connecting link between Tetraphyllidea and Cyclophyllidea.

Cohn (1900)[1] as a result of his researches concludes that the primitive form of the nervous system which must have governed the common ancestors of Cestodes should have been an irregular network traversing unbrokenly the entire body of the Cestodes. He states that in all the Cestodes studied by him the two main longitudinal stems have already been differentiated and therefore considers the nervous system of *Ligula* as the simplest of the extant types. *Ligula* and *Schistocephalus* have two main longitudinal stems and a much larger number of longitudinal nerves than any other Cestode. The main reason for the belief that they occupy the lowest position is that all the longitudinal nerves—the two main ones excepted—are exactly similar and without any secondary differentiation. Cohn argues therefore that the meagre adaptation of these animals to intestinal parasitism is the cause for the absence of any differentiated development in these animals, and this seems to be substantiated by the insignificant development of the sucker grooves and the resulting simplicity of the scolex innervation.

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[1] My thanks are due to Mr. N. T. Mathew, *M.Sc.*, for help in translation of the paper.

It will be seen that the nervous system of *Tylocephalum* is more primitive than that of *Ligula* and *Schistocephalus*. The brain is a cap-shaped plate from which arise 32-42 nerves. As in *Ligula* and *Schistocephalus* there is an irregular meshwork of nerve fibrils at the very anterior end of the proglottid chain, though further behind the meshes have differentiated themselves into ring commissures. But Cohn's explanation that the primitive nature of the nervous system of *Ligula* and *Schistocephalus* is due to their meagre adaptation to intestinal parasitism does not hold good in the case of *Tylocephalum*. Development of suckers on the head is a distinct adaptation to parasitism, but why *Tylocephalum* has a simpler nervous system than *Ligula* is at present inexplicable. The question whether the nervous system of *Tylocephalum* is the simplest in the polyzootic Cestodes cannot also be answered until many more members of the different families of Cestodes are investigated. As simplicity of arrangement of the nervous system does not indicate poor adaptation in *Tylocephalum* it is likely that further exhaustive studies may alter entirely the present conceptions of the phylogenetic relationships among the various orders of Cestodes.

SUMMARY AND CONCLUSIONS.

The nervous system of *Tylocephalum dierama* is very simple in plan. The brain is not constituted by a system of ganglia but is plate-like and the slight differences in shape observed in different examples are due to the various degrees of contraction of the head and myzorhynchus. Bundles of fibres proceed from the brain and get distributed at the anterior edge of the myzorhynchus. There are large and small ganglion cells in the brain. Thirty-two to forty-two nerves, all of the same thickness, run through the length of the proglottid chain. A meshwork of nerve fibrils connecting the nerve cords is present at the extreme anterior end of the proglottid chain but further behind the meshes have differentiated themselves into ring commissures. The commissure at the posterior end of each proglottid is plate-like. The nervous system of *Ligula* and *Schistocephalus* is supposed to be the most primitive as the insignificant development of the sucker grooves in these animals indicates a poor adaptation to parasitism. These animals have two main lateral stems and a far larger number of longitudinal nerves than any other Cestode. In *Tylocephalum dierama* all the nerves are of the same size, and therefore it is assumed that its nervous system is more primitive than that of the two above mentioned animals. As simplicity of arrangement of the nervous system does not indicate poor adaptation in *Tylocephalum*—as evidenced by the presence of suckers —it is likely that further exhaustive studies may alter entirely the present conceptions regarding the phylogenetic relationships among the various orders of Cestoda.

ACKNOWLEDGMENT.

I wish to express my grateful thanks to Professor R. Gopala Aiyar for his criticisms and encouragement.

Explanations of lettering in plates.

Br., Brain ; *cm.*, Circular muscles ; *lm.*, Longitudinal muscles ; *mg.*, Multipolar ganglion cells ; *mn.*, Marginal nerve ; *n.*, Nerve cord ; *nc.*, Nerve cells ; *nf.*, Nerve fibrils ; *oa.*, An Acinus of the ovary ; *pc.*, Plate commissure ; *rc.*, Ring commissure ; *sc.*, Sense cells ; *tv.*, Testicular vesicles.

Bibliography.

Blochmann, von F., 1895.—Ueber Freie Nervendigungen und Sinneszellen bei Bandwurmern. *Biol. Zentralbl.* XV, pp. 14-25.

Cohn, L., 1900.—Untersuchungen über das centrale Nervensystem der Cestoden. *Zool. Jahrb. Anat.* XII, pp. 89-160.

Fuhrmann, O., 1930.—Cestoidea—in Kükenthal and Krumbach's *Handb. d. Zool.* II. (2).

Meggitt, F. J., 1924.—*The Cestodes of Mammals.* London.

Southwell, T., 1925.—A Monograph on the Tetraphyllidea. *Liverpool Sch. Trop. Med. Mem.* (N. S.) II.

Southwell, T., 1930.—*Fauna of British India.* Cestoda. Vol. I.

Subramaniam, M. K., 1939.—Studies on Cestode Parasites of Fishes. I. *Biporophyllaeus madrassensis* gen. *et* sp. nov., with a note on its Systematic position. *Rec. Ind. Mus.* XLI, pp. 131-149.

Tower, W. L., 1900.—The Nervous System in the Cestode *Moniezia expansa*. *Zool. Jahrb. Anat.* XIII, pp. 359-385.

EXPLANATION OF PLATE X.

FIG. 1.—A longitudinal section showing the subcuticular circular and longitudinal muscles and the nerve cord. Bielchowsky. Iron Haematoxylin : ×636.

FIG. 2.—A longitudinal section of the head showing the brain. Vom Rath. Iron Haematoxylin : ×195.

FIG. 3.—A longitudinal section showing the brain and bundles of nerve fibrils to the tip of the myzorhynchus. Bielchowsky : ×195.

FIG. 4.—A portion of the brain magnified to show the large ganglion cells. Vom Rath. Iron Haematoxylin : ×636.

FIG. 5.—A transverse section showing the brain and the radiating nerve fibrils. Bielchowsky : ×288.

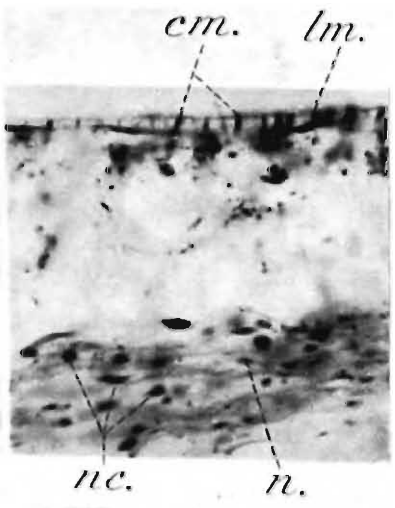
FIG. 6.—A transverse section showing the arrangement of the small ganglion cells in the brain. Vom Rath. Iron Haematoxylin : ×195.

FIG. 7.—A portion of the brain seen in Fig. 6. enlarged. Vom Rath. Iron Haematoxylin : ×636.

FIG. 8.—A transverse section showing the arrangement of the nerves in the dilated portion of the head. Bielchowsky : ×195.

FIG. 9.—A longitudinal section showing the ladder-like connections between two adjacent nerve cords in the early segments. Bielchoswky. Iron Haematoxylin : ×660.

FIG. 10.—A longitudinal section showing multipolar and bipolar ganglion cells in the early segments. Bielchowsky. Iron Haematoxylin : ×636.



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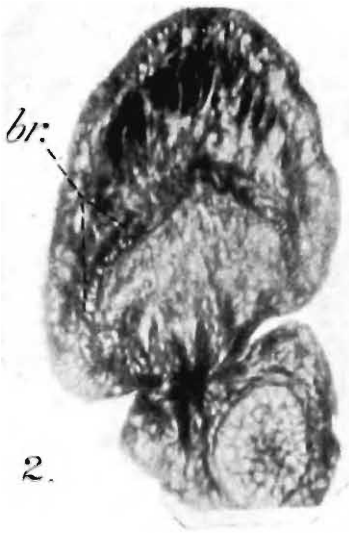

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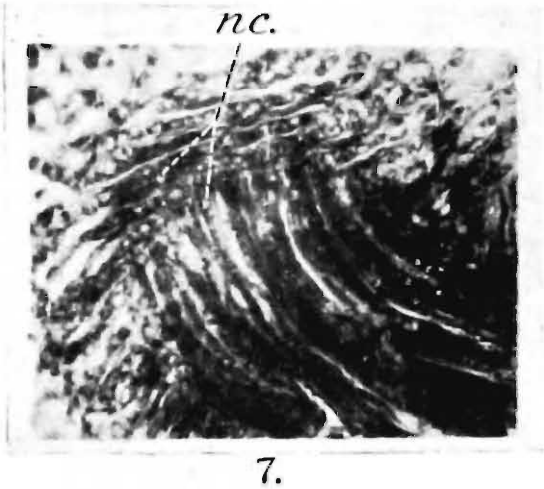

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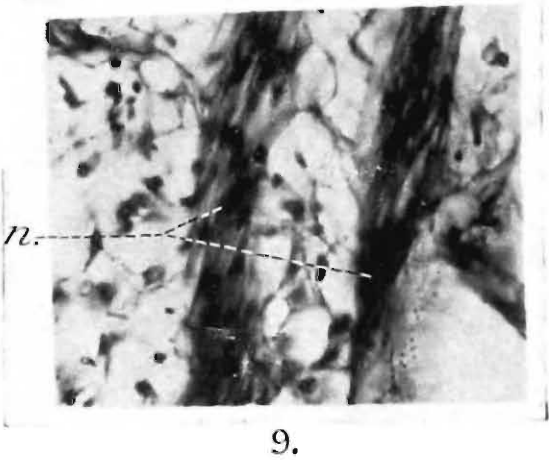

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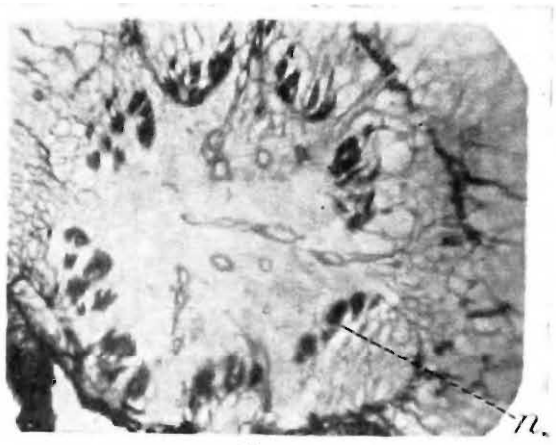

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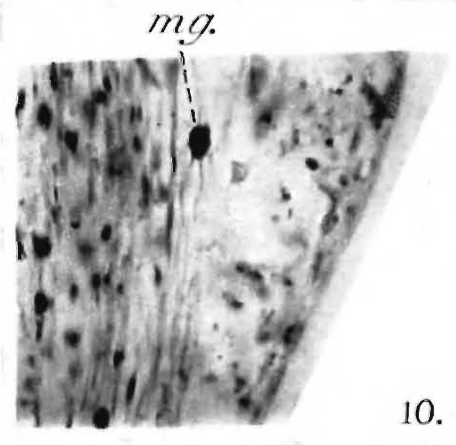

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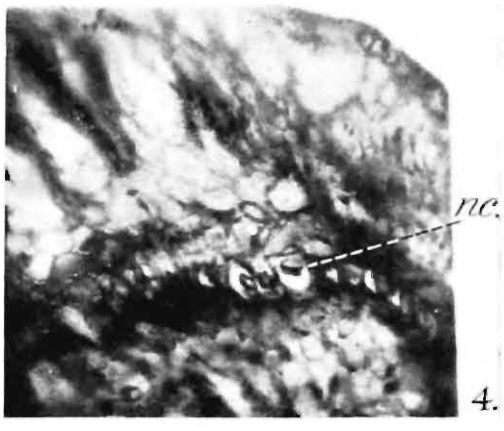

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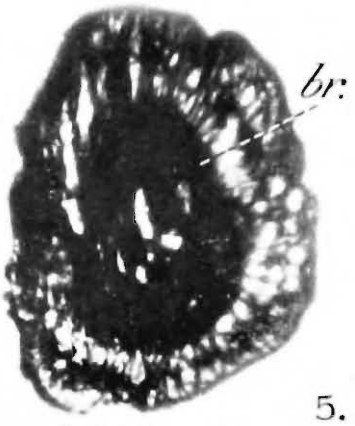

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6.

Nervous System of *Tylocephalum dierama.*

EXPLANATION OF PLATE XI.

FIG. 1.—A longitudinal section showing the nerve cord in a mature segment. Bielchowsky. Iron Haematoxylin: ×636.

FIG. 2.—A longitudinal section showing nerve cells lying transversely in the nerve cord. Bielchowsky. Iron Haematoxylin: ×636.

FIG. 3.—A transverse section of the mature segment showing the nerve cords and the ring commissure. Bielchowsky: ×636.

FIG. 4.—A transverse section showing nerve fibrils proceeding from a nerve cord to innervate the vitelline glands and structures in the medulla. Bielchowsky: ×660.

FIG. 5.—A transverse section showing the plate commissure and the nerve fibrils innervating the acini of the ovary. Bielchowsky: ×195.

FIG. 6.—A longitudinal section showing the marginal nerve. Bielchowsky: ×660.

FIG. 7.—A longitudinal section showing the nerve fibrils leaving one of the nerve cords for the innervation of the acini of the ovary. Bielchowsky: ×636.

FIG. 8.—A longitudinal section showing the arrangement of nerve fibrils in a segment in the middle of the proglottid chain. Bielchowsky: ×180.

FIG. 9.—A longitudinal section of a mature proglottid showing the bundles of nerve fibrils leaving one of the nerve cords for the innervation of the vitelline glands and the testicular vesicles. Bielchowsky: ×219.

FIG. 10.—A portion of a transverse section of a mature segment showing sense cells and fibrils from sense cells terminating in the cuticle. Bielchowsky: ×660.

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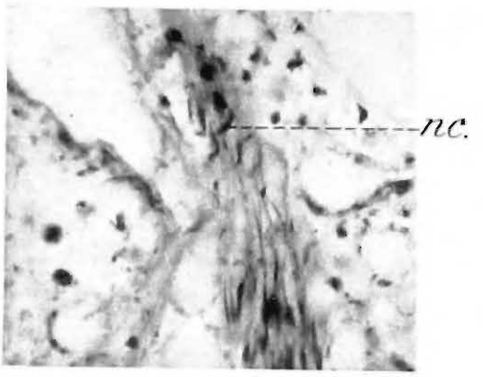

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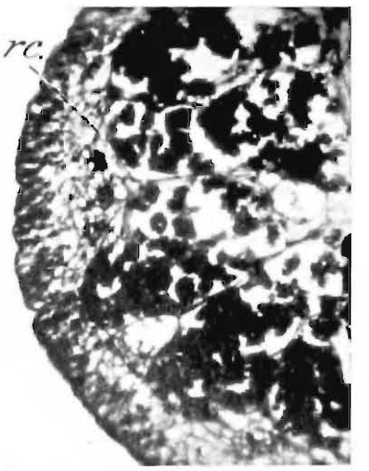

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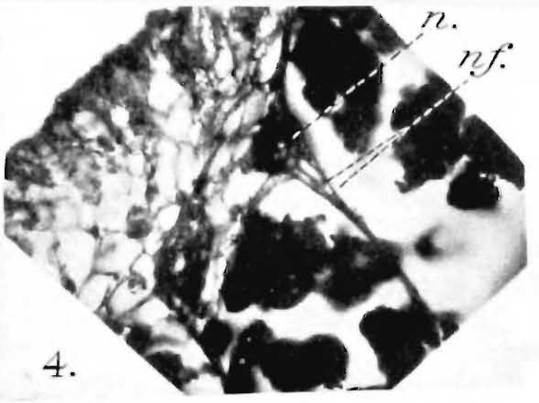

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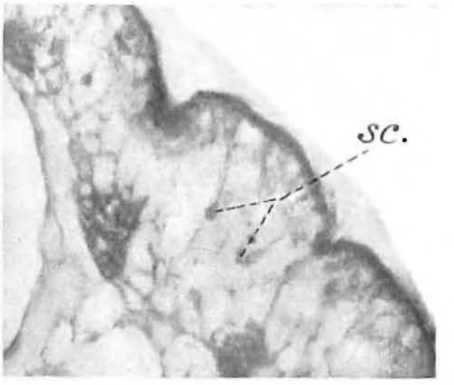

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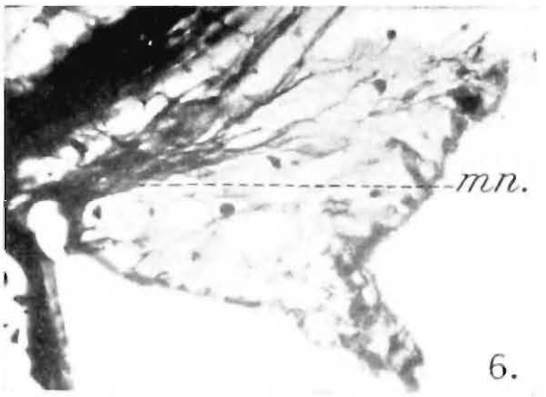

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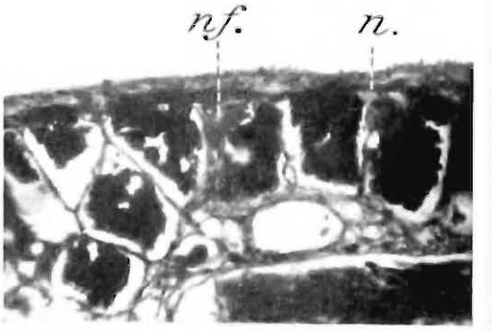

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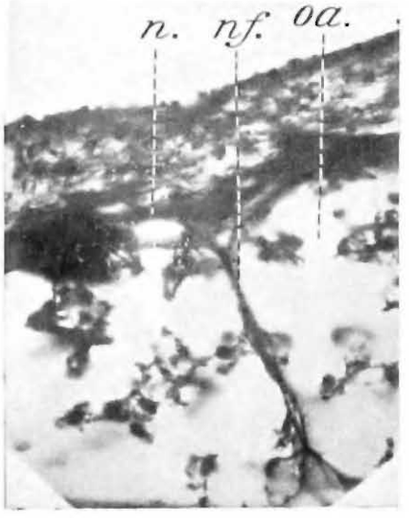

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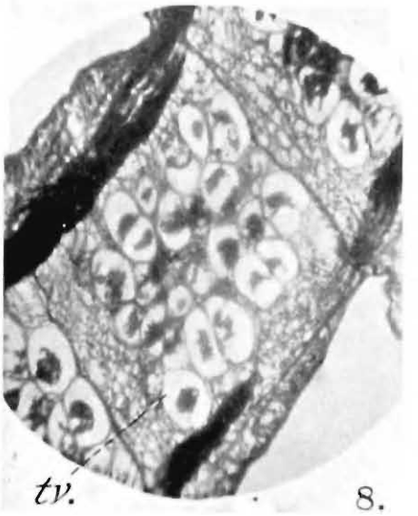

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5.

Nervous System of *Tylocephalum dierama*.

CATALOGUE OF BIRDS IN THE INDIAN MUSEUM, CALCUTTA.

I. COLUMBAE (PIGEONS AND DOVES).

By M. L. ROONWAL, *M.Sc., Ph.D. (Cantab.), Zoological Survey of India, Calcutta.*

CONTENTS.

I. FOREWORD.

The bird skins in the collection of the Museum of the Asiatic Society[1], which formed the nucleus of the Indian Museum collection of birds, were listed by Edward Blyth in his well known *Catalogue of the Birds in the Museum of the Asiatic Society of Bengal* in 1849. Subsequent to the foundation of the Indian Museum this bird collection grew enormously as a result of the disinterested but devoted labours of a number of distinguished ornithologists in the country; their names are given in the list published by Sclater in his account of the India Museum collection[2]. In addition, a number of skeletons of birds, a small collection of bird eggs, and a few nests, have been added to the collection from time to

[1] All collections in the Museum of the Asiatic Society of Bengal, Calcutta, were formally transferred to the authorities of the newly constituted Indian Museum about 1865, though the building of the Museum was not completed till 1875.

[2] Sclater, W. L., *Ibis* (6) IV, pp. 69-71 (1892).

time. On the foundation of the Zoological Survey of India in 1916, the bird collection, together with all other collections in the Natural History section, including Ethnology, were transferred to the Director, Zoological Survey of India, and have been under his charge since that date.

The large collection of bird skins, however, remained almost entirely uncatalogued, except for being serially entered in a number of accession registers as the skins were received and identified.

The only published catalogues of this collection are the following :—

(1) *A List of Birds' Eggs in the Indian Museum, Calcutta.* (Author not given.) 1st edition : 1890. 2nd edition : 1891.

(2) *A List of Type-specimens in the Indian Museum Collection and a Brief History of the Collections as a whole,* by W. L. Sclater, *Ibis* (6) IV, pp. 69-71 (1892).

(3) *List of Birds in the Indian Museum,* by F. Finn[1] :

Part I (1901)—Families : Corvidae, Paradiseidae, Ptilonorhynchidae and Crateropodidae.

Part II (1905)—Families : Sittidae, Dicruridae, Certhiidae, Regulidae and Sylviidae.

The bird collection in the Indian Museum at present consists of nearly 27,000 registered and a few hundred unregistered skins. Outside workers are naturally handicapped in the study of the Indian birds owing to the absence of any information regarding the collections in the Indian Museum. This is particularly unfortunate, as the Indian Museum collection, in so far as the Indian birds are concerned, is probably only next to the collection in the British Museum both in regard to its size and importance. Unfortunately this state of affairs could not be remedied, as ever since Mr. Frank Finn's retirement from the Indian Museum staff in 1904 no suitably trained officer has been in charge of the Bird Collection. In 1939, Dr. M. L. Roonwal was appointed as a probationer to look after the collections of birds and mammals, and soon after his appointment, it was decided to make a start by preparing an up-to-date catalogue of the collection. The first part of this Catalogue—on Columbae or Pigeons and Doves, which Dr. Roonwal has prepared—is now issued. Catalogues of the other orders will be prepared and published as and when ready.

The collection of birds in the Indian Museum is, as noted above, fairly large, but it is not fully representative of all the species found in India. Several species are either totally unrepresented, or only a few badly preserved skins are available. I take this opportunity of requesting workers all over the country to help us in filling up the lacunae in the collection of India's National Museum of Natural History. The desiderata in regard to Pigeons and Doves are listed on pp. 288, 289, but any specimens for increasing the collection and filling up the lacunae will be very gratefully received.

INDIAN MUSEUM,
Calcutta ;
16th June, 1941.

BAINI PRASHAD,
Director,
Zoological Survey of India.

[1] Only two parts of the list were published.

II. INTRODUCTION.

(*a*) *CLASSIFICATION OF THE COLUMBAE.*

Owing to the structural uniformity of the Columbae, the classification of this order is not easy, and the various schemes of classification suggested have not found general acceptance. Salvadori (1893), after a study of the Pigeons and Doves of the world, introduced the following classification which is, so far, the best available. I have adopted this classification, with such changes in family and subfamily names as are indicated by alterations in generic nomenclature—the new family and subfamily names are given within brackets.

(i) *Salvadori's classification.*

Ord. COLUMBAE.

Subord. I. *COLUMBAE.*

Fam. (i) TRERONIDAE.

Subfam. 1. *TRERONINAE.*

Subfam. 2. *PTILOPODINAE* (modern *PTILINOPINAE*).

Subfam. 3. *CARPOPHAGINAE* (modern *DUCULINAE*).

Fam. (ii) COLUMBIDAE.

Subfam. 1. *COLUMBINAE.*

Subfam. 2. *MACROPYGIINAE.*

Subfam. 3. *ECTOPISTINAE.*

Fam. (iii) PERISTERIDAE (modern CLARAVISIDAE).

Subfam. 1. *ZENAIDINAE.*

Subfam. 2. *TURTURINAE* (now merged into *COLUMBINAE*).

Subfam. 3. *GEOPELIINAE.*

Subfam. 4. *PERISTERINAE* (modern *CLARAVISINAE*).

Subfam. 5. *PHABINAE.*

Subfam. 6. *GEOTRYGONINAE.*

Subfam. 7. *CALOENADINAE.*

Fam. (iv) GOURIDAE.

Fam. (v) DIDUNCULIDAE.

Subord. II. *DIDI.* (Extinct.)

The following new names have to be adopted for the reasons given below :—

Ptilopodinae, based on genus *Ptilopus* Strickland 1841 (not Schönherr 1826), is changed to Ptilinopinae, based on genus *Ptilinopus* Swainson 1825, which replaces *Ptilopus* Strickland. Carpophaginae, based on genus *Carpophaga* Selby 1835, is changed to Duculinae, based on genus *Ducula* Hodgson 1836, which includes *Carpophaga* Selby. Peristeridae and Peristerinae, based on genus *Peristera* Swainson 1827 (not Rafinesque 1815), are changed to Claravisidae and Claravisinae respectively, based on genus *Claravis* Oberholser 1899, which replaces *Peristera* Swainson. Turturinae, based on genus *Turtur* Selby 1835 (not Boddaert 1783) is given up being merged into Columbinae, as *Turtur* Selby, which was the sole genus in the subfamily Turturinae as used by Salvadori, is now merged into the genus *Streptopelia* Bonaparte 1855 belonging to the subfamily Columbinae[1]. Also see Peters 1937, for some changes in generic nomenclature.

The revised classification of the Suborder Columbae as employed in the present Catalogue is given below. Families and subfamilies

[1] The modern genus *Turtur* Boddaert 1783 (=*Chalcopelia* Bonaparte 1855 of Salvadori) belongs to the subfamily Phabinae.

occurring within the Indian limits[1] are marked with a dagger (†), while all those represented in the Indian Museum collection are marked with an asterisk (*).

Subord. *COLUMBAE.*
- Fam. (i) *†TRERONIDAE.
  - Subfam. 1. *†*TRERONINAE.*
  - Subfam. 2. **PTILINOPINAE.*
  - Subfam. 3. *†*DUCULINAE.*
- Fam. (ii) *†COLUMBIDAE.
  - Subfam. 1. *†*COLUMBINAE.*
  - Subfam. 2. *†*MACROPYGIINAE.*
  - Subfam. 3. *ECTOPISTINAE.*
- Fam. (iii) *†CLARAVISIDAE.
  - Subfam. 1. *ZENAIDINAE.*
  - Subfam. 2. *†*GEOPELIINAE.*
  - Subfam. 3. *CLARAVISINAE.*
  - Subfam. 4. *†*PHABINAE.*
  - Subfam. 5. **GEOTRYGONINAE.*
  - Subfam. 6. †*CALOENADINAE.*
- Fam. (iv) GOURIDAE.
- Fam. (v) DIDUNCULIDAE.

(ii) *Other classifications.*

Peters (1937) has combined the Sand-grouse (Suborder Pterocletes) and the Pigeons and Doves (Suborder Columbae) into the Order Columbiiformes. The Suborder Columbae is further divided as follows :—

Fam. (i) RAPHIDAE (=DIDI of Salvadori). Extinct.
Fam. (ii) COLUMBIDAE.
- Subfam. 1. *TRERONINAE* (=*TRERONIDAE* of Salvadori).
- Subfam. 2. *COLUMBINAE* (=*COLUMBIDAE* + *PERISTERIDAE* of Salvadori).
- Subfam. 3. *GOURINAE* (=*GOURIDAE* of Salvadori).
- Subfam. 4. *DIDUNCULINAE.* (=*DIDUNCULIDAE* of Salvadori).

Peters's Treroninae and Columbinae are large, unwieldy subfamilies, which it is preferable to divide further according to Salvadori's subdivisions which appear to be both natural and practical.

Stuart Baker (1928, p. 179) had adopted the following grouping for the Indian species :—

Ord. COLUMBAE.
- Fam. COLUMBIDAE.
  - Subfam. 1. *TRERONINAE.*
  - Subfam. 2. *GEOPELIINAE.*
  - Subfam. 3. *DUCULINAE.*
  - Subfam. 4. *CALOENADINAE.*
  - Subfam. 5. *PHABINAE.*
  - Subfam. 6. *COLUMBINAE.*

The comparative importance of the subfamilies is here either over- or under-emphasized as the classification does not take into account extra-Indian subfamilies.

(*b*) *INDIAN SPECIES OF THE COLUMBAE.*

The home of the Columbae (Pigeons and Doves, but excluding the Raphidae) is the Indo-Malayan Region where they are found in great abundance and variety ; both these features, however, tail off in the Australian Region. The Palaearctic Region (Old World) is poor in Columbae, and the New World still poorer.

Of the 59 world genera and 841 species and subspecies (including 30 doubtfully distinct and 5 extinct forms) recognised by Peters (1937),

[1] By the term " Indian limits " is meant the following area : The whole of India (politically so known, including Gilgit and the North-West Frontier Province in the north to Cape Comorin in the south, and from British Baluchistan and Indian Mekran in the west to Assam in the east) ; Burma south to Tenasserim ; Ceylon ; and the Andamans, the Nicobars and other islands in the Indian Ocean. These are the limits covered by the official *Fauna of British India, Birds*, 2nd ed., Vols. I-VIII (1922-30) by Stuart Baker.

there are represented within the Indian limits 10 genera and 59 species and subspecies—if *Dendrophassa bicincta praetermissa* (Rob. & Kl.) is regarded as distinct from *D. b. bicincta* (Jerd.), the number 59 would be raised to 60. If the genera and forms recognised by Stuart Baker (1928) are accepted, there occur within the Indian limits 18 genera and 62 species and subspecies. The reasons for this difference are given below; it may be added that Peters is in many cases supported by Ticehurst (1930) who has given reasons for not including certain forms as Indian.

Dendrophassa bicincta praetermissa (Rob. & Kl.).—This subspecies is admitted by Stuart Baker. Peters, however, does not separate it from the typical *bicincta*. I have tentatively accepted *praetermissa* (but *vide* pp. 301-304).

The following three subspecies are regarded by Stuart Baker as occurring within the Indian limits, but Peters does not include India within their range :—*Columba livia livia* Gm., *Streptopelia turtur turtur* (Linn.) and *Streptopelia senegalensis ermanni* (Bonap.).

Chalcophaps indica maxima Hartert.—This subspecies from the Andamans was first recognised in 1931, and is accepted by Peters. Stuart Baker (1928) included the Andaman birds under *C. i. indica* (Linn.).

For the Indian forms I have retained the 18 genera used by Stuart Baker, except *Sphenocercus* G. R. Gray 1840 which is replaced by the earlier *Sphenurus* Swainson 1837. Table 1 below gives a list of Stuart Baker's Indian genera and their equivalent under Peters's nomenclature.

TABLE 1.

Generic names of Indian Columbae as used by Stuart Baker (1928) and by Peters (1937).

Stuart Baker.	Peters.
1. *Crocopus* Bonaparte	Merged into *Treron* Vieillot.
2. *Dendrophassa* Gloger	Merged into *Treron* Vieillot.
3. *Treron* Vieillot ..	Merged into *Treron* Vieillot.
4. *Butreron* Bonaparte ..	*Butreron* Bonaparte.
5. *Sphenocercus* G. R. Gray (1840) ..	*Sphenurus* Swainson (1837).
6. *Ducula* Hodgson	Merged into *Ducula* Hodgson.
7. *Muscadivora* Selby ..	Merged into *Ducula* Hodgson.
8. *Myristicivora* Reichenbach ..	Merged into *Ducula* Hodgson.
9. *Caloenas* G. R. Gray	*Caloenas* G. R. Gray.
10. *Chalcophaps* Gould ..	*Chalcophaps* Gould.
11. *Columba* Linnaeus ..	Merged into *Columba* Linnaeus.
12. *Alsocomus* Blyth ..	Merged into *Columba* Linnaeus.
13. *Ianthoenas* Reichenbach ..	Merged into *Columba* Linnaeus.
14. *Dendrotreron* Hodgson	Merged into *Columba* Linnaeus.
15. *Streptopelia* Bonaparte	Merged into *Streptopelia* Bonaparte.
16. *Oenopopelia* Blanford	Merged into *Streptopelia* Bonaparte.
17. *Macropygia* Swainson	*Macropygia* Swainson.
18. *Geopelia* Swainson	*Geopelia* Swainson.

The majority of the Indian Columbae regularly breed within the Indian limits. In a few cases, namely, *Dendrophassa pompadora chloroptera* (Blyth) and *Janthoenas palumboides* (Hume), although the birds most probably breed within the Indian limits, nothing is known of their nidification. *Columba leuconota gradaria* Hartert has as yet been known as breeding only in the region around Gyantse (southern Tibet); no breeding records of it are available within the Indian limits, but it is not unlikely that the bird might be breeding near the borders of Tibet and Yunnan. Similarly, *Geopelia striata striata* (Linnaeus) is so far known to breed in the Malay Peninsula and further south, but no breeding records are available within the Indian limits although the bird occurs in southern Tenasserim; it is not unlikely that a few breeding birds might be found in southern Tenasserim. Of *Streptopelia turtur arenicola* (Hartert) no authentic breeding record within the Indian limits is available. *Butreron capellei* (Temminck) is a straggler in Mergui from the Malay Peninsula, etc., and is not known to breed within the Indian limits. Finally, *Columba eversmanni* Bonaparte is only a winter visitor to India and is not known to breed within the Indian limits.

The greater number of the Indian Columbae are resident and non-migratory although several species do undergo local migrations. The following 10 species and subspecies are migratory (apart from local migrations), some strongly so, others comparatively slightly :—*Sphenurus sphenurus sphenurus* (Vigors), *Myristicivora bicolor* (Scopoli), *Columba leuconota leuconota* Vigors, *Columba leuconota gradaria* Hartert, *Columba eversmanni* Bonaparte, *Columba pulchricollis* Blyth, *Dendrotreron hodgsonii* (Vigors), *Streptopelia turtur arenicola* (Hartert), *Streptopelia orientalis orientalis* (Latham) and *Streptopelia orientalis meena* (Sykes).

(c) GENERAL PARTICULARS REGARDING THE COLUMBAE SKINS IN THE INDIAN MUSEUM.

(i) *General.*

The Indian Museum collection of the Columbae consists of some 675 skins of which 520 are of forms occurring within the Indian limits; the remaining 155 are extra-Indian. All of these, with the exception of 20 skins of foreign Columbae which could not be identified, are included in the present Catalogue. They comprise 28 genera and some 96 species and subspecies. Of these latter, 54 species and subspecies are Indian, 6 (or 7) of a known total of 59 (or 60) being not represented in the collection; and the remainder are foreign.

The skins in the Indian Museum are mostly rather old and represent most of the collection of the Asiatic Society of Bengal which formed the nucleus of the Indian Museum collection. Most of the skins and types listed by Blyth (1849) are available, although some have now become brittle and their colour faded. The donors who largely contributed towards the building up of the Museum's collection of Columbae are mentioned below :—

E. Blyth (1849, *Catal. Birds Mus. Asiat. Soc. Bengal*); T. C. Jerdon (1848, a few skins from South India); V Ball (1868, several skins from

Bihar); Dr. J. Anderson (some skins from Upper Burma and Western Yunnan collected during the two British Expeditions to Yunnan during 1868 and 1875 and described in 1879 in *Zool. Results Two Yunnan Exped., 1868, 1875*; also some skins from Tenasserim and the Mergui Archipelago, 1882); Capt. (later Major and afterwards Sir O. B.) St. John (1870, some skins from southern Iran); Dr. G. Henderson (several skins collected in the Punjab, Kashmir and Eastern Turkestan during Forsyth's First Yarkand Mission of 1870, and described in Henderson & Hume's *Lahore to Yarkand*, 1873); W. T. Blanford (an excellent series of skins from Eritrea and Abyssinia collected during the British Abyssinian Expedition of 1867-68, and described in his *Obs. Geol. Zool. Abyssinia*, 1870; Blanford also presented some skins from Baluchistan and eastern Iran obtained during the travels of the Persian Boundary Commission, 1870-72, and described in *Eastern Persia*, Vol. II, *Zool. & Geol.*, 1876, by Blanford); Dr. F. Stoliczka (a large series of excellently preserved skins from Kashmir and Eastern Turkestan obtained during Forsyth's Second Yarkand Mission of 1873-74 during which Stoliczka lost his life—the results were published by Sharpe in *Sci. Results Second Yarkand Miss.: Aves*, 1881); Dr. J. Scully (a fine collection of skins from Eastern Turkestan, especially from the neighbourhood of Yarkand, made in 1874-75, and described by him in *Str. Feath.* IV, pp. 41-205, 1876; and a smaller collection from Nepal made in 1878 and described by him in *Str. Feath.* VIII, pp. 339-342, 1879); Surgeon J. Armstrong (1878, a large and excellent series of skins from the Konkan Coast, especially Ratnagiri District and the immediately adjoining areas[1]); Dr. J. E. T. Aitchison (a few skins from the Afghanistan-Iran frontier collected during the travels of the Afghan Boundary Commission of 1885, and described by Sharpe in *Trans. Linn. Soc. Lond.* (2) V pp. 66-93, 1889); C. B. Rickett (1890-91, some skins from Foochow in eastern China); Lt.-Col. Dr. A. W Alcock (some skins from the Pamirs, collected during the Pamir Boundary Commission of 1896, and described by him in 1898 in *Rept. Nat. Hist. Results Pamir Bound. Comm.*); C. B. Antram (several skins collected in about 1904 or earlier from the Sylhet Division in Assam); Dr. S. W Kemp (a few skins collected in the Abor country in north Assam during the British Abor Expedition of 1911-12, and described by Stuart Baker in *Rec. Ind. Mus.*, VIII, pp. 286, 287, 1913); and Dr. S. C. Law (a few skins from Bihar collected in 1927). Apart from these, there are a number of skins from the Trivandrum Museum and

[1] Sclater (1892, p. 70) wrongly refers the Armstrong collection to the Malabar Coast. Surgeon J. Armstrong, who belonged to the Marine Survey of India, collected extensively in the Ratnagiri District and adjoining areas (portions of Savantvadi and Kolhapur States) mostly during 1877-1878. An account of his collections, as far as I know, was never fully published, but the collections were deposited in the Indian Museum, Calcutta. The localities from which Armstrong's Columbae skins came are: "Waghotan" (=Vaghotan), "Fanasgaon" (=Phanasgaon) and "Bhoura" or "Bhowra" which is the name given on the labels, but cannot be satisfactorily traced. I have identified it with Bavda (town and *taluk*) in the Kolhapur State not far from the Ratnagiri District-Kolhapur Frontier. Vidal (1880) in his list of South Konkan birds also utilised Armstrong's list supplied by the latter; Vidal used the name Bavda which must be the same as "Bhoura" or "Bhowra" used by Armstrong on his labels in the Indian Museum skins. Since the altitude given by Armstrong for "Bhoura" varies from 1,500 to 2,500 feet, he was probably referring to Bavda *taluk* rather than Bavda town. A report on the entire Armstrong collection of birds is under preparation and will be published in due course.

from the former Riddell Museum (Agra); others are labelled as donated by "Mus. Coll. Jaffa" which I cannot locate; as "Mus. Coll." which means (*vide* Sclater, 1892, p. 71) that they were collected by an official collector of the Indian Museum; and finally, a few are presentations or exchanges from foreign museums and societies.

(ii) *Type-specimens.*

Sclater (1892, p. 86) had stated that the types of four species, namely, *Crocopus viridifrons* (Blyth), *Crocopus chlorigaster* (Blyth), *Osmotreron chloroptera* (Blyth) and *Macropygia rufipennis* Blyth, are present in the Indian Museum. Besides these four, I have found that the types of two others, namely, *Muscadivora aenea pusilla* (Blyth) and *Streptopelia decaocto stoliczkae* (Hume), are also present. Some of the particulars given by Sclater differ from my conclusions, and are discussed under the species concerned.

The following types are present in the Indian Museum (Table 2):—

TABLE 2.

Type-specimens of the Columbae in the Indian Museum, Calcutta.

Name.	Nature of type-specimen.	Discussion on
1. *Crocopus phoenicopterus viridifrons* (Blyth).	Lectotype; and one Syntype.	p. 293.
2. *Crocopus phoenicopterus chlorigaster* (Blyth).	Lectotype; and two Syntypes.	p. 294.
3. *Dendrophassa pompadora chloroptera* (Blyth).	Lectotype; and three Syntypes.	p. 299.
4. *Muscadivora aenea pusilla* (Blyth)	Holotype; and one Syntype.	p. 314.
5. *Streptopelia decaocto stoliczkae* (Hume)	Holotype ..	p. 354.
6. *Macropygia rufipennis* Blyth	Lectotype; and two Syntypes.	p. 343.

(iii) *Indian pigeons and doves unrepresented or poorly represented in the Indian Museum.*

The number indicated within the square brackets gives the number of skins present:—

1. *Dendrophassa pompadora pompadora* (Gmelin)—[Nil].
2. *Dendrophassa fulvicollis fulvicollis* (Wagler)—[Two].
3. *Dendrophassa bicincta leggei* (Hartert)—[One].
4. *Ducula badia badia* (Raffles)—[One].
5. *Ducula badia griseicapilla* Walden—[Two].
6. *Muscadivora aenea aenea* (Linnaeus)—[Two].
7. *Muscadivora aenea insularis* (Blyth)—[Nil].
8. *Columba leuconota gradaria* Hartert—[Nil].

9. *Columba torringtoni* (Bonaparte)—[One].
10. *Columba pulchricollis* Blyth—[Nil].
11. *Janthoenas palumboides* (Hume)—[One].
12. *Streptopelia chinensis forresti* Rothschild—[Nil].
13. *Streptopelia chinensis ceylonensis* (Reichenbach)—[Two].
14. *Streptopelia decaocto xanthocyclus* (Newman)—[One].
15. *Oenopopelia tranquebarica murmensis* Hartert—[Two].
16. *Macropygia ruficeps assimilis* Hume—[Nil].
17. *Chalcophaps indica maxima* (Hartert)—[Two].
18. *Chalcophaps indica robinsoni* Stuart Baker—[Two].

(*d*) GENERAL REMARKS.

Nomenclature.—In regard to generic and specific nomenclature I have followed Stuart Baker (1928) for the Indian species. Regarding the non-Indian species, I have, as far as possible, followed Peters (1937).

Measurements.—All measurements have been taken on dried museum skins, except in a few cases indicated in the text where the original " fresh " measurements indicated on the labels are given. Doubtful measurements are given within round brackets, while the measurements of juveniles are enclosed within square brackets. The following measurements are given for most skins :—

Wing (W.) : From the bend of the wing to the tip of the longest primary with the quills flattened out.

Tail (Tl.) : From the base of the central tail-feathers to the tip of the longest tail-feather.

Tarsus (Tr.) : From the tarso-metatarsal joint to the metatarso-digital joint (base of the middle toe).

Culmen (C.) : From the base of the exposed culmen, including cere, to the tip. This is the method adopted by Stuart Baker in the *Faun. Brit. Ind., Birds* (2nd ed.) I, 1922. The " culmen " thus measured differs from the " bill " of some writers, the latter measurement being taken from the junction of the bill with the skull to the tip of the bill.

Localities.—The exact determination of the localities as indicated on the labels gave no end of trouble. For, in most cases neither the Province nor the District was mentioned, and the place-names, familiar enough to the collector, are often not to be found in the usual atlases and sometimes not even in the larger maps. In some cases the older spellings of places differ so markedly from the modern ones as to render their being traced in the gazetteers a most intricate task. Wherever possible I have checked the names from the maps and accounts published along with the report of a particular collection. In this way, it is hoped, that most of the localities have been correctly identified. In nearly every case I have given the Province and, where necessary, the District, as demarcated to-day, along with the place-names.

Abbreviations used.—The following abbreviations have been used throughout :

♂, ♀—Male and female respectively in which the sex was *presumably originally determined by an examination of the gonads,* since it is clearly indicated on the original collector's label or in the Indian Museum registers. Many of the older specimens bear the mark ♂ ; this has been

interpreted as ♂, and in some cases it has been possible to test the accuracy of this interpretation by reference to the plumage of the specimens.

(♂), (♀)—Male and female respectively as determined by an examination of plumage alone. The gonads were not examined for the determination of sex, as is indicated by the absence of sexing on the original collector's labels or in the Indian Museum registers.

C.—Length of culmen.
L.—Total body length.
Reg. No.—Registered number of specimen in the Zoological Survey of India (Indian Museum), Calcutta.
Tl.—Length of tail.
Tr.—Length of tarsus.
W.—Length of wing.
X.—Length, along rhachis, of the white tip of the left outermost tail-feather.

(*e*) *Acknowledgments.*

I am deeply grateful to Dr. Baini Prashad, the Director, for ready advice and help throughout the preparation of this Catalogue and for his kindness in writing the Foreword. To Dr. S. L. Hora and Dr. B. N. Chopra I am indebted for kindly going through a portion of the manuscript and suggesting useful changes. Dr. T. J. Job kindly read through the proofs for which I am indebted to him. Finally, to the late Dr. Claud B. Ticehurst[1] I owe a debt of gratitude for critically reading through the whole manuscript and giving me the benefit of his mature ornithological experience. As a result of his advice the Catalogue has improved in many ways.

Some species and subspecies previously unrepresented in the Indian Museum have recently been acquired for the Museum through the courtesy of the following gentlemen whose assistance is gratefully acknowledged: Dr. P. E. P. Deraniyagala, Director, Colombo Museum, Ceylon; Dr. F. N. Chasen, Director, Raffles Museum, Singapore; and Mr. C. M. Inglis, Curator, Natural History Museum, Darjeeling.

III. Systematic Account.

(*a*) *Indian species.*

The following Indian species and subspecies are listed in the present Catalogue :—

TRERONIDAE.

TRERONINAE

CROCOPUS Bonap.

C. phoenicopterus (Lath.), p. 292.
C. p. phoenicopterus (Lath.), p. 292.
C. p. viridifrons (Bly.), p. 293.
C. p. chlorigaster (Bly.), p. 294.

DENDROPHASSA Glog.

D. pompadora (Gmel.), p. 296.
D. p. phayrei (Bly.), p. 296.
D. p. affinis (Jerd.), p. 297.
D. p. chloroptera (Bly.), p. 299.
D. fulvicollis (Wagl.), p. 300.
D. f. ?fulvicollis (Wagl.), p. 300.

[1] Dr. Ticehurst died on February 17, 1941.

Family TRERONIDAE.

Subfamily *TRERONINAE.*

Genus **Crocopus** Bonaparte.

Crocopus phoenicopterus (Latham).

The genus *Crocopus* contains a single species, *C. phoenicopterus*, with four subspecies as admitted by Peters (1937, p. 23); of these, three occur within the Indian limits.

Crocopus phoenicopterus phoenicopterus (Latham).

(The Bengal Green Pigeon.)

1790. *Columba phoenicoptera*, Latham, *Index Orn.* II, p. 597, No. 13. (India.)

1849. *Treron (Treron) phoenicoptera*, Blyth, *Catal. Mus. Asiat. Soc. Bengal*, p. 229, No. 1384.

1928. *Crocopus phoenicopterus phoenicopterus*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 181. (Latham's type-locality wrongly quoted as " in insula Eimeo ".)

1937. *Treron phoenicoptera phoenicoptera*, Peters, *Check-list Birds World* III, p. 23.

Crocopus phoenicopterus phoenicopterus is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
26460	♂	Calcutta (vicinity). ..	1842-46 ..	Asiat. Soc. Bengal.	195	123	29	18
26461	♀	Calcutta (vicinity). ..	1842-46 ..	Asiat. Soc. Bengal.	188	..	30	18
3935	♂	Gauhaty (Assam). ..	Mar. 1, 1870	" Mus. Coll."	204	127	32	18
24564	(♂?)	South Sylhet (Assam).	(?)	C. B. Antram.	174	107	27	18
24565	♀	South Sylhet (Assam).	(?)	C. B. Antram.	176	113	29	19
24583	♂	South Sylhet (Assam).	(?)	C. B. Antram.	181	118	26	17·5
26462	♂	(?)	Jan. 7, 1914..	Zool. Gardens, Calcutta.	163	118	27	19
26463	(?)	(?)	Jan. 1, 1914..	Zool. Gardens, Calcutta.	182	113	26	16·5

Remarks.—Nos. 26460 and 26461 were listed by Blyth (1849, p. 229, Nos. 1384*A* and *B* respectively). Nos. 24564 (♂?) and 24565, ♀, both from South Sylhet, Assam, are rather small birds (wing : 174-176 mm.), but another from the same locality is larger. Three Assam birds recorded here, *viz.*, Nos. 24564, 24565 and 3935, distinctly belong to *phoenicopterus*, but No. 24583 from South Sylhet appears to be intermediate between *phoenicopterus* and *viridifrons* as is shown by the upper tail-coverts tending to be grey rather than yellowish olive-green.

Distribution.—" Northern India from the southern base of the Himalayas east to Assam, south to central India, Bengal and southern Assam " (Peters).

Crocopus phoenicopterus viridifrons (Blyth).

(The Burmese Green Pigeon.)

1845. *Treron viridifrons*, Blyth, *Journ. Asiat. Soc. Bengal* XIV, Pt. 2, p. 849. ("Tenasserim provinces"=Mergui, S. Burma, *vide* below.)
1849. *Treron (Treron) viridifrons*, Blyth, *Catal. Birds Mus. Asiat. Soc. Bengal*, p. 228, No. 1383.
1928. *Crocopus phoenicopterus viridifrons*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 183.
1937. *Treron phoenicoptera viridifrons*, Peters, *Check-list Birds World* III, p. 23.

Crocopus phoenicopterus viridifrons is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
22202	♂	Myitkyina (Burma). ..	Mar. 18, 1897	Capt. E. Pottinger.	192	123	30	19
3937	♂	Burma.	1865 ..	Dr. Williams.	184	116	29	18
3938	♂	Burma.	1865 ..	Dr. Williams.	174	114	25	17·5
9086	♂	Tamilone (Upper Burma).	Feb. 6, 1868	Dr. J. Anderson.	188	106	26	19
9087	♀	"Tongine"=Tsagine (Upper Burma).	Dec. 29, 1879	Dr. J. Anderson.	190	107	30	18
23529	♂	Maymyo (Upper Burma).	Nov. 2, 1899	Col. C. T. Bingham.	183	116	28	19
23224	(♀?)	Yatsauk (Shan States).	Jan. 15, 1900	Col. C. T. Bingham.	190	119	27	17
5898	(?)	Arakan (Burma). ..	(?)	"Mus. Coll."	197	124	28	17
26485 (Syntype).	(?)	Mergui (Tenasserim, Burma).	1846 ..	Rev. J. Barbe (Asiat. Soc. Bengal).	180	115	(36)	19
26486 (Lectotype).	(?)	Mergui (Tenasserim, Burma).	1846 ..	Rev. J. Barbe (Asiat. Soc. Bengal).	185	109	28	19

Remarks.—Nos. 26485 and 26486 bear identical labels as follows : "Type No. 1383, *Crocopus viridifrons* Blyth, Mergui, Rev. J. Barbe, 1846, A.S.B." On the outer paper wrapper of each specimen is also written : "Type of sp." They are thus the two specimens recorded by Blyth (1849, p. 228, No. 1383, *A*, *B*). Presumably, Blyth (1845, p. 849) originally described his bird from one of these specimens. Since it is not possible to determine which of these two specimens is Blyth's type, they must be regarded as the Syntypes ; of these, I select the better preserved specimen, No. 26486, as the Lectotype.

Type-locality.—Blyth (1845, p. 849) had stated that his birds came from the "Tenasserim provinces", which in those days included a considerable portion of Burma from about 19°N. to 10°N. latitudes. Since Blyth's birds actually came from Mergui, this place becomes the type-locality. It may be added that there seem to be no other records from as far south as Mergui—Oates's (1883, p. 307) southern limit was Moulmein, while Hume (1888, p. 290) gave it as northern and central Tenasserim.

Distribution.—"Burma, northern Tenasserim and northwestern Siam" (Peters).

Crocopus phoenicopterus chlorigaster (Blyth)[1].

(The Southern Green Pigeon.)

1843. *Vinago chlorigaster*, Blyth, *Journ. Asiat. Soc. Bengal* XII, Pt. 1, p. 167, foot-note. (No locality=Southern India by Blyth, *Ann. Mag. Nat. Hist.* XIV, p. 116, 1844: restricted to Salem District, Madras Presidency, by Whistler & Kinnear, *Journ. Bombay Nat. Hist. Soc.* XXXVIII, p. 672, 1936.)

1849. *Treron (Treron) chlorigaster*, Blyth, *Catal. Birds Mus. Asiat. Soc. Bengal*, p. 229, No. 1385.

1928. *Crocopus phoenicopterus chlorogaster*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 184.

1937. *Treron phoenicoptera chlorigaster*, Peters, *Check-list Birds World* III, p. 23.

Crocopus phoenicopterus chlorigaster is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
3939	♂	Cawnpore (U. P.). ..	Dec. 28, 1869	E. Buck. ..	185	(120)	27	18
3940	♂	Cawnpore (U. P.). ..	Oct. 25, 1869	E. Buck. ..	185	129	33	18
3941	♂	Cawnpore (U. P.). ..	Oct. 25, 1869	E. Buck. ..	187	129	29	17
3943	♂	Cawnpore (U. P.). ..	Oct. 25, 1869	E. Buck. ..	188	121	30	18
3944	♂	Cawnpore (U. P.). ..	Oct. 25, 1869	E. Buck. ..	176	113	23	19
3945	♀	Cawnpore (U. P.). ..	Oct. 25, 1869	E. Buck. ..	172	107	(32)	18
3942	(?)	Cawnpore (U. P.). ..	(?)	E. Buck. ..	185	107	30	16
3959	♂	Agra (U. P.). ..	Mar. 1868 ..	"Riddell Mus."	185	118	30	16
3958	♀ (Juv.)	Agra (U. P.). ..	Mar. 1868 ..	"Riddell Mus."	[182	122	26·5	18]
3955	♂	Bind(a)ra (C. P.). ..	(?)	Mr. W. T. Blanford.	167	119	28·5	19·5
3961	(?)	N. E. Chanda (C. P.).	Feb. 7, 1869	Mr. W. T. Blanford.	190	..	30	17·5
3954	(?)	Nagpur (C. P.). ..	(?)	Mr. W. T. Blanford.	192	125	28	17·5
3960	♂	S. E. Berar. ..	Mar. 1870 ..	Mr. W. T. Blanford.	177	108	28	17
3951	♂	Udipur (west Chota Nagpur, C. P.).	Jan. 4, 1870..	Mr. W. T. Blanford.	187	121	27	17·5
3952	♀	Chota Nagpur. ..	Nov. 29, 1868	Mr. V. Ball.	178	107	27	18
3950	(?)	Chota Nagpur. ..	Dec. 9, 1868	Mr. V. Ball.	187	119	26	(18)
26464	♂	Burkul Is. (Chilka Lake, Orissa).	July 1914 ..	Dr. S. W. Kemp.	181	120	25	17
25744	♀	Near Ramgarh (Ranchi Dist., Bihar).	Oct. 18, 1927	Dr. S. C. Law.	187	(111)	27	17
3946	♀	Manbhum (Bihar). ..	Jan. 1865 ..	Lt. R. C. Beavan.	179	110	26	19
3948	(?)	Manbhum (Bihar). ..	(?)	Lt. R. C. Beavan.	190	117	26	19·5
3947	(?)	Manbhum (Bihar). ..	Feb. 1865 ..	Lt. R. C. Beavan.	177	105	26	16·5

[1] The original spelling is *chlorigaster*. Several writers, including Stuart Baker (1928, p. 184), have wrongly used *chlorogaster*.

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
3949	♀ (Juv.)	Manbhum (Bihar). ..	(?)	"Mus. Coll."	[183	117	27	17]
3932	(?)	Manbhum (Bihar). ..	(?)	"Mus. Coll."	196	125	28	..
3931	(?)	Singhbhum (Bihar). ..	(?)	Mr. V. Ball.	185	110	27	16
3956	(?)	Singhbhum (Bihar). ..	Dec. 10, 1868	Mr. V. Ball.	187	(120)	28	17
3933	(?)	Daminiok (Bihar ?). ..	(?)	Mr. V. Ball.	187	118	30	20
3930	(?)	Daminiok (Bihar ?). ..	(?)	Mr. V. Ball.	183	114	29	16·5
3934	(?)	Daminiok (Bihar ?). ..	(?)	Mr. V. Ball.	187	123	28	18
25767 (Mounted in gallery.)	♂	"Palamau border" (Ranchi Dist., Bihar).	Oct. 23, 1927	Dr. S. C. Law.	196	(126)	..	19
11828	♂	Fanasgaon (=Phanasgaon, Ratnagiri Dist., Bombay Pres.).	Mar. 15, 1878	Surg. J. Armstrong.	194	123	29	18·5
11829	♀	Fanasgaon (=Phanasgaon, Ratnagiri Dist., Bombay Pres.).	Mar. 17, 1878	Surg. J. Armstrong.	175	109	28	17
11830	♀	"Bhoura" (=Bavda, 2,000 ft., Kolhapur State, Bombay Pres.).	Feb. 12, 1878	Surg. J. Armstrong.	184	122	27	17
18443	♂	N. Bangalore (Mysore State).	(?)	"Mus. Coll."	183	122	26	17
18547	♀	N. Bangalore (Mysore State).	(?)	"Mus. Coll."	179	110	27	..
18514	♂	S. Arcot Dist. (Madras Pres.).	(?)	"Mus. Coll."	175	101	26	17
18515	♂	S. Arcot Dist. (Madras Pres.).	(?)	"Mus. Coll."	172	99	27	18
18516	♀	S. Arcot Dist. (Madras Pres.).	(?)	"Mus. Coll."	174	(110)	25	16
26482 (Lectotype).	(?)	(?)	(?)	Asiat. Soc. Bengal.	197	130	30	18
26483 (Syntype).	(?)	(?)	(?)	Asiat. Soc. Bengal.	170	118	..	18
26484 (Syntype).	(?)	(?)	(?)	Asiat. Soc. Bengal.	182	114	..	19

Remarks.—Nos. 26482, 26483 and 26484 bear identical labels : "Type No. 1385. *Crocopus chlorigaster* Blyth. No further history. A. S. B." Two of the specimens bear, in addition, the following particulars : "Blyth, J. A. S. XII, p. 167. S. India ; rare in Bengal." On the paper wrapper of each of the three specimens is written, among other notes, the following : "One of these is type." No doubt, these are the three specimens which were listed by Blyth (1849, p. 229, No. 1385, *A*, *B*, *C*). *A* and *B* are males, while *C*, "from the vicinity of Calcutta 1841-6)", is female. It was presumably from one of these three specimens that Blyth (1843, p. 167) originally described this bird ; since Blyth's original specimen was a female, it was presumably No. 1385*C* of his *Catalogue*, but *A* and *B* cannot be placed, so that it is not possible to say which of the three Indian Museum specimens is No. 1385*C*

Under these circumstances, I regard the three Indian Museum specimens as the Syntypes of the species, and select the best preserved specimen, No. 26482, as its Lectotype.

Sclater (1892, p. 86) listed only one type-specimen of ***chlorigaster***, with the locality "Near Calcutta" and the donor "E. Blyth" I find nothing, either on the labels or on the outer wrappers of the skins, to support Sclater. Again, he wrongly gave Blyth's name as *Treron chlorigaster* instead of *Vinago chlorigaster*.

From the specimens in the Indian Museum, the following is indicated :—Specimens from Cawnpore and Agra in the United Provinces are intermediate in plumage between *chlorigaster* and *phoenicopterus*. While their breast and abdomen are yellowish as in true *chlorigaster*, there is a more or less clear basal band of yellowish-green on the tail. Only in one specimen (No. 3941, ♂, Cawnpore) is the tail ashy throughout as in *chlorigaster*.

Similarly, in respect of tail-coloration, specimens from southern Bihar (Singhbhum, Manbhum, Ranchi and ?Daminiok) and Orissa (Chilka Lake), are intermediate between *chlorigaster* and *phoenicopterus*.

Discussing its distribution in the Eastern Ghats (Madras Presidency), Whistler & Kinnear (1936, p. 672) state that specimens from the Madras Presidency appear to be smaller than those from the central belt of the Indian peninsula (wing 182-184 mm., as against 203 mm.). Birds from the Ratnagiri District (Bombay Presidency), Bangalore and Arcot in the Indian Museum collection, however, are not appreciably smaller than North Indian birds as shown below :—

Wing (mm.).

N. India (down to 18° N. lat.).		*S. India (below 18° N. lat.).*	
10♂♂	: 167-188	4♂♂	: 172-194
4♀♀	: 172-187	4♀♀	: 174-184
6 o?	: 177-196	3 o?	: 170-197

Distribution.—"All of the Indian Peninsula south of the range of *p. phoenicoptera* ; Ceylon" (Peters).

Genus **Dendrophassa** Gloger.

Dendrophassa pompadora (Gmelin).

The species extends from Ceylon and India *via* Siam (not Malaya) and Cochin China to the Philippines and the East Indies. Peters (1937, pp. 15-17) recognises seventeen subspecies of which four occur within the Indian limits.

Dendrophassa pompadora phayrei (Blyth).

(The Ashy-headed Green Pigeon.)

1849. *Treron (Treron) malabarica* (part), Blyth, *Catal. Birds Mus. Asiat. Soc. Bengal*, p. 229, No. 1389.

1862. *Osmotreron Phayrei*, Blyth, *Journ. Asiat. Soc. Bengal* XXXI, p. 344. (Tounghoo, Burma.)

1928. *Dendrophassa pompadora phayrei*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 186.

1937. *Treron pompadora phayrei*, Peters, *Check-list Birds World* III, p. 16.

Dendrophassa pompadora phayrei is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
24581	♂	S. Sylhet (Assam).	(?)	C. B. Antram.	149	83	23	15
5801	♀	Lamagooting (Assam).	(?)	Capt. Butler.	153	102	23	14
5897	♂	Arakan (W. Burma).	(?)	" Mus. Coll."	151	101	25	14
26451	♂	Arakan (W. Burma).	1843	Capt. J. R. Abbott.	147	92	25	16
26452	♂	Arakan (W. Burma).	1843	Capt. J. R. Abbott.	150	95	26	14
5896	♀	Arakan (W. Burma).	(?)	" Mus. Coll."	150	96	23	16
8135	♀	Meetan (Tenasserim, Burma).	Jan. 18, 1877	Dr. J. Anderson (Tenasserim Exped.).	143	90	22	16
8134	♂	Meetan (Tenasserim, Burma).	Feb. 8, 1877	Dr. J. Anderson (Tenasserim Exped.).	152	93	20	14
24227	♂	(?)	July 15, 1902	(?)	140	88	22	17

Remarks.—Nos. 26451 and 26452 were listed by Blyth (1849, pp. 229, 230, No. 1389 *A*, *B* respectively). The specimens are in poor condition and the plumage is faded, but they can clearly be distinguished from *D. p. affinis* by the ashy patch on the crown and the remnants of the orange patch on the forebreast.

Distribution.—" Bengal eastward through Assam to Laos, south to Calcutta, Tenasserim, continental Siam and Cochinchina " (Peters).

Dendrophassa pompadora affinis (Jerdon).

(The Grey-fronted Green Pigeon.)

1840. *Vinago affinis* (♀), Jerdon, *Madras Journ. Lit. & Sci.* XII, p. 13. (West coast of Indian Peninsula.)

1845. *Vinago malabarica* (♂), Jerdon, *Illustr. Ind. Orn.* III, letterpress to pl. 21.

1849. *Treron (Treron) malabarica* (part), *Catal. Birds Mus. Asiat. Soc. Bengal,* p. 229, No. 1389.

1928. *Dendrophassa pompadora affinis,* Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 188.

1937. *Treron pompadora affinis,* Peters, *Check-list Birds World* III, p. 15.

Dendrophassa pompadora affinis is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
11832	♂	" Bhoura " (=Bavda), 2,000 ft., Kolhapur State, Bombay Pres.	Mar. 28, 1878	Surg. J. Armstrong.	142	105	23	14
26449	♂	" Bhoura " (=Bavda), 2,500 ft.	Mar. 28, 1878	Surg. J. Armstrong.	147	101	22	15

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
11038	♂	"Bhoura" (=Bavda), 2,500 ft.	Mar. 28, 1878	Surg. J. Armstrong.	142	102	21	15
11831	♂	"Bhoura" (=Bavda), 2,000 ft.	Mar. 30, 1878	Surg. J. Armstrong.	149	101	23·5	16
11834	♂	"Bhoura" (=Bavda), 2,000 ft.	Apr. 14, 1878	Surg. J. Armstrong.	142	101	23	..
11146	♂ (Juv.)	"Bhoura" (=Bavda), 2,500 ft.	Mar. 29, 1878	Surg. J. Armstrong.	[135	82	23	19]
11323	♀	"Bhoura" (=Bavda), 2,000 ft.	Mar. 28, 1878	Surg. J. Armstrong.	143	92	20	13
11039	♀	"Bhoura" (=Bavda), 2,500 ft.	Mar. 28, 1878	Surg. J. Armstrong.	149	98	25	13
11325	♀	"Bhoura" (=Bavda).	Mar. 28, 1878	Surg. J. Armstrong.	141	85	22	14
11833	♀	"Bhoura" (=Bavda), 2,000 ft.	Apr. 6, 1878	Surg. J. Armstrong.	145	102	21	13
11835	♀	"Bhoura" (=Bavda), 2,500 ft.	Apr. 10, 1878	Surg. J. Armstrong.	139	92	23	12
11326	♀ (Juv.)	"Bhoura" (=Bavda), 2,000 ft.	Apr. 18, 1878	Surg. J. Armstrong.	[134	80	22	15]
11088	♀ (Juv.)	"Bhoura" (=Bavda), 2,500 ft.	Mar. 29, 1878	Surg. J. Armstrong.	[139	79	21	18]
18120	♂	Shevaroy Hills (Madras Pres.).	(?)	W. Daly.	146	96	21·5	16
23928	(♂)	Ponmudi (Travancore).	April 1895	Trivandrum Mus.	139	97	21	15

Remarks.—No. 11146, ♂ (juv.), has no maroon on the back and is indistinguishable from the juvenile females, Nos. 11326 and 11088. No. 11326 is labelled only as "♀"; because of its small size and the condition of the feathers of the back I consider it as juvenile.

The males and females of *D. p. affinis* are very similar in appearance and size to those of *D. p. phayrei*, but the former subspecies can be distinguished from the latter by the following characters :—(1) In *affinis* the ashy patch on the crown, forehead and foreneck is less pure (being mixed with an olive-green tinge) and gradually merges into the olive-green of the hindneck and back instead of being more or less sharply defined as in *phayrei*. (2) The complete absence in *affinis* of the orange patch of the forebreast which is present, though sometimes very faint or even absent, in *phayrei*. (3) The maroon-chestnut of the back is darker (having almost a purplish tinge) in *affinis* than in *phayrei*. (4) A fourth point in which the two subspecies differ needs mention. Stuart Baker (1928, p. 185) mentions in the key to the species of *Dendrophassa* that all the Indian subspecies of *D. pompadora* have the "tibial plumes in both sexes buff or yellowish" The series of skins in the Indian Museum, however, shows the following characters :—

D. pompadora affinis.—Tibial plumes deep lemon-yellow in ♂, but generally white (sometimes faintly lemon yellow mixed with white) in ♀.

D. pompadora phayrei.—Tibial plumes white in both the sexes.

Distribution.—"Western India from Bombay to southern Travancore" (Peters).

Dendrophassa pompadora chloroptera (Blyth).

(The Nicobar Green Pigeon)[1].

1845. *Treron chloroptera*, Blyth, *Journ. Asiat. Soc. Bengal* XIV, p. 852. (Nicobar Islands.)
1849. *Treron (Treron) chloroptera*, Blyth, *Catal. Birds Mus. Asiat. Soc. Bengal*, p. 229, No. 1388.
1903. *Osmotreron chloroptera andamanica*, Richmond, *Proc. U. S. Nation. Mus.* XXV, p. 308.
1928. *Dendrophassa pompadora chloroptera*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 188.
1937. *Treron pompadora chloroptera*, Peters, *Check-list Birds World* III, p. 16.

Dendrophassa pompadora chloroptera is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
25924	♂	Bonnington (N. Andaman Is.).	Feb. 17, 1930	Zool. Survey of India.	171	107	26	18
25925	♀	Bonnington (N. Andaman Is.).	Feb. 17, 1930	Zool. Survey of India.	175	108	28	19
18667	♀	Anikhet (S. Andaman Is.).	Mar. 13, 1890	G. H. Booley	170	101	27	17·5
3918	♂	Andamans. ..	(?)	Dr. G. E. Dobson	170	(95)	23	..
26487 (Lectotype).	(♂)	Nicobars.	1845	Rev. J. Barbe (Asiat. Soc. Bengal).	178	111	(31)	19
26488 (Syntype).	(♂)	Nicobars.	1845	Capt. Lewis & Rev. J. Barbe (Asiat. Soc. Bengal).	167	98	..	17
26489 (Syntype).	(♀)	Nicobars.	1845	Capt. Lewis & Rev. J. Barbe (Asiat. Soc. Bengal).	173	104	..	(20)
26490 (Syntype).	(♀)	Nicobars.	1845	Capt. Lewis & Rev. J. Barbe (Asiat. Soc. Bengal).	170	105	29	..

Remarks.—Nos. 26488 (♂), 26489 (♀) and 26490 (♀) bear the labels: "Type No. 1388, *Treron chloroptera* Blyth, *A*, *B* & *C*, Nicobars, Capt. Lewis & Rev. J. Barbe, 1845, A. S. B." No. 26487 (♂) is similarly labelled except that only one collector's name (Rev. J. Barbe) is given, and the letters "*A*, *B*, & *C*" are not given. On the outer paper wrapper of each specimen is also written: "Type of sp. Bly" no doubt meaning 'Type of species of Blyth' The three specimens recorded by Blyth (1849, p. 229, No. 1388, *A*, *B*, *C*) most probably form part of the series of four specimens mentioned above; Blyth records: *A* ♂ and *B* ♀ collected by Capt. Lewis, and *C* ♂ by Rev. J. Barbe, all obtained from the Nicobars in 1845. Presumably, it was from one of these four specimens that Blyth (1845, p. 852) described the species. I have taken the four specimens mentioned above as the Syntypes. Of these,

[1] This name is preferable to "Andaman Green Pigeon" employed by Stuart Baker (1928, p. 188) because (i) the type-locality is Nicobars, not Andamans; and (ii) more than one race is recognised by some authors in the Andamans and the Nicobars.

No. 26487 (♂, Rev. J. Barbe) is presumably the same as Blyth's specimen (No. 1388 *C*, ♂, Rev. J. Barbe), and since this is also the better preserved of the two males, I select it as the Lectotype.

There has been much diversity of opinion regarding the number of races occurring in the Andaman and the Nicobar groups of islands. Hume (1874, p. 258) regarded the Nicobar birds as somewhat different from the Andaman birds, but did not consider the differences sufficiently marked for the separation of the races. Richmond (1903, p. 308) described S. Andaman birds as much smaller and darker than the Nicobar birds, but according to Stuart Baker (1928, p. 188) no such distinction holds good in a series.

Andaman and Nicobar birds in the Indian Museum collection cannot be separated as regards measurements as shown below :—

		Wing (mm.)	Tail (mm.)
Andamans	2♂♂	170-171	(95)-107
	2♀♀	170-175	101-108
Nicobars	2 ♂♂	167-178	98-111
	2 ♀♀	170-173	104-105

No. 3918, ♂, Andamans, differs from the other specimens in being comparatively small and also much darker throughout ; the lower plumage shows some brownish tinge on the lower breast.

Distribution.—" Nicobar and Andaman Islands " (Peters).

Dendrophassa fulvicollis (Wagler).

This species extends from Tenasserim (S. Burma) in the west, through Malaya and French Indo-China, to some of the islands in the East Indies, *viz.*, Sumatra, Borneo, Billiton, etc. Peters (1937, pp. 17, 18) recognises four subspecies of which only *D. f. fulvicollis* occurs within the Indian limits.

Dendrophassa fulvicollis ?fulvicollis (Wagler).

(The Cinnamon-headed Green Pigeon.)

1827. *Columba fulvicollis*, Wagler, *Syst. Av., Columba*, sp. 8. (Java=Sumatra.)
1928. *Dendrophassa fulvicollis fulvicollis*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 189.
1937. *Treron fulvicollis fulvicollis*, Peters, *Check-list Birds World* III, p. 17.

Dendrophassa fulvicollis ?fulvicollis is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
26447	♂	Kuching (Sarawak, Borneo).	Nov. 23, 1896	Sarawak Mus. (Borneo).	143	103	22	15
26448	(♂)	(?)	(?)	(?)	146	93	23	13

Remarks.—Having had no opportunity of comparing the two specimens here recorded with other subspecies of *D. fulvicollis*, I have placed them under *D. f. fulvicollis* on distributional grounds only. No. 26447 is from south-western Borneo and, therefore, may perhaps not be referred to *D. f. barmensis* which occurs only in northern Borneo. No. 26448 (no history) appears to be an old specimen and is hardly distinguishable from No. 26447.

Distribution.—" Tenasserim south through the Malay States and Malay Archipelago to Sumatra ; Rhio Archipelago ; southern Borneo ; islands of Billiton and Banka ; Cochinchina (?)" (Peters).

According to Delacour and Jabouille (1931, p. 12 ; 1940, p. 114) it occurs sparingly in French Indo-China and Cochin China.

Dendrophassa bicincta (Jerdon).

The species extends from the United Provinces (India) in the west and Ceylon in the south, and *via* the Malay Peninsula, Siam, and Indo-China to the Island of Hainan in the north-east, and to Java and the Island of Sao Thome and Rollas islet in the Gulf of Guinea in the east. It is not recorded from the intermediate islands of the East Indies. Peters (1937, pp. 19, 20) recognises four subspecies, namely, *bicincta*, *leggei*, *domvilii* and *javana*, of which the first two occur within the Indian limits. The subspecies *praetermissa* Robinson & Kloss, which is accepted by Stuart Baker (1928, p. 193), is united with *bicincta* by Peters. Although *praetermissa* is very difficult to distinguish from *bicincta*, and no satisfactory distinguishing characters have yet been given, I have tentatively accepted it as distinct and referred to it all the specimens from the range as defined by Stuart Baker (1928).

I have found it quite impossible to distinguish individual specimens of the races *bicincta*, *leggei* and *praetermissa* on plumage characters, while size differences in small collections are of little help.

Inglis (1927, p. 47) has recorded *D. b. domvilii* (Swinhoe) from the Bengal Duars ! This is presumably due to wrong identification of *D. b. bicincta*, as *domvilii* occurs only in the Island of Hainan off the coast of S. E. China.

Dendrophassa bicincta bicincta (Jerdon).

(The Indian Orange-breasted Green Pigeon.)

1840. *Vinago bicincta* (♂), Jerdon, *Madras Journ. Lit. & Sci.* XII, p. 13, No. 289. (Sea-coast south of Tellichery, Madras Presidency.)

1849. *Treron* (*Treron*) *bicincta* (part), Blyth, *Catal. Birds Mus. Asiat. Soc. Bengal*, p. 229, No. 1386.

1928. *Dendrophassa bicincta bicincta*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 191.

1937. *Treron bicincta bicincta* (part), Peters, *Check-list Birds World* III, p. 19.

Dendrophassa bicincta bicincta is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
2921	(♀)	Travancore. ..	(?)	Asiat. Soc. Bengal.	156	99	24	15
18399	♀	S. Mangalore (Madras Pres.).	(?)	Dr. J. Scully.	157	100	25	16
3923	♂	Manbhum (Bihar).	Dec. 16, 1864	Lt. R. C. Beavan.	151	95	24	17
26521	♂	Midnapore Dist. (Bengal).	Nov. 25, 1938	Mr. A. E. F. Wood.	148	108	23	15·5

Remarks.—No. 2921 from Travancore is sexed as a "♀" =♂, but has the plumage of a ♀. No. 26521, ♂, Midnapore District, Lower Bengal, is an exceptionally small specimen, with wing 148 mm. only; in this respect it resembles the Ceylon race *leggei*. A ♂ (No. 3923) from Manbhum (Bihar) is also rather small, with wing only 151 mm. The wing-length given by Stuart Baker (1928, pp. 191-193) for males of *D. b. bicincta* is 153-164 mm., once 170 mm.; and for *leggei* 140-146 mm., once 149 mm.

The length of the culmen is given by Stuart Baker (*loc. cit.*) as 12-13 mm.; in the Indian Museum birds it is 15-17 mm.

Distribution.—Peters (1937, p. 19) does not separate *praetermissa* from the typical *bicincta*, as was done by Stuart Baker (1928, p. 192). The latter gives the following range of *D. b. bicincta* :—Malabar Coast, perhaps excluding Travancore; North India from the United Provinces along the Terai through foot hills and adjoining plains to east Assam north of the Brahmaputra; Bengal and Bihar, but replaced in the extreme east, *i.e.*, Assam south of the Brahmaputra, Comilla and Chittagong, by the closely allied and hardly distinguishable race *praetermissa*; rare (probably only a winter visitor) in Chota Nagpur; more common in Manbhum, Purulia and the adjoining eastern districts.

In the Indian Museum there is a female from Travancore which, by its wing-length (156 mm.), should be assigned to *bicincta* and not to *leggei* which is said to occur in southern Travancore although satisfactory evidence for the latter view is wanting.

Recently, Eates (1938, p. 330) found a stray specimen of *D. b. bicincta* as far west as Kiamari (Karachi, Sind). This is considerably beyond the hitherto known western range of the subspecies. Eates opined that the bird might possibly have been driven so far south-westwards by the prevalent cold wave.

Whistler & Kinnear (1936, p. 673) have discussed its distribution in South India, and have shown that this bird is fairly common both in the eastern and western portions of the Madras Presidency. They further note that the status of Malabar birds is not yet clear.

Dendrophassa bicincta leggei (Hartert).

(The Ceylon Orange-breasted Green Pigeon.)

1849. *Treron (Treron) bicincta* (part), Blyth, *Catal. Birds Mus. Asiat. Soc. Bengal*, p. 229, No. 1386.
1910. *Treron bicincta leggei*, Hartert, *Novit. Zool.* XVII, p. 193. (Ceylon.)
1928. *Dendrophassa bicincta leggei*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 192.
1937. *Treron bicincta leggei*, Peters, *Check-list Birds World* III, p. 19.

Dendrophassa bicincta leggei is represented in the collection of the Indian Museum by the following skin :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
26566	♂	Vauvonia (North Prov., Ceylon).	Apr. 18, 1904	Colombo Mus., Ceylon.	151	106	23	16

Remarks.—Stuart Baker (1928, p. 192) gives the wing-length as 140-146 mm. In addition to No. 26566 listed here, I have examined a male from Ceylon (Coll. : Major E. W Mayor, June, 1914) loaned by the Bombay Natural History Society. Both the males have the wing 151 mm. I am unable to separate these skins from the typical *bicincta*.

Distribution.—" Ceylon ; birds from the south of Travancore may be referable here " (Peters).

Dendrophassa bicincta praetermissa (Robinson & Kloss).

(The Siam Orange-breasted Green Pigeon.)

1849. *Treron (Treron) bicincta* (part), Blyth, *Catal. Birds Mus. Asiat. Soc. Bengal*, p. 229, No. 1386.
1921. *Treron bisincta* (sic) *praetermissa*, Robinson & Kloss, *Journ. Fed. Malay States Mus.* X, p. 203. (Koh Lak, S. W. Siam.)
1928. *Dendrophassa bicincta praetermissa*, Stuart Baker, *Faun. Brit. Ind. Birds* (2nd ed.) V, p. 193.
1937. *Treron bicincta bicincta* (part), Peters, *Check-list Birds World* III, p. 19.

Dendrophassa bicincta praetermissa is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.)			
					W.	Tl.	Tr.	C.
24562	(♂)	S. Sylhet (Assam). ..	(?)	C. B. Antram.	152	102	24	16
24563	(Juv. ♂).	S. Sylhet. ..	(?)	C. B. Antram.	[151	83	19	17]
24584	(Juv. ♂).	S. Sylhet. ..	(?)	C. B. Antram.	[146	85	22	15]
24506	♀	S. Sylhet. ..	(?)	C. B. Antram.	150	89	23	15
24561	(Juv.)	S. Sylhet. ..	(?)	C. B. Antram.	[139	(81)	23	15·5]
24566	(♂)	S. Sylhet. ..	(?)	C. B. Antram.	147	95	24	..
5895	(♀)	Arakan (W. Burma).	(?)	" Mus. Coll."	151	103	23	17
12949	♂	Pilai (Mergui, S. Burma).	Mar. 9, 1882	Dr. J. Anderson (Mergui Exped.).	152	(61)	23	18
12950	♂	Pilai (Mergui, S. Burma).	Mar. 13, 1882	Dr. J. Anderson (Mergui Exped.).	147	95	23	16

Remarks.—No. 24561 is a juvenile without any trace of the lilac band and orange patch on the breast; Nos. 24563 and 24584 are also juveniles, but the lilac band and orange patch on the breast, which are characteristic of the adult male, are faintly seen.

Robinson & Kloss (1921, p. 203) while creating *praetermissa* remarked: "Larger than *T b. bisincta* (Jerdon) from Madras (wing 144): differs from *T b. domvilii* (Swinh.) from Hainan in having the grey nuchal patch in the female clear and more extensive whereas, fide Hartert, it is indistinct and small in the island bird. Wing 157-163 mm."

Stuart Baker (1928, p. 190, key) stated that *praetermissa* is "lighter and more yellow" than *bicincta*; he further added (p. 193): "Only differs from *D. b. bicincta* in being somewhat more yellow and brightly coloured, hardly sufficiently so to enable one to differentiate it as a subspecies. The female, however, has usually more grey on the nape. ...Measurements as in the Indian bird."

So far as the skins in the Indian Museum are concerned, none of the above distinctions works. The females from Travancore to Burma all look exactly alike. It is, however, possible to distinguish between the two males from Bihar and western Bengal on the one hand, and the three males from southern Sylhet (Assam) and Mergui (southern Burma) on the other. In the former, the dorsal grey patch is larger (50-60 mm. long) and extends from the hind-crown to the foreback; in the latter, the grey patch is much smaller (35-38 mm. long). The grey patch is not sharply defined at either ends, so that the above measurements are approximate. The specimens available to me are too few for generalisation; nevertheless the distinction given here is noteworthy, and may prove to be subspecific.

The few Assamese and Burmese birds in the Indian Museum collection are not larger (wing 147-152 mm.) than those from the rest of India.

Distribution.—Stuart Baker (1930, p. 688) gave the range as: "Assam south of the Brahmapootra; Bengal East of Bay; all Burma" But this does not include the type-locality in S. W Siam! The range also includes the northern portions of the Malaya Peninsula and western Siam (Robinson & Chasen, 1936, p. 47).

Dendrophassa vernans (Linnaeus).

The species is distributed from southern Tenasserim *via* the Malay Peninsula, Java, Sumatra and Borneo to Celebes in the east, and *via* Siam to Indo-China and possibly a little further up in the north, and the Philippines in the north-east. Peters (1937, pp. 18, 19) recognises eight subspecies of which only *D. v. griseicapilla* occurs within the Indian limits.

Dendrophassa vernans griseicapilla (Schlegel).

(The Malay Pink-necked Green Pigeon.)

1849. *Treron (Treron) viridis* (part), Blyth, *Catal. Birds Mus. Asiat. Soc. Bengal*, p. 229, No. 1387.

1863. *Treron griseicapilla.* Schlegel, *Neder. Tijd. Dierk.* I, p. 70. (Sumatra and Banka.)

1928. *Dendrophassa vernans griseicapilla*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 194.
1937. *Treron vernans griseicapilla*, Peters, *Check-list Birds World* III, p. 18.

Dendrophassa vernans griseicapilla is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
12951	♂	Yumeekee (Mergui, S. Burma).	Feb. 24, 1882	Dr. J. Anderson.	144	101	24	..
12952	(♀)	Pilai (Mergui, S. Burma).	Mar. 9, 1882	Dr. J. Anderson.	137	88	22	
17907	♂	Perak (Malay Penin.).	(?)	(?)	141	94	22	17
17908	♂	Perak (Malay Penin.).	(?)	(?)	147	110	21	15
3919	(♂)	Malacca (Malay Penin.).	(?)	(?)	152	96	22	16
26559	♂	Pulau Bintang (Rhio Archipelago).	May 28, 1930	Raffles Mus., Singapore.	150	94	25	16
26560	♀	Pulau Bintang (Rhio Archipelago).	May 28, 1930	Raffles Mus., Singapore.	138	..	23	15
12044	♀	(?)	Mar. 11, 1875	W. Rutledge	138	87	24	16
22338	♀	(?)	Nov. 16, 1897	W. Rutledge	134	85	20	15
22339	♀	(?)	Nov. 25, 1897	W. Rutledge	132	(89)	22	15
22340	♀	(?)	Dec. 9, 1897	W. Rutledge	141	98	15	14
22341	♀	(?)	Nov. 26, 1897	W. Rutledge	121	79	21	14
3200	(♂)	Amoy (Fu-Kien, E. China).	(?)	R. Swinhoe	135	92	22	16

Distribution.—" Southern Tenasserim, Malay Peninsula, Cambodia, Cochinchina, Sumatra (except northeastern), Rhio Archipelago, Banka, Billiton, western Java and northern Borneo " (Peters).

Delacour & Jabouille (1940, p. 115) also include southern Annam in French Indo-China within its range.

In the Indian Museum there is a skin, No. 3200 (♂), from Amoy, E. China, which is indistinguishable from *griseicapilla*. This seems to be the sole record from E. China—La Touche (1932) does not list it from that area.

Genus **Treron** Vieillot.

Treron curvirostra (Gmelin).

The species extends from western Nepal to several islands of the East Indies. Peters (1937, pp. 14, 15), following Hartert, recognises ten subspecies of *T curvirostra*. Of these only *T c. nipalensis* occurs within the Indian limits.

As pointed out by Ticehurst (1930, p. 477), Stuart Baker's (1928, p. 195) statement that of *T curvirostra*, " two races ...*T c. curvirostra* and *T c. nipalensis*, extend through the greater part of our area... "

is misleading because it suggests that both the subspecies occur within the Indian limits, though actually only *nipalensis* occurs.

Treron curvirostra nipalensis (Hodgson).

(The Northern Lesser Thick-billed Green Pigeon.)

1836. *Toria Nipalensis*, Hodgson, *Asiat. Res.* XIX, p. 164. (Nepal.)
1928. *Treron curvirostra nipalensis*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 196.
1937. *Treron curvirostra nipalensis*, Peters, *Check-list Birds World* III, p. 14.

Treron curvirostra nipalensis is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
26541	♂	"Chupramai" (Jalpaiguri Dist., N. Bengal).	Mar. 19, 1935	C. M. Inglis.	139	83	24	14
26542	♀	"Imenghat Forest" (The Duars, N. Bengal).	Mar. 24, 1928	C. M. Inglis.	139	77	23	15
24578	♂	S. Sylhet (Assam). ..	(?)	C. B. Antram.	139	92	22	14
24579	♂	S. Sylhet (Assam). ..	(?)	C. B. Antram.	142	(95)	24	15
24580	♀	S. Sylhet (Assam). ..	(?)	C. B. Antram.	133	80	23	14
12916	♂	Pilai (Mergui, S. Burma).	Mar. 5, 1882	Dr. J. Anderson (Mergui Exped.).	137	90	21	14
26562	♂	Chiengmai, N. Siam. (Purchased as skin.)	Apr. 6, 1937	Raffles Mus., Singapore.	143	92	24	14
26563	♀	Bandon (Peninsular Siam).	July 14, 1929	Raffles Mus., Singapore.	139	76	22	14

Distribution.—"Western Nepal east through Assam and the Shan States to French Indochina, south to Bengal, Tenasserim, Siam and Cambodia" (Peters).

Genus **Butreron** Jacquinot & Pucheran.

The genus contains a single species, *B. capellei.*

Butreron capellei (Temminck).

(The Large Thick-billed Green Pigeon.)

1823. *Columba capellei*, Temminck, *Pl. Color d'Oiseaux* IV, livr. 24, p. 223, pl. 143. (Java.)
1849. *Treron capellei*, Blyth, *Catal. Birds Mus. Asiat. Soc. Bengal*, p. 228, No. 1382.
1928. *Butreron capellei*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 197.
1937. *Butreron capellei*, Peters, *Check-list Birds World* III, p. 13.

Butreron capellei is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
12948	♀	Pilai (Mergui, S. Burma).	Mar. 13, 1882	Dr. J. Anderson (Mergui Exped.).	203	(109)	33	(22)
17095	♂	Perak (Malay Penin.).	(?)	"Mus. Coll."	193	140	27	21
17906	♀	Perak (Malay Penin.).	(?)	"Mus. Coll."	198	129	31	20
26458	♂	Malacca (Malay Penin.).	1844	Rev. F. W. Lindstedt (Asiat. Soc. Bengal).	196	126	32	22
26459	♂	Malacca (Malay Penin.).	1844	Rev. F. W. Lindstedt (Asiat. Soc. Bengal).	191	125	30	22
13454	(Juv.)	Malacca (Malay Penin.).	(?)	Bengal Economic Mus.	[186	..	30	20]

Remarks.—Nos. 26458 and 26459 were listed by Blyth (1849, p. 229, No. 1382, *A*, *B*). No. 13454 is unsexed ; it is smaller than the others and its breast is golden yellowish-green ; it appears to be a juvenile.

Distribution.—"Malay Peninsula, Sumatra, Java and Borneo" (Peters).

Stuart Baker (1928, p. 199) remarked that it was once obtained by Dr. Anderson in Elphinstone Is. off the Mergui coast. I presume that this bird is the Indian Museum skin (No. 12948, ♀) from Pilai, Mergui, and was possibly a straggler. It is not known to breed within the Indian limits.

Some authors recognise various subspecies of *B. capellei*, but Peters does not admit them.

Genus **Sphenurus** Swainson[1].

Sphenurus apicauda (Blyth).

The species extends from the Himalayan foot-hills of Kumaun (U. P., India) in the west, *via* Assam, Burma (including Tenasserim) and Siam(?) to Indo-China. It does not occur, except perhaps as a straggler, in the Malay Peninsula. Of the three subspecies recognised by Peters (1937, p. 11), only *S. a. apicauda*, occurs within the Indian limits.

Sphenurus apicauda apicauda (Blyth).

(The Pin-tailed Green Pigeon.)

1845 (after May 1846). *Treron apicauda* "Hodgson" Blyth, *Journ. Asiat. Soc. Bengal* XIV, p. 845. (Southeastern Himalayas and hill ranges of Assam ; common at Darjeeling.)

1849. *Treron (Sphenocercus) apicauda*, Blyth, *Catal. Birds Mus. Asiat. Soc. Bengal*, p. 230, No. 1392.

1928. *Sphenocercus apicaudus apicaudus*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 199.

1937. *Sphenurus apicauda apicauda*, Peters, *Check-list Birds World* III, p. 11.

[1] *Sphenurus* Swainson 1837 replaces *Sphenocercus* G. R. Gray 1840.

Sphenurus apicauda apicauda is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
3929	(♀?)	Kurseong, 2,000 ft. (Sikkim).	May 19, 1870	Capt. H. J. Elwes.	159	160	29	20
26457	(♀?)	Darjeeling (N. Bengal).	1845	Mr. Webb (Asiat. Soc. Bengal).	165	..	23	16·5
26539	♀	Hsimara Duars, 500 ft. (N. Bengal).	Mar. 7, 1927	Mr. C. M. Inglis.	164	171	26	19
26540	♂	Rahti Forest (Jalpaiguri Dist., N. Bengal).	Feb. 27, 1937	Mr. C. M. Inglis.	170	190	24	21
26343	♂	Chongliemseu (Naga Hills, Assam).	Mar. 3, 1935	Zool. Survey of India.	164	231	24	20
26455	(♂?)	(?)	(?)	Asiat. Soc. Bengal.	168	203	26	19
26456	(♂?)	(?)	(?)	Asiat. Soc. Bengal.	166	223	29	18

Remarks.—No. 26457 was listed by Blyth (1849, p. 230, No. 1392 *B.*)

Distribution.—" Himalayan foothills up to 6000 feet from Kumaun to eastern Assam and southward to Tenasserim " (Peters).

Stuart Baker (1928, p. 200 ; 1935, p. 135) gave the following additional range :—Goes up to at least 8,000 feet ; found as a straggler in the plains of Bihar and Bengal ; a solitary but rather doubtful instance from Perak in northern Malaya.

Sphenurus sphenurus (Gould).

The species ranges along the Himalayan foothills from Kashmir in the west, *via* Assam to Yunnan and northern Tonkin, and Annam (Indo-China) to the Island of Hainan ; also in the mountains in the main range of the Malay Peninsula. Peters (1937, p.12) admits five subspecies of which only *S. s. sphenurus* occurs within the Indian limits.

Sphenurus sphenurus sphenurus (Gould).

(The Wedge-tailed Green Pigeon.)

1831. *Vinago sphenura*, Gould, *Century of Birds*, pl. 57. (Himalayas.)

1831. *Vinago sphenura*, Gould, *Birds hitherto unfigured from the Himalaya Mts.*, pl. 40. (Himalayas.)

1849. *Treron (Sphenocercus) cantillans*, Blyth, *Catal. Birds Mus. Asiat. Soc. Bengal*, p. 230, No. 1391.

1928. *Sphenocercus sphenurus sphenurus*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 200.

1937. *Sphenurus sphenurus sphenurus*, Peters, *Check-list Bird World* III, p. 12.

Sphenurus sphenurus sphenurus is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
26453	(♂)	"Murri" (=?Murree, Rawalpindi Dist., N. Punjab).	June 30, 1873	Dr. F. Stoliczka (Yarkand Exped.).	178	139	23	18
26454	(Juv.)	"Murri" (=?Murree, Rawalpindi Dist., N. Punjab).	July 2, 1873	Dr. F. Stoliczka (Yarkand Exped.).	[168	106	25	..]
4334	♂	Katmandu (Nepal).	(?)	"Mus. Coll."	175	135	24	19
3926	♂	Darjeeling (N. Bengal).	(?)	Dr. J. Anderson.	180	142	26	20
3927	(Juv.)	Darjeeling (N. Bengal).	(?)	Dr. J. Anderson.	[180	133	23	..]
3928	♀	Darjeeling (N. Bengal).	Nov. 1871	(Mr. Donett ?)	171	122	27	17
23222	♀	"Loisampa" =Loi-San-Pa, 600 ft. (S.Shan States).	Jan. 1, 1900	Col. C. T. Bingham.	166	98	25	12

Remarks.—In the Indian Museum there is a poorly preserved skin labelled : "Type No. 1391, *Sphenocercus cantillans* Blyth. Upper Provinces ? Purchased. A. S. B." This appears to be the bird described by Blyth (1843, p. 166) as *Vinago cantillans* (Cape variety), and subsequently by the same author (1849, p. 230, No. 1391 *D*) as *Sphenocercus cantillans.* The Indian Museum specimen resembles *Sphenurus sphenurus sphenurus* in structural characters but is very different in coloration. The green, orange and yellow of the normal bird is here completely replaced by dark grey ; the fore-head is pink-rufous and the fore-breast pinkish grey ; the upper back, scapulars and lesser wing-coverts are maroon as in the male of *S. s. sphenurus.* Salvadori (1893, p. 10) regarded it as a separate variety, *cantillans*, and recorded two specimens in the British Museum—one adult ♂ collected by A. Grote (no locality) in the Gould Coll., and another adult ♀ collected by B. M. Hodgson from Nepal. Jerdon (1864, p. 453) had stated that "after moulting in confinement, the green colour, in some specimens, becomes pale maronne" This statement was repeated by Blanford (1898, p. 17), but lacks further confirmation.

Distribution.—"Mountains between 2000 and 8000 feet from Kashmir to Assam and the Shan States, south to Tenasserim" (Peters).

Subfamily *DUCULINAE.*

Genus **Ducula** Hodgson[1].

Ducula badia (Raffles).

The species ranges from India and Burma to Yunnan, Siam and Indo-China, and *via* the Malay Peninsula to Sumatra, Java and Borneo.

[1] I have used the name *Ducula* in the restricted sense of Hodgson (*Asiat. Res.* XIX, p. 160, 1836) as accepted by Stuart Baker (1928, p. 202). It is partly equivalent to *Carpophaga* Selby. Peters (1937, pp. 42-54) uses *Ducula* Hodg. in the extended sense so as to include in it nine genera including *Carpophaga* Selby and *Myristicivora* Reichenbach,

Peters (1937, p. 51) specifically separates *D. lacernulata* (Temminck) (Java, Lombok and Flores) from *D. badia*, but Chasen (1935, p. 19) regards the two groups as conspecific under *badia*.

Ducula badia badia (Raffles).

(The Malay Imperial Pigeon or Mountain Imperial Pigeon.)

1822. *Columba badia*, Raffles, *Trans. Linn. Soc. Lond.* XIII, p. 317. (Sumatra =Benkulen, W. Sumatra.)
1928. *Ducula badia badia*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 202.
1937. *Ducula badia badia*, Peters, *Check-list Birds World* III, p. 51.

Ducula badia badia is represented in the collection of the Indian Museum by the following skin :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
26554	♂	Bought alive in Bagan Datok Market, Perak (Malay Penin.).	Jan. 18, 1915	Raffles Mus., Singapore.	239	190	32	22

Distribution.—" Southern Tenasserim southward over the Malay Peninsula ; islands off the Mergui coast ; Sumatra ; Borneo " (Peters). Certain records from Yunnan proved later to be erroneous.

Ducula badia insignis Hodgson.

(Hodgson's Imperial Pigeon.)

1836. *Ducula insignis*, Hodgson, *Asiat. Res.* XIX, p. 162, pl. 9 (head and foot). (Nepal.)
1849. *Carpophaga insignis* (part), Blyth, *Catal. Birds Mus. Asiat. Soc. Bengal*, p. 232, No. 1404.
1913. *Ducula insignis insignis*, Stuart Baker, *Rec. Ind. Mus.* VIII, pp. 286, 287. (*a* only ; *b* from Kobo is wrongly identified as *Ducula* ; it is really *Alsocomus puniceus* Blyth.)
1928. *Ducula badia insignis*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 203.
1937. *Ducula badia insignis*, Peters, *Check-list Birds World* III, p. 51.

Ducula badia insignis is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
26467	♀	Darjeeling (N. Bengal).	1849	Asiat. Soc. Bengal.	233	185	31	20
3970	♀	Darjeeling (N. Bengal).	1870	Capt. H. J. Elwes.	240	197	28	23
26543	♂	Jalpaiguri Dist. (N. Bengal).	Jan. 26, 1940	Mr. C. M. Inglis.	241	196	32	22·5
26544	♀	Hasimari (Jalpaiguri Dist., N. Bengal).	Jan. 25, 1940	Mr. C. M. Inglis.	240	187	31	23
25372	(?)	Pasighat, 600 ft. (N. E. Assam).	1912	Dr. S. W. Kemp (Abor Exped.).	252	197	29	25

Remarks.—No. 26467 was recorded by Blyth (1849, p. 232, No. 1404 *B*).

Distribution.—" Western Nepal, Sikkim and Bhutan, east to Khasia Hills and the Brahmapootra River " (Peters).

Ducula badia griseicapilla Walden.

(The Grey-headed Imperial Pigeon.)

1849. *Carpophaga insignis* (part), Blyth, *Catal. Birds Mus. Asiat. Soc. Bengal*, p. 232, No. 1404.
1875. *Ducula griseicapilla*, Walden, *Ann. Mag. Nat. Hist.* (4) XVI, p. 228. (Karen Hills between 4,000 and 4,200 feet, Burma).
1928. *Ducula badia griseicapilla*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 204.
1937. *Ducula badia griseicapilla*, Peters, *Check-list Birds World* III, p. 51.

Ducula badia griseicapilla is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
26466	♂	63 miles west of Imphal (Manipur State, Assam).	Feb. 13, 1936	Zool. Survey of India.	244	207	31	25
23220	♂	" Loisampa " =Loi-San-Pa (Shan States).	Dec. 30, 1899	Col. C. T. Bingham.	247	206	35	25

Distribution.—" Burma and southwestern Yunnan to northern Tenasserim, Siam and all Indochina " (Peters).

Stuart Baker (1928, pp. 204, 205) also includes within its range the whole of Assam (except the hill ranges of Brahmaputra River and the Khasia Hills where *insignis* occurs). He says that the birds from Cachar, Sylhet, Manipur and the Bengal districts east of the Bay, though somewhat intermediate between *insignis* and *griseicapilla*, are nearest to the latter.

Ducula badia cuprea (Jerdon).

(Jerdon's Imperial Pigeon.)

1840. *Carpophaga cuprea*[1], Jerdon, *Madras Journ. Lit. & Sci.* XII, p. 12. (Wynaad, Malabar, S. India.)
1928. *Ducula badia cuprea*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 205.
1937. *Ducula badia cuprea*, Peters, *Check-list Birds World* III, p. 51.

Ducula badia cuprea is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
18456	♂	Madathuray (Travancore).	(?)	" Mus. Coll. Jaffa."	223	173	29	23
18457	♀	Madathuray (Travancore).	(?)	" Mus. Coll. Jaffa."	223	174	31	24
23962	(?)	Palode (N. or S. Travancore).	1870	Trivandrum Mus.	235	(171)	31	24
18696	♀	N. Bangalore (Mysore State).	(?)	" Mus. Coll. Jaffa."	225	175	31	(21)

[1] Not *Columba cuprea* as wrongly given by some authors including Stuart Baker (1928, p. 205).

Distribution.—" Southwestern India from Kanara, southward " (Peters). Once (?) recorded from Ceylon[1].

Genus **Muscadivora** Schlegel[2].

Muscadivora aenea (Linnaeus).

The species ranges from India, Ceylon, the Andaman and Nicobar Islands and the Indo-Burmese countries (including Burma, Siam, French Indo-China, the Malay Peninsula) to the Malayasian Islands (Java, Sumatra, Borneo and Celebes), and thence east to the Philippines and the Flores, and Lombock and Sulu Islands. Peters (1937, pp. 46, 47) admits thirteen subspecies of which four occur within the Indian limits.

Muscadivora aenea aenea (Linnaeus).

(The Malay Green Imperial Pigeon.)

1766. *Columba aenea*, Linnaeus, *Syst. Nat.* (12th ed.) I, p. 283. (" In Moluccas ", *errore*=Flores Is., Dutch East Indies, *vide* Hartert & Goodson, *Novit. Zool.* XXV, p. 346, 1918.)

1849. *Carpophaga sylvatica* (part), Blyth, *Catal. Birds Mus. Asiat. Soc. Bengal*, p. 231, No. 1401.

1928. *Muscadivora aenea aenea*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 207.

1937. *Ducula aenea aenea*, Peters, *Check-list Birds World* III, p. 46.

Muscadivora aenea aenea is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
26555	♀	Juara Bay, Pulau Tioman, S. China Sea.	June 9, 1906	Raffles Mus., Singapore.	226	157	34	21
26337 (Mounted in gallery.)	♀	(?)	May 11, 1935	Zool. Gardens, Calcutta.	(229)	147	..	25

Distribution.—" Southern Tenasserim and southern Siam, southward over the Malay Peninsula ; Rhio Archipelago, Sumatra, Java, Banka, Borneo ; Anamba, Natuna and Tambelan Islands ; Lombok, Sumbawa, Sumba, Flores, Panter and Alor ; Sulu Archipelago " (Peters).

Its Indian distribution " Southern Tenasserim " needs some comments. Stuart Baker (1928, p. 208) remarked that " Tenasserim specimens, as in so many species of birds, are somewhat intermediate but the southernmost seem distinctly referable to this race " In the Indian Museum there are a few skins (p. 313) from Taing and Pilai in the Mergui area which are referable to race *sylvatica* (not *aenea*), so that *aenea* probably occurs only farther south than Taing and Pilai.

[1] The only record is that given by Stuart Baker (1913, p. 107) who says that J. Stewart obtained this bird, together with an egg (taken in October) at Ratnapura in Ceylon. Later (1935, p. 139) he refers evidently this same specimen to Inglis, and in this he appears to be wrong. Phillips (1941, p. 205) says that it was " recorded only once, from the Sabaragamuwa jungles "—this is probably the same record as that given by Stuart Baker.

[2] Stuart Baker (1928, p. 206) wrongly assigns this genus to Selby (*Nat. Libr., Pigeons*, p. 112, 1835) who is the author of *Carpophaga*. *Carpophaga* Selby=*Muscadivora* Schlegel (see Salvadori, 1893, p. 181).

Muscadivora aenea sylvatica (Tickell).

(The Indian Green Imperial Pigeon.)

1833. *Columba Sylvatica*, Tickell, *Journ. Asiat. Soc. Bengal* II, p. 581. (Jungles of Borobhum and Dholbhum, Bihar.)
1849. *Carpophaga sylvatica* (part), Blyth, *Catal. Birds Mus. Asiat. Soc. Bengal*, p. 231, No. 1401.
1928. *Muscadivora aenea sylvatica*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 208.
1937. *Ducula aenea sylvatica*, Peters, *Check-list Birds World* III, p. 46.

Muscadivora aenea sylvatica is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
3963	♀	Daminiok (Bihar ?).	(?)	Mr. V. Ball.	235	162	27	23
3965	♂	Rajmahl Hills (E. Bihar).	(?)	Mr. V. Ball.	240	160	31	20
5730	(?)	Lamagooting (Assam).	(?)	Capt. Butler.	230	153	34	26
5731	(?)	Lamagooting (Assam).	(?)	Capt. Butler.	240	156	40	22
5732	(?)	Lamagooting (Assam)	(?)	" Mus. Coll."	239	160	29	23
3964	(?)	Cachar (Assam). ..	(?)	" Mus. Coll."	234	155	35	23
3966	(?)	Cachar (Assam). ..	(?)	" Mus. Coll."	245	163	30	21
6951	(?)	Naga Hills (Assam). ..	(?)	Capt. Butler.	240	169	34	(22)
6952	(?)	Naga Hills (Assam). ..	(?)	Capt. Butler.	245	166	42	26
13325	♀	Jergo Is. (off Arakan Coast, W. Burma).	Mar. 1884	Marine Survey of India.	232	155	41	25
9046	♂	Poodeepgoo (Upper Burma).	1875	Dr. J. Anderson.	245	160	29	25·5
5732	(?)	Burma.	(?)	" Mus. Coll."	234	153	31	28
5733	♀	Burma.	(?)	Capt. Butler.	232	153	28	23·5
12913	(?)	Taing (Mergui, S. Burma).	Jan. 31, 1882	Dr. J. Anderson (Mergui Exped.).	245	(170)	31	(22)
12912	(?)	Taing (Mergui, S. Burma).	Jan. 31, 1882	Dr. J. Anderson (Mergui Exped.).	232	154	31	24
12909	♂	Pilai (Mergui, S. Burma).	Mar. 9, 1882	Dr. J. Anderson (Mergui Exped.).	231	160	33	22
12910	♀	Pilai (Mergui, S. Burma).	Mar. 9, 1882	Dr. J. Anderson (Mergui Exped.).	233	166	28	24
12911	♂	Pilai (Mergui, S. Burma).	Mar. 13, 1882	Dr. J. Anderson (Mergui Exped.).	239	156	33	23
3967	(?)	Andamans. ..	(?)	Dr. G. E. Dobson.	232	(153)	30	22
3968	(?)	Andamans. ..	(?)	Dr. G. E. Dobson.	241	165	31	24
3969	(?)	Andamans. ..	(?)	Dr. G. E. Dobson.	232	(162)	32	22
26468	♀	Anikhet (Port Blair, S. Andamans).	Feb. 28, 1890	Dr. G. H. Bailey.	232	148	30	24

Remarks.—Stuart Baker (1928, p. 208) states that the " Andaman birds are very green and average more white on the forehead and face but seem hardly separable from *sylvatica*" The few skins from the Andamans in the Indian Museum support these remarks.

In the Indian Museum specimens no difference in measurement is discernible between birds from Eastern India, Burma and the Andamans.

Distribution.—" Nepal, Sikkim Terai and Assam, south to about lat. 20° N. in the Indian Peninsula, central Tenasserim, northern Siam and all of Indochina ; Andaman Islands[1] ; Pulo Condor, Hainan (?)" (Peters).

Muscadivora aenea pusilla (Blyth).

(The South Indian Green Imperial Pigeon.)

1849. *Carpophaga pusilla*, Blyth, *Journ. Asiat. Soc. Bengal* XVIII, Pt. 2, p. 816. (Nilgiris, *errore*=South India, *vide infra.*)
1849. *Carpophaga pusilla*, Blyth, *Catal. Birds Mus. Asiat. Soc. Bengal*, p. 232, No. 1402.
1928. *Muscadivora aenea pusilla*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 209.
1937. *Ducula aenea pusilla*, Peters, *Check-list Birds World* III, p. 46.

Muscadivora aenea pusilla is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
18455	♂	" Mudthary " (Travancore).	(?)	" Mus. Coll."	217	150	30	24
26469 (Holotype).	(?)	" Nilgiris " (*errore*) (=S. India).	1845	Dr. T. C. Jerdon.	210	(138)	28	20
26470 (Syntype).	(?)	" Nilgiris " (*errore*) (=S. India).	1845	Dr. J. C. Jerdon.	202	142	30	(22)
26548	♂	Katupathawwa (North Central Prov., Ceylon). [*Dry Zone.*]	Sept. 11, 1919.	Colombo Mus., Ceylon.	215	160	30	19
26547	♀	Higara or Hujara (South Prov., Ceylon). [*Wet Zone.*]	May 18, 1932.	Colombo Mus., Ceylon.	213	151	(32)	24

Remarks.—Blyth (1849*a*, p. 816) wrote about the bird as follows :—" No. 1402 *C. pusilla*, nobis. Like *C. sylvatica* (vel *aenea* of India), but much smaller, and nape very rufescent. Length of wing 8¼ in. ; of tail 5½ in. Nilgiris." No other particulars were given. In his *Catalogue* (1849, p. 232) he wrote :" 1402 *C. pusilla*, Blyth, J. A. S. XVIII, HAB. Nilgiris. *A.* Specimen presented by T. C. Jerdon, Esqr. (1845)."

In the Indian Museum, however, there are two skins, Nos. 26469 and 26470, which bear identical labels as follows :—" Type No. 1402, *Carpophaga pusilla* Blyth. Nilgiris. T. C. Jerdon, Esqr., 1845, A. S. B." No doubt, one of these two skins is the specimen listed in Blyth's

[1] " The Andaman birds possibly represent a distinct race " (Peters).

Catalogue. Of the two, No. 26469 agrees with Blyth's *Journ. Asiat. Soc. Bengal* specimen in measurements (wing $8\frac{1}{4}''$=about 210 mm.; tail $5\frac{1}{2}''$=about 138 mm.) and also in having the nape rupescent. It must therefore be regarded as the Holotype. No. 26470 then becomes a Syntype.

Type-locality.—Referring to this bird as *Carpophaga sylvatica*, Jerdon (1864, p. 456) showed that Blyth was wrong in accepting Nilgiris as the type-locality. Jerdon wrote : " I do not consider Blyth's small race *C. pusilla*, from the South of India, distinct from the bird of Central India ; the supposed new species was founded on a peculiarly small specimen." And further : " .Mr. Blyth was mistaken when he stated that the specimen sent him by myself, from which he made his *pusilla*, was from the Neilgherries [old spelling of Nilgiris] ; indeed I have not even seen this pigeon in the Wynaad."

Blyth's type, therefore, did not come from the Nilgiris, but from some other place in " South of India " The type-locality should, therefore, be South India. (Stuart Baker, 1928, p. 209, gives the type-locality as Ceylon, but without authority.)

Distribution.—" Indian Peninsula from about lat. 20°N., southward ; Ceylon " (Peters).

Genus **Myristicivora** Reichenbach.

Myristicivora bicolor (Scopoli).

(The Pied Imperial Pigeon.)

1786. *Columba bicolor*, Scopoli, *Delic. Flora et Faunae Insubr.* , fasc. 2, p. 94. (New Guinea.)
1849. *Carpophaga bicolor*, Blyth, *Catal. Birds Mus. Asiat. Soc. Bengal*, p. 232, No. 1406.
1928. *Myristicivora bicolor bicolor*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 211.
1937. *Ducula bicolor*, Peters, *Check-list Birds World* III, p. 50.

Some authors have recognised several races of this species, but they are not admitted by Peters (1937, p. 50).

Myristicivora bicolor is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
18347	♀	Andamans.	(?)	G. H. Booley	(220)	..	33	25
3972	(?)	Nicobars. ..	(?)	(?)	224	137	32	24
3973	(?)	Nicobars.	(?)	(?)	207	119	31	22
26556	♂	Pulau Jarak, Straits of Malacca (Malaya).	April 8, 1915.	Raffles Mus., Singapore.	225	123	31	23
10806	♀	New Guinea.	June 1877	Jardin des Plantes (Paris ?).	224	112	32	23
26822	♀	(?)	1901	Zool. Gardens, Calcutta.	247	143	35	23

Remarks.—No. 18347 is a poorly preserved specimen with the plumage soiled with fat; the tail and wings are damaged; the under tail-covert have a few irregular black spots at the base. In Nos. 3972 and 3973 the under tail-coverts are pure white with no black spots.

Distribution.—" Recorded from many localities between the Bay of Bengal and the Philippines, eastward to the Aru Islands and islands west of New Guinea. Occurs chiefly on smaller islands and islets, wandering in large flocks from island to island in search of food " (Peters).

There is a skin, No. 10806, in the Indian Museum merely labelled " New Guinea "

Family COLUMBIDAE.

Subfamily *COLUMBINAE*.

Genus **Columba** Linnaeus[1].

Columba livia Gmelin.

The species ranges from the British Isles and W. Europe, *via* N. Africa and W. Aisa to India, and N. China (?). Peters (1937, pp. 58-60) admits fourteen subspecies of which two, *neglecta* and *intermedia*, occur with certainty within the Indian limits, while about the occurrence of a third, *livia*, opinion is divided—most probably it does not occur within the Indian limits.

Columba livia neglecta Hume.

(Hume's Blue Rock Pigeon.)

1873. *Columba neglecta*, Hume, *Lahore to Yarkand* (by Henderson & Hume), p. 272. (Ladak, Kashmir.)
1928. *Columba livia neglecta*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 220.
1937. *Columba livia neglecta*, Peters, *Check-list Birds World* III, p. 59.

Columba livia neglecta is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
9931	♀	West of Bām (E. Iran).	April 26, 1872	Mr. W. T. Blanford.	219	130	29	19
24850	♀	Kuhak (Seistan, E. Iran).	April 22, 1905	J. W. N. Cumming.	218	121	30	19
25463	(?)	Lab-i-Baring, 1,600 ft. (Seistan, E. Iran).	March 11, 1919	Drs. N. Annandale & S. W. Kemp.	230	136	31	19

[1] *Columba*, Linnaeus, *Syst. Nat.* (10th ed.) I, p. 162, 1758. Type (by subsequent designation of Vigors, 1825) is *Columba oeneas*, Linnaeus (*loc. cit.*). Stuart Baker (1928, pp. 218, 219), following Mathews (1927, p. 55), regards as the type *Columba palumbus* Selby (*Ill. Brit. Orn.* I, p. xxx, 1825). He gives Selby's date first (p. 218) as 1852 and then (p. 219) as 1925, both wrong, as Ticehurst pointed out in 1930. Both Hartert (1920) and Peters (1937) give priority to Vigors 1825 over Selby 1825, and I follow them.

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
21879	♂	Shorawak (S. Afghanistan).	(?)	Dr. F. R. Maynard.	231	126	(32)	19
22838	(?)	(Kashmir or Yarkand region ?).	Aug. 11, 1873	Capt. Trotter (Forsyth's Yarkand Exped., 1873-74).	216	127	30	19
22836	♀	(Kashmir or Yarkand region ?).	Aug. 20, 1873	Dr. F. Stoliczka (Forsyth's Yarkand Exped., 1873-74).	222	129	31	21
6059	♂	Kharbu (=Kurbu or Karbu) (Ladak, Kashmir).	June 26, 1870	Dr. G. Henderson.	227	135	32	20
22835	(?)	Kharbu (=Kurbu or Karbu) (Ladak, Kashmir).	Aug. 21, 1873	Dr. F. Stoliczka.	222	135	32	21
17268	♂	Shergul (Kashmir).	Sept. 25, 1875	Dr. J. Scully.	235	120	(30)	18
17269	♀	Shergul (Kashmir).	Sept. 25, 1875	Dr. J. Scully.	231	..	31	21
22837	(?)	Nurla (Kashmir).	Aug. 28, 1873	Dr. F. Stoliczka.	225	125	31	21
7963	♀	Gilgit, 5,000 ft. (Kashmir).	July 1876	J. Biddulph.	212	116	29	19
17276	♂	Gilgit (Kashmir).	Nov. 19, 1878	Dr. J. Scully.	227	125	30	21
17279	♀	Gilgit (Kashmir).	Jan. 12, 1879	Dr. J. Scully.	215	120	29	18
17277	♂	Gilgit (Kashmir).	March 9, 1879	Dr. J. Scully.	222	128	31	21
17278	♂	Gilgit (Kashmir).	May 24, 1879	Dr. J. Scully.	230	128	33	20
22839	♂	Gilgit (Kashmir).	Jan. 16, 1880	Dr. J. Scully.	..	123	30	20
6097	(?)	Dras (Kashmir).	June 23, 1870	Dr. G. Henderson.	214	112	27	19

Remarks.—The specimens of *neglecta* in the Indian Museum are in some respects, especially the colour of the rump, intermediate between *livia* and *intermedia*. As pointed out by Ticehurst (1923, p. 463), in *neglecta* the rump is in most cases either very pale grey or white. But the lighter patch is considerably narrower than in *livia*. In a few cases, as in Nos. 7963 (Gilgit), 17269 (Shergul), 22835 (Kharbu), 22838 (Kashmir or Yarkand ?) and 21879 (Shorawak, S. Afghanistan), the rump is grey almost as in *intermedia* from which it is difficult to distinguish these individuals. However, other specimens from the same regions correspond to true *neglecta*.

Distribution.—" Transcaspia and Turkestan south to southern Persia, Baluchistan, Sind and northwestern Punjab " (Peters).

There is a specimen, No. 21879, in the Indian Museum from Shorawak in S. Afghanistan which is *neglecta*. (From N. E. Afghanistan, Meinertzhagen, 1938, p. 707, has recently recorded *C. l. gaddi*.)

Columba livia intermedia Strickland.

(The Indian Blue Rock Pigeon.)

1844. *Columba intermedia*, Strickland, *Ann. Mag. Nat. Hist.* XIII, p. 39 (India= Calcutta.)
1849. *Columba (Columba) livia* (part, variety in S. Asia), Blyth, *Catal. Birds Mus. Asiat. Soc. Bengal*, pp. 233, 234, No. 1417, *C* to *H*.
1928. *Columba livia intermedia*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 221.
1937. *Columba livia intermedia*, Peters, *Check-list Birds World* III, p. 59.

Columba livia intermedia is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
26515	(?)	" Upper Burma ". ..	1863	Col. Phayre.	215	122	30	18
26516	(?)	" Upper Burma ". ..	1863	Col. Phayre.	216	120	30	18
26517	(?)	Burma.	(?)	Dr. C. Williams.	219	117	33	..
26518	(?)	India.	(?)	Asiat. Soc. Bengal.	220	(135)	29	19
26519	(?)	Lower Bengal. ..	1843	Asiat. Soc. Bengal.	228	129	31	19
4000	(♀?)	Barrackpore (24-Parganas, Bengal).	Feb. 1870	Asiat. Soc. Bengal (Purchased).	218	(132)	32	20
4001	(♀?)	Barrackpore (24-Parganas, Bengal).	Feb. 1870	Asiat. Soc. Bengal. (Purchased).	226	..	29	20
17270	(?)	Katmandu (Nepal).	April 10, 1877	Dr. J. Scully.	204	116	29	..
17271	(?)	Katmandu (Nepal).	April 10, 1877	Dr. J. Scully.	218	138	30	18·5
17272	(?)	Katmandu (Nepal).	April 29, 1877	Dr. J. Scully.	213	121	27	20
17273	(?)	Balaji (Nepal). ..	May 15, 1877	Dr. J. Scully.	207	117	31	18
17275	(?)	Near Balaji (Nepal).	Nov. 25, 1877	Dr. J. Scully.	223	136	31	..
17274	♂	Harigaon (Nepal). ..	Sept. 17, 1877	Dr. J. Scully.	215	136	36	..
3999	(?)	Simla (Punjab). ..	(?)	Dr. F. Stoliczka.	231	124	30	20
3997	♂	Agra (U. P.). ..	Nov. 1867	" Riddell Mus."	213	125	31	21
3994	♀	Agra (U. P.). ..	Nov. 1869	" Riddell Mus."	212	130	31	22
26568	(?)	" Masuri " =? Mussooree (U. P.).	1849	Capt. Hutton.	(231)	133	..	21
3995	♂	Chota Nagpur. ..	Dec. 1868	Mr. V. Ball.	226	(125)	31	20
3996	(?)	Daminiok (Bihar ?).	May 31, 1870	Mr. V. Ball.	210	118	28	18
3998	♂	Singhbhum (Bihar).	April 16, 1869	Mr. V. Ball.	220	123	33	19
10761	♂	Palamau (Bihar).	April 6, 1878	Mr. V. Ball.	212	118	30	19
11456	♂	" Bhoura " (=Bavda), 2,500 ft. (Kolhapur State, Bombay Pres.).	April 19, 1878	Surg. J. Armstrong.	217	120	31	20
23950	♂	Trivandrum (Travancore).	Nov. 1891	Trivandrum Mus.	206	..	30	20

Remarks.—Nos. 22351, ♀, 21950, ♂, and 23712 are ornamental breeds mounted in the gallery ; they are not listed in the above table.

No. 26517 (" Burma ") and No. 26518 (" India ") have a dark, almost black, upper plumage ; and No. 3996 (Daminiok, ?Bihar) is speckled with black on the back and wings. These three specimens are evidently domesticated varieties.

With the exception of some of the skins discussed above, all the other skins in the Indian Museum, including the two skins from " Upper Burma ", Nos. 26515 and 26516, have the plumage typical of wild birds.

Hartert (1920, p. 1470) was of the opinion that the darkest and the most typical forms are found in S. India. The two S. Indian specimens, Nos. 11456 and 23950, in the Indian Museum are not appreciably darker than the N. Indian birds.

Distribution.—" All of India (except the part occupied by *neglecta*) east to western Assam and south to the dry parts of Burma ; Ceylon ; occurrence in Siam may be due to introduction " (Peters).

Columba rupestris Pallas.

1827. *Columba Oenas* δ *rupestris,* Pallas, *Zoogr. Russo-Asiat.* I, p. 560. (Dauria, Transbaikalia.)

The species ranges from practically the whole of Asiatic Russia below the Arctic Circle down to Kashmir, Tibet and S. China in the south, and Manchukuo and Korea in the north-east. Peters (1937, p. 57) admits two subspecies of which one occurs within the Indian limits.

Columba rupestris turkestanica Buturlin.

(The Turkestan Hill Pigeon.)

1893. *Columba rupestris pallida* (not *Columba pallida* Latham), Rothschild & Hartert, *Orn. Monatsb.* I, p. 41. (Altai Mts., Mongolia ; type from Katon Karagai.) Name preoccupied.

1908. *Columba rupestris turkestanica,* Buturlin, *Orn. Monatsb.* XVI, p. 45. (New name for *Columba rupestris pallida* Roth. & Hart.)

1928. *Columba rupestris turkestanica,* Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 222.

1937. *Columba rupestris turkestanica,* Peters, *Check-list Birds World* III, p. 57.

Columba rupestris turkestanica is represented in the collection of the Indian Museum by the following skins :—

(*a*) *Juveniles.*

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
21501	♂ (Juv.)	Little Pamir (E. Turkestan).	(?)	Dr. Alcock.	[205	124	27	19]
21502	♂ (Juv.)	Little Pamir (E. Turkestan).	(?)	Dr. Alcock.	[199	116	28	21]
21503	♀ (Juv.)	Little Pamir (E. Turkestan).	(?)	Dr. Alcock.	[200	118	27	20]
13289	♂ (Juv.)	Kilian Valley (E. Turkestan).	July 11, 1883	C. Ellis.	[223	115	26	18]

(*b*) *Adults.*

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
17282	♂	Gilgit (Kashmir).	Dec. 7, 1879	Dr. J. Scully.	228	123	29	17
17283	♂	Gilgit (Kashmir).	Dec. 7, 1879	Dr. J. Scully.	240	140	33	17
17284	♀	Gilgit (Kashmir).	Nov. 8, 1879	Dr. J. Scully.	230	122	28	17
17286	♀	Gilgit (Kashmir)	Dec. 8, 1879	Dr. J. Scully.	228	144	29	16
13288	(?)	Tutigalak, 14,000 ft. (Ladak, Kashmir).	May 25, 1883	C. Ellis.	225	116	28	..
13268	(?)	Tutigalak, 14,000 ft. (Ladak, Kashmir).	May 25, 1883	C. Ellis.	235	135	29	16
22843	(?)	Leh (Ladak, Kashmir).	Sept. 4, 1873	Dr. F. Stoliczka.	240	136	30	16
22847	(?)	Tank(t)se (Ladak, Kashmir).	Sept. 16, 1873	Dr. F. Stoliczka.	229	143	29	15
22848	(?)	Lu(c)kung or Lughung, (Ladak, Kashmir).	Sept. 19, 1873	Dr. F. Stoliczka.	222	135	31	16
22842	(?)	Lu(c)kung or Lughung (Ladak, Kashmir).	Sept. 19, 1873	Dr. F. Stoliczka.	219	131	30	17
22846	(?)	Above Sakti (Ladak, Kashmir).	Sept. 14, 1873	Dr. F. Stoliczka.	220	127	28	14
22849	(?)	Above Sakti, 14,000 ft. (Ladak, Kashmir).	Sept. 14, 1873	Dr. F. Stoliczka.	227	138	28	14
22845	(?)	Above Sakti, 14,000 ft. ((Ladak, Kashmir).	Sept. 14, 1873	Dr. F. Stoliczka.	234	129	30	17
22844	(?)	Above Sakti, 15,000 ft. (Ladak, Kashmir).	Sept. 14, 1873	Dr. F. Stoliczka.	215	128	28	17
17280	♂	Karakoram Pass (Kashmir).	Aug. 28, 1875	Dr. J. Scully	217	138	29	16
22853	(?)	Tangitar (E. Turkestan).	Feb. 18, 1874	Dr. F. Stoliczka.	220	129	27	16
22850	(?)	Tangitar (E. Turkestan).	Feb. 18, 1874	Dr. F. Stoliczka.	228	141	29	15·5
22852	(?)	Tangitar (E. Turkestan).	Feb. 18, 1874	Dr. F. Stoliczka.	234	144	30	14·5
22840	(?)	Tangitar (E. Turkestan).	Feb. 18, 1874	Dr. F. Stoliczka.	227	134	28	16
22841	(?)	Pasrabat (E. Turkestan).	March 26, 1874	Dr. F. Stoliczka.	235	139	30	17
22851	(?)	Pasrabat (E. Turkestan).	March 26, 1874	Dr. F. Stoliczka.	224	129	30	16·5
24946	♀	Khambajong (Tibet).	Oct. 7, 1910	Capt. H. J. Walton.	232	130	28	15
17281	♀	Ku(e)nlun Mts. (W. Tibet).	Aug. 16, 1875	Dr. J. Scully	220	141	28	(19)

Remarks.—The skins in Table (*b*) are clearly identifiable as *C. r. turkestanica* adults. The four skins in Table (*a*) differ from those in Table (*b*) in the following points :—(i) smaller size ; (ii) absence of metallic sheen on the nape and foreback, these areas being dark slaty ; (iii) absence of metallic gloss and of purple colour on the hind neck and the forebreast, these areas being dark grey-brown with narrow rufous-brown edgings to the feathers. The birds would thus appear to be the juveniles of *turkestanica*. They further differ from the adults in the particular noted below. Whereas in all the adult skins in Table (*b*), the first primary is subequal to the second and longer than the third, in the four skins in Table (*a*) it is not so. Three of them (Nos. 21501, 21502 and 21503) have the first primary considerably shorter than the second and third, the latter two being subequal. In the fourth,

No. 13289, the second primary is the longest, and the first and the third are subequal.

Distribution.—" Semiretchensk, Zaissan and the Russian Altai, south through Turkestan and western Tibet to Gilgit and the northern slopes of the Himalayas[1] (Peters).

Columba leuconota Vigors.

The species ranges from W Afghanistan and S.W Turkestan (the Pamirs, etc.), north to Kansu in W. China, east to N. E. Burma and Yunnan, and south to the northern slopes of the Himalayas, including Nepal, Sikkim and Bhutan. Peters (1937, p. 57) admits two subspecies both of which occur within the Indian limits.

Columba leuconota leuconota Vigors.

(The White-bellied or Snow Pigeon.)

1831. *Columba leuconota*, Vigors, *Proc. Comm. Zool. Soc. Lond.* Pt. 1, p. 23. (Himalayas. According to Peters, *infra*, the type was probably from Nepal. According to Hartert, 1920, p. 1473, the type probably lost, but certainly from west of Sikkim.)

1928. *Columba leuconota leuconota*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 224.

1937. *Columba leuconota leuconota*, Peters, *Check-list Birds World* III, p. 57.

Columba leuconota leuconota is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.)			
					W.	Tl.	Tr.	C.
22883	(?)	Tashgaon (Dras Valley, Kashmir).	Aug. 17, 1873	Dr. F. Stoliczka.	226	138	30	19
6032	♀	Dras (Kashmir).	June 23, 1870	1st Yarkand Exped.	230	130	32	17·5
17287	♀	Above Matayon (Kashmir).	Oct. 1, 1875	Dr. J. Scully.	235	145	31	20
17288	♂	Joth (Gilgit, Kashmir).	Oct. 14, 1875	Dr. J. Scully.	222	127	32	21·5
24247	(Juv.)	Dhasladhar Range, 13,000 ft. (Punjab).	Aug. 22, 1902	W. M. Craddock.	[227	138	29	22]
3993	♂	Kumaon (U. P.).	1867	" Riddell Mus."	242	142	32	19
3990	♂	Kumaon (U. P.)	(?)	Dr. F. Stoliczka.	246	(139)	29	19
3989	(?)	" Rakha in Bussahir " (=Bashahr State, N. E. Punjab).	Jan. 7, 1869	Mr. A. O. Hume.	221	..	28	15
3988	♂	Sikkim 12,000 ft. ..	Sept. 23, 1870	H. J. Elwes.	239	151	28	19
3991	(?)	Lachung Valley, 11,000 ft. (E. Sikkim).	Oct. 3, 1870	Mr. W. T. Blanford.	234	..	32	18
3987	♀	Chola Range 13,000 ft. (E. Sikkim).	Aug. 25, 1870	Mr. W. T. Blanford.	230	131	31	18
22882	(?)	" Sikkim "	June 28, 1875	W. E. Brooks.	236	143	32	19
12053	♂	Bhutan.	March 6, 1876	W. Rutledge.	..	..	32	20
12052	♂	Bhutan.	March 6, 1876	W. Rutledge.	208	..	31	21·5
12054	♀	(?)	March 12, 1877	W. Rutledge.	..	..	33	20
23982	(♀, Juv ?)	(?)	(?)	Zool. Gardens, Calcutta.	[232	137	33	18]

[1] "Birds from northern Kansu are referable to this race, *vide* F. Steinbacher *in litt.*" (Peters).

Remarks.—No. 23982 has the adult plumage, but differs from the other adults in the Indian Museum in the fact that its first primary is about 35 mm. shorter than the second and third, the latter two being subequal ; in all other adults the first primary is only 5-10 mm. shorter than the second.

I am unable to distinguish Bhutan and Sikkim skins in the Indian Museum from those obtained farther west.

Distribution.—" The Himalayas from western Afghanistan to Sikkim, where it intergrades with the next form [*i.e., gradaria*] ; occurs in summer in the Alai Mountains[1] and the Pamirs in southwestern Turkestan " (Peters).

Columba eversmanni Bonaparte.

(The Eastern Stock-Pigeon.)

1856. *Columba eversmanni*, Bonaparte, *C. R. Acad. Sci. Paris* XLIII, p. 838 (Western and Central Asia.)

1928. *Columba oenas eversmanni*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 226.

1937. *Columba eversmanni*, Peters, *Check-list Birds World* III, p. 61.

Columba eversmanni is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
24851	♀	Kuhak (Seistan, E. Iran).	April 28, 1905	J. W. N. Cumming.	190	107	24	18
14529	♀	Tirphul (N. W. Afghanistan).	April 23, 1885	Surg. Aitchison (Afghan Bound.Comm.).	195	108	26	18
14530	♀	Tirphul (N. W. Afghanistan).	April 22, 1885	Surg. Aitchison (Afghan Bound.Comm.).	195	108	29	18
14528	♂	Toman-Agha (N. W. Afghanistan).	April 25, 1885	Surg. Aitchison (Afghan Bound. Comm.).	200	108	27	17
14300	♂	Min Darakht (Afghanistan).	June 1, 1886	Capt. Yate (Afghan Bound. Comm.)	204	118	25	17
17293	♂	Yak Shamba Bazar (40 miles S. of Yarkand, E. Turkestan).	Aug. 1, 1875	Dr. J. Scully.	203	110	25	18
17295	♀ (Juv.)	Yak Shamba Bazar (40 miles S. of Yarkand, E. Turkestan).	Aug. 1, 1875	Dr. J. Scully.	[196	107	27	17·5]
17296	(Juv.)	Dras (Ladak, Kashmir).	Sept. 29, 1875	Dr. J. Scully.	[190	108	25	17]
6116	♂ (Juv.)	Chagrā (Ladak, Kashmir).	Oct. 8, 1870	Dr. G. Henderson.	[201	111	25	17]
3984	(?)	Sirsa District (Punjab).	(?)	Mr. A. O. Hume.	209	112	28	18
26520	(?)	Hansi (Hissar District, Punjab).	(?)	Dr. Scott (Asiat. Soc. Bengal).	202	116	(28)	18
14694	(?)	Kolassi (Purnea District, Bihar).	Jan. 14, 1886	H. Reilly.	198	99	26	20
3985	(?)	(?)	(?)	Dr. Fayrer.	199	113	27	17
3986	(?)	(?)	(?)	Dr. Fayrer.	201	104	27	16·5

[1] Stuart Baker's remark (1928, p. 224) that it breeds as far north as the Altai Mts. is probably wrong. The only records are from the Alai Mts. which lie considerably south of the Altai Mts.

Remarks.—Nos. 17295, 17296 and 6116 from Ladak appear to be juveniles. In No. 6116 the plumage is brownish instead of the grey of adults, and there is no metallic gloss on the neck and forebreast—Dr. Henderson (1873, p. 27) who obtained it had stated : " possibly a young bird " Nos. 17295 and 17296 are less brown, and the metallic gloss is partially present.

Distribution.—" Turkestan from the Aral Sea to northern Afghanistan and east to Zaissan-nor ; in winter to Sind, the southern Punjab, the United Provinces and Bihar " (Peters).

The distribution in Afghanistan and E. Turkestan calls for some remarks. Birds from Kandahar in S. Afghanistan are *eversmanni* (Ticehurst, 1927, p. 73). From the N. W border of Afghanistan, west of Herat, there are some skins (Nos. 14528, 14529, 14530) in the Indian Museum which are typical *eversmanni*, not intermediate between *eversmanni* and *oenas* as Stuart Baker (1913, p. 149) opined. These three skins are from Tirphul (34° 30′ N. lat. and 61° 30′ E. long) ; and Toman-Agha (34° 52′ N. lat. and 61° 2′ E. long.).

Columba palumbus Linnaeus.

The species ranges from W Europe, south to N. Africa and *via* Asia Minor, Caucasus, Turkestan, Transcaspia, Palestine, Iraq and Iran to N. W. India (east up to Oudh) and the Himalayas (east up to Sikkim). Peters (1937, pp. 61, 62) admits six subspecies of which only *C. p. casiotis* occurs within the Indian limits.

Columba palumbus casiotis (Bonaparte).

(The Eastern Wood-Pigeon or Ring-Dove[1] or Cushat.)

1849. *Columba* (*Palumbus*) *torquatus* (part, " variety in N. W. Himalayas "), Blyth, *Catal. Birds Mus. Asiat. Soc. Bengal*, p. 233, No. 1413.
1854 (Dec. 11). *Palumbus casiotis*, Bonaparte, *C. R. Acad. Sci. Paris* XXXIX, p. 1103. (Chinese Tartary.)
1854. *Palumbus casiotis*, Bonaparte, *Consp. Gen. Av.*, p. 42. (Himalayas.)
1928. *Columba palumbus casiotis*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 227.
1937. *Columba palumbus casiotis*, Peters, *Check-list Birds World* III, p. 227.

Columba palumbus casiotis is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
17289	♂	Gilgit (Kashmir).	Oct. 15, 1879	Dr. J. Scully.	247	178	35	..
17292	♀	Dangor (Gilgit, Kashmir).	Nov. 11, 1879	Dr. J. Scully.	247	179	..	..
17291	Juv. ♀	Gilgit (Kashmir).	Oct. 22, 1879	Dr. J. Scully.	[227	142	29	22]
3982	(?)	N. Simla, (Punjab).	(?)	Dr. F. Stoliczka.	258	165	33	20·5
3983	(?)	Kumaon (U. P.).	1867	" Riddell Mus."	253	199	32	20
9892	♂	Near Shiraz (S. Iran). [In oak forest, 6,000 ft.]	June 1870	Major St. John.	247	201	32	22
9893	Juv. ♀	Near Shiraz (S. Iran). [In oak forest, 6,000 ft.]	(?)	Major St. John.	[235	152	32	24]

[1] The name " Ring-Dove " is now used for *Streptopelia decaocto* (Frivaldszky)

Remarks.—In No. 9892 (Shiraz) the neck-patches are pale buff, conspicuously lighter than in *casiotis* from India but deeper than in *palumbus*.[1]

Distribution.—" Turkestan and Zaissan, south to eastern Persia, Baluchistan[2], the Salt Range and the Himalayas east to Sikkim. Migrates in winter south to Sind, the Punjab and Oudh " (Peters).

Columba elphinstonii (Sykes).

(The Nilgiri Wood-Pigeon.)

1833. *Ptilinopus Elphinstonii*, Sykes, *Proc. Comm. Zool. Soc. Lond.* (1832) II, p. 149. (The Ghats of Deccan.)
1849. *Columba (Palumbus) Elphinstonei*, Blyth, *Catal. Birds Mus. Asiat. Soc. Bengal*, p. 233, No. 1415.
1928. *Columba elphinstonii*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 228.
1937. *Columba elphinstonii*, Peters, *Check-list Birds World* III, p. 68.

Columba elphinstonii is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
26522	(?)	Nilgiris (S. India).	1848	Dr. T. C. Jerdon.	199	(154)	(37)	17
26523	(?)	Nilgiris (S. India.)	1848	Dr. T. C. Jerdon.	186	158	34	18
23914	(?)	" High range " (N. E. Travancore).	(?)	Trivandrum Mus.	208	158	29	18

Distribution.—" Hill tracts of southwestern India from Mahabaleshwar to Cape Comorin " (Peters).

Columba torringtoni (Bonaparte).

(The Ceylon Wood-Pigeon.)

1854 (Dec. 11). *Palumbus torringtoni*, " Layard ", Bonaparte, *C. R. Acad. Sci. Paris* XXXIX, p. 1103. (Ceylon.)
1854. *Palumbus torringtoni*, Bonaparte, *Consp. Gen. Av.* II, p. 42. (Ceylon.)
1928. *Columba torringtonii*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 229.
1937. *Columba torringtoni*, Peters, *Check-list Birds World* III, p. 68.

Columba torringtoni is represented in the collection of the Indian Museum by the following skin :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
26551	♂	Hakgalla (Ceylon). [*Hill Zone.*]	April 24, 1923	Colombo Mus., Ceylon.	180	(122)	26	18

Distribution.—" Confined to Ceylon " (Peters).

[1] Dr. C. B. Ticehurst said *in litt.* (Nov. 1940) that this difference is due to the fact the Shiraz birds were taken in June while the Indian birds were taken in winter.

[2] Stuart Baker (1928, p. 228) excludes Baluchistan. But Ticehurst (1927, p. 73; and 1930, p. 478) has shown that *casiotis* breeds in the juniper forests of northern Baluchistan; he also recorded a bird obtained as far south as Turbat in British Mekran on Nov. 27.

Genus **Alsocomus** Blyth.

Alsocomus puniceus Blyth.

(The Purple Wood-Pigeon.)

1842. *Columba* (*Alsocomus*) *Puniceus*, "Tickell", Blyth, *Journ. Asiat. Soc. Bengal* XI, Pt. 1, p. 461. (Chyebassa, Burma.)
1849. *Columba* (*Alsocomus*) *puniceus*, Blyth, *Catal. Birds Mus. Asiat. Soc. Bengal*, p. 233, No. 1411.
1928. *Alsocomus puniceus*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 232.
1937. *Columba punicea*, Peters, *Check-list Birds World* III, p. 69.

Alsocomus puniceus is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
3976	♂	Manbhum (E. Bihar).	(?)	Lt. Beavan.	219	(144)	29	18
7642	♂	Midnapore (Lower Bengal)	About 1874	W. Rutledge.	(223)	151	28	19
3977	♂	Cachar (Assam).	(?)	"Mus. Coll."	237	(162)	31	19
25272	(?)	Kobo, 400 ft. (N. E. Assam).	Dec. 5, 1911	Dr. S. W. Kemp (Abor Exped. 1911-12).	222	152	29	16
12917	♂	Gna Islet (Mergui Archipelago, S. Burma).	Feb. 18, 1882	Dr. J. Anderson (Mergui Exped.).	223	154	28	17
12918	♂	Gna Islet (Mergui Archipelago, S. Burma).	Feb. 15, 1882	Dr. J. Anderson (Mergui Exped.).	222	(156)	27	18

Remarks.—No. 25272 was wrongly identified as *Ducula insignis insignis* (Hodg.) by Stuart Baker (1913*a*, pp. 286, 287, specimen *b*).

Distribution.—"Eastern Bengal, Assam, Laos, south to the northern part of the Malay Peninsula, Siam and southern Annam" (Peters).

Some further remarks are necessary with regard to its distribution. Jerdon (1864, p. 462) recorded it from the "eastern portion of Central India, extending to near the sea coast in Midnapore and possibly southwards towards Cuttack" Salvadori (1893, p. 397) listed a skin from "Central India", and included the "Eastern part of Central India" in its range, probably on Jerdon's authority. Blanford (1898, p. 38) included in its range S. E. Bihar (Manbhum and Singhbhum) and "as far west as Sirguja" (=Surguja State in Chota Nagpur, C. P.). In the Indian Museum, No. 3976 is from Manbhum, and No. 7642 from Midnapur (Lower Bengal). Finally, Stuart Baker (1913, p. 177) has included the Sundarbans within its range.

Layard (1854, p. 58) recorded it from Ceylon where it probably occurs as a rare straggler (not as a seasonal immigrant as suggested by some authors). Legge (1880, p. 696) once observed a flock in Ceylon in 1869. The bird has never been recorded from S. India, and its occasional occurrence in Ceylon is rather mysterious,

Genus **Janthoenas**[1] Reichenbach.

Janthoenas palumboides (Hume).

(The Andaman Wood-Pigeon.)

1873. *Carpophaga palumboides*, Anonymous=Hume, *Str. Feath.* I, p. 302. (Port Mouat, S. Andaman Is.)
1874. *Ianthoenas nicobarica*, Walden, *Ann. Mag. Nat. Hist.* (4) XIV, p. 157. (Trinkut and Nangcowry Islands, Nicobars.)
1928. *Ianthoenas palumboides*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 233.
1937. *Columba palumboides*, Peters, *Check-list Birds World* III, p. 69.

Janthoenas palumboides is represented in the collection of the Indian Museum by the following skin :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
23075	(?)	Andamans. ..	(?)	Capt. R. A. S. Anderson.	238	..	31	18

Distribution.—" Andamans and Nicobars " (Peters).

Genus **Dendrotreron** Hodgson.

Dendrotreron hodgsonii (Vigors).

1832. *Columba Hodgsonii*, Vigors, *Proc. Comm. Zool. Soc. Lond.*, Pt. 2, p. 16. (Nepal.)
1849. *Columba* (*Alsocomus*) *Hodgsonii*, Blyth, *Catal. Birds Mus. Asiat. Soc. Bengal*, p. 233, No. 1410.
1928. *Dendrotreron hodgsonii*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 234.
1937. *Columba hodgsonii*, Peters, *Check-list Birds World* III, p. 64.

Dendrotreron hodgsonii is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
17327	♂	Gilgit (Kashmir).	June 24, 1879	Dr. J. Scully.	226	155	..	18
17328	♀	Kergah (Gilgit, Kashmir).	June 23, 1879	Dr. J. Scully.	224	151	..	16·5
26524	♀	Simla (Punjab).	1849	Asiat. Soc. Bengal.	233	(155)	28	16
3974	(♀)	Kumaon (U. P.).	(?)	" Riddell Mus."	233	171	27	18
3975	(♀)	Darjeeling (N. Bengal).	Winter of 1869-70.	H. J. Elwes.	220	135	25	17
4728	(♂)	Katmandu (Nepal).	(?)	(?)	226	165	(28)	19·5

Distribution.—" Resident between 8000 and 13000 feet in the Himalayas from Kashmir to Assam and south to Burma and the Shan States ; western China in southern Kansu, western Szechuan and western Yunnan " (Peters).

[1] The spelling given by Neave (*Nomenc. Zool.* II, p. 806, 1939) is *Janthoenas*, not *Ianthoenas* which Stuart Baker (1928, p. 233) has used.

Genus **Streptopelia** Bonaparte.

Streptopelia turtur (Linnaeus).

The species ranges from W Europe and N. Africa to the whole of S. W Asia from the Khirgiz Steppes and Turkestan to Arabia, Iraq, Iran, Afghanistan and N. W India. Peters (1937, p. 89) admits five subspecies. Of these only *arenicola* occurs with certainty within the Indian limits. According to Stuart Baker (1913, p. 187 ; 1928, p. 236), *S. t. turtur* is a rare staggler in extreme N. W India but, as pointed out by Ticehurst (1930, p. 478), this contention is based on very slender and doubtful evidence.

Streptopelia turtur arenicola (Hartert).

(The Persian Turtle-Dove.)

1894. *Turtur turtur arenicola*, Hartert, *Novit. Zool.* I, p. 42. (Fao, S. Iran.) Type was in Tring Mus., England ; now evidently in Amer. Mus. Nat. Hist.

1928. *Streptopelia turtur arenicola*, Stuart Baker, *Faun. Brit. Ind. Birds* (2nd ed.) V, p. 237.

1937. *Streptopelia turtur arenicola*, Peters, *Check-list Birds World* III, p. 89.

Streptopelia turtur arenicola is represented in the collection of the Indian Museum by the following skins :—

(*a*)

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
21574	(Juv. ♂)	Little Pamir (E. Turkestan).	(?)	Dr. Alcock (Pamir Bound. Comm.).	[175	116	23·5	16]
22887	(?)	Kashgar (E. Turkestan).	Dec. 16, 1873	Dr. F. Stoliczka.	169	123	22	17
22886	(?)	Yarkand (E. Turkestan).	May 23, 1874	Dr. F. Stoliczka.	174	123	23	16
17316	♂	Yarkand (E. Turkestan).	May 28, 1875	Dr. J. Scully.	174	129	23	17
17317	♂	Yarkand. ..	May 30, 1875	Dr. J. Scully.	171	130	22	19
17318	♂	Yarkand. ..	May 31, 1875	Dr. J. Scully.	174	118	23	..
17319	♂	Yarkand. ..	June 2, 1875	Dr. J. Scully.	175	123	22	17
17320	♂	Yarkand. ..	June 10, 1875	Dr. J. Scully.	174	(123)	25	18
17321	♀	Yarkand. ..	May 28, 1875	Dr. J. Scully.	169	127	21	17
22888	(?)	Kargalik, near Yarkand (E. Turkestan).	May 30, 1874	Dr. F. Stoliczka.	175	132	24	15·5

(*b*)

26529	♀	Gilgit, 5,000 ft. (Kashmir).	May 26, 1879	(?)	171	121	23	17
10433	♀ (Juv.?)	Near Shiraz (Iran).	July 1869	Capt. St. John.	[160	106	20	16]
9894	♂	Near Shiraz, 6,000 ft. (Iran).	June 1870	Major St. John.	171	129	22	16
9932	♂	Near Bám, 2,500 ft. (Murmanshir, S. E. Iran).	April 19, 1872	Dr. W. T. Blanford.	162	123	22	16
10282	(?)	(?)	(?)	Dr. W. T. Blanford. (Persian Coll.)	171	(122)	21	16

Remarks.—Hartert (1920, p. 1486) and Stuart Baker (1928, p. 237) state that birds from southern Iran, Turkestan (east up to Kashgar and Yarkand), Afghanistan, Baluchistan, Iráq, etc. are paler and smaller than the typical birds, *S. t. turtur*, from Europe. The wing-length given is 163-177 mm. (Hartert) and 161-181 mm. (Stuart Baker), while for the typical race *turtur* the figures are 163-182 mm. but mostly 173-178 mm. (Hartert) and 165-184 mm. (Stuart Baker); *arenicola* is generally regarded as smaller than *turtur*.

Hartert (1894, p. 42), who first separated the southern Iranian birds into a separate race *arenicola*, had stated that " the birds from Yarkand might also be distinguished subspecifically ", but later (1920, p. 1486) he regarded the Yarkand birds as *arenicola*.

The Turkestan and Iranian birds in the Indian Museum fall into separate groups [Tables (*a*) and (*b*) above], the Iranian birds being markedly paler and smaller, as shown by the following measurements (mm.) :—

		Wing	Tail	Tarsus	Culmen
E. Turkestan	5♂♂:	171-175	118-130	22-25	17-19
	1♀:	169	127	21	17
	3 o?:	169-175	123-132	22-24	15·5-17
Iran	2♂♂:	162-171	123-129	22	16
	1 o?:	171	(122)	21	16

No. 26529 from Gilgit resembles the Iranian birds in plumage. Having no typical European birds for comparison, I cannot go further into the question.

Distribution.—" Breeds in northern Africa from Morocco to Tripoli; in southwestern Asia from the Kirghiz Steppes to Turkestan south to Iraq, Persia, Afghanistan and Yarkand. Recorded as a migrant in Egypt, Yemen, and the Danakil country, and as wintering in northwestern India " (Peters).

Streptopelia orientalis (Latham).

The species ranges from Siberia in the north to Iran and India in the south, and China, Japan, Formosa and Hainan Island in the east. Peters (1937, pp. 89, 90) admits five subspecies. Of these, three occur within the Indian limits. Koelz (1939, p. 81) recently created a sixth race, *sylvicola*, based on six specimens from Castle Rock, Bombay Presidency. From Koelz's description, *sylvicola* seems hardly separable from *agricola* Tickell.

The uncertainty of the nomenclature of two of the three subspecies occurring within the Indian limits has led to considerable confusion in the past. Among those who have discussed the question from various angles are the following :—Hartert (1916, p. 80 ; 1920, pp. 1488-1490), Hartert & Steinbacher (1936, p. 458), Rothschild (1926, p. 223), Ticehurst (1930, p. 478), Ludlow & Kinnear (1934, pp. 97, 98) and, finally, Whistler & Kinnear (1936, pp. 677-679). Ludlow & Kinnear have finally settled the question of nomenclature, while Whistler & Kinnear have given an excellent summary of the distribution of the subspecies in India.

The three main views on nomenclature are summarised below :—

Common name.	Under tail-coverts.	Subspecific name.		
		View No. 1. (Correct one —adopted in present account.)	*View No. 2.* (Adopted by Stuart Baker in *Faun. Brit. Ind.*)	*View No. 3.*
1. Rufous Turtle-Dove.	Pale dove-grey	*orientalis* Latham.	*orientalis* Latham.	*orientalis* Latham.
2. Northern Indian Rufous Turtle-Dove.	White	*meena* Sykes.	*ferrago* Eversmann.	*ferrago* Eversmann.
3. Indian Rufous Turtle-Dove.	Dark grey	*agricola* Tickell.	*meena* Sykes.	*agricola* Tickell.

Streptopelia orientalis orientalis (Latham).

(The Rufous Turtle-Dove.)

1790. *Columba orientalis*, Latham, *Index Orn.* II, p. 606. (China, *ex* Sonnerat.)
1849. *Turtur orientalis* (part), Blyth, *Catal. Birds Mus. Asiat. Soc. Bengal*, p. 236, No. 1436.
1928. *Streptopelia orientalis orientalis*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 238.
1937. *Streptopelia orientalis orientalis*, Peters, *Check-list Birds World* III, p. 89.

Streptopelia orientalis orientalis is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
25387	♀	Mipi, 8,500 ft. (Mishmi Hills, N. E. Assam).	March 9, 1913	Capt. R. S. Kennedy.	197	141	29	16
20913	♂	Foochow (S. E. China).	Oct. 1870	C. B. Rickett.	194	138	29	19

Remarks.—The bird is stated by some to be common in the hills of Yunnan up to about 7,000 feet (*vide* Rothschild 1926, p. 233). Rothschild refers to some of Anderson's specimens. There are in the Indian Museum two of Anderson's skins labelled *Turtur gelastes* Tem., one from " Ponsee ", W Yunnan (April 11, 1868) and another from " Katha Up. Burma " (January 19, 1868)—both are *agricola* (Tickell) as listed below (p. 332). However, Rothschild refers one of Anderson's skins from Ponsee (♂, March 1868) to *S. o. orientalis*, although Anderson had referred it to *meena*. The statement of Stanford & Ticehurst (1939, p. 215) that " Anderson's records nominally from Yunnan, are really from Burma " is not quite correct since some of Anderson's skins of the Rufous Turtle-Doves *were* from Yunnan (see p. 332).

Distribution.— " Breeds from central Siberia, Transbaikalia, Amurland and Island of Sakhalin south to the Himalayas, northern

Assam, Yunnan Kwangtung and Island of Kiusiu. Winters over the greater part of eastern India, Indo-Chinese countries, southern China, the Japanese Islands, Formosa and Hainan" (Peters).

Streptopelia orientalis meena (Sykes).

(The Northern Indian Rufous Turtle-Dove.)

1832. *Columba Meena*, ♂, Sykes, *Proc. Comm. Zool. Soc. Lond.* II, p. 149. (Deccan.)
1842. *Columba ferrago*, Eversmann, *Addenda Pallas Zoogr. Rosso-Asiat.*, fasc. 3, p. 17. (Songaria and mountains of Tarbagati, Mongolia.)
1928. *Streptopelia orientalis ferrago*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 239.
1937. *Streptopelia orientalis meena*, Peters, *Check-list Birds World* III, p. 90.

Streptopelia orientalis meena is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector. or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
22890	(?)	"S. W. of Egisya" (=Ighizyar) (E. Turkestan).	May 18, 1874	Dr. F. Stoliczka.	193	139	27	16
14301	(Juv.?)	Chilik (Afghan Turkestan, not Iran).	July 2, 1886	Capt. Yate (Afghan Bound.Comm.).	[166	118	23	16]
17297	♂	Sharot (Gilgit, Kashmir).	April 28, 1879	Dr. J. Scully.	193	149	28	..
17298	♀	Gilgit (Kashmir). ..	May 1, 1879	Dr. J. Scully.	197	141	27	16
22884	(?)	Chiliscambo (Ladak, Kashmir).	Aug. 18, 1873	Dr. F. Stoliczka.	185	126	23	15
17299	♀	"Singal, Punjal" (? Gilgit, Kashmir).	May 27, 1879	Dr. J. Scully.	189	(140)	24	18
6401	♂	Kangan, near Srinagar (Kashmir).	June 15, 1870	Dr. G. Henderson. (Forsyth's First Yarkand Exped.).	184	(139)	25	17
6105	♂	Kangan, near Srinagar (Kashmir).	June 15, 1870	(Forsyth's First Yarkand Exped.).	188	138	27	16
4064	(?)	Kyelang (or Keylang) Lakul (?Kangra District), (Punjab).	(?)	Dr. F. Stoliczka.	189	127	26	16
17315	♂	Kansrao (Dehra Dun District, United Provinces).	April 2, 1870	(Mr. G. Ki or Dr. J. Scully ?).	187	148	27	17
11804	♀	"Bhoura" (=Bavda), 2,500 ft. (Kolhapur State, Bombay Pres.).	April 7, 1878	Surg. J. Armstrong.	183	135	25	15
11802	♂	"Bhoura" (=Bavda), 2,500 ft.	April 8, 1878	Surg. J. Armstrong.	189	140	27	16
11359	♂	"Bhoura" (=Bavda), 2,500 ft.	April 10, 1878	Surg. J. Armstrong.	190	137	28	17
11264	♀	"Bhoura" (=Bavda), 2,500 ft.	April 10, 1878	Surg. J. Armstrong.	188	134	25	18
11803	♂	"Bhoura" (=Bavda), 2,500 ft.	April 11, 1878	Surg. J. Armstrong.	191	142	27	16·5
11263	♀	"Bhoura" (=Bavda), 2,000 ft.	April 11, 1878	Surg. J. Armstrong.	180	131	26	15
11360	♂	"Bhoura" (=Bavda), 1,500 ft.	April 19, 1878	Surg. J. Armstrong.	184	133	27	..
11138	♂	"Bhoura" (=Bavda), 2,500 ft.	April 19, 1878	Surg. J. Armstrong.	188	131	26	17

Remarks.—Hartert (1920, p. 1490) gave the wing-length as 187-202 mm., mostly about 195 mm. Stuart Baker's (1928, p. 240) figures are : " 169-200 mm., but nearly always over 175 mm." In the 17 adult skins in the Indian Museum, the wing measures 180-197 mm., the majority being grouped closely around 188-189 mm.

Distribution.—" Breeds in the southern part of western Siberia east to the western Altai ; Turkestan, Persia, Afghanistan, Kashmir and the Himalayas east to western Nepal. Winters over the whole of western and southern India " (Peters).

The following further remarks are necessary.

The bird does not occur over the whole of W India—it avoids the desert areas of Sind and Rajputana.

Ticehurst (1927, p. 73) has recorded two birds on passage (October 1 and June 3) from Quetta in Baluchistan.

Whistler & Kinnear (1936, pp. 677, 678) have quoted several records from the western and eastern coast of Peninsular India down to about lat. 12°N. ; in the Indian Museum there are several Armstrong skins (April 7-19) from the Kolhapur State in the Bombay Presidency. Below 12°N. lat., there are no records from the mainland of India.

It occurs as a winter straggler in Ceylon (Wait, 1931, p. 296)[1].

There is a skin, No. 17315 (April 2), in the Indian Museum from the Dehra Dun District, U. P. There are several records from Bihar where it is said to be common in winter.

Stuart Baker's statement (1913, p. 200) that it is certainly an occasional straggler in Dhubri (Assam) needs confirmation.

Another statement of Stuart Baker (1928, p. 240) that " Rothschild accepts Anderson's record of this race from Yunnan " is incorrect. Rothschild (1926, pp. 223, 234) does not accept it as a Yunnan bird at all. Neither Mayr (1938, p. 317) nor Stanford & Ticehurst (1939, pp. 215, 216) have recorded it from N. Burma where the race *orientalis*, and not *meena*, is found.

The Indian distribution may thus be summed up as follows :—Breeds in Kashmir and the Himalayas east up to western Nepal where it intergrades with the darker race, *agricola* Tickell ; breeding birds (intermediates ?) may occasionally be found in the plains of Bihar. Winters in the whole of India (excluding the desert areas of Sind and Rajputana, etc.) east up to Bihar. Migrating birds met with in Baluchistan. Stragglers occur in Ceylon in winter.

Streptopelia orientalis agricola (Tickell).

(The Indian Rufous Turtle-Dove.)

1833. *Columba Agricola*, Tickell, *Journ. Asiat. Soc. Bengal* II, p. 581. (Jungles of Borabhum and Dholbhum, Bihar.)
1928. *Streptopelia orientalis meena*, Stuart Baker, *Faun. Brit. Ind. Birds* (2nd ed.) V, p. 240.
1937. *Streptopelia orientalis agricola*, Peters, *Check-list Birds World* III, p. 90.

[1] Stuart Baker (1930, p. 689) has wrongly referred this record to *S. o. agricola*, see foot-note on p. 332.

Streptopelia orientalis agricola is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
14918	♂	Kendrapara (Orissa).	Aug. 1888	"Mus. Coll."	176	134	27	15
14919	♀	Kendrapara (Orissa).	Aug. 1888	"Mus. Coll."	173	124	26	15·5
4063	(?)	Manbhum (Bihar).	(?)	Lt. Beavan.	174	118	27	18
25751	♀	Kuru (Ranchi District, Bihar).	Oct. 22, 1927	Dr. S. C. Law.	185	..	27	18
25530	(?)	Jessore (E Bengal).	(?)	T. C. Tweedie.	168	133	26	16
24582	♂	South Sylhet (Assam).	(?)	C. B. Antram.	163	110	25	17
8272	♀	Thayetmyo (Burma).	May 24, 1877	Dr. F. Stoliczka.	182	139	27	18
23221	♀	Kalaw, 4,300 ft. (S. Shan States, Burma).	Nov. 23, 1899	Col. C. T. Bingham.	184	140	25	18
23223	♀	Banqué (S. Shan States, Burma).	Dec. 20, 1899	Col. C. T. Bingham.	175	131	26	17
9085	(?)	Katha (Upper Burma).	Jan. 19, 1868	Dr. J. Anderson.	184	..	33	(17)
9084	(?)	Ponsee, 3,300 ft. (Kakhyen Hills, Yunnan).	April 11, 1868	Dr. J. Anderson.	188	142	27	16

Remarks.—Rothschild (1926, pp. 223, 234) accepted Anderson's record of this race from Yunnan. He wrote that an Anderson skin of "*Turtur gelastes*" from Tsitkaw (February 1875) in the British Museum is "*meena*" (=*agricola* Tickell). In the Indian Museum there are two Anderson skins, No. 9084 (Ponsee, Kakhyen Hills, W Yunnan, April 11) and No. 9085 (Katha, Upper Burma, January 19) labelled *Turtur gelastes*; they are *agricola* Tickell. These records, and that of Andrews & Heller (*vide* Rothschild, *loc. cit.*) from Ho-mu-shu Pass, W Yunnan, April 17, would suggest the inclusion of S. W Yunnan within the range of *agricola*.

Distribution.—"Resident in northeastern India in Bihar, Orissa and Bengal; southern Assam, and Burma south to Tenasserim" (Peters).

On the basis of the remarks given above, S. W. Yunnan may be included within its range.

In winter it may straggle as far south-west as Mahabaleshwar, Bombay Presidency (Stuart Baker, 1928, p. 241).

The statements of Whistler (1928, p. 302) and Stuart Baker (*loc. cit.*) that the bird breeds both in the Deccan and Central Provinces is, so far as I know, not supported by actual records.

Stuart Baker's (1930, p. 689) statement that Wait has recorded it from Ceylon is incorrect[1].

Streptopelia decaocto (Frivaldszky).

The species ranges from Hungary *via* S. E. Europe, Iran, India and Turkestan to China and Japan in the east. Peters (1937, p. 92) admits

[1] The only Turtle-Dove which Wait (1931, p. 296) records as occurring in Ceylon is *ferrago* Evers. (=*meena* Syk.) with white under tail-coverts.

three subspecies of which two occur within the Indian limits (*vide* also Roonwal, 1940, pp. 437-452). Ticehurst (1929, pp. 7-10) has suggested that *S. decaocto* (Frivaldszky) should perhaps retain the older name *S. risoria* (Linnaeus).

Streptopelia decaocto decaocto (Frivaldszky).

(The Indian Ring-Dove.)

[1758. ?*Columba risoria*, Linnaeus, *Syst. Nat.* (10th ed.) I, p. 165. (India.) Considered by some as applying to domesticated forms only.]
1838. *Columba risoria* Linn., variety *decaocto*, Frivaldszky, *K. magyar tudos Társaság Evkönyvi* III, Pt. 3, p. 183. (Turkey.)
1849. *Turtur risorius* (part ?), Blyth, *Catal. Birds Mus. Asiat. Soc. Bengal*, p. 235. (Part habitat, N. Africa, *errore* ?)
1928. *Streptopelia decaocto decaocto* (part), Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 248.
1937. *Streptopelia decaocto decaocto*, Peters, *Check-list Birds World* III, p. 92.
1940. *Streptopelia decaocto decaocto*, Roonwal, *Rec. Ind. Mus.* XLII, p. 440.

Streptopelia decaocto decaocto is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
24588	♂	Khwaja Ahmad (Seistan, E. Iran).	May 7, 1905	J. W. N. Cumming.	(164)	140	23	16
9080	♀ (Juv.?)	Pishin (Baluchistan).	Feb. 10, 1872	Mr. W. T. Blanford.	[161	128	23	15]
17322	♂	Mt. Abu (Rajputana).	May 22, 1868.	Mr. S. King.	167	(135)	23	..
25733	♀	Rajadara (Ranchi District, Bihar).	Oct. 18, 1927	Dr. S. C. Law.	173	143	23	16
25739	♀	Chandwa (Ranchi-Palamau border, Bihar).	Oct. 22, 1927	Dr. S. C. Law.	168	139	23	16
4058	(?)	Manbhum (E. Bihar).	(?)	" Mus. Coll."	167	133	24	15
4060	(?)	Manbhum (E. Bihar).	(?)	" Mus. Coll."	176	148	25	17
4061	(?)	Singhbhum (E. Bihar).	(?)	Mr. V. Ball.	175	140	27	15
4333	(?)	Nepal.	(?)	(?)	172	140	..	16
4059	♂	Nagpur (Central Provinces).	(?)	Mr. W. T. Blanford.	171	150	24	17
4062	(?)	S. E. Berar. ..	(?)	Mr. W. T. Blanford.	161	131	22	15
11902	♂	Phonda (Ratnagiri District, Bombay Presidency).	May 23, 1878	Surg. J. Armstrong.	161	136	25	(13)
18442	♀	Near Bangalore (Mysore State).	(?)	" Mus. Coll., Jaffa."	160	132	22	15·5
26533[1]	(Juv.?)	Calcutta. ..	(1842-45)	Asiat. Soc., Bengal.	[155	..	23	18]

[1] This is No. 1430 *H* of Blyth's *Catal. Birds Mus. Asiat. Soc. Bengal*, pp. 235, 236 (1849), where it is described as " Young. (White race) ", under *Turtur risorius*. The plumage of the specimen is entirely white. I have included this identification on Blyth's authority.

Remarks.—Stuart Baker (1928, p. 248) included under *S. d. decaocto* the E. Turkestan birds also ; the latter are really *S. d. stoliczkae* Hume (see p. 351).

The Indian specimens of *S. d. decaocto* in the Indian Museum give a wing-length of 160-176 mm., average 168 mm.

Distribution.—" Resident from Hungary over southeastern Europe, Asia Minor, Turkestan, northern China and Japan, south to Palestine, Iraq, Persia, India, Ceylon and western China. A pale variety found under domestication " (Peters).

Streptopelia decaocto xanthocyclus (Newman).

(The Burmese Ring-Dove.)

1906. *Turtur decaocto xanthocycla*, Newman, *Avicult. Mag.* (N. S.) IV, p. 324 and fig. 1 of plate. (Minbu and Mangue Districts, Upper Burma.)
1928. *Streptopelia decaocto xanthocycla*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 249.
1937. *Streptopelia decaocto xanthocyclus*, Peters, *Check-list Birds World* III, p. 82.
1940. *Streptopelia decaocto xanthocyclus*, Roonwal, *Rec. Ind. Mus.* XLII, p. 449.

Streptopelia decaocto xanthocyclus is represented in the collection of the Indian Museum by the following skin:—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
9064	(?)	" Upper defile Irrawady ", about 40 miles below Bhamo (N. Burma).	Sept. 1868	Dr. J. Anderson.	182	151	27	(17)

Remarks.—The single Anderson skin in the Indian Museum agrees with Anderson's description (1879, p. 666) in that the " colour generally is darker and more vivid than in Indian specimens of the species (*S. d. decaocto*), and the collar is larger and more crescentic. "; it is also " decidedly larger " (*vide* Roonwal, 1940).

Distribution.—" Burma, Shan States, Yunnan and eastern China (lower Yangtse Valley and Fohkien " (Peters).

Streptopelia chinensis (Scopoli).

The species extends from W. India (excluding Sind and the Punjab), to China, Formosa and the Philippines in the east, and south to Ceylon, the Malay Peninsula and the East Indies. Peters (1937, pp. 97, 98) admits eight subspecies of which four occur within the Indian limits.

Streptopelia chinensis suratensis (Gmelin).

(The Indian Spotted Dove.)

1789. *Columba suratensis*, Gmelin, *Syst. Nat.* I, Pt. 2, p. 778. (Surat, Bombay Presidency, *ex* Sonnerat, *Voy. Indes* II, p. 179.)
1849. *Turtur suratensis* (part), Blyth, *Catal. Birds Mus. Asiat. Soc. Bengal*, p. 236, No. 1435.
1928. *Streptopelia chinensis suratensis*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 242.
1937. *Streptopelia chinensis suratensis*, Peters, *Check-list Birds World* III, p. 97.

Streptopelia chinensis suratensis is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
17308	♀ (Juv.)	Dangor (Gilgit, Kashmir).	Nov. 11, 1879	Dr. J. Scully.	[133	125	22	15·5]
17309	♀ (Juv.)	Gilgit (Kashmir). ..	Nov. 26, 1879	Dr. J. Scully.	[125	117	22	..]
17306	♂ (Juv.)	Gilgit (Kashmir). ..	Dec. 18, 1879	Dr. J. Scully.	[135	(134)	24	16]
17310	♀	Gilgit (Kashmir). ..	Feb. 4, 1880	Dr. J. Scully.	130	146	(20)	15·5
17300	♀ (Juv.)	Chattar (Kashmir). ..	Oct. 17, 1875	Dr. J. Scully.	[130	(120)	..	15]
22892	(?)	Changligally, near Murree (Rawalpindi, District, Punjab).	July 6, 1873	Dr. F. Stoliczka.	130	(139)	22	16
22891	(?)	Ghari (Punjab ?).	July 20, 1873	Dr. F. Stoliczka.	137	132	24	..
17304	♂ (Juv.)	" Residency Grounds " [Katmandu] " Nepal Valley".	Feb. 4, 1878	Dr. J. Scully.	[128	119	22	14·5]
17301	♂	Katmandu (Nepal).	April 19, 1877	Dr. J. Scully.	144	139	24·5	15·5]
17302	♂	Katmandu (Nepal).	May 2, 1877	Dr. J. Scully.	137	145	20	15
17305	♀	" Residency Grounds " [Katmandu] " Nepal Valley ".	June 28, 1877	Dr. J. Scully.	133	144	22	15
5186	(?)	Katmandu (Nepal).	(?)	(?)	140	137	24·5	16
17303	♂	Thankot (Nepal).	Sept. 2, 1877	Dr. J. Scully.	137	(157)	24	16
4032	(?)	Darjeeling (N. Bengal).	(?)	Dr. J. Anderson.	127	145	18	..
4031	♂	Darjeeling (N. Bengal).	(?)	Dr. J. Anderson.	136	136	23	(14)
4034	(?)	" Darjeeling Terai " (N. Bengal).	(?)	Dr. J. Anderson.	130	127	23	15
26445	(?)	Gish (Jalpaiguri District, N. Bengal).	Nov. 22, 1938	Zool. Survey of India.	137	142	25	16
4044	♂	Moisraka (Midnapore Dist., W. Bengal).	Jan. 3, 1870	Mr. J. Wood-Mason.	136	(148)	23	16
4045	(?)	Midnapore (W. Bengal).	Jan. 4, 1870	Mr. J. Wood-Mason.	142	162	23	16·5
25673	(?)	Ranaghat (Nadia Dist., Bengal).	Aug. 28, 1927	Mr. A. Rahim.	138	154	25	14·5
4037	(?)	Calcutta.	Aug. 1, 1867.	" Mus. Coll."	132	(146)	24·5	14
4035	♂	Calcutta.	Oct. 1867	Dr. J. Anderson.	132	133	23	14
26398 (Mounted in gallery).	♂	Ind. Mus. garden, Calcutta.	Mar. 2, 1938	Mr. R. V. Sherard.	139	133	..	17
26532	♂	Pulta Water Works, 17 miles N. of Calcutta.	Oct. 6, 1939	Dr. M. L. Roonwal.	132	144	25	15
24567	♀	South Sylhet (Assam).	(?)	C. B. Antram.	141	147	24	15
24586	♂	South Sylhet (Assam).	(?)	C. B. Antram.	134	143	22	(15)
24592	(?)	South Sylhet (Assam).	(?)	C. B. Antram.	137	143	23	15
4041	♀	Singhbhum (Bihar).	Feb. 26, 1869	Mr. V. Ball.	137	145	25	16·5

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
25755	♂	Angara (Ranchi District, Bihar).	Oct. 12, 1927	Dr. S. C. Law.	134	142	23	15
4039	♂	"Chota Nagpur." ..	Dec. 1868	Mr. V. Ball.	140	..	23	15
4046	♀	West of Chanda (Central Provinces).	Jan. 1, 1870	Mr. W. T. Blanford.	135	137	22	14
17311	♀	Mt. Abu (Rajputana).	Jan. 1, 1868	Mr. S. King.	136	127	23	15
17312	♀	Mt. Abu (Rajputana).	Apr. 27, 1868	Mr. S. King.	138	137	23	15·5
18318	(?)	Ahmadabad (Gujrat).	(?)	H. E. M. James.	140	(140)	22	16
11362	♂	Waghotan (=Vaghotan) (Ratnagiri District, Bombay Pres.).	Mar. 1, 1878	Surg. J. Armstrong.	132	157	23	..
11086	♀	Waghotan (=Vaghotan) (Ratnagiri District, Bombay Pres.).	Feb. 28, 1878	Surg. J. Armstrong.	(135)	148	22	..
11905	♂	"Bhoura" (=Bavda), 2,500 ft. (Kolhapur State, Bombay Presidency).	Mar. 27, 1878	Surg. J. Armstrong.	133	139	24	..
11453	♂	"Bhoura" (=Bavda), 2,000 ft.	Apr. 3, 1878	Surg. J. Armstrong.	138	146	24	16
11903	♂	"Bhoura" (=Bavda), 2,000 ft.	Apr. 3, 1878	Surg. J. Armstrong.	136	145	24	..
11365	♂	"Bhoura" (=Bavda), 2,000 ft.	Apr. 3, 1878	Surg. J. Armstrong.	133	134	23	15
22893	♀	"Bhoura" (=Bavda), 2,000 ft.	Apr. 3, 1878	Surg. J. Armstrong.	137	143	24	16
11363	♂	"Bhoura" (=Bavda), 2,000 ft.	Apr. 4, 1878	Surg. J. Armstrong.	134	144	22·5	15
11904	♀	"Bhoura" (=Bavda), 2,000 ft.	Apr. 7. 1878	Surg. J. Armstrong.	132	140	22	..
11364	♀	"Bhoura" (=Bavda), 2,000 ft.	Apr. 7, 1878	Surg. J. Armstrong.	132	137	24	15
11085	♂ (Juv.?)	"Bhoura" (=Bavda), 2,000 ft.	Apr. 10, 1878	Surg. J. Armstrong.	[123	116	22	..]
18543	♂	Near Bangalore (Mysore State).	(?)	"Mus. Coll. Jaffa."	135	139	24	15
18544	♀	Near Bangalore (Mysore State).	(?)	"Mus. Coll. Jaffa."	137	(136)	22	15·5
23924	♂	Deviculum (Travancore).	Feb. 1892	Trivandrum Mus.	130	136	22	14
23925	(?)	Deviculum (Travancore).	Feb. 1892	Trivandrum Mus.	128	130	21·5	14
1043	(?)	"Travancore." ..	(?)	(Purchased.)	127	139	23	13
4042	(?)	"Travancore." ..	(?)	(Purchased.)	127	127	23	16
4040	♂	Chasri (?). ..	1865	Dr. F. Stoliczka.	138	(141)	24	16
22894	(Juv.)	(?)	(?)	(?)	[134	..	(24)	16]
24512	(?)	(?)	(?)	(?)	134	(128)	22	15

Distribution.—"All of India (but absent from a large area of Sind and Punjab) and in the Himalayas up to 7,000 feet; birds from Cachar and Manipur form the transition to *S. c. tigrina* and those from Travancore tend towards *S. c. ceylonensis*. Introduced into Mauritius" (Peters).

Streptopelia chinensis tigrina (Temminck).

(The Burmese Spotted Dove.)

1810. *Columba Tigrina*, Temminck, in Knip, *Les Pigeons* I, p. 94, pl. 43. (Timor and Batavia in E. Indies. According to Hartert, 1920, p. 1491, the type in the Paris Museum is from Java.)

1928. *Streptopelia chinensis tigrina*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 244.

1937. *Streptopelia chinensis tigrina*, Peters, *Check-list Birds World* III, p. 98.

Streptopelia chinensis tigrina is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
8271	♀	Thayetmyo (Burma).	Dec. 21, 1871	Dr. F. Stoliczka.	132	139	23	13
4047	(?)	Burma.	(?)	Dr. Williams.	145	157	25	16
9067	(?)	Upper Burma. ..	Jan. 1868	Dr. J. Anderson.	149	162	24	15
9068	(?)	Upper Burma. ..	Jan. 14, 1868	Dr. J. Anderson.	147	155	27	16
9069	♂	Yayleymau (Upper Burma).	Jan. 5, 1875	Dr. J. Anderson.	140	147	25	14·5
9077	♂	Ava (Upper Burma).	Oct. 4, 1868	Dr. J. Anderson.	147	169	25	16·5
9078	(?)	Ava (Upper Burma).	Oct. 4, 1868	Dr. J. Anderson.	147	153	23	14
9079	(?)	Katha (Upper Burma).	Jan. 19, 1868	Dr. J. Anderson.	139	140	25	14
9070	(?)	"Bhaman" (= Bhamo?) (Upper Burma).	Sept. 8, 1868	Dr. J. Anderson.	147	149	24	16
9071	(?)	"Bhaman" (= Bhamo?) (Upper Burma).	Sept. 11, 1868	Dr. J. Anderson.	141	162	27	17
9072	(?)	"Bhaman" (= Bhamo?) (Upper Burma).	Sept. 3, 1868	Dr. J. Anderson.	141	155	25	16
9074	(?)	"Bhaman" (= Bhamo?) (Upper Burma).	Feb. 1868	Dr. J. Anderson.	141	160	24	16
9075	(?)	"Bhaman" (= Bhamo?) (Upper Burma).	Feb. 28, 1868	Dr. J. Anderson.	149	149	26	15
9076	(?)	"Bhaman" (= Bhamo?) (Upper Burma).	Oct. 7, 1868	Dr. J. Anderson.	141	141	24	14
9066	(?)	Tapeng (Upper Burma).	Mar. 1, 1868	Dr. J. Anderson.	147	155	25	17
9082	(?)	Ponsee (Kakhyen Hills, W. Yunnan, China).	Mar. 16, 1868	Dr. J. Anderson.	137	138	24	15
9083	(?)	Ponsee, 3,300 ft. (Kakhyen Hills, W. Yunnan, China).	Mar. 14, 1868	Dr. J. Anderson.	147	140	22	15
9081	(?)	Muangla-Sanda Valley, 3,000 ft. (W. Yunnan, China).	May 18, 1868	Dr. J. Anderson.	143	130	23	14·5
9080	(♂)	Momien, 5,500 ft. (W. Yunnan, China).	June 5, 1868	Dr. J. Anderson.	157	155	28	15

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
8115	♂	Meetan (=Mitan) (Amherst District, S. Burma).	Jan. 1, 1877	"Tenasserim Exped."	145	149	22	16·5
8116	♂	Houngdaraw River (Amherst District, S. Burma).	Jan. 29, 1877	"Tenasserim Exped."	144	..	27	15
8117	♀ (Juv.)	Houngdaraw River (Amherst District, S. Burma).	Feb. 27, 1877	"Tenasserim Exped."	[136	128	25	17]
12913	(?)	"Taing" (Mergui, S. Burma).	Jan. 31, 1882	Dr. J. Anderson.	138	152	25·5	15·5
12915	♂	"Yeemuku" (Mergui, S. Burma).	Jan. 24, 1882	Dr. J. Anderson.	148	(160)	26	15
4048	(?)	Wellesly Prov. (Malay Penin.).	(?)	(Purchased.)	139	146	27	16
13460	(Juv.)	Malacca (Malay Penin.).	(?)	Bengal Economic Mus.	[(137)	135	22	14]
13459	(Juv.)	Malacca (Malay Penin.).	(?)	Bengal Economic Mus.	[133 (Head missing.)	..	25	..]

Remarks.—I have included a few birds from W Yunnan under *tigrina*, as I am unable to separate these from the *tigrina* obtained from all over Burma. Some authors refer W Yunnan birds to the race *forresti* which, however, is considered by Peters (1937, p. 98) as doubtfully distinct from *tigrina*.

Distribution (of *tigrina* 'senu stricto').—"Eastern Bengal, Burma, Malay Peninsula, Indo-Chinese countries, Palawan, Borneo, Sunda Islands from Sumatra to Babar. Introduced into Celebes, small islands in the Flores Sea, and the Moluccas" (Peters).

Streptopelia chinensis ceylonensis (Reichenbach).

(The Ceylonese Spotted or Ash Dove.)

1851. *Turtur ceylonensis*, Reichenbach, *Vollst. Natursyst., Tauben*, pl. 253*b*, figs. 3373, 3374. (Ceylon.)
1928. *Streptopelia chinensis ceylonensis*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 245.
1937. *Streptopelia chinensis ceylonensis*, Peters, *Check-list Birds World* III, p. 97.

Streptopelia chinensis ceylonensis is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
26549	♂	Passara (Ceylon). [*Hill Zone.*]	Dec. 3, 1920	Colombo Mus., Ceylon.	129	129	24	15
26550	♂	Hakgalla (Central Prov., Ceylon). [*Hill Zone.*]	Apr. 24, 1924	Colombo Mus., Ceylon.	127	129	19	15·5

Distribution.—"Ceylon" (Peters).

Streptopelia senegalensis (Linnaeus).

The species ranges over the whole of Africa ; farther east it occurs in Arabia, Palestine, Syria, Asia Minor, and thence to Iran, Afghanistan, Russian Turkestan and practically the whole of India (excluding the extreme eastern portion of the mainland, and also excluding Burma and Ceylon). Peters (1937, pp. 98-100) admits nine subspecies of which only one, *cambayensis*—two, *cambayensis* and *ermanni*, according to some —occurs within the Indian limits.

The trivial name calls for some comment. The African races go under the name " Laughing Doves " Since the type-locality of the species is in Africa, it is desirable that all races should follow a trivial nomenclature identical to that of the African races. In Indian ornithological literature, however, this dove is called the " Little Brown Dove " which, for the above reason, should be changed to " Laughing Dove "

Streptopelia senegalensis cambayensis (Gmelin).

(The Indian Laughing Dove or Indian Little Brown Dove.)

1789. *Columba cambayensis*, Gmelin, *Syst. Nat.* I, p. 779. (" Cambaya ", *i.e.*, Gulf of Cambay, W. coast of India).
1849. *Turtur senegalensis* (part), Blyth, *Catal. Birds Mus. Asiat. Soc. Bengal*, p. 237, No. 1438.
1928. *Streptopelia senegalensis cambayensis* and *S. s. ermanni* (part), Stuart Baker, *Faun. Brit. Ind., Birds* (2nd. ed.) V, pp. 246, 247.
1937. *Streptopelia senegalensis cambayensis*, Peters, *Check-list Birds World* III, p. 99.

Streptopelia senegalensis cambayensis is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
17313	♂	Gilgit (Kashmir).	Jan. 27, 1880	Dr. J. Scully.	125	116	..	12·5
4065	(?)	Simla (Punjab)	(?)	Dr. F. Stoliczka.	129	..	22	13
18317	(?)	Ahmadabad (Gujrat).	(?)	H. E. M. James.	126	122	20	15
4066	(?)	Manbhum (E. Bihar).	(?)	" Mus. Coll."	121	(117)	21	13
4067	(?)	Manbhum (E. Bihar).	(?)	" Mus. Coll."	119	..	19	14
4068	♂	S. E. Berar, West of Chanda (Central Provinces).	Jan. 18, 1870	Mr. W. T. Blanford.	123	(111)	20	15
11644	♀	" Bhoura " (=Bavda), 2,200 ft. (Kolhapur State, Bombay Presidency).	Mar. 26, 1878	Surg. J. Armstrong.	123	..	18	14
18441	♂	Near Bangalore (Mysore State).	(?)	" Mus. Coll., Jaffa."	124	114	20	13·5
18542	♀	Near Bangalore (Mysore State).	(?)	" Mus. Coll., Jaffa."	124	113	20	14
9933	♀	Bampur, 2,000 ft. (Baluchistan).	Apr. 5, 1872	Mr. W. T. Blanford.	127	117	21	13·5

Remarks.—The two Baluchistan skins, Nos. 9933 and 9934, are indistinguishable from the rest, and are *cambayensis*, not *ermanni*.

Distribution.—" Eastern Persia, Baluchistan and the greater part of India " (Peters).

Genus **Oenopopelia** Blanford.

Oenopopelia tranquebarica (Herman).

This, the only species of the genus, ranges over the whole of S. E. Asia, *e.g.*, from E. Afghanistan (Meinertzhagen, 1938, p. 710) and Sind in the west, through the whole of India and Ceylon, *via* N. E. Tibet, Yunnan, Burma and the Andaman Islands to Siam (not the Malay Peninsula), Indo-China, the whole of China (straggling up to Japan) to the northern Phillippines, Hainan and Formosa ; once also found on the coast of British N. Borneo (Hartert & Steinbacher, 1936, p. 460). Peters (1937, p. 97) admits three subspecies all of which occur within the Indian limits.

Oenopopelia tranquebarica tranquebarica (Herman).

(The Indian Red Turtle-Dove.)

1804. *Columba tranquebarica*, Herman, *Obs. Zool.*, p. 200. (" Tranquebaria ", India.)
1849. *Turtur humilis* (part), Blyth, *Catal. Birds Mus. Asiat. Soc. Bengal*, p. 236, No. 1432.
1928. *Oenopopelia tranquebarica tranquebarica*, Stuart Baker, *Faun. Brit. Ind, Birds* (2nd ed.) V, p. 250.
1937. *Streptopelia tranquebarica tranquebarica*, Peters, *Check-list Birds World* III, p. 97.

Oenopopelia tranquebarica tranquebarica is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
4051	♂	Agra (United Provinces).	(?)	" Riddell Mus."	134	99	20	13
4052	♂	Agra (United Provinces).	(?)	" Riddell Mus."	134	(94)	18	13·5
4054	♂	Nagpur (Central Provinces).	(?)	Mr. W. T. Blanford.	131	98	19	14
4057	♂	S. E. Berar.	(?)	Mr. W. T. Blanford.	137	..	19	13
18546	♀	Near Bangalore (Mysore State).	(?)	" Mus. Coll., Jaffa."	135	90	19	14

Distribution.—" India from Sind and the Punjab east to western Nepal, Bihar and Bengal " (Peters).[1]

[1] Layard (1854, p. 60) once recorded a small colony of " *Turtur humilis* " breeding in the Jaffna Peninsula in Ceylon. This is the sole record from Ceylon. Stuart Baker (1928, p. 250), Wait (1931, p. 298) and Phillips (1941, pp. 207, 211) refer Layard's Ceylon record to *O. t. tranquebarica* and not to *O. t. humilis*, but I cannot say how far they are right in doing so.

For the following reasons, the western limit given above needs extension. Whistler (1928, p. 308) stated that it occurs in the North-West Frontier Province. Later, Whilstler (1930, p. 271) recorded typical *tranquebarica* as a summer visitor in the Rawalpindi District (extreme N. W Punjab). Meinertzhagen (1938, p. 710) observed this dove (subspecies not given, but presumably *S. t. tranquebarica*) at Jalalabad in E. Afghanistan on May 31st. The range should, therefore, be extended as far west as Jalalabad.

Oenopopelia tranquebarica murmensis Hartert.

(The Sikkim Red Turtle-Dove.)

1920. *Oenopopelia tranquebarica murmensis*, Hartert, *Vögel paläark. Fauna* II, p. 1499. (Eastern Himalayas, *i.e.*, Nepal and Sikkim.)

1928. *Oenopopelia tranquebarica murmensis*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 252.

1937. *Streptopelia tranquebarica murmensis*, Peters, *Check-list Birds World* III, p. 97.

Oenopopelia tranquebarica murmensis is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
26545	♂	Jalpaiguri District (N. Bengal).	Feb. 27, 1934	Mr. C. M. Inglis.	146	113	20	14
26546	♀	Jalpaiguri District (N. Bengal).	Feb. 11, 1929	Mr. C. M. Inglis.	135	..	21	14

Distribution.—" Eastern Nepal, Sikkim, and Assam north of the Brahmapootra " (Peters).

The two Indian Museum skins from the Jalpaiguri District (N. Bengal) would appear to be nearer to *murmensis* than to *tranquebarica*, but I have no typical *murmensis* to compare with.

Oenopopelia tranquebarica humilis (Temminck).

(The Burmese Red Turtle-Dove.)

1824. *Columba humilis*, ♂, Temminck, *Pl. Color d'Oiseaux*, livr. 44, p. 287 and pl. 259 (but not pl. 258). (Bengal, India ; and Luzon Is., Philippines.) Although labelled as ♀, the specimen figured in pl. 259 is really ♂.

1849. *Turtur humilis* (part), Blyth, *Catal. Birds Mus. Asiat. Soc. Bengal*, p. 236, No. 1432.

1928. *Oenopopelia tranquebarica humilis*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 251.

1937. *Streptopelia tranquebarica humilis*, Peters, *Check-list Birds World* III, p. 97.

Oenopopelia tranquebarica humilis is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
24585	(♂)	Sylhet (Assam). ..	(?)	C. B. Antram.	133	89	19	14
24577	♀	S. Sylhet (Assam). ..	(?)	C. B. Antram.	128	88	20	14
24576	♀	S. Sylhet (Assam). ..	(?)	C. B. Antram.	132	..	18	13
8268	♂	Thayetmyo (Central Burma).	Dec. 14, 1871	Dr. F. Stoliczka.	145	98	20	13
8269	♀	Thayetmyo (Central Burma).	Dec. 14, 1871	Dr. F. Stoliczka.	133	93	20	..
8270	♀	Thayetmyo (Central Burma).	(?)	Dr. F. Stoliczka.	136	91	21	14
25940 (Mounted in gallery.)	♀	"Aberdeen" (Andamans).	1930	Zool. Survey of India.	(137)	(98)	21	16
20910	♂	Foochow (E. China).	May 1891	C. B. Rickett.	145	97	20	14·5
20911	(♀)	Foochow (E. China).	Apr. 1891	C. B. Rickett.	133	91	52	15
20912	(♀)	Foochow (E. China).	Apr. 1891	C. B. Rickett.	139	94	20	13
4056	(♂)	S. W. Formosa. ..	(?)	R. Swinhoe.	145	93	21	14
4055	(♀)	S. W. Formosa. ..	(?)	R. Swinhoe.	134	82	22	13
26537[1]	(♀)	(?)	(?)	(?)	131	..	21	13·5

[1] On the label this specimen bears the Indian Museum Registered No. 24622, and the following additional particulars : "*Turtur humilis*, S. Sylhet". However, in the I. M. Bird Register No. IV of the Zoological Survey of India (Indian Museum), the bird listed against the above number is the Roller "*Eurystomus orientalis*, ♀, S. Sylhet, Purchased (C. B. Antram)", and, corresponding to this, there is in the Indian Museum collection a specimen of *E. orientalis* bearing a similar label and number. The data given on the label of the Dove have, therefore, to be rejected, and the Dove has been given a new Reg. No., 26537.

Distribution.—"Greater part of southeastern Asia from northeastern Tibet and northern China, south to Assam, Burma, Andaman Islands, Siam, Indochina and the northern Philippines. Migratory in the northern part of its range, locally resident in the southern part" (Peters).

Subfamily *MACROPYGIINAE.*

Genus **Macropygia** Swainson.

Macropygia unchall (Wagler).

The species ranges from Kashmir in the west and along the Himalayas to the hills of Burma extending to N. Siam, French Indo-China, S. E. China and the Island of Hainan. South it extends *via* the Malay Peninsula to Sumatra, Java and Lombok. Peters (1937, pp. 75, 76) admits three subspecies of which one, *tusalia*, occurs within the Indian limits.

Macropygia unchall tusalia (Blyth).

(The Bar-tailed Cuckoo-Dove.)

1843[1]. *Columba tusalia* " Hodgson ", Blyth, *Journ. Asiat. Soc. Bengal* XII, Pt. 2, p. 936. (Darjeeling, N. Bengal.)

1849. *Macropygia leptogrammica*, Blyth, *Catal. Birds Mus. Asiat. Soc. Bengal*, p. 235, No. 1424.

1928. *Macropygia unchall tusalia*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd. ed.) V, p. 253.

1937. *Macropygia unchall tusalia*, Peters, *Check-list Birds World* III, p. 75.

Macropygia unchall tusalia is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
4012	(♂)	Darjeeling (N. Bengal).	(?)	T. R. Doucett.	195	199	25	15
4013	(♂)	Darjeeling (N. Bengal).	(?)	T. R. Doucett.	196	193	26	..
4007	(♀)	Darjeeling (N. Bengal).	(?)	T. R. Doucett.	184	191	22	15
26495	♀	Darjeeling (N. Bengal).	1843	Mrs. Saxon (Asiat. Soc. Bengal).	191	..	26	16
4016	(♀)	Darjeeling Terai (N. Bengal).	(?)	Dr. Anderson.	184	(186)	24	16·5
4015	(Juv. ♂?)	Darjeeling Terai (N. Bengal).	(?)	Dr. Anderson.	194	216	25	16
4017	(♀)	Darjeeling Terai (N. Bengal).	(?)	Dr. Möller.	193	170	25	15
26494	♀	Manipur State (E. Assam).	Feb. 11, 1936	Zool. Survey of India.	177	174	24	16

Remarks.—No. 26495 (Darjeeling) was listed by Blyth (1849, p. 235, No. 1424 *B*) as *Macropygia leptogrammica* Temminck.

Distribution.—" The Himalayas from Kashmir and Garhwal east to Assam and perhaps to western Szechuan, south in the hills to Burma and the Shan States " (Peters).

De Schauensee (1934, p. 273) recently secured in January immature females, suggesting breeding, at Chieng Dao (4,500 feet) in N. W Siam ; he found the bird there " not uncommon "

Macropygia rufipennis Blyth.

(The Nicobar Cuckoo-Dove[2].)

1846. *Macropygia rufipennis*, Blyth, *Journ. Asiat. Soc. Bengal* XV, p. 371. (Southern Nicobars.)

1849. *Macropygia rufipennis*, Blyth, *Catal. Birds Mus. Asiat. Soc. Bengal*, p. 234, No. 1422.

[1] Stuart Baker (1928, p. 253) wrongly gives the first reference as : " *Coccyzura tusalia* Hodgs., J. A. S. B., XIV, p. 809 (1843) (Nepal)." The whole reference is wrong, even apart from the question of priority—volume, page, year and author are all confused, and the above reference does not exist.

Stuart Baker (1930, p. 442) is again wrong in giving Blyth's reference. He wrongly gives *Macropygia* as a subgenus of *Columba*. Blyth wrote : " *Columba* (*Macropygia*, Swainson) [*tusalia*, Hodgson.] ", no doubt meaning that his *Columba tusalia* would be referable to genus *Macropygia* Swainson. The date is clearly 1843, not " 1843-44 " as given by Stuart Baker.

[2] This name is preferable to " The Andaman Cuckoo-Dove " employed by Stuart Baker (1928, p. 255) for, the type-locality is the Nicobars, not the Andamans.

1928. *Macropygia rufipennis*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 255.
1937. *Macropygia rufipennis*, Peters, *Check-list Birds World* III, p. 80.

Macropygia rufipennis is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
26491 (Lecto-type).	(♀)	Nicobars. ..	(1846)	Capt. Lewis & Rev. J. Barbe (Asiat. Soc. Bengal).	188	194	29	17
26492 (Syn-type).	(♀)	Nicobars. ..	(1846)	Capt. Lewis & Rev. J. Barbe (Asiat. Soc. Bengal).	193	202	(28)	16
26493 (Syn-type).	(♀)	Nicobars. ..	(1846)	Capt. Lewis & Rev. J. Barbe (Asiat. Soc. Bengal).	187	..	28	(19)
4008	(♀)	Andamans. ..	(?)	Dr. G. E. Dobson.	181	183	24·5	..
4009	(♂)	Andamans. ..	(?)	Dr. G. E. Dobson.	191	(188)	27	16
4010	(♂)	Andamans. ..	(?)	Dr. G. E. Dobson.	195	216	27	17
4011	(♂)	Andamans. ..	(?)	Dr. G. E. Dobson.	190	175	23	16

Remarks.—Each of the three skins, Nos. 26491, 26492 and 26493, bears the label " Type No. 1422, *Macropygia rufipennis* Blyth, *A*, *B*, *C*, Nicobars, Capt. Lewis and Rev. J. Barbe, 1846, A. S. B." Obviously they are the three specimens listed by Blyth (1849, p. 234, No. 1422, *A*, *B*, *C*) as *Macropygia rufipennis* (specimens from Nicobar Islands, presented by Capt. Lewis & Rev. J. Barbe, 1846). Presumably also, Blyth gave his original description of the species (1846, pp. 371, 372) from one of these three specimens. They may, therefore, be regarded as Syntypes. Among these, No. 26491 is the best preserved, and I, therefore, select it as the Lectotype.

In Nos. 4009 and 4011 the tail is markedly shorter than the wings ; the specimens look normal in other respects.

I cannot find any difference between birds from the Andamans and the Nicobars.

Distribution.—" Andaman and Nicobar Islands " (Peters).

Family CLARAVISIDAE.

Subfamily *GEOPELINAE.*

Genus **Geopelia** Swainson.

Geopelia striata (Linnaeus).

The species extends from southern Tenasserim in Burma, through the Malay Peninsula and the East Indies to the whole of Australia. Peters (1937, pp. 100, 101) admits five subspecies of which *striata* alone is found within the Indian limits.

Geopelia striata striata (Linnaeus).

(The Barred Ground-Dove.)

1766. *Columba striata*, Linnaeus, *Syst. Nat.* (12th ed.) I, p. 282. ("India *orientali*"; restricted to Malacca by Chasen, 1935, and to Java by Peters, 1937.)
1849. *Geopelia striata*, Blyth, *Catal. Birds Mus. Asiat. Soc. Bengal*, p. 235, No. 1428.
1928. *Geopelia striata striata*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 258.
1937. *Geopelia striata striata*, Peters, *Check-list Birds World* III, p. 100.

Geopelia striata striata is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
4069	(?)	Wellesley Prov. (Malay Penin.).	1870	(Purchased.)	98	113	20	13
26561	♀	Nong Koh (Ghirbi, Peninsular Siam).	Jan. 3, 1918	Raffles Mus. Singapore.	100	105	19	13
24004	(Juv.)	Bred in aviary at Calcutta.	1902	Major A. Alcock.	..	..	..	..

Distribution.—"Southern Tenasserim southward over the Malay Peninsula; Luzon and occasionally other islands in the Philippines; Borneo, Sumatra, Java and Lesser Sunda Islands to Lombok. Introduced into Madagascar and other islands in the western Indian Ocean; St. Helena; Hawaiian Islands; its presence in southern Celebes and Ambonia is believed to be due to introduction also" (Peters).

Subfamily *PHABINAE*.

Genus **Chalcophaps** Gould.

Chalcophaps indica (Linnaeus).

The species ranges from India *via* Malaya, S. China and the East Indies to Australia. Peters (1937, pp. 114, 115) accepts ten subspecies of which three, *indica*, *maxima* and *robinsoni*, occur within the Indian limits.

Chalcophaps indica indica (Linnaeus).

(The Indian Emerald or Bronze-winged Dove.)

1758. *Columba indica*, Linnaeus, *Syst. Nat.* (10th ed.) I, p. 164. ("India *orientali*"; restricted to Calcutta by Stuart Baker, 1928, p. 215.)
1849. *Chalcophaps indicus* (part), Blyth, *Catal. Birds Mus. Asiat. Soc. Bengal*, p. 237, No. 1440.
1928. *Chalcophaps indica indica* (part), Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 215.
1937. *Chalcophaps indica indica*, Peters, *Check-list Birds World* III, p. 114.

Chalcophaps indica indica is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
13520	(♂)	Malacca (Malay Penin.).	(?)	Bengal Economic Mus.	140	(96)	25	15
13468	(♀)	Malacca (Malay Penin.).	(?)	Bengal Economic Mus.	142	95	27	15
4077	♂	Welesley Province (Malay Penin.).	1870	Asiat. Soc. Bengal. (Purchased.)	145	97	26	17
4074	♀	Welesley Province (Malay Penin.).	(?)	Asiat. Soc. Bengal. (Purchased.)	131	93	25	15
12919	♂	Pilai (Mergui, S. Burma).	Mar. 4, 1882	Dr. J. Anderson.	134	(84)	27	16·6
12920	♂	Pilai (Mergui, S. Burma).	Mar. 5, 1882	Dr. J. Anderson.	147	(105)	28	15
9088	♀	Katha (Upper Burma).	Jan. 19, 1868	Dr. J. Anderson.	147	(98)	27	16
9079	(Juv. ♂)	Cachar (Assam). ..	(?)	"Mus. Coll."	[135	87	26	19]
4078	♂	Darjeeling (N. Bengal).	Apr. 3, 1869	Mr. Muller.	144	95	26	16
25675	♂	Ranaghat (Nadia District, Bengal).	Aug. 20, 1927	Mr. A. Rahim.	145	104	26	17
4071	♀	Bengal.	(?)	(?)	139	95	25·5	16
18119	♂	Shevaroy Hills, (Salem District, Madras Presidency).	May 16, 1869	W. Daly.	144	95	25	16
23939	(♀)	Talayai (Travancore).	Jan. 1892	Trivandrum Mus.	146	99	26	17
4075	(♀)	Travancore.	(?)	Asiat. Soc., Bengal. (Purchased.)	138	94	25	(17)

Remarks.—No. 23939 is labelled as a "♂" by the collector, but has the plumage of a ♀. Stuart Baker (1928, p. 216) gives the wing-length as 146-161 mm. In the Indian Museum collection, some birds have very much shorter wings, thus : No. 4071, ♀, Bengal, 139 mm. ; No. 12919, ♂, Pilai (Mergui), 134 mm. ; No. 4074, ♀, Welesley Province (Malay Penin.), 131 mm.

Distribution.—"Kashmir, Bengal, Assam, Tonkin[1], Hainan and the Riu Kiu Islands south over India, Burma, Malay Peninsula, Indochina, the Philippines, Borneo and Celebes to the Great Sunda Islands, and the Lesser Sunda chain to Alor and Sumba ; Moluccas and extreme western Papuan Islands (Gebe and Koffiao)" (Peters).

The following remarks are necessary with regard to the Indian range :—Ticehurst (1930, p. 477) has pointed out that the record of its occurrence in Kashmir seems to be incorrect. On the western coast it extends from Travancore to the Salsette Island near Bombay. On the eastern side it is said to occur from Bihar and Orissa, south to the Nelliampathy and the Shevaroy hills, and is fairly common all over Peninsular India.

[1] "Recorded from Yunnan and western Szechuan by David ; it has not been taken in these provinces by collectors in the present century" (Peters).

Chalcophaps indica maxima Hartert.

(The Andaman Emerald or Bronze-winged Dove.)

1928. *Chalcophaps indica indica* (part), Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 215.
1931. *Chalcophaps indica maxima*, Hartert, *Orn. Monatsb.* XXXIX, p. 145. (Golapabung, S. Andamans.)
1937. *Chalcophaps indica maxima*, Peters, *Check-list Birds World* III, p. 114.

Chalcophaps indica maxima is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
4072	(Juv. ?) ♂	Andamans. ..	(?)	Dr. G. E. Dobson.	[153	(100)	31	19]
4073	(Juv.)	Andamans. ..	(?)	Dr. G. E. Dobson.	[143	86	29	18]

Remarks.—No. 4072 is labelled as a "♀" by the collector, but has the plumage of a juvenile ♂—the male plumage is quite clear on the head, mantle and breast, but the white patch on the wing is not yet well developed.

Distribution.—" Andaman Islands " (Peters).

Chalcophaps indica robinsoni Suart Baker.

(The Ceylon Emerald or Bronze-winged Dove.)

1928. *Chalcophaps indica robinsoni*, Stuart Baker, *Bull. Br. Orn. Club* XLVIII, p. 58. (Cocawatte Estate, Ceylon.)
1928. *Chalcophaps indica robinsoni*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 217.
1937. *Chalcophaps indica robinsoni*, Peters, *Check-list Birds World* III, p. 114.

Chalcophaps indica robinsoni is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
26553	♂	Higara (or Hujara) (South Province, Ceylon) [*Wet Zone*].	May 20, 1932	Colombo Mus., Ceylon.	137	(90)	25	15
26552	♀	Udugama (South Province, Ceylon) [*Wet Zone*].	Aug. 21, 1905	Colombo Mus., Ceylon.	137	87	25	16

Distribution.—" Ceylon " (Peters).

Subfamily *CALAENADINAE.*

Genus **Caloenas** G. R. Gray.

Caloenas nicobarica (Linnaeus).

This, the only species of the genus, occurs in the greater part of the Indo-Australian region from the Nicobars and the Mergui Archipelago

eastward to the Solomon Islands. Peters (1937, p. 139) admits two subspecies; of these, only *nicobarica* occurs within the Indian limits.

Caloenas nicobarica nicobarica (Linnaeus).

(The Nicobar Pigeon.)

1758. *Columba nicobarica*, Linnaeus, *Syst. Nat.* (10th ed.) I, p. 164. (Nicobar Islands.)
1849. *Caloenas nicobarica*, Blyth, *Catal. Birds Mus. Asiat. Soc. Bengal*, p. 238, No. 1444.
1928. *Caloenas nicobarica nicobarica*, Stuart Baker, *Faun. Brit. Ind., Birds* (2nd ed.) V, p. 213.
1937. *Caloenas nicobarica nicobarica*, Peters, *Check-list Birds World* III, p. 139.

Caloenas nicobarica nicobarica is represented in the collection of the Indian Museum by the following skins :—

Reg. No.	Sex.	Locality.	Date.	Collector or Donor.	Measurements (mm.).			
					W.	Tl.	Tr.	C.
5941	♂	Nicobars. ..	Oct. 7, 1870	W. Rutledge.	254	103	45	25
6875	(?)	Nicobars. ..	July 1873	H. D. Cooper.	225	(97)	48	25
5940	♀	Nicobars. ..	Sept. 22, 1871	Lady Mayo.	245	93	47	23
5942	♂	Nicobars. ..	Feb 27, 1871	W. Rutledge.	247	91	48	26
26473	(Juv.)	Nicobars. ..	1846	Capt. Lewis.	[240	..	44	22]
4094	♀	Andamans. ..	July 2, 1867	(Purchased.)	244	91	43	26
18346	♀ (Juv.)	Andamans. ..	(?)	G. H. Booley.	[249	..	45	24]
14094	(?)	Gregory Is. (Mergui Archipelago, S. Burma).	(?)	Dr. G. M. Giles.	255	95	49	25
14095	(?)	Gregory Is. (Mergui Archipelago, S. Burma).	(?)	Dr. G. M. Giles.	245	79	50	22
23159	♂	(Purchased at Calcutta.)	(?)	Mr. F. Finn.	199	77	43	23
25975 (Mounted in gallery.)	♂	(?)	Nov. 27, 1929	Zool. Gardens, Calcutta.	252	96	(43)	23

Remarks.—No. 26473 was listed by Blyth (1849, p. 238, No. 1444 *C*) as "young (black-tailed. .)". Blyth (1846, p. 371), Robinson & Chasen (1936, p. 65), and others have stated that young birds have a greenish-black tail, instead of white as in adults. In the Indian Museum collection Nos. 26473 and 18346 have greenish-black tails, and are, therefore, young forms—in all others the rectrices are white.

Distribution.—"The greater part of the Indo-Australian region from the Nicobars and the Mergui Archipelago eastward over the Sunda Islands, Philippines, Celebes, Moluccas, Papuan Islands, New Guinea, Admiralty Islands, D'Entrecasteaux Archipelago; Trobriand Islands, and Louisiades, to the Solomon Islands. Wherever found occurs only on the small islands and on the islets off the larger land masses. Migrates between various groups of islands" (Peters).

(*b*) *Extra-Indian Species.*

The following extra-Indian species and subspecies are listed in the present Catalogue :—

Treronidae.

Treroninae.

Dendrophassa Glog.

D. olax (Temm.), p. 350.

Vinago Cuv.

V. waalia (Gmel.), p. 350.
V. australis (Linn.) (subsp. ?), p. 350.

Treron Vieil.

T. curvirostra nasica Schl., p. 350.

Ptilinopinae.

Ptilinopus Swain.

P. jambu (Gmel.), p. 350.
P. perousii perousii Peale, p. 350.
P. ponapensis (Finsch) (subsp. ?), p. 351.
P. superbus superbus (Temm.), p. 351.
P. bellus (Sclat.), p. 351.
P. solomensis speciosus (Schl.), p. 351.
P. melanospila ?melanauchen (Salvad.), p. 351.
P. pectoralis (Wagl.) (subsp. ?), p. 351.
P. geelvinkiana (Schl.), p. 351.

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Family Treronidae.

Subfamily *Treroninae.*

Genus **Dendrophassa** Gloger.

Dendrophassa olax (Temminck).

(The Little Green Pigeon.)

Five skins—three from the Wellesley Province and Malacca in the Malay Peninsula, and two from Sarawak, Borneo.

Genus **Vinago** Cuvier.

Vinago waalia (Gmelin)[1].

(Bruce's Fruit or Green Pigeon.)

Five skins from various places in Eritrea. Collected by Mr. W. T Blanford in 1868 and listed by him (1870, p. 418) as *Treron abyssinica.*

Vinago australis (Linnaeus) (subsp. ?).

One skin from Madagascar.

Genus **Treron** Vieillot.

Treron curvirostra nasica Schlegel.

(The Borneo Lesser Thick-billed Green Pigeon.)

Three skins from Sarawak, Borneo.

Subfamily *Ptilinopinae.*

Genus **Ptilinopus** Swainson.

Ptilinopus jambu (Gmelin).

(The Pink-headed Fruit Dove.)

Thirteen skins—six from the Malay Peninsula, one from Banguara in Peninsular Siam (July 8, 1926), and six from unknown localities.

Peters (1937, p. 38) does not include Siam in its range. Besides other records, there is the above skin from Peninsular Siam in the Indian Museum.

Ptilinopus perousii perousii Peale.

Two skins, Nos. 26479 and 26480, from Samoa (Navigator) Islands, S. Pacific; they are Nos. 1397*A* and *B* respectively of Blyth (1849, p. 231). Blyth regarded *A* as adult and *B* as young; actually both are adults—*A* is ♀ and *B* ♂.

[1] Peters (1937, p. 22) assigns the authorship of the species to F. A. A. Meyer 1793, but Gmelin 1791 has priority.

Ptilinopus ponapensis (Finsch) (subsp. ?).

One skin, No. 26478, from Ladrone (Marianne) Islands, S. Pacific. It was listed by Blyth (1849, p. 231, No. 1396 *A*) who wrongly identified it as *P. purpuratus* Temminck.

Ptilinopus superbus superbus (Temminck).

(The Purple-crowned Fruit Dove.)

Three skins from New South Wales, Australia.

Ptilinopus bellus (Sclater).

One ♂ from Hatam, Arfak, Dutch New Guinea.

Ptilinopus solomensis speciosus (Schlegel).

One ♂ from Korido, Musauri or Mysori Is., Geelvink Bay, New Guinea.

Ptilinopus melanospila ?melanauchen (Salvadori).

One ♂ from Java.

Ptilinopus pectoralis (Wagler) (subsp. ?).

One ♀ from Amberbaken, Dutch New Guinea.

Ptilinopus geelvinkiana (Schlegel).

One ♂ from Pulo-Manin Is., Geelvink Bay, New Guinea.

Genus **Megaloprepia** Reichenbach.

Megaloprepia magnifica puella (Lesson).

One ♂ from Amberbaken, New Guinea.

Subfamily *DUCULINAE*.

Genus **Muscadivora** Schlegel.

Muscadivora aenea (Linnaeus) (subsp. ?).

No. 23811 from an unknown locality. Wing 213, tail 153, tarsus 34, culmen 26 mm. In its wing-length and certain other characters it resembles *M. a. pusilla*, but differs in the virtual absence of the vinous colour on the abdomen and the forebody. The under tail-coverts are chestnut.

Muscadivora aenea (Linnaeus) (subsp. ?).

No. 26471 from an unknown locality. Donor : " Batavian Society ", 1845. Wing 219, tail 145, tarsus 27, culmen 23 mm.

The skin closely resembles *M. a. sylvatica* except that the grey of the forebody and venter is rather darker and with hardly any vinaceous ; the wing-length is also slightly shorter.

It was listed by Blyth (1849, p. 231, No. 1400 *A*) as "*Carpophaga ianthiana* (?)" Blyth wrote: "Syn. *Col. ianthiana* (?). Temminck (*Pl. Col.* 503)"; no locality was given. It is not clear why Blyth quoted this synonymy even with a query. The specimen figured by Temminck, *Pl. Color d' Oiseaux* IV, 1823, pl. 503 as "*Colombe violette*", and described by him on p. 257 under *Columba janthiana* (not *ianthiana*) Temm., has no resemblance to the specimen in the Indian Museum. Besides, Temminck's specimen came from Japan where *M. aenea* does not occur.

Muscadivora perspicillata (Temminck) (subsp. ?).

One skin from an unknown locality.

Genus **Hemiphaga** Bonaparte.

Hemiphaga novaeseelandiae (Gmelin) (subsp. ?).

Two skins from the Bank Peninsula, New Zealand.

Family COLUMBIDAE.

Subfamily *COLUMBINAE*.

Genus **Columba** Linnaeus.

Columba livia livia Gmelin.

(The Blue Rock Pigeon.)

Four skins—one from "Europe", two from England; and a fourth, No. 26567, ("L. Bengal", *errore* ?) is mounted in the gallery and bears the label: "1417 *D*. .*Columba intermedia* Strickl." Under this number, Blyth (1849, p. 234) wrote: " .no white on rump" Actually there is a white rump about 55 mm. broad and the specimen resembles *C. l. livia*. Evidently Blyth's labelling was faulty.

There is also a specimen mounted in the gallery and bearing the label "1417*A* a variety of domestic pigeon"; this is evidently the specimen listed by Blyth (*loc. cit.*, No. 1417 *A*). It is about twice the size of the normal wild bird. Colour: head and neck metallic green tinged with copper; remaining portions white speckled with black.

According to Stuart Baker (1928, p. 220), *C. livia livia* is a straggler in N. W. India. But Ticehurst (1930, p. 477) has given reasons to show that its range does not extend to India.

Columba oenas oenas Linnaeus.

(The European Stock Pigeon.)

Three skins—two from England and one ♀, No. 14527, from Karaagh (about 34° 50′ N. lat. and 61° 45′ E. long.) in N. W. Afghanistan

(collected by Surgeon J. Aitchison, Afghan Boundary Commission, Nov. 28, 1884). The Afghanistan skin is indistinguishable from the two skins from England, but is separable from the Yarkand skins, *yarkandensis*, in that the latter are paler and larger. The Afghanistan skin measures: wing 219, tail 123, tarsus 32, culmen 18 mm.

Columba oenas yarkandensis Buturlin.

Four skins—three from Yarkand in E. Turkestan and one ♀, No. 14299, from "Chahar Shamba" (= ?Chahar Sada) in N. W. Afghanistan (collected by Capt. Yate, 1886). The Afghanistan skin measures: wing 223, tail 130, tarsus 30, culmen 17 mm. It is inseparable from the Yarkand skins.

Columba albitorques Rüppell.

(The White-collared Pigeon.)

Two skins from Senafe, 7,500 feet, in Tigre, S. Eritrea. Collected by Mr. W T. Blanford in 1868.

Columba palumbus palumbus Linnaeus.

(The European Wood-Pigeon or Ring-Dove[1].)

Two skins from England.

Columba guinea dilloni (Bonaparte).

(The Abyssinian Speckled Pigeon.)

Five skins—three from Tekoonda, Halai and Badraket in Tigre in N. Abyssinia, and two from Mahbar on R. Lebka in Habab, Eritrea. Collected by Mr. W T. Blanford in 1868.

Columba norfolciensis Latham.

(The Australian White-headed Fruit Dove.)

Two skins from New South Wales, Australia.

Genus **Streptopelia** Bonaparte.

Streptopelia orientalis (Latham) (subsp. ?).

One juv. ♀, unknown locality.

Streptopelia lugens lugens (Rüppell).

(The Abyssinian Dusky Dove or Abyssinian Pink-breasted Turtle Dove.)

Four skins from the Tigre Province in S. Eritrea and on the Eritrea-Abyssinia frontier. Collected by Mr. W T. Blanford in 1868.

[1] The name "Ring Dove" is now used for *Streptopelia decaocto* (Frivaldszky).

Streptopelia decaocto stoliczkae (Hume).

(The Kashgar Ring-Dove.)

1874. *Turtur Stoliczkae,* Hume, *Str. Feath.* II, p. 519. (Kashgar, E. Turkestan.)

Five skins from E. Turkestan—two from Kashgar and three from Yarkand. They give the following wing-length :—3♂♂ : 176-187 ; 2♀♀ : 169-175 mm. No. 26534 (Kashgar) is the Holotype and is in good condition. After Hume (1874), the type-specimen was re-described by Sharpe (1881, p. 117) and recently by Roonwal (1940, p. 444).

Streptopelia roseogrisea arabica (Neumann).

(The Arabian Pink-headed Dove.)

Four skins from Eritrea, collected by Mr. W T. Blanford in 1868 and described by him (1870, p. 417) as *Turtur albiventris.* Wing—3♂♂ : 154-161 ; 1♀ : 155 mm.

Streptopelia semitorquata semitorquata (Rüppell).

(The Half-collared or Red-eyed Dove.)

Four skins from Eritrea and N. Abyssinia, collected by Mr. W. T. Blanford in 1868.

Streptopelia chinensis chinensis (Scopoli).

(The Chinese Spotted Dove.)

Three skins from E. China—two from Foochow and one from Amoy.

Streptopelia senegalensis senegalensis (Linnaeus).

(The Laughing Dove.)

Four skins from Eritrea, collected by Mr. W T. Blanford in 1868.

Subfamily *MACROPYGIINAE.*

Genus **Macropygia** Swainson.

Macropygia ruficeps malayana Chasen & Kloss.

(The Little Malaya Cuckoo-Dove.)

One skin from the Wellesley Province, Malay Peninsula.

Macropygia ruficeps (Temminck) (subsp. ?).

One skin, unknown locality.

Macropygia phasianella phasianella (Temminck).

One ♀ from New South Wales, Australia.

Family Claravisidae.

Subfamily *Geopelinae*.

Genus **Geopelia** Swainson.

Geopelia striata maugeus (Temminck).

Two skins from the Timor Island, E. Indies.

Geopelia striata placida Gould.

Four skins—one from the Northern Territory in Australia, two from " Australia ", and one without locality.

Geopelia striata tranquilla Gould.

Three skins from New South Wales, Australia.

Subfamily *Phabinae*.

Genus **Oena** Swainson.

Oena capensis capensis (Linnaeus).

(The Namaqua Dove.)

Ten skins—five from various places in Eritrea and five from Abyssinia—all collected by Mr. W T. Blanford in 1868.

Genus **Turtur** Boddaert.

Turtur abyssinicus abyssinicus (Sharpe).

(The Abyssinian Black-bellied Blue-spotted Wood-Dove.)

Six skins from the Anseba and Lebka Valleys and Samhar, all in Eritrea. Collected by Mr. W T. Blanford in 1868. Blanford (1870, p. 417) wrongly described them as *Peristera afra* (Linn.). In the older literature the Spotted Wood-Doves of E. Africa were confused with one another, and the differences have been clarified only in comparatively recent years. Three similar-looking and co-existing species are involved, namely, *Turtur abyssinicus* (Sharpe), *T afer* (Linnaeus) and *T chalcospilos* (Wagler). The clarification of the differences is due to Erlanger (1901, p. 183), Sclater & Mackworth-Praed (1920, pp. 834-836) and Friedmann (1930, p. 239).

The Indian Museum specimens agree with the plumage characters of *T abyssinicus* given by Sclater & Mackworth-Praed, the bill too, in dried skins, being horny-brown with black tips. Furthermore, Blanford (1870, p. 417), who collected these skins, gave the colour of the fresh bill as " deep purple ", whereas in *afer* it is yellow or orange. The back is brown instead of grey, but this, I think must be due to fading.

Genus **Chalcophaps** Gould.

Chalcophaps indica chrysochlora (Wagler).

Three skins from New South Wales, Australia.

Genus **Phaps** Selby.

Phaps chalcoptera chalcoptera (Latham).

(The Bronze-winged Pigeon.)

One ♀ from New South Wales, Australia.

Phaps chalcoptera (Latham) (subsp. ?).

Three skins from Australia.

Phaps elegans neglecta Mathews.

Three skins—two from New South Wales, and one juvenile from "Australia"

Genus **Ocyphaps** G. R. Gray.

Ocyphaps lophotes (Temminck).

Three skins—one from New South Wales in Australia, one from an unknown locality, and one juvenile bred in the Zoological Gardens, Calcutta.

Genus **Geophaps** G. R. Gray.

Geophaps scripta (Temmnick) (subsp. ?).

Two skins, unknown locality.

Subfamily *Geotrygoninae*.

Genus **Leucosarcia** Gould.

Leucosarcia melanoleuca (Latham).

(The Larger Wonga-Wonga.)

Two skins from New South Wales, Australia.

IV. References.

Aitchison, J. E. T., 1889.—*Trans. Linn. Soc. Lond.* (2) V, pp. 53-55.

Alcock, A. W., 1898.—*Rept. Nat. Hist. Results Pamir Boundary Commission.* Birds, pp. 7-13. Calcutta.

Anderson, J., 1879.—*Anat. Zool. Researches: Zool. Results Two Exped. W. Yunnan, 1868, 1875* I, pp. 664-668. London.

Blanford, W T., 1870.—*Obs. Geol. & Zool. Abyssinia*, pp. 415-419. London.

Blanford, W T., 1876.—*Eastern Persia: Journey Persian Boundary Commission, 1870-1872* II, *Zool. & Geol.* Aves, pp. 98-304. London.

Blanford, W T., 1898.—*Faun. Brit. Ind. Ceylon & Burma. Birds* IV, pp. 1-52. London.

Blyth, E., 1843.—*Journ. Asiat. Soc. Bengal* XII (1), pp. 166, 167

Blyth, E., 1845.—*Journ. Asiat. Soc. Bengal* XIV (2), pp. 845-878.

Blyth, E., 1846.—*Journ. Asiat. Soc. Bengal* XV (1), pp. 370-372.

Blyth, E., 1849.—*Catal. Birds Mus. Asiat. Soc.* [*Bengal*], pp. 228-238. Calcutta.

Blyth, E., 1849(*a*).—*Journ. Asiat. Soc. Bengal* XVIII (2), pp. 816, 817

Chasen, F. N., 1935.—*Bull. Raffles Mus. Singapore.* No. 11, pp. 10-24.

Delacour, J. and Jabouille, P. 1931.—*Oiseaux l'Indochine Francaise* II, pp. 8-44. Paris.

Delacour, J. and Jabouille, P. 1940.—*Extr. l'Oiseau e Rev. Franc. d'Orn.* Nos. 1 and 2, pp. 114-117

De Schauensee, R. M., 1934.—*Proc. Acad. Nat. Sci. Philadelphia* LXXXVI, pp. 271-273.

Eates, K. R., 1938.—*Journ. Bombay Nat. Hist. Soc.* XL. pp. 330, 331.

Erlanger, C. F. von., 1901.—*Orn. Monatsb.* IX, p. 183.

Friedmann, M., 1930.—*Bull. U. S. Nation. Mus.* No. 153, Pt. 1, pp. 205-248.

Hartert, E., 1916.—*Novitat. Zool.* XXIII, pp. 78-88.

Hartert, E., 1920.—*Vögel paläarkt. Fauna* II, Hefts 5 and 6, pp. 1464-1500. Berlin.

Hartert, E. and Steinbacher, F., 1936.—*Vögel paläarkt. Fauna*, Ergänzungsbd., Heft 5, pp. 454-460. Berlin.

Henderson, G., 1873.—See Henderson and Hume.

Henderson, G. and Hume, A., 1873.—*Lahore to Yarkand*, pp. 153-304. London.

Hume, A., 1874.—*Str. Feath.* II, pp. 258-276.

Hume, A., 1888.—*Str. Feath.* XI, p. 290.

Inglis, C. M., 1927.—*Journ. Darjeeling Nat. Hist. Soc.* I, pp. 47, 48.

Jerdon, T. C., 1864.—*Birds of India* III, pp. 441-487. Calcutta.

Koelz, W., 1939.—*Proc. Biol. Soc. Washington* LII, p. 81.

La Touche, J. D. D., 1932.—*Handb. Birds E. China* II, Pt. 2, pp. 202-218. London.

Layard, E. L., 1854.—*Ann. Mag. Nat. Hist.* (2) XIV, pp. 57-62.

Legge, W V., 1880.—*Hist. Birds Ceylon* II, pp. 693-730. London.

Ludlow, F. and Kinnear, N. B., 1934.—*Ibis* (13) IV, pp. 95-99.

Mathews, G. M., 1927.—*Syst. Av. Australasianarum*, pp. 25-77. London.

Mathews, G. M. and Iredale, T., 1921.—*Man. Birds Australia* I, pp. 240-272. London.

Mayr, E., 1938.—*Ibis* (14) II, pp. 316, 317.

Meinertzhagen, R., 1938.—*Ibis* (14) II, pp. 707-710.

Oates, E. W., 1883.—*Handb. Birds Brit. Burma* II, pp. 288-311. London.

Peters, J. H., 1937.—*Check-list Birds World* III, pp. 10-141. Cambridge (U. S. A.).

Phillips, W. W. A., 1941.—*Loris* II, pp. 202-212.

Richmond, C. W., 1903.—*Proc. U. S. Nation. Mus.* XXV, pp. 308-310.

Robinson, M. C. and Chasen, F. N., 1936.—*Birds Malay Penin.* III, pp. 34-66. London.

Robinson, M. C. and Kloss, C. B., 1921.—*Journ. Fed. Malay States* X, p. 203.

Rothschild, Lord., 1926.—*Novitat. Zool.* XXXIII, pp. 222-224.

Roonwal, M. L., 1940.—*Rec. Ind. Mus.* XLII., pp. 437-452.

Salvadori, T., 1893.—*Catal. Birds Brit. Mus.* XXI, *Columbae*, pp. 1-675. London.

Sclater, W L., 1892.—*Ibis* (6) IV, pp. 65-87.

Sclater, W L., 1924.—*Syst. Av. Ethiopicarum*, pp. 160-177. London.

Sclater, W L. and Mackworth-Praed, C., 1920.—*Ibis* (11) II, pp. 826-837.

Scully, J., 1876.—*Str. Feath.* IV, pp. 175-178.

Scully, J., 1879.—*Str. Feath.* VIII, pp. 339-342.

Sharpe, B., 1889.—*Trans. Linn. Soc. Lond.* (2) V, pp. 66-93.

Sharpe, B., 1891.—*Sci. Results 2nd Yarkand Miss.* : *Aves* I, pp. 114-119 ; II, pl. xiv. London.

Stanford, J. K. and Ticehurst, C. B., 1939.—*Ibis* (14) III, pp. 211-217.

Stresemann, E., Meise, W and Schönwetter, M., 1937.—*Journ. f. Orn.* LXXXV, p. 441.

Stresemann, E., Meise, W. and Schönwetter, M., 1938.—*Journ. f. Orn.* LXXXVI, pp. 193, 194.

Stuart Baker, E. C., 1913.—*Indian Pigeons & Doves*, pp. 1-260. London.

Stuart Baker, E. C., 1913(*a*).—*Rec. Ind. Mus.* VIII, pp. 286, 287.

Stuart Baker, E. C., 1920.—*Rec. Ind. Mus.* XVIII, p. 127.

Stuart Baker, E. C., 1928.—*Faun. Brit. Ind. Ceylon & Burma. Birds* (2nd ed.) V, pp. 177-259. London.

Stuart Baker, E. C., 1930.—*Faun. Brit. Ind. Ceylon & Burma. Birds* (2nd ed.) VII, pp. 428-443 ; VIII, pp. 687-689. London.

Stuart Baker, E. C., 1935.—*Nidification Birds Indian Emp.* IV, pp. 124-176. London.

Ticehurst, C. B., 1923.—*Ibis* (11) V, pp. 463-467.

Ticehurst, C. B., 1927.—*Journ. Bombay Nat. Hist. Soc.* XXXII, pp. 72-74.

Ticehurst, C. B., 1929.—*Bull. Brit. Orn. Cl.* I, pp. 7-10.

Ticehurst, C. B., 1930.—*Journ. Bombay Nat. Hist. Soc.* XXXIV, pp. 477-479.

Ticehurst, C. B., Buxton, P. A. and Cheesman, R. E., 1922.—*Journ. Bombay Nat. Hist. Soc.* XXVIII, pp. 945-948.

Vidal, G. W., 1880.—*Str. Feath.* IX, pp. 1-96.

Wait, W E., 1931.—*Man. Birds Ceylon* (2nd ed.), pp. 284-299. London.

Whistler, H., 1928.—*Pop. Handb. Ind. Birds*, pp. 296-308. London.

Whistler, H., 1930.—*Ibis* (2) VI, p. 271.

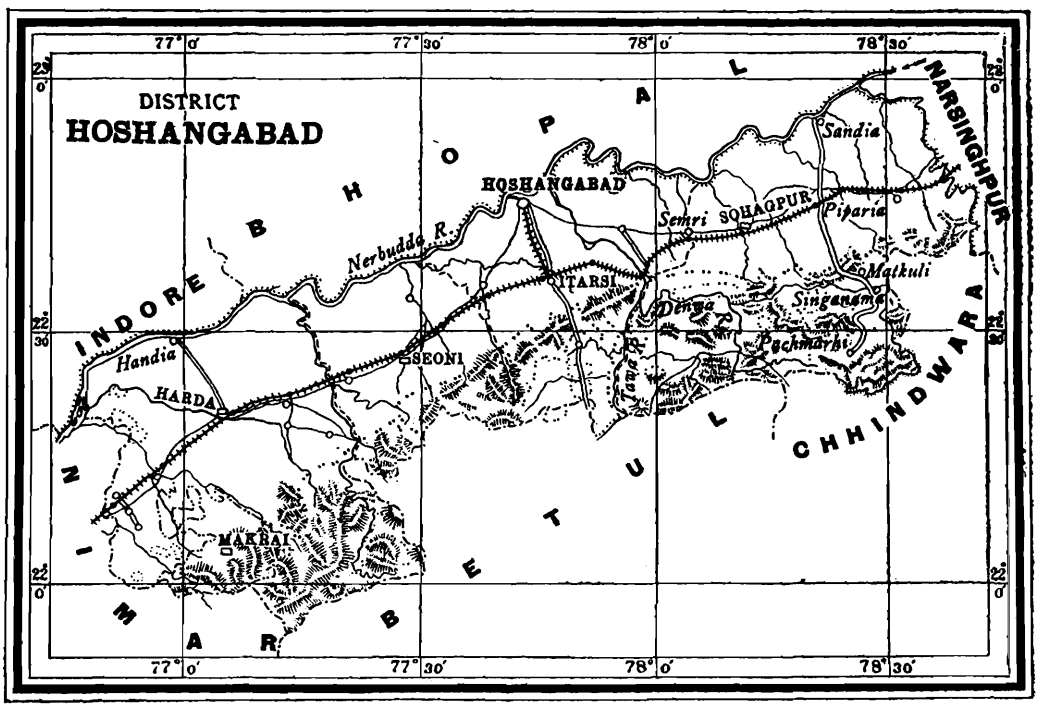
Whistler, H. and Kinnear, N. B., 1936.—*Journ. Bombay Nat. Hist. Soc.* XXXVIII, pp. 672-680.

V. INDEX.

FISHES OF THE SATPURA RANGE, HOSHANGABAD DISTRICT, CENTRAL PROVINCES.

By SUNDER LAL HORA, *D.Sc., F.R.S.E., F.N.I., Assistant Superintendent and* K. KRISHNAN NAIR, *M.Sc., Gallery Assistant, Zoological Survey of India, Calcutta.*

In 1937, one of us[1], while referring to the distribution of Himalayan fishes, explained the occurrence of similar forms in the Eastern Himalayas and the Assam Hills on the one hand and the south-western hills of Peninsular India on the other by suggesting that the Satpura Trend of mountains probably stretched across India as a continuous range from the Assam Himalayas to Gujarat from the Miocene period till comparatively recent times. To test this hypothesis, the Zoological Survey of India has made collections in the Rajmahal Hills[2], Santal Parganas[3], Hazaribagh Hills[4], headwaters of the Mahanadi River, Raipur District[5], and from the Satpura Range, Hoshangabad District.



Map of the Hoshangabad District, Central Provinces, showing the localities in which collections of fish were made.

The last locality was visited by Drs. B. N. Chopra and M. L. Roonwal, who made an extensive collection of fish in the small hill-streams arising from the Satpura Range in the vicinity of the Pachmarhi Plateau and

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[1] Hora, S. L., *Rec. Ind. Mus.* XXXIX, p. 255 (1937).

[2] Hora, S. L., *Rec. Ind. Mus.* XL, pp. 169-181 (1938).

[3] Mr. K. N. Das is preparing a report on the fish collected by Dr. H. A. Hafiz in the Santal Parganas during November-December, 1938.

[4] Das, K. N., *Rec. Ind. Mus.* XLI, pp. 437-450 (1939).

[5] Hora, S. L., *Rec. Ind. Mus.* XLII, pp. 365-374 (1940).

from comparatively sluggish streams in the plains at Itarsi and Harda. Dr. Chopra has very kindly supplied us the following note on the physical features and the ecological conditions of the area surveyed :

" The Hoshangabad District[1] in the Central Provinces of India lies between latitude 21° 53′ and 22° 59′ N. and longitude 76° 47′ and 78° 44′ E. It is a long and narrow strip of country stretching along the left bank of the Nerbudda, between the Vindhyan mountains and the Satpura hills, and includes parts of the latter range within its borders. The Nerbudda forms the northern boundary of the District.

" The drainage of the Hoshangabad District need not be considered in detail but for the purpose of this note it may be stated that many streams, large and small, flow down from the Satpuras, generally in a north-westerly direction, into the Nerbudda. The Nerbudda itself is a large river flowing between somewhat steep banks along the northern boundary of the District. From the eastern slopes of the Pachmarhi hills in the south-east corner of the District the water is collected in a large number of streams and flows into the Denwa which, after a short northerly course, turns due west near Matkuli, about 14 miles below Pachmarhi, and joins the Tawa which is the most important tributary of the Nerbudda in this District. The western slopes of the Pachmarhi hills are drained by the Sonbhadra, which flows north to join the Denwa. Another important tributary of the Denwa is the Nag Dewali, which rises near Pachmarhi in the deep gorge known as Jambudwip and descends north-westwards through the hills to join the Denwa. This stream forms a series of charming cascades. The Nerbudda has several other important tributaries also, but the only one that need be mentioned here is the Ajnal which passes close to Harda and joins the Nerbudda in the north-west corner of the District. Near Itarsi, practically in the centre of the District, a small stream flows in a north-westerly direction and joins the Lathia, before it falls into the Nerbudda.

" The plateau of Pachmarhi lies at an elevation of about 3,500 feet, with the Mahadeo hills of the Satpura range forming a rugged background of great beauty and rising in places to almost 4,500 feet above the sea-level. The plateau is formed of almost level or slightly undulating stretches of grassy glades, interspersed with clumps of forest trees. The prevailing sandstone, which is of great depth and succumbs readily to denudation, has, under the action of water, formed a maze of gorges and ravines in which numerous streams flow. The plateau receives a rainfall of about 77 inches a year and nearly the whole of it falls between June and September. The climate is rather mild, the average minimum and maximum temperatures ranging between 47·5° and 95·1°F.

" The plains consist of a rich alluvium, the average rainfall is about 47 inches per annum and the average minimum and maximum temperatures at Hoshangabad vary between 71·3° and 107·6° F.

" The survey was carried out in February and March, which are practically the driest months in the year in the District. The streams in the hills, that is, around the Pachmarhi plateau, had only a restricted flow, while those in the plains had naturally considerable quantities of water in them. In a few of the former the current was merely in the form of a trickle and in none was the flow very rapid, except near cascades and falls. There were pools in the course of most of these streams and rich collections were obtained in these pools. The bottom for the most part consisted of stones and pebbles mixed with sand and clay, but in the pools and in some other parts also there was a lot of mud. This was especially the case in some parts of the small streams round Badkachar. In some cases the water flowed over large rocks and boulders, some of which had been worn flat by the current; this was the case in the vicinity of the Small Water Fall, some parts of the stream in the Jambudwip gorge and that in the neighbourhood of the Pansy Pool. There was only a small amount of vegetation in most of the streams, except in some near Badkachar and those near Singanama. In many cases the country through which the streams were flowing was thickly wooded; this was especially the case with the streams near Pansy Pool, that near Rohrighat and the Jambudwip. The streams round Badkachar, that near Darmar and one or two others flowed through country which was for the most part bare. The water in all these streams was clear. In the hill-streams the dominant fish at this time of the year was *Garra mullya*. This fish was collected in practically every stream, sometimes in considerable numbers, and was found even in pools with a muddy bottom and slow current. Two species of *Nemachilus*, locally known as *Patharchat* (stone licker) were also met with practically everywhere, living under stones and hiding in the vegetation near banks. Another fish collected in some streams in considerable numbers is *Danio aequipinnatus*. This prominently striped fish was found to be the dominant form in streams round Badka-

[1] The information regarding physical features, etc., has been taken partly from the Hoshangabad District Gazetteer by Corbett and Russel (1908), and that about the distribution of fishes from the lists prepared by Dr. Hora and Mr. Nair.

char, at Rohrighat and in some streams round Singanama; in these streams *Garra* was collected in comparatively smaller numbers. Several other species also were collected in these streams, the genera represented being *Parapsilorhynchus*, *Barbus*, *Barilius*, *Rasbora*, *Lepidocephalus*, and *Ophicephalus*.

"The streams in the plains differed considerably in their physical conditions from those described above. In most of these there was a considerable flow of water, the current was sluggish to moderately swift and the bottom for the most part consisted of sand and mud, with occasional patches of small stones and pebbles. There was considerably more vegetation in the water than in the hill-streams and in the Ajnal nullah near Harda there was such a luxurious growth of algae and other vegetation in the stream that it required considerable efforts to wade through it. This thick vegetation afforded excellent protection to large numbers of fish and though plenty of them could be seen darting about from cover to cover, it was difficult to bag them. The course of these streams lay through country that was for the most part only sparsely wooded, and in parts was quite bare. The water was more or less clear. *Garra* was practically absent in these streams and was collected in small numbers only in the stream near Mehragaon, close to Itarsi. *Nemachilus* was collected in practically all these streams, but of the two species found in the hills, one, *N. evezardi*, was totally absent in the plains, while the other, *N. dayi*, was common throughout. A third species of *Nemachilus*, *N. botius*, which was met with rather rarely in the hills, was found in fair numbers in these streams. There are several species that were common to both the localities, but some of these were more abundant in one than in the other. Barbels were far more common, both in the number of species and in individuals, in the plains than in streams round Pachmarhi. Among the genera met with in the streams in the plains only may be mentioned *Brachydanio*, *Esomus*, *Labeo*, *Rohtee*, *Oreichthys*, *Amblyceps*, *Xenentodon*, *Badis*, *Laguvia*, *Glossogobius*. In all 26 genera were collected; of these, nine were found in the hill streams also."

Descriptions of Localities with Lists of Fishes Collected from each.

Jambudwip stream, about 2 miles north-west of Pachmarhi. 9. ii. 1941.

This is a typical hill-stream running in a deep well-wooded valley. The bottom is rocky or strewn over with stone and pebbles in some places and muddy in others. The current is not very fast, except in the regions of small falls and cascades. Portions of the stream contain plenty of vegetation. Here and there large pools are formed with the bottom generally muddy. In some places the stream flows as a small trickle over a bed of large flat rocks.

	Length in mm.	No. of specimens.
Garra mullya (Sykes)	59—69	4
Parapsilorhynchus tentaculatus (Ann.)	26—41	5
Nemachilus dayi Hora	26—40	12
Nemachilus evezardi Day	18—52	11

"Pansy Pool", about 4 miles south-west of Pachmarhi. 10. ii. 1941.

The Denwa river runs in places through a deep *khud* between high rocks and forms a series of deep pools, popularly known as "Pansy Pool" The current is generally sluggish but in between the pools rapids are formed. The bottom consists of rocks and stones intermixed with pebbles and sand. Parts of the stream are thickly shaded, but there is little vegetation in the water.

	Length in mm.	No. of specimens.
Barbus (Tor) khudree Sykes.. ..	33	1
Garra mullya (Sykes)	39—76	20
Nemachilus dayi Hora ..	21—57	8
Nemachilus evezardi Day ..	23—28	3

"Small Waterfall" about 2 miles east of Pachmarhi. 11. ii. 1941.

The waterfall is about 75 feet high and below it there is a typical hill-stream formed of rapids and pools in succession. The bottom is formed of pebbles and brownish sand, and the banks are overgrown with grasses and forest trees. Some of the pools are over 10 feet deep and the current in them is sluggish.

	Length in mm.	No. of specimens.
Barilius bendelisis Ham.	46—85	13
Danio aequipinnatus (McClell.)	55—73	7
Barbus (Puntius) dorsalis (Jerdon) ..	53 & 56	2
Barbus (Puntius) ticto Ham.	28—53	5
Parapsilorhynchus tentaculatus (Ann.) . ..	31	1
Nemachilus evezardi Day	26—35	4

Darmar stream near Darmar village, below Pachmarhi-Piparia Road about 3 miles north-east of Pachmarhi. 12. ii. 1941.

A small stream with a comparatively slow current of clear water flowing over stones and boulders, and in places over sand and shingle, etc. In the course of the stream there are several pools with muddy bottom and a sluggish current. There is no vegetation in the water but there are some tall trees along the banks.

	Length in mm.	No. of specimens.
Garra mullya (Sykes)	29—78	113
Nemachilus dayi Hora	25—83	16
Nemachilus evezardi Day	20—38	7

Streams around Badkachar, about 6 miles north-west of Pachmarhi. 14. ii. 1941.

The streams are small and sluggish with restricted flow over a bottom of stones and rocks. In places the bottom is muddy. There is very little of aquatic vegetation, but there are trees along the banks of the streams.

	Length in mm.	No. of specimens.
Danio aequipinnatus (McClell.)	45—76	46
Parapsilorhynchus tentaculatus (Ann.)	23—28	7
Nemachilus dayi Hora	31—65	6

Rohrighat stream near Rohrighat village, about 8 miles south-west of Pachmarhi. 15. ii. 1941.

A small, comparatively sluggish stream running on two sides of the village. In places the stream runs through open country without any shade, while in other places the banks are very thickly wooded. There is very little aquatic vegetation. The bottom is mostly muddy, but

in places there are lots of stones. The stream forms several pools in its course.

	Length in mm.	No. of specimens.
Barilius bendelisis Ham.	105 & 110	2
Danio aequipinnatus (McClell.)	42—86	64
Rasbora daniconius (Ham.)	97	1
Garra mullya (Sykes)	43—75	7
Nemachilus dayi Hora	23—79	12
Ophicephalus gachua Ham.	120	1

Choka nullah near Singanama on the Pachmarhi-Piparia Road, about 14 miles from Pachmarhi. 18 & 20. ii. 1941.

A small sluggish stream with a muddy bottom, which is strewn over with rocks in places. Pools in the course of the stream are almost stagnant and have a lot of algae and other aquatic vegetation. The bottom consists of black mud, mixed with sand. The water is generally clear. This stream joins the Denwa a little below Singanama village.

	Length in mm.	No. of specimens.
Barilius bendelisis Ham.	..	Several young specimens.
Danio aequipinnatus (McClell.)	49—72	11
Rasbora daniconius (Ham.)	41—78	7
Barbus (Puntius) dorsalis (Jerdon)	44	1
Barbus (Puntius) ticto Ham.	32—63	5
Barbus (Tor) khudree Sykes.	33 & 37	2
Garra mullya (Sykes)	57—65	5
Lepidocephalus guntea (Ham.)	60 & 66	2
Nemachilus dayi Hora	66	1
Ophicephalus gachua Ham.	83 & 88	2

Denwa river near Singanama, on Pachmarhi-Piparia Road, about 14 miles from Pachmarhi. 19 & 20. ii. 1941.

The Denwa opens out into a broad stream of clear water flowing over a bed of sand, with large rocks here and there. The water is clear and there is very little aquatic vegetation. The current is moderately swift. On the sides of the river there are isolated pools.

	Length in mm.	No. of specimens.
Barilius bendelisis Ham.	27—98	58
Danio aequipinnatus (McClell.)	46—70	5
Rasbora daniconius (Ham.)	58 & 75	2
Barbus (Puntius) pinnauratus (Day)	82	1
Barbus (Puntius) ticto Ham.	25—47	3
Barbus (Tor) khudree Sykes	20—68	27
Garra mullya (Sykes)	56—80	9
Garra gotyla (Gray)	63	1
Nemachilus botius (Ham.)	76	1

Mahabir nullah just behind the Rest House at Singanama on Pachmarhi-Piparia Road, 14 miles from Pachmarhi. 20. ii. 1941.

The nullah consists of small, isolated pools with a small trickle of water flowing in between them. The bottom consists of rocks and stones with patches of sand and darkish mud. The water is clear. There is no aquatic vegetation.

	Length in mm.	No. of specimens.
Barilius bendelisis Ham. ..		Several young specimens.
Danio aequipinnatus (McClell.)	42—75	30
Rasbora daniconius (Ham.)	49—91	17
Barbus pinnauratus (Day) ..	91	1
Barbus (Puntius) dorsalis (Jerdon)	50 & 64	2
Barbus (Puntius) ticto Ham.	40—66	5
Garra mullya (Sykes) . ..	50 & 61	2
Lepidocephalus guntea (Ham.) ..	65	1
Nemachilus dayi Hora	38 & 45	2

Machhuasa or Machha stream about 1½ miles north of Piparia, and under Railway bridge close to Railway Station. 22 & 23. ii. 1941.

A small stream of clear water flowing slowly over a bed of sand and clay. The vegetation consists of algae and grasses.

	Length in mm.	No. of specimens.
Barilius bendelisis Ham.	45—71	14
Brachydanio rerio (Ham.)	22—30	43
Rasbora daniconius (Ham.)	69	1
Barbus (Puntius) ticto Ham. ..	25 & 27	2
Lepidocephalus guntea (Ham.	45—71	19
Nemachilus dayi Hora	26—32	6

Stream near Mehra village, about 1½ miles from Itarsi. 24-26. ii. 1941.

It is a small sluggish stream running over a bed of gravel and mud. The banks are muddy and steep in places. The water is somewhat turbid and harbours large quantities of filamentous algae.

	Length in mm.	No. of specimens.
Chela clupeoides (Bloch)	63 & 74	2
Laubuca laubuca (Ham.	56	1
Brachydanio rerio (Ham.) ..	25—28	11
Danio aequipinnatus (McClell.) ..	47	1
Esomus danricus (Ham.)	37—44	25
Rasbora daniconius (Ham.)	41—67	14
Barbus (Puntius) chrysopoma (Jerdon)	117 & 126	2
Barbus (Puntius) dorsalis (Jerdon)	41	1
Barbus (Puntius) sophore Ham. .	35—48	4
Barbus (Puntius) ticto Ham.	32—58	49
Barbus (Puntius) titius Ham.	59—81	9
Barbus (Tor) khudree Sykes ..	104	1
Garra mullya (Sykes)	63—94	5
Labeo boggut (Sykes) ..	86—97	3
Rohtee cotio (Ham.)	50—58	7
Lepidocephalus guntea (Ham.) ..	52—67	10
Nemachilus dayi Hora	37—54	4
Mystus vittatus (Bloch) ..	65—88	17
Ophicephalus gachua Ham. ..	67—130	4
Ophicephalus punctatus Bloch ..	80—145	9
Glossogobius giuris (Ham.)	28—65	24

Nerbudda river near Handia, about 13 miles north of Harda. 27 ii. 1941.

A large river of clear water, flowing over a bed of sand and clay. There is a large number of rocks and boulders on the bank with pools in between them. Near the edge, there is a growth of grasses and algae. The bottom of the pools is muddy.

	Length in mm.	No. of specimens.
Barbus (Puntius) ticto Ham.	13—22	12
Barbus (Tor) khudree Sykes	35—43	3
Nemachilus dayi Hora	26—39	4

Timarni nullah on the Timarni Road, a little south of Harda. 28. ii. *and* 2. iii. 1941.

The nullah forms a branch of the Ajnal river, and is a fairly large stream of clear water, flowing over a bed of clay mixed with sand and gravel. In some places the bottom is stony. The vegetation consisting of grasses and algae is quite abundant in the shallower parts of the stream. The banks are fairly steep.

	Length in mm.	No. of specimens.
Barilius bendelisis Ham.	32—111	14
Brachydanio rerio (Ham.)	26—31	3
Danio aequipinnatus (McClell.)	58	1
Barbus (Puntius) chrysopoma (Jerdon)	180	1
Barbus (Puntius) conchonius (Ham.)	38—64	10
Barbus (Puntius) dorsalis (Jerdon)	76	1
Barbus (Puntius) guganio (Ham.)	33—41	11
Barbus (Puntius) pinnauratus (Day)	71—89	9
Barbus (Puntius) ticto Ham.	28—65	8
Barbus (Puntius) titius Ham.	84	1
Barbus (Tor) khudree Sykes	89—97	4
Garra mullya (Sykes)	45—90	7
Labeo boggut (Sykes) ..	57—95	12
Oreichthys cosuatus (Ham.) ..	28—44	5
Rohtee cotio (Ham.)	57—71	5
Lepidocephalus guntea (Ham.)	37	1
Nemachilus dayi Hora ..	25—60	26
Nemachilus botius (Ham.) ..	47	1
Mystus vittatus (Bloch) ..	85—90	3
Amblyceps mangois (Ham.) ..	23—44	6
Xenentodon cancila (Ham.)	76 & 108	2
Mastacembelus armatus (Lacép.)	95—148	4
Mastacembelus pancalus (Ham.) ..	79—85	3
Ophicephalus gachua Ham.	132	1
Badis badis (Ham.) ..	34	1
Glossogobius giuris (Ham.) ..	38—107	3

Ajnal nullah near the Railway bridge about 2 miles south-west of Harda. 1. iii. 1941.

A fairly large stream of clear water, running between steep banks over a bottom consisting mostly of small pebbles, etc., mixed with

sand and mud. The current is fairly swift. Large masses of algae were found growing in the water.

	Length in mm.	No. of specimens.
Notopterus notopterus (Pallas) ..	200	1
Barilius bendelisis Ham. ..	..	Several young specimens.
Danio aequipinnatus (McClell.)	83	1
Barbus (Puntius) dorsalis (Jerdon) ..	71	1
Barbus (Puntius) pinnauratus (Day)	86	1
Barbus (Puntius) ticto Ham.	26—55	44
Barbus (Tor) khudree Sykes	71—142	8
Garra mullya (Sykes)	70—88	7
Labeo boggut (Sykes)	105	1
Lepidocephalus guntea (Ham.)	44—57	3
Nemachilus dayi Hora ..	27—60	14
Nemachilus botius (Ham.) ..	56—71	4
Xenentodon cancila (Ham.)	51	1
Mastacembelus armatus (Lacép.)	70—109	4
Ophicephalus punctatus Day .. .	190	1
Glossogobius giuris (Ham.) ..	98	1

Midkul nullah near the Railway bridge, about 2 miles south-west of Harda.
3. iii. 1941.

The stream is about 40-60 feet wide and 2-5 feet deep. The current is sluggish and the vegetation consists of reeds, etc. The bottom consists of coarse sand and large stones here and there.

	Length in mm.	No. of specimens.
Rasbora daniconius (Ham.). ..	40	1
Barbus (Puntius) guganio (Ham.) ..	34—48	7
Barbus (Puntius) pinnauratus (Day)	80	1
Barbus (Puntius) ticto Ham. ..	22—51	7
Barbus (Tor) khudree Sykes ..	85	1
Oreichthys cosuatus (Ham.)	30—45	11
Nemachilus botius (Ham.)	53—66	6
Mystus vittatus (Bloch) ..	84	1
Laguvia rebeiroi Hora ..	24 & 28	2
Mastacembelus armatus (Lacép.)	88	1
Nandus nandus (Ham.)	108	1
Badis badis (Ham.) ..	18—46	6
Glossogobius giuris (Ham.)	37	1

Fishes purchased from markets at Sandia and Harda.

Purchased in the market at Sandia, on River Nerbudda, 12 miles from Piparia on 21. ii. 1941.

	Length in mm.	No. of specimens.
Mystus cavasius (Ham.) ..	108	1
Mystus vittatus (Bloch) ..	75—80	3

Purchased in the market at Harda on 28. ii. 1941.

	Length in mm.	No. of specimens.
Rita pavimentata Val. ..	152—160	3
Mastacembelus armatus (Lacép.)	277	1

Systematic Account.

The collection under report comprises 1,167 specimens belonging to 40 species. The systematic position of the species is shown in the following table :

Family Notopteridae.
1. *Notopterus notopterus* (Pallas).

Family Cyprinidae.

Subfamily *Abramidinae.*
2. *Chela clupeoides* (Ham.).
3. *Laubuca laubuca* (Ham.).

Subfamily *Rasborinae.*
4. *Barilius bendelisis* Ham.
5. *Brachydanio rerio* (Ham.).
6. *Danio aequipinnatus* (McClell.).
7. *Esomus danricus* (Ham.).
8. *Rasbora daniconius* (Ham.).

Subfamily *Cyprininae.*
9. *Barbus* (*Puntius*) *chrysopoma* Cuv. & Val.
10. *Barbus* (*Puntius*) *conchonius* Ham.
11. *Barbus* (*Puntius*) *dorsalis* (Jerdon).
12. *Barbus* (*Puntius*) *guganio* (Ham.).
13. *Barbus* (*Puntius*) *pinnauratus* (Day).
14. *Barbus* (*Puntius*) *sophore* Ham.
15. *Barbus* (*Puntius*) *ticto* Ham.
16. *Barbus* (*Puntius*) *titius* Ham.
17. *Barbus* (*Tor*) *khudree* Sykes.
18. *Garra mullya* (Sykes).
19. *Garra gotyla* (Gray).
20. *Parapsilorhynchus tentaculatus* (Ann.).
21. *Labeo boggut* (Sykes).
22. *Oreichthys cosuatus* (Ham.).
23. *Rohtee cotio* (Ham.).

Family Cobitidae.
24. *Lepidocephalus guntea* (Ham.).
25. *Nemachilus botius* (Ham.).
26. *Nemachilus dayi* Hora.
27. *Nemachilus evezardi* Day.

Family Bagridae.
28. *Mystus cavasius* (Ham.).
29. *Mystus vittatus* (Bloch).
30. *Rita pavimentata* Val.

Family Amblycepidae.
31. *Amblyceps mangois* (Ham.).

Family Sisoridae.
32. *Laguvia ribeiroi* Hora.

Family Belonidae.
33. *Xenentodon cancila* (Ham.).

Family Mastacembelidae.
34. *Mastacembelus armatus* (Lacép.).
35. *Mastacembelus pancalus* (Ham.).

Family Ophicephalidae.
36. *Ophicephalus gachua* Ham.
37. *Ophicephalus punctatus* Bloch.

Family Nandidae.
38. *Nandus nandus* (Ham.).

Family Pristolepidae.
39. *Badis badis* (Ham.).

Family Gobiidae.
40. *Glossogobius giuris* (Ham.).

Of the 40 species listed above, 26 belong to the order Cyprinoidea (22 Cyprinidae and 4 Cobitidae), 5 to the order Siluroidea (3 Bagridae, 1 Amblycepidae and 1 Sisoridae), while the remaining species are distributed among the families Notopteridae (1), Belonidae (1), Mastacembelidae (2), Ophicephalidae (2), Nandidae (1), Pristolepidae (1) and Gobiidae (1). With the exception of a few species of carp-minnows, all others are fairly well known and do not call for any comments from a systematic point of view. However, a few remarks are necessary on *Danio aequipinnatus* (McClelland), *Barbus* (*Puntius*) *chrysopoma* Cuv. & Val., *Nemachilus dayi* Hora, *Amblyceps mangois* (Ham.) and *Laguvia ribeiroi* Hora.

From a zoogeographical point of view the occurrence of *Amblyceps* and *Laguvia* in the Hoshangabad District shows the affinities of the fish-fauna of this region with that of the Assam Hills and the Eastern Himalayas. The former genus has been obtained from all the portions of the Satpura Trend surveyed by the Zoological Survey of India, while *Laguvia* was collected only in the Rajmahal Hills. The presence in

the collection of forms, such as *Barbus* (*Puntius*) *dorsalis* (Jerdon), *Garra mullya* (Sykes), *Parapsilorhynchus tentaculatus* (Ann.), *Labeo boggut* (Sykes), *Nemachilus dayi* Hora, *N. evezardi* Day and *Rita pavimentata* Val., shows that the fish-fauna of this part of the Satpuras is closely allied to the fauna of the Western Ghats. Some of these species, such as *Parapsilorhynchus tentaculatus*, *Nemachilus evezardi* and *Rita pavimentata*, were not found in the Sihawa range, Raipur District.[1] The remaining species are widely distributed in India and are, therefore, of little significance in a zoogeographical discussion. These studies have clearly shown that the Satpura Trend of mountains must have, at not a very remote period, acted as a highway for the dispersal of the Eastern Himalayan and Assam forms to the Western Ghats and that the Garo-Rajmahal Gap is only a comparatively recent feature in the physiography of India. Further, it is also clear that there must have been a continuity of waterways between the Western Ghats and the Satpuras of the Hoshangabad District not very long ago as can be inferred from a large number of identical species of limited range that are found in both the regions.

Though in his studies on ' The Distribution of Vertebrate Animals in India, Ceylon and Burma ', Blanford[2] attached little importance to the distribution of freshwater fishes, it is significant that he had also come to similar conclusions as stated above from the distribution of other types of vertebrates. In describing the peculiarities of the fauna of the Indian Peninsula, he stated :

" The majority of the genera named are typically forest forms ; the species of the Bihar-Orissa area are, with very few exceptions, the same as those of Malabar, and may have inhabited the whole of Southern India before the forests of the Deccan and Carnatic were cleared. One circumstance seems strongly to support this view. There are two kinds of *Anthracoceros* in India, one of which inhabits Ceylon and the Western or Malabar coast as far north as Ratnagiri, whilst the other inhabits the lower Himalayas and countries to the eastward. Neither is known to be found in the Deccan or Carnatic. The two meet in the Bihar-Orissa area, the Malabar form to the south, the Himalayan to the north. It is scarcely probable that the southern species would exist in the area unless it once ranged over the country intervening between Chutia Nagpur and Malabar. In the same manner the southern grackle (*Eulabes religiosa*) meets the Himalayan and Burmese grackle (*E. intermedia*) in the same area, but is not known to be met with in the Deccan or Carnatic tracts.

" That the differences between the Bihar-Orissa province and the adjoining provinces of the Indian Peninsula are not ancient is, I think, shown by the absence of distinctive genera amongst the reptiles and batrachia."

With regard to the value of freshwater fishes in zoogeographical studies, Blanford (*loc. cit.*, p. 343) stated :

" The evidence afforded by freshwater fishes varies so much with the presence or absence of suitable habitats, such as lakes and rivers, that it is generally, I think, only applicable to large areas."

The distribution of hill-stream fishes, such as *Amblyceps*, *Laguvia*, *Garra*, *Parapsilorhynchus*, *Nemachilus*, etc., can only take place along hill ranges, so there is hardly any necessity to contemplate vast level tracts of the country to be once covered with forests in order to explain the distribution of any genus occurring in the Peninsula of India on the one hand and the hills of Assam and the Eastern Himalayas on the other. Such a continuity of hill-ranges was provided by the once

[1] Hora, S. L., *Rec. Ind. Mus.* XLII, pp. 365-374 (1940).
[2] Blanford .W. T., *Phil. Trans. Roy. Soc. London* (B) CXCIV, p. 392 (1901).

extensive Satpura Trend[1] which stretched from the Assam Himalayas in the east to the Western Ghats in the west. We believe that the Satpura Trend not only provided a highway for the dispersal of the so-called Malayan fishes to Peninsular India, but also served as a route for the forest-loving forms among other groups of vertebrates that show a similar discontinuous range of distribution.

Danio aequipinnatus (McClelland).

1878. *Danio aequipinnatus*, Day, *Fish. India*, p. 596, pl. cl., fig. 6.

In 1934, Hora and Mukerji[2] gave an artificial key to the species of *Danio* and distinguished three closely allied species by the following characters :

I. A well-defined black mark near upper angle of gill-opening.	
A. Lateral bands breaking up anteriorly to form a mottled pattern. L. l. 37 ; L. tr. 10 ($7\frac{1}{2}/2\frac{1}{2}$) ..	*D. strigillifer* Myers.
B. Lateral bands not breaking up anteriorly to form a mottled pattern. Several well marked and uniform lateral bands. L. l. 34-36, L. tr. 10 or 11 ($7\frac{1}{2}/2\frac{1}{2}$ or $8\frac{1}{2}/2\frac{1}{2}$)	*D. aequipinnatus*[3] (McClelland).
II. Black mark near upper angle of gill-opening absent. L. l. 32-34 ; L. tr. 11 ($8\frac{1}{2}/2\frac{1}{2}$)	*D. malabaricus* (Jerdon).

In 1937, Hora[4] recorded *D. strigillifer* Myers[5] from Southern India and commented on the discontinuous range of distribution of the species. In the material under report we have all gradations of colour and scale counts and find that the three species mentioned above cannot be distinguished from one another on any reliable character and should, therefore, be regarded as identical. Recently Hora and Law[6] found that the specimens of *Danio* from Travancore were *D. aequipinnatus* and that *D. malabaricus* must be regarded as a synonym of this species. The South Indian specimens of *D. aequipinnatus* grow to a larger size than those found in Northern India.

Barbus (Puntius) chrysopoma Cuvier and Valenciennes.

1878. *Barbus chrysopoma*, Day, *Fish. India*, p. 561.

Under the description of *Barbus pinnauratus*, Day (*loc. cit.*, p. 562) stated that " This form [*B. pinnauratus*] and *B. chrysopoma* may be merely varieties of a single species, while *B. sarana* is closely allied ". According to Day's descriptions of *B. chrysopoma* and *B. pinnauratus*, the two species can be distinguished by the number of predorsal scales —12 in the former and 10 in the latter. Sundara Raj[7], however, found

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[1] Hora, S. L., *Rec. Ind. Mus.* XXXIX, p. 255 (1937) ; *Proc. Nat. Inst. Sci. India* IV, p. 405 (1938).

[2] Hora, S. L. and Mukerji, D.D., *Rec. Ind. Mus.* XXXVI, p. 134 (1934).

[3] Mukerji (*Journ. Bombay Nat. Hist. Soc.* XXXVII, p. 76, 1934) has given reasons to show that Regan's *Danio browni* (*Rec. Ind. Mus.* I, p. 395, 1907) cannot be regarded as a species distinct from *D. aequipinnatus* (McClell.).

[4] Hora, S. L., *Rec. Ind. Mus.* XXXIX, p. 10 (1937).

[5] Myers, G. S., *Amer. Mus. Novitates*, No. 150, p. 1 (1924).

[6] Hora, S. L. and Law, N. C., *Rec. Ind. Mus.* XLIII, p. 243 (1941).

[7] Raj, B. Sundara, *Rec. Ind. Mus.* XII, p. 254 (1916).

that besides other characters there are 10 to 12 rows of predorsal scales in the specimens of *B. chrysopoma* from Madras and remarked :

" The above particulars show that Madras examples combine the characters of the three species, *B. sarana*, H. B., *B. chrysopoma*, C. and V., *B. pinnauratus*, Day, all of which according to the *Fauna of British India* may occur in Madras."

In the limited series of specimens that we have examined, it has been possible to distinguish *B. pinnauratus* from *B. chrysopoma* by the number of predorsal scales, but there seems no doubt that the three species mentioned above along with *B. caudimarginatus* Blyth and *B. sewelli* Prashad & Mukerji form a series of very closely allied species, the specific limits of which are by no means well defined.

Nemachilus dayi Hora.

1935. *Nemachilus dayi*, Hora, *Rec. Ind. Mus.* XXXVII, p. 57.
1938. *Nemachilus dayi*, Hora, *Rec. Ind. Mus.* XL, p. 240.
1938. *Nemachilus dayi*, Das, *Rec. Ind. Mus.* XL, p. 447.

Nemachilus dayi is represented in the collection by a large number of young, half-grown and adult specimens. The colouration is very variable. In young specimens the lighter bands are almost as wide as the darker ones and the dorsal and caudal fins are provided with only a few rows of spots. The characteristic colouration of the species is assumed in specimens about an inch and a half in length. From the large series of specimens now examined, it seems that the examples referred by Das (*loc. cit.*, p. 446) and Hora[1] to *N. denisonii* are referable to this species.

Amblyceps mangois (Hamilton).

1933. *Amblyceps mangois*, Hora, *Rec. Ind. Mus.* XXXV, pp. 607-621, text-figs. 1-7.
1940. *Amblyceps mangois*, Hora, *Rec. Ind. Mus.* XLII, p. 374.

The occurrence of *Amblyceps mangois* in the streams of the Hoshangabad District is of special significance. During the survey of the Satpura Trend, it has been collected from all the hilly districts and its range has thus been extended considerably westwards.

The specimens under report are juvenile. The caudal fin is deeply forked and in some the lobes, especially the upper, are greatly drawn out and pointed. The adipose dorsal is relatively short and low.

Amblyceps mangois is found along the Himalayas, hills of Assam, Burma, Siam, the Malay Peninsula and the Satpura Trend of mountains.

Laguvia ribeiroi Hora.

1921. *Laguvia ribeiroi*, Hora, *Rec. Ind. Mus.* XXII, p. 741, pl. xxix, fig. 3.
1938. *Laguvia ribeiroi*, Hora, *Rec. Ind. Mus.* XL, p. 179, text-fig. 5.

Laguvia ribeiroi was originally described from a single specimen collected from the Khoila River, a tributary of the Tista River in the Jalpaiguri District. Two more specimens of this remarkable catfish were recorded from the Morel River in the Santal Parganas. The occurrence of the species in the Hoshangabad District is of great zoo-

[1] Hora, S. L., *Rec. Ind. Mus.* XLII, p. 373 (1940).

geographical interest as showing the probable continuity of the Satpura Trend of mountains with the hills of Assam and the Darjeeling Himalayas at a not very distant date.

It has been pointed out by Hora (*loc. cit.*, 1938) that *L. ribeiroi* can be readily distinguished from *L. shawi* by the nature of the dorsal spine which is serrated anteriorly in *L. ribeiroi* and is smooth in *L. shawi*. In the chest region, there are folds of skin which form an adhesive apparatus similar to that found in species of *Glyptothorax* Blyth. Recently, Hora and Gupta[1] described similar corrugations in *L. shawi*.

Summary.

The collection comprises 40 already known species. A note on the physical features and ecological conditions of the area from which the collection was made is added. Short descriptions of localities with lists of fishes collected from each are also included. A reference is made to the zoogeographical distribution of *Amblyceps* and *Laguvia*, the Eastern Himalayan forms, and of *Parapsilorhynchus*, *Nemachilus evezardi*, *Rita pavimentata*, etc., of the Western Ghats. The significance of the Satpura Trend in the distribution of Malayan forms to Peninsular India is discussed. Notes are appended on *Danio aequipinnatus* (McClelland), *Barbus* (*Puntius*) *chrysopoma* Cuv. & Val., *Nemachilus dayi* Hora, *Amblyceps mangois* (Ham.) and *Laguvia ribeiroi* Hora.

[1] Hora, S. L. and Gupta, J. C., *Journ. Roy. As. Soc. Bengal* (3) VI, p. 5, 1940 (1941).

TWO NEW CYPRINID FISHES FROM TRAVANCORE, SOUTH INDIA, WITH REMARKS ON *BARBUS (PUNTIUS) MICROPOGON* CUV. AND VAL.

By B. SUNDARA RAJ, *Diwan Bahadur, M.A., Ph.D. (Liverpool).*

In a recent article,[1] a remarkable new genus of the Schizothoracine fishes was described from the Periyar Lake, Travancore, and attention was directed to the location and physical features of the Lake. Of the two new Cyprinid fishes, which form the subject matter of the present article, one was obtained from the Lake, while the other was collected from the Kallar, a tributary of the Pambiyar River, a few miles to the south of the Lake.

In their account of the freshwater fishes of Travancore, Hora and Law[2] have referred to the preponderance of endemic species in Peninsular India and indicated that this fauna must have been isolated from that of the rest of India for a considerable period. The two new forms of fish described in this paper add further to their list of the endemic species known from the State.

I wish to express here my great indebtedness to Dr. Baini Prashad and Dr. S. L. Hora of the Zoological Survey of India for the loan of material, literature and suggestions. The illustrations were prepared by the artists of the Zoological Survey of India under the supervision of Dr. Hora.

Barbus (Puntius ophicephalus, sp. nov.

B. iii ; D. 3/7 ; P. 1/13 (1/13–1/15)[3]; V 1/8 ; A. 2/5 (2/5–3/5) ; C. 19 (17-19) ; L. l. 40+1 (40-42+1-2). L. tr. 7-7½/6.[4]

Tamil name.—EECHATHALAI KENDAI.

The head and anterior portion of the body are not compressed in the adult though somewhat compressed in the young. The dorsal profile is slightly more arched than the ventral ; it is convex from the tip of the snout to the dorsal fin and almost straight behind that fin. The top of the head and nape are noticeably broad and flattened. The maximum depth of the body, which is at the nape or immediately behind it, is contained 4·3 (3·8–4·1) times in the standard length. The large and bluntly conical head is broad and depressed (compressed in the young). The height of the head is equal to its width (in the young the head is higher than broad) which is 2/3 of its length. The head is contained

[1] Raj, B. Sundara, *Rec. Ind. Mus.* XLIII, pp. 209–214 (1941).

[2] Hora, S. L., and Law, N. C., *Rec. Ind. Mus.* XLIII, pp. 233–256 (1941).

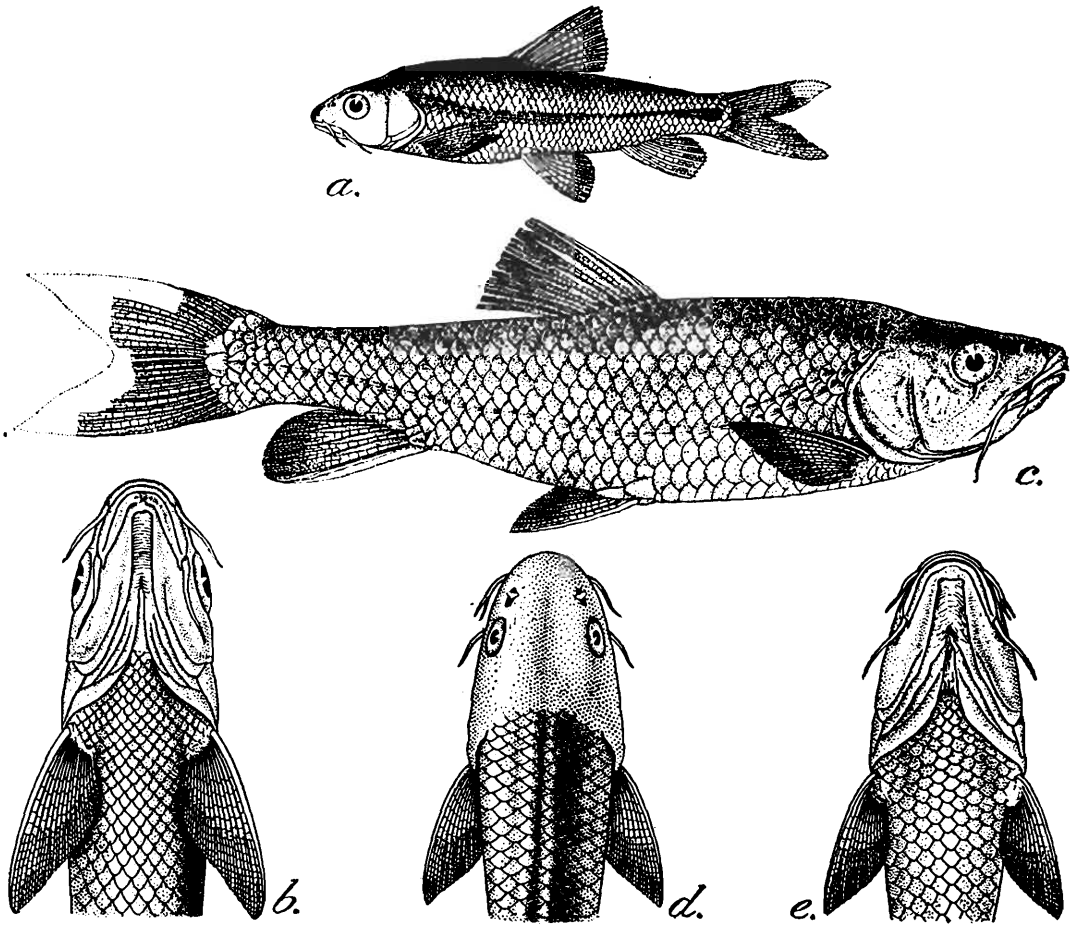
[3] In the descriptions which follow the scale counts and measurements of the holotype, which is the largest complete specimen collected, are given, followed within brackets by the range of variation, if any, shown by the paratypes.

[4] Counted from the origin of the dorsal fin to the lateral line and from the lateral line to the midventral row immediately in front of the root of the ventral fin, omitting the mid-dorsal, mid-ventral and lateral line rows of scales.

3·7 (3·2-4) times in the standard length. The caudal peduncle is 1½ times as long as high at its narrowest part.

The eyes are large and rather elevated, being placed close to the dorsal profile and almost entirely in the anterior half of the head. They are distinctly dorso-lateral in position in the adult. The diameter of the eye is contained 5·5 (3·2–5·5) times in the length of the head and 2·2 (1·2–2·2) times in the interorbital space, which is more or less flat. The eyes in the young are proportionately larger.

The snout, which is somewhat prominent and broadly rounded anteriorly, is wider than long and is about 1/3 in the length of the head. It has short lateral lobes which bear the rostral pair of barbels. Its



TEXT-FIG. 1.—*Barbus* (*Puntius*) *ophicephalus*, sp. nov.

a. Lateral view of a Paratype : × ⅓ ; *b*. Ventral surface of head and anterior part of body of same : × 1 ⅕ ; *c*. Lateral view of Holotype : × ½ ; *d*. Dorsal surface and anterior part of body of same : × ½ ; *e*. Ventral surface and anterior part of body of same : × ½.

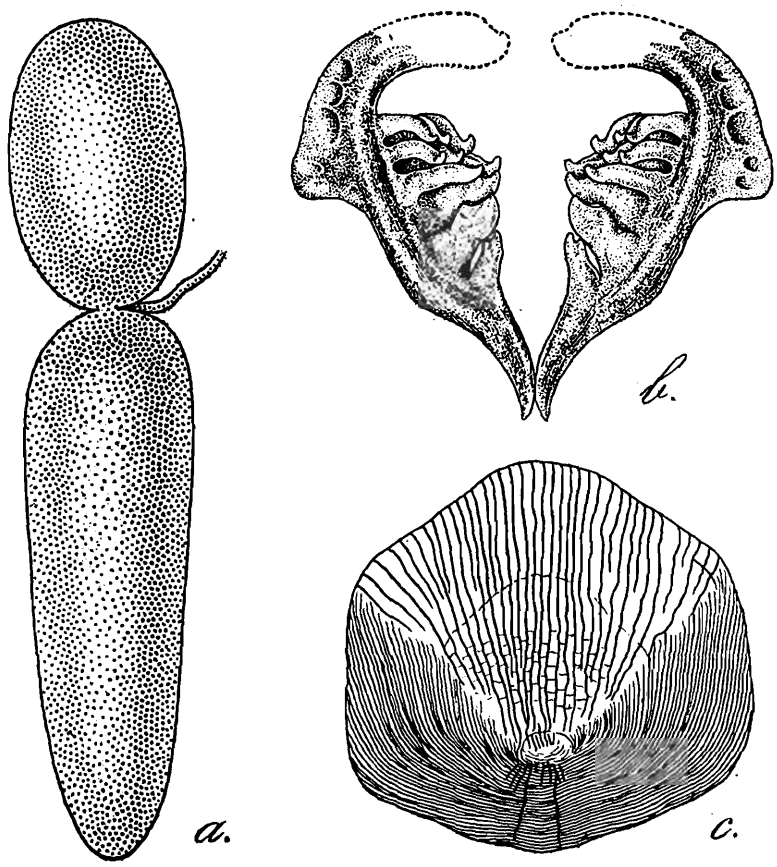
anterior margin is sharp, entire, and forms a horizontal rostral fold. A few scattered pearl organs are present on the sides of the snout in some specimens.

The mouth is subinferior and horseshoe-shaped; its cleft is more or less horizontal and does not reach below the anterior border of the eye. The upper jaw is feebly protractile and projects beyond the lower jaw. The lips, papillated in some examples, are fairly thick and continuous at the angles of the mouth by a narrow bridge and not by the whole width. The lower lip is separated from the lower jaw by a superficial furrow. The postlabial groove is narrowly interrupted in the middle.

A rostral and a maxillary pair of barbels are present, the former are equal in length to and the latter 1½ times as long as the diameter of the eye. They are relatively shorter in the young. The left rostral barbel of the holotype is bifid, evidently an abnormality.

The gill openings are large. The gill membranes are united with the isthmus below the posterior border of the preopercle. The gill rakers are few— 4 (4-6)—widely spaced, short and stout; the longest is 2/5 of the gill filaments.

The pharyngeal teeth[1] are in three rows 5·3·2–2·3·5. They are strongly compressed and hooked, with oblique spoon-like grinding sur-



TEXT-FIG. 2.—*Barbus* (*Puntius*) *ophicephalus*, sp. nov.

a. Air-bladder : ×2 ; *b*. Pharyngeal bones and teeth : ×4 ; *c*. A scale from dorsal surface : ×6.

The above parts were dissected out from a Paratype.

faces. The pharyngeal bone is 4 times as long as broad and has a well defined anterior angle and a narrow pitted surface which does not extend beyond the angle.

The scales are moderately large, the largest being about 3/4 the size of the eye. In the scapular region the scales are broader than long and have a gently convex basal margin, more or less straight lateral margins, and a bluntly conical apex. The nuclear area is large and is basal in position. The radii are developed all round the scale. The circulii are degenerate in the apical field. A long axillary scale is present at the root of the ventral fin. The lateral line is complete, and extends in the form of open pores on the head as far as the nasal openings. There are two lateral lines on the right side of the holotype,

[1] The description is after that of Y. T. Chu, *Biol. Bull. St. John's University, Shanghai*, II, pp. 83, 84 (1935).

the upper terminating after the tenth scale, evidently an abnormality. There are 3 ($3\frac{1}{2}$–5) rows of scales between the lateral line and the base of the ventral fin, 17 (15–17) predorsal scales, and 16 rows round the caudal peduncle.

The dorsal fin, which is as long as the head from the anterior margin of the eye to the gill cleft, commences slightly nearer the tip of the snout than the base of the caudal fin, somewhat in advance of the ventral fin. It has a slightly concave or nearly straight free margin. Its last undivided ray is stiff and slightly enlarged but very weak, smooth and articulated in its upper part. The pectoral fin is somewhat falciform and as long as the head without the snout. In the young it is comparatively longer. It does not reach the ventral, when depressed, by a distance equal to half its own length. The ventral fin is shorter than the pectoral, has an obliquely truncate free margin, and does not reach the anal fin, when depressed, by a distance about two-thirds its own length (in young specimens this distance is only half the length of the fin). The anal fin, which is longer than the dorsal fin, has a rounded free margin. In the young this fin is shorter than the dorsal. It reaches when depressed, the root of the caudal fin, (in the young the anal does not reach the caudal). The caudal fin is deeply emargin ate.

In fresh specimens the back and the fins are rich golden brown, the sides and the abdomen silvery brown. A broad dark band runs along the lateral line which is composed of fine black spots on the bases of the lateral line scales.

The food of the specimen dissected consisted almost exclusively of insects. The alimentary canal is about 2·75 times as long as the body.

Barbus ophicephalus is rare and was found in the Kallar, a tributary of the Pambiyar River, to the South of the Pachakani Estate adjoining the Periyar Lake. It inhabits rocky pools in which decaying vegetation is present in large quantities. The vernacular name of the fish refers to this peculiar habitat. Four specimens were collected in 1935 and seven in 1937, ranging in size from 56 to 196 mm. The measurements of the largest (holotype) and the smallest (paratype) are given below.

Holotype.—F. 13514/1, Zoological Survey of India (*Ind. Mus.*), Calcutta. Besides the holotype, 7 paratypes (F 13515/1) are also deposited in the collection of the Zoological Survey of India.

Measurements in millimetres.

	Holotype.	Paratype.
Standard length	163	42
Height of body	38	11
Length of head	44	13
Width of head	30	7
Height of head	30	9
Length of caudal peduncle	25	7
Least height of caudal peduncle ..	15	5
Diameter of eye	8	4
Interorbital space	18	5
Length of snout	14	4
Length of dorsal fin	33	10
Length of pectoral fin	31	9
Length of ventral fin	26	7
Length of anal fin	34	8

Remarks.—Dr. Hora called my attention to the close resemblance of this species to *Barbus lithopidos* Day.[1] It is, however, distinguished from Day's species by the absence of a horny covering to its jaws in the preserved specimens, the smaller number of its fin rays and the larger number of its lateral line and predorsal scales. I examined all the specimens of *B. lithopidos* in the collection of the Zoological Survey of India including Day's own specimens as well as one in my collection from Nilambur. The fin rays and scales in 7 specimens of *B. lithopidos*, ranging in size from 90 to 325 mm. in standard length were as follows :

D. 4/9 ; A. 3/5 ; V 2/9 ; L. l. 36-38+1 ; Predorsal scales 11–14.

In a very young specimen measuring 57 mm. in standard length the counts were :

D. 4/8 ; A. 3/5 ; V 1/8 ; L. l. 30.

The corresponding numbers in 8 specimens of *Barbus ophicephalus*, ranging in size from 42 to 163 mm. in standard length, were as follows :

D. 3/7 ; A. 2-3/5 ; V 2/8 ; L. l. 40–42+1–2 ; Predorsal scales 15–17

Two of the specimens of *B. lithopidos* were very young specimens measuring 57 and 90 mm. in standard length respectively. They differed from the rest in the remarkable depth of body, which was 2·6 times in the length in both, whereas in the rest the depth of body ranged from 3·3 to 3·7 times in the length. Evidently this is a characteristic of the young of *B. lithopidos*. The depth of body in *B. ophicephalus* ranges from 3·8 to 4·1 times in the length. Even in the youngest specimens, 42 mm. in standard length, the depth is 4·1 times in the length.

In *B. lithopidos*, except in the very young specimens, the anterior rays of the dorsal fin are distinctly prolonged and the caudal fin is proportionately longer with narrow, falciform, sharply pointed lobes ; whereas in *B. ophicephalus* the corresponding dorsal rays and the caudal fin are short, and the latter having broad blade-shaped lobes. Finally the difference in colour is very marked. Except in the very young specimens, *B. lithopidos* has the outer rays of the caudal fin characteristically white ; this was seen in all the specimens examined, including those collected by Day nearly three-quarters of a century ago. Moreover, *B. lithopidos* is devoid of a dark lateral band on the body.

Barbus (Puntius) micropogon, subsp. **periyarensis,** nov.

D. 3/9 (3-4/9) ; P. 1/15 (1/13-15) ; V 2/8 ; A. 3/5 ; C. 19 ; L. l. 42–43+2 ; L. tr. 7/7.

Tamil name.—KARIVAN (The charcoal-coloured one).

The body is oblong and compressed, its greatest depth, which is below the commencement of the dorsal fin, is 3·2 (3·2–3·3) times in the standard length. The head is rather small, conical, and somewhat depressed. Its length is 4·5 (4·2–4·5) times in the standard length and its width is almost equal to its height. The caudal peduncle is a little longer than high ; its least height being 1·2 (1·1–1·3) times in its length.

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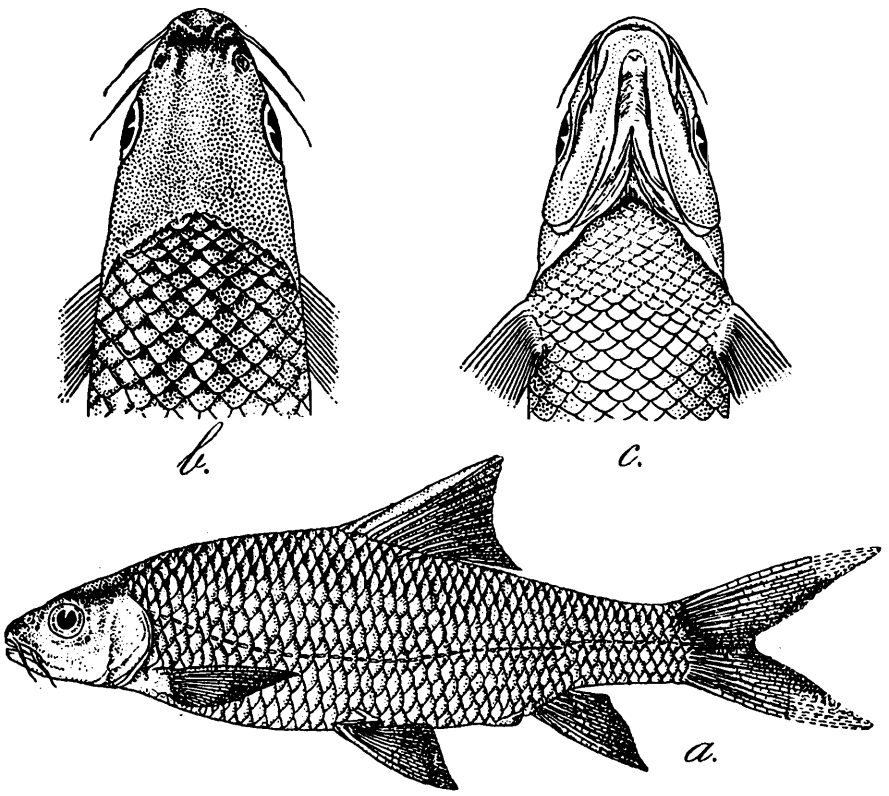
[1] Day, F., *Proc. Zool. Soc. London*, p. 708 (1873) ; *Fish. India*, p. 567, pl. cxxxviii, fig. 2 (1878) ; *Faun. Brit. Ind.* Fish. I, p. 310 (1889).

The eye is large, comparatively larger in the young; its diameter is contained 4·3 (3·1–5·5) times in the length of the head. It is placed nearer the dorsal profile than the ventral, and almost entirely in the anterior half of the head. The interorbital space is proportionately wider in the adult. It is nearly flat and is 1·7 (1·1–2·5) times in the diameter of the eye.



TEXT-FIG. 3.—*Barbus* (*Puntius*) *micropogon*, subsp. *periyarensis*, nov.

a. Lateral view of Holotype: ×⅓; *b*. Dorsal surface of head and anterior part of body of same: ×⅔; *c*. Ventral surface of head and anterior part of body of same.: ×⅔.

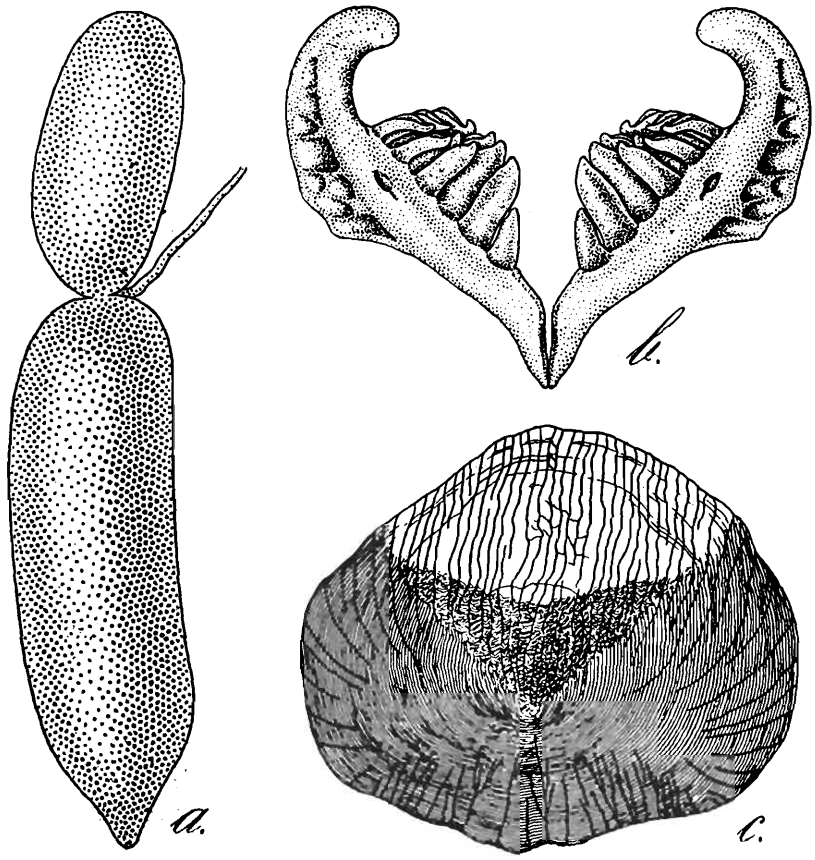
The snout is conical and bluntly pointed and has no free lateral lobes. It is 1·5 (1·1–2·2) times as long as the diameter of the eye. The mouth is semicircular and subinferior (distinctly inferior in the adult). The cleft of the mouth is nearly horizontal and does not reach below the anterior border of the eye. The rostral fold is deep, horizontal and entire. The lips are moderately developed and continuous round the corners of the mouth. The postlabial groove is interrupted in the middle. The upper jaw is longer than the lower.

A rostral and a maxillary pair of barbels of almost equal size are present, and reach well beyond the anterior and posterior borders of the orbit respectively.

The 9 or 10 gill rakers in the adult are mere stumps anteriorly; the longest of them is hardly one-fourth as long as the gill filaments. The pharyngeal bone is 2/3 as wide as long; its anterior eduntulous process is very short and the pitted surface narrow. The anterior angle is prominent.[1] The pharyngeal teeth are compressed and hooked and as usual in three rows: 5·3·2–2·3·5. The alimentary canal is a little

[1] The description is after Y. T. Chu, *Biol. Bull. St. John's University, Shanghai* II, pp. 83, 84 (1935).

over twice as long as the body and in the specimen dissected contained green vegetable matter.



TEXT-FIG. 4.—*Barbus* (*Puntius*) *micropogon* sub. sp. *periyarensis*, nov.

a. Air-bladder : ×1¾ ; *b*. Pharyngeal bones and teeth : ×4½ ; *c*. A scale from dorsal surface : ×5.

The above parts were dissected out from a Paratype.

The scales are fairly large ; the largest is of the same size as the eye. They are rounded with a wavy basal margin The nucleus is basal. The circulii are obsolescent in the apical region. The apical radii are numerous and more or less parallel ; the median ones reach the nucleus. A few lateral and basal radii are present in the scales of the caudal peduncle. There are 4 rows of scales between the lateral line and the base of the ventral fin, 16 rows round the caudal peduncle and 21 (19–21) predorsal scales.

The dorsal fin commences opposite the ventral and midway between the tip of the snout and the base of the caudal fin. It is longer than the head. The last undivided dorsal ray is osseous, smooth and much enlarged. In young specimens it is relatively longer. The free margin of the dorsal fin is concave. The first branched ray, which is the longest, when depressed, reaches ½ (½–¾) the way to the root of the caudal fin. The pectoral fins are somewhat falciform and nearly as long as the head. They reach the 12th (12th-13th) scale of the lateral line, and are separated from the base of the ventral fin by a quarter of their own length. The ventral fins have an obliquely truncate free margin and are separated from the anal fin by half their own length. The anal has an obliquely truncate free margin and when depressed reaches the base of the caudal fin (in immature specimens the anal fin is shorter). The anal fin in

breeding females is longer than the dorsal and often reaches beyond the base of the caudal. The caudal fin is deeply forked. The upper lobe is longer than the lower. The head and body are dark brown or blackish ; the fins are stained black.

Measurements in millimetres.

	Holotype.	Smallest paratype.
Standard length	200	117
Length of head	47	28
Width of head	30	17
Height of head	32	18
Height of body	63	37
Length of snout	16	9
Diameter of eye	11	9
Interorbital space	19	10
Length of caudal peduncle	27	18
Least height of caudal peduncle	23	14

Holotype.—F 13516/1, Zoological Survey of India (*Ind. Mus.*), Calcutta. Besides the holotype, 1 paratype (F 13517/1) is also deposited in the collection of the Zoological Survey of India.

Remarks.—*B. micropogon*, which has not so far been recorded from Travancore, is one of the commonest fish in the lake. The above description is based on the head of a large specimen, the length of which was not noted, and three smaller specimens, which alone were preserved. For the relationships of the new subspecies reference may be made to the following account of *B. micropogon* Cuv. and Val.

REMARKS ON *BARBUS (PUNTIUS) MICROPOGON* CUV. & VAL.

Barbus (Puntius) micropogon Cuv. & Val.

1842. *Barbus micropogon*, Cuvier & Valenciennes, *Hist. Nat. Poiss.* XVI, p. 188.
1848. *Barbus mysorensis*, Jerdon, *Mad. Journ. Litt. Sci.* XV, p. 312.
1867. *Puntius (Barbodes) gracilis*, Day, *Proc. Zool. Soc. London*, p. 290.
1868. *Barbus conirostris*, Günther, *Cat. Fish. Brit. Mus.* VII, p. 127.
1877. *Barbus conirostris*, Beaven, *Handbook. Fr. Water Fish. India*, p. 44.
1878. *Barbus micropogon*, Day, *Fish. India*, p. 563, pl. cxxxvi, fig. 3; pl. cxxxviii, fig. 4.
1889. *Barbus micropogon*, Day, *Faun. Brit. Ind.* Fish. I, p. 304.
1927. *Barbus micropogon*, Narayan Rao and Seshachar, *H. Yly. Journ. Mysore Univ.* I, pp. 117, 130.
1931. *Barbus micropogon* var. *mysorensis*, Mukerji, *Journ. Bombay Nat. Hist. Soc.* XXXV, pp. 166, 167.
1937. *Barbus micropogon*, Hora, *Rec. Ind. Mus.* XXXIX, p. 19.

There is a certain amount of confusion in the taxonomy of *Barbus micropogon*. Cuvier and Valenciennes[1] originally described this species in 1842 from Mysore ; their description based on a young specimen (3″ long) is meagre and is not accompanied by a figure. In 1848, Jerdon[2] described two similar species from the Cauvery, *Barbus mysorensis* with 38 scales along the lateral line in 9 rows and snout covered with mucous pores, and *Barbus gracilis* with 42 scales along the lateral line

[1] Cuvier, G. and Valenciennes, A., *Hist. Nat. Poiss.* XVI, p. 188 (1842).
[2] Jerdon, T. C., *Mad. Journ. Litt. Sci.* XV, pp. 312, 313 (1848).

in 12 rows and snout smooth. He noted that both the species occurred together in the same locality in the Cauvery and that the latter was " a very well defined species " In 1867, Day[1] in redescribing *B. gracilis* under the name *Puntius (Barbodes) gracilis* gave the number of scales along the lateral line as 40 and along the transverse series as 7/4. At the same time he described a new species *Puntius (Barbodes) dubius* from the Bhavani, a tributary of the Cauvery, with 42 scales along the lateral line, and remarked that in appearance *B. dubius* was the same as *P. gracilis* from which it might be only a sexual difference. In 1868, Günther[2] redescribed *B. micropogon* from a stuffed specimen and mentioned only $2\frac{1}{2}$ scales between the lateral line and the root of the ventral fin on account of which and other differences Day[3] did not consider Günther's *B. micropogon* as synonymous with that of Cuvier and Valenciennes. Günther[4] also described a new species, *B. conirostris*, with the scale counts " L. l. 40 and L. tr. 7/7 " from specimens supplied by Day as *B. gracilis* and included *B. gracilis* Jerdon and *P. gracilis* Day in its synonymy, but recognised *B. dubius* as a valid species, with Day's reservation that as it is extremely similar to *B. conirostris* (=*P. gracilis* Day) and might be only a sexual difference. *B. mysorensis* Jerdon was considered by Günther[5] as a doubtful species. In 1870, Day[6] stated : " It appears not improbable that *B. mysorensis*, Jerdon is the same as *B. conirostris*, Günther. The species I termed *B. dubius*, I find, has five series of scales between the lateral line and the base of the ventral fin." In his later publication, Day[7] merged Jerdon's two species, *B. mysorensis* and *B. gracilis*, and Günther's *B. conirostris* in the synonymy of *B. micropogon*, but retained his own species *B. dubius* as distinct. However, he recognised *B. mysorensis* Jerdon as a variety of *B. micropogon* with numerous pores on the snout and preorbitals. In 1931, Mukerji[8] redescribed *B. mysorensis* from two specimens, 135 and 160 mm. long, in the collection of the Zoological Survey of India, and distinguished it from the *forma typica* as follows :—

B. micropogon.	*B. micropogon* var. *mysorensis.*
" 1. Head less than 4 times in length of body.	Head 4·25 times in length of body.
2. Snout blunt and without tubercles.	Snout pointed and covered with pointed tubercles.
3. Anal fin when laid flat extends to the base of the caudal fin.	Anal fin when laid flat extends to the middle of caudal peduncle.
4. 38-39 scales along lateral line.	41-42 scales along lateral line.
5. 12 predorsal scales.	14-15 predorsal scales."

The form from the Periyar Lake described above differs in having 42+2 scales along the lateral line and 19–21 predorsal scales, and it is on these characters that it has been kept separate as a subspecies.

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1 Day, F., *Proc. Zool. Soc. London*, p. 290 (1867).
2 Günther, *A., Cat. Fish. Brit. Mus.* VII, p. 126 (1868).
3 Day, F., *Fish. India*, p. 563 (1878).
4 Günther, A., *Cat. Fish. Brit. Mus.* VII, p. 127 (1868).
5 Günther, A., *Cat. Fish. Brit. Mus.* VII, p. 83 (1868).
6 Day, F., *Proc. Zool. Soc. London*, p. 373 (1870).
7 Day, F., *Fish. India*, p. 563 (1878).
8 Mukerji, D. D., *Journ. Bombay Nat. Hist. Soc.* XXXV, pp. 166, 167 (1931).

In order to determine the validity of the various forms of *B. micropogon* mentioned above, the following specimens in the collection of the Zoological Survey of India, the Madras Fisheries Department and the specimens collected by me from the Periyar Lake were examined.

Barbus dubius.

1. Day's type. Indian Museum No. 2373, Bhavani R. .. 250 mm.
   Pores on snout.
   L. l. 42+2.[1]
   L. tr. 9/4-5.
2. Indian Museum No. F. 12388/1, Cauvery, Coorg .. .. 64 mm.
   No pores on snout.
   L. l. 42+1.
   L. tr. 8/4.
3. Madras Fisheries Department, Cauvery, Mettur Dam. .. 320 mm.
   Pores on snout.
   L. l. 42+2.
   L. tr. 9/4½.
4. Madras Fisheries Department, Cauvery, Mettur Dam .. 230 mm.
   Pores on snout.
   L. l. 42+1.
   L. tr. 8/3½.

Barbus micropogon and varieties.

5. Indian Museum, No. 2305, Day's specimen from Bhavani R. 110 mm.
   No pores on snout.
   L. l. 39+1.
   L. tr. 7/3½.
6. Indian Museum, No. 2372, Day's specimen from Bhavani R. 200 mm.
   Pores on snout.
   L. l. 40+1.
   L. tr. 6-7/3½.
7. Indian Museum No. 2411, Day's specimen from Bhavani R. 165 mm.
   Pores on snout.
   L. l. 40+2.
   L. tr. 7/3½.
8. Indian Museum No. F. 11140/1, Burton's specimen from Bhavani R. 138 mm.
   Pores on snout.
   L. l. 39+1.
   L. tr. 7/3½.
9. Madras Fisheries Department, Cauvery, Mettur Dam. .. 120 mm.
   Pores on snout.
   L. l. 39+1.
   L. tr. 7/3½.
10. Madras Fisheries Department, Cauvery, Mettur Dam .. 125 mm.
    Pores on snout.
    L. l. 38 & 39.
    L. tr. 8/3½.
11. Madras Fisheries Department, Periyar Lake .. .. 200 mm.
    No pores on snout.
    L. l. 42+2.
    L. tr. 7/3½.
12. Madras Fisheries Department, Periyar Lake .. .. 150 mm.
    No pores on snout.
    L. l. 43+1.
    L. tr. 7/3½.
13. Madras Fisheries Department, Periyar Lake .. .. 117 mm.
    No pores on snout.
    L. l. damaged.
    L. tr. 7/3-3½.

[1] The additional scales are those on the caudal fin.

There is no one character which absolutely distinguishes *B. dubius* from *B. micropogon*. If, however, both the number of scales along the lateral line and the number of transverse rows of scales from the origin of the dorsal fin to the lateral line and from the lateral line to the root of the ventral fin (omitting the mid-dorsal and lateral line rows) be taken into account the specimens examined can be arranged in three groups as follows :—

GROUP 1.—L. l. 38–40+1-2 and L. tr. 7-8/3½.
Specimens Nos. 5-10 from Bhavani and Cauvery rivers named *B. micropogon* and var. *mysorensis* in the collections.

GROUP 2.—L. l. 42–43+1-2 and L. tr. 7/3-3½.
Specimens Nos. 11–13. The new subspecies from the Periyar Lake.

GROUP 3.—L. l. 42+1-2, and L. tr. 8-9/3½-5.
Specimens No. 1-4 from Bhavani and Cauvery rivers named *B. dubius* Day in the collections.

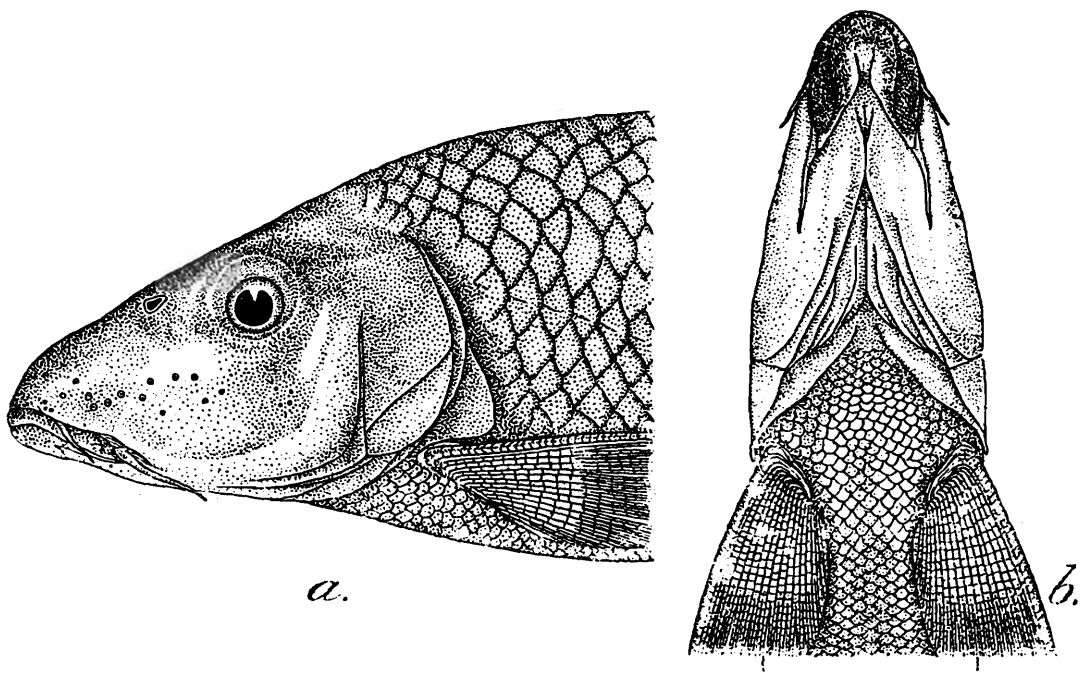
The wider range of specimens now examined in *Group* 1 does not support Mukerji's[1] attempt to distinguish *B. micropogon forma typica* from the variety *mysorensis* chiefly on the presence or absence of pores on the snout, as the other distinguishing characters mentioned by him are intermixed. For instance, specimen No. 2305, which has no pores on the snout, has a head which measures 4·2 times in standard length, while specimen No. 2372, which has pores on its snout, has an anal fin extending to the base of the caudal fin. The occurrence of pores and the prolonged anal fin will in all probability prove to be secondary sexual characters, as they are in some other species of *Barbus*.

Group 2 from the Periyar Lake is sufficiently distinct from *Group* 1 to rank as a subspecies and has accordingly been described above as new.

Group 3 represents all the specimens labelled *B. dubius* in the collections. The number of scales along the lateral line in young and adult specimens is 42 as in *Group* 2, but the latter has only 7/3½ transverse rows of scales. Further, except in one very young specimen, measuring 64 mm. (No. F. 12388/1 from Coorg), the length of the snout is twice the diameter of the eye. Though Day in all his descriptions gives the length of the snout as 1½ diameter of the eye, in his type specimen (No. 2373) as well as in his figure the length of the snout is two eye-diameters. Though in the very large specimen of *periyarensis* the diameter of the eye is contained 2·2 in the snout, the shape of the snout is very different from that of *B. dubius*. Also the eye is nearer the edge of the opercle than the tip of the snout in all the specimens of *B. dubius*, except in the very young specimen in which it is placed in the middle of the head. In *B. micropogon* and its subspecies *periyarensis*, the eye is nearer the tip of the snout and rarely in the centre of the head. The mouth of *B. dubius* is narrow and pointed anteriorly, whereas in *B. micropogon* it is broad and semicircular. Except in the very young specimens, the long and peculiarly shaped snout as well as its

[1] Mukherji, D. D., *Journ. Bombay Nat. Hist. Soc.* XXXV, pp. 166, 167 (1931).

bright pink colour changing to a uniform silvery white after preservation readily distinguish *B. dubius* from *B. micropogon* and its subspecies



TEXT-FIG. 5.—*Barbus* (*Puntius*) *dubius* Day.

a. Lateral view of head and anterior part of body : ×*ca*. ⅔ ; *b*. Ventral surface of head and anterior part of body : ×*ca*. ⅔.

periyarensis. Further, the scales, size for size, are smaller and the dorsal spine weaker in *B. dubius*. These two characters are discernable even in very young specimens measuring two to three inches in length.

Both *B. micropogon forma typica* with 38–40+1 scales along the lateral line and 7-8/3½ transverse rows and *B. dubius* Day with 42+1-2 scales along the lateral line and 8-9/3½-5 transverse rows occur together in the Bhavani and the Cauvery. As Jerdon's *B. mysorensis* with 38 scales along the lateral line in 9 rows and *B. gracilis* with 42 scales along the lateral line in 12 rows were found by Jerdon in the same locality and the latter was considered by him " a very well defined species ", there is little doubt that the species described by Jerdon correspond to *B. micropogon* and *B. dubius* respectively. Day gave the lateral line scales in *B. gracilis* as 40, evidently mistaking it for *B. micropogon*, and redescribed the form with 42 scales as his new species *B. dubius*. Following Day, Günther also assigned the form with 40 lateral line scales to *B. gracilis* and renamed it as *B. conirostris*. Günther's *B. micropogon* is evidently not a synonym of *B. micropogon* Cuv. & Val. In his later works, Day[1] persisted in ignoring the 42 scales, the distinctive character of *B. gracilis* mentioned by Jerdon, and included both *B. mysorensis* and *B. gracilis* as synonyms of *B. micropogon*. Cuvier and Valenciennes's being the first name of the species with 38 to 41 scales along the lateral line should supersede *B. mysorensis* Jerdon and *B. conirostris* Günther. For the species with 42 scales along the lateral line *B. gracilis* Jerdon has priority over *B. dubius* Day, but as Jerdon's name is preoccupied by *B. gracilis* Schleg., the species has to be designated *B. dubius* Day.

[1] Day, F. *Fish. India*, p. 563 (1878) ; *Faun. Brit. Ind.* Fish. I, p. 304 (1889).

NOTES ON FISHES IN THE INDIAN MUSEUM.

XLI. New Records of Freshwater Fish from Travancore.

By Sunder Lal Hora, *D.Sc., F.R.S.E., F.N.I., Assistant Superintendent*, and K. Krishnan Nair, *M.Sc., Gallery Assistant, Zoological Survey of India, Calcutta.*

In their recent account of ' The Freshwater Fish of Travancore ', Hora and Law[1] gave a list of 76 species so far recorded from Travancore and discussed their geographical distribution. It was surmised that further research will bring to light the presence of more species of fresh water fishes from this very interesting zoogeographical area, which forms the extreme south of Peninsular India. More recently, Sundara Raj[2] has described a species of *Barbus*, *B.* (*Puntius*) *ophicephalus*, and a subspecies of the South Indian *Barbus* (*Puntius*) *micropogon* (subsp. *periyarensis* Raj) from the Kallar, a tributary of the Pambiyar River, and the Periyar Lake respectively. Mr. S. Jones, made a small collection of fish from the Kallar stream, 30 miles northeast of Trivandrum, on the 8th June 1941 and obtained specimens of the following species :—

1. *Barilius gatensis* Cuvier and Valenciennes .. 2 specimens.
2. *Danio aequipinnatus* (McClelland) .. .. 3 specimens.
3. *Barbus* (*Puntius*) *filamentosus* (Cuvier and Valenciennes) 2 specimens.
4. *Barbus* (*Tor*) *malabaricus* Jerdon .. .. .. 3 specimens.
5. *Garra, jerdoni* (Day) .. .. 2 specimens.
6. *Garra mullya* (Sykes) .. .. 2 specimens.
7. *Sicyopterus griseus* (Day) .. .. 5 specimens.

The last species is recorded here from Travancore for the first time ; it was described by Day[3] in 1878 from South Canara where he " had procured two examples in fresh water, the largest being 3 inches" One of Day's specimens is probably in the s'Rijks Museum van Natuurlijke Historie, Leiden, for Koumans[4] mentions to have examined an example from Canara. The whereabouts of the second specimen are not known. *Sicyopterus griseus* marks the western limits of the genus. We avail ourselves of this opportunity to redescribe this rare species from fresh material.

Mr. K. Bhaskaran Nair sent 5 specimens of a small freshwater Globefish, which he had collected in April from the Pamba River in Central Travancore. He noted that " It is called ' Attunta ' (ball of the river) in Malayalam and children play with it by blowing into its mouth and inflating it. The general yellow colour of the body has faded now, but when fresh it gives the fish a beautiful appearance."

These specimens belong to the monotypic subgenus *Monotretus* Bibron[5] ; the only other species included in it being *Tetraodon*

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[1] Hora, S. L. and Law, N. C., *Rec. Ind. Mus.* XLIII, pp. 233-256 (1941).

[2] Raj, B. Sundara, *Rec. Ind. Mus.* XLIII, pp. 375-386 (1941).

[3] Day, F., *Journ. Linn. Soc. London* (Zoology) XIII, p. 140 (1878).

[4] Koumans, F. P., *Mem. Ind. Mus.* XIII, p. 296 (1941).

[5] Jordan, in his *Genera of Fishes* (pp. 198, 263, 1919) notes that *Monotretus* Bibron (*Rev. Mag. Zool. Paris* VII, p. 281, 1855) is a synonym of *Leiodon* Swainson (*Nat. Hist. Classification Fish*, etc. II, p. 194, 1839). A reference to Swainson's work shows that *Leiodon* is insufficiently characterized. We have, therefore, retained the name *Monotretus* for this group of ' Puffers'.

(*Monotretus*) *cutcutia* (Hamilton), which, according to Day,[1] is known from " Fresh waters of Orissa, Bengal and Assam"; it is also common in Burma[2]. This new species is also described below. The discontinuous distribution of *Monotretus* is of zoogeographical significance.

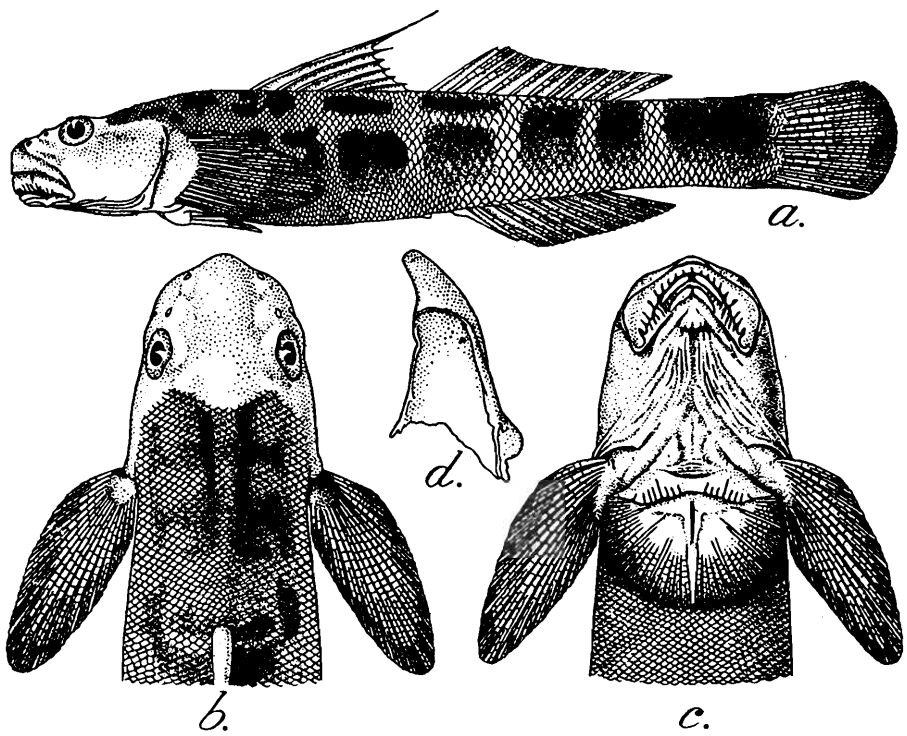
It is worthy of remark that with the exception of *Sicyopterus griseus*, which is known from South Canara and Travancore, the other three species or subspecies are endemic in the State.

Sicyopterus griseus (Day).

1878. *Sicydium griseum*, Day, *Journ. Linn. Soc. London* (Zool.) XIII, p. 140.
1878. *Sicydium griseum*, Day, *Fish. India* (Addenda and Corrigenda), p. 747.
1889. *Sicydium griseum*, Day, *Faun. Brit. Ind.* Fish. II, p. 273.
1941. *Sicyopterus griseus*, Koumans, *Mem. Ind. Mus.* XIII, p. 296.

D. 6|1/9-10; A. 1/9-10; P. 16-17; V 6; C. 13+; L. l. 76-82; L. tr. 25-27.

Sicyopterus griseus is a stoutly built species in which the head and the anterior part of the body are slightly depressed or subcylindrical while the tail portion is compressed. The height of the body is contained from 4·82 to 5·48 times in the standard length and from 5·68 to 6·60 times in the length with the caudal fin. The head is depressed and



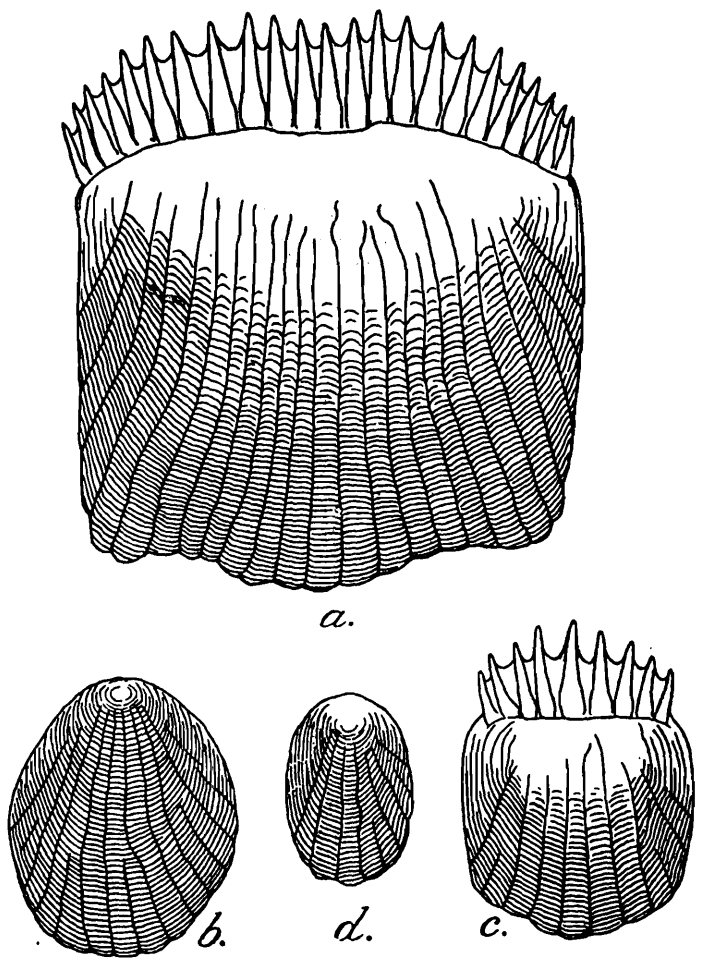
TEXT-FIG. 1.—*Sicyopterus griseus* (Day).

a. Lateral view: ×1⅓; *b*. Dorsal surface of head and anterior part of body: ×1⅖; *c*. Ventral surface of head and anterior part of body: ×1⅖; *d*. A median tooth from the upper jaw: ×25.

flattened both above and below; its width is greater than its height. The length of the head is contained from 4·18 to 4·83 times in the standard length and from 5·04 to 5·78 times in the total length. The width of the head is contained from 1·08 to 1·32 times and its height from 1·49 to 1·69 times in its length. The eyes are situated dorso-laterally almost

[1] Day, F., *Fish. India*, p. 703 (1878).
[2] Prashad, B. and Mukerji, D. D., *Rec. Ind. Mus.* XXXI, p. 223 (1929).

in the anterior half of the head ; the superior border of the orbit projects beyond the dorsal profile. The diameter of the eye is contained from 5·06 to 5·40 times in the length of the head and from 2·10 to 2·39 times in the interorbital width. The interorbital space is broad and slightly concave. The snout is obtuse and overhangs the mouth. The mouth is small, inferior, crescentic and horizontal ; it is bordered by thick lips which are continuous at the angles of the mouth but the labial groove is widely interrupted. The anterior lip is covered by the rostral fold which is broadly fimbriated. The jaws are subequal and the maxillary extends to below the anterior border of the eye. The teeth in the lower jaw are sharp, arranged in a series, and recurved ; a short space in the middle between the two canines is toothless while behind the canines the teeth are of irregular sizes, the larger ones being either near the canines or the posterior ends of the jaw. In the upper jaw there is a single moveable row of fine, hooked teeth which are embedded in the gum. The gill-openings are vertical and almost co-extensive with the bases of the pectoral fins.



Text-fig. 2.—Scales of *Sicyopterus griseus* (Day) : ×36.

a. A scale from the middle of the body behind the dorsal and anal fins ; *b*. A scale from in front of the first dorsal fin ; *c*. A scale from the middle of the body below the first dorsal fin ; *d*. A scale from the ventral surface behind the pelvic fins.

The spines of the first dorsal are filiform and project beyond the membrane ; the first and the second spines are considerably elongated and extend beyond the commencement of the second dorsal. The pectoral fin is pointed while the caudal fin is rounded. The second dorsal and the anal fins are similar, being low and of moderate length. The

pelvic fins form a strong muscular sucker. Mr. S. Jones noticed that the fish can adhere very firmly by means of these fins. The caudal fin is shorter than the head and is contained from 5·7 to 6·7 times in the total length. The caudal peduncle is contained from 1·32 to 1·77 times in its length.

The scales are small and somewhat irregularly arranged, those in the tail region are considerably larger and more strongly ctenoid. The scales on the ventral surface and on the dorsal surface in front of the dorsal fin are greatly reduced and are more or less cycloid ; they extend on the head almost as far as the eyes but are absent on the cheeks. The number of predorsal scales varies from 30 to 31.

According to Day, the colour is " Brownish, with eight or nine rings of a darker tint encircling the body, and wider than the ground colour. *Fins*—dark, most deeply so at their edges " Day seems to have overlooked the fact that in the case of the pectoral, anal and caudal fins the dark band near the edges of the fins is followed by a white fringe, which in the case of anal is not easily distinguishable when the fin is depressed. The dorsal and lateral surfaces as well as the dorsals, middle parts of the pectoral and caudal fins are grayish, while the ventral surface and the pelvic and anal fins along with the edges of the pectoral and caudal fins are much lighter. The body is usually encircled by a number of broad, darker bands which become indistinct when the specimens are taken out of spirit.

Distribution.—South Canara and Travancore.

General Observations.—*Sicyopterus griseus* inhabits torrential streams, and its general body form and structure of the lips, rostral fold and pelvic fins are well adapted for combating strong currents. Mr. S. Jones observed that in nature the fish sticks very fast to rocks and stones, and can even adhere to the vertical sides of an aquarium above the water level like fishes of the genera *Periophthalmus* and *Periophthalmodon.*

S. griseus is distinguished from the other Indian species of the genus by its smaller scales, entire upper lip and fringed rostral fold.

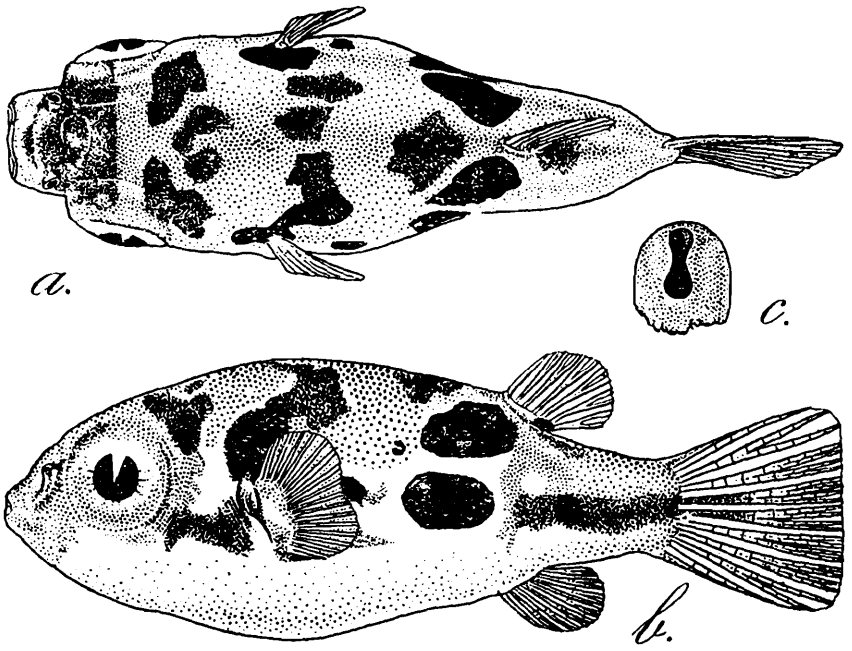
Measurements in millimetres, scale counts and number of fin rays.

Total length	84·0	86·4	87·8	88·0	97·8
Length of caudal	12·6	14·6	15·4	14·5	15·3
Depth of body	14·8	13·5	15·0	13·4	15·2
Length of head	16·7	16·2	17·3	15·2	17·2
Width of head	13·9	12·3	14·0	13·0	15·9
Height of head	11·2	10·9	10·9	10·2	10·2
Diameter of eye	3·2	3·0	3·3	3·0	3·3
Interorbital distance	7·2	6·3	7·0	6·8	7·9
Length of caudal peduncle	12·0	12·4	12·9	13·2	15·9
Least height of caudal peduncle	8·0	8·2	9·8	8·2	9·0
Longest ray of first dorsal	21·0	19·4	24·0	21·4	26·2
Length of pectoral	14·4	13·8	16·3	15·0	15·6
Length of ventral	9·2	10·0	10·6	10·5	10·1
Length of anal	8·0	7·8	10·2	9·8	9·6
Number of rays in dorsals	6|1/10	6|1/10	6|1/9	6|1/10	6|1/10
Number of rays in pectoral	17	17	17	16	17
Number of rays in ventral	6	6	6	6	6
Number of rays in anal	1/10	1/10	1/9	1/9	1/10
Number of rays in caudal	13	13	13	13	13
Number of scales along lateral line	78	81	82	76	78
Number of scales in a transverse series	27	25	25	26	25
Number of predorsal scales	31	30	30	30	30

Tetraodon (Monotretus) travancoricus, sp. nov.

D. 7-8 ; A. 8 ; P. 16-17 ; V 0.; C. 9.

Monotretus travancoricus is a small species less than an inch in total length. When inflated, it is about one-third as high as long and its width is considerably less than its height. Both the dorsal and the ventral profiles are greatly arched, but the dorsal is more so with the result that the mouth is situated in the lower half of the fish and not in the centre. The length of the head is more or less equal to the depth



Text-fig. 3.—*Tetraodon* (*Monotretus*) *travancoricus*, sp. nov.

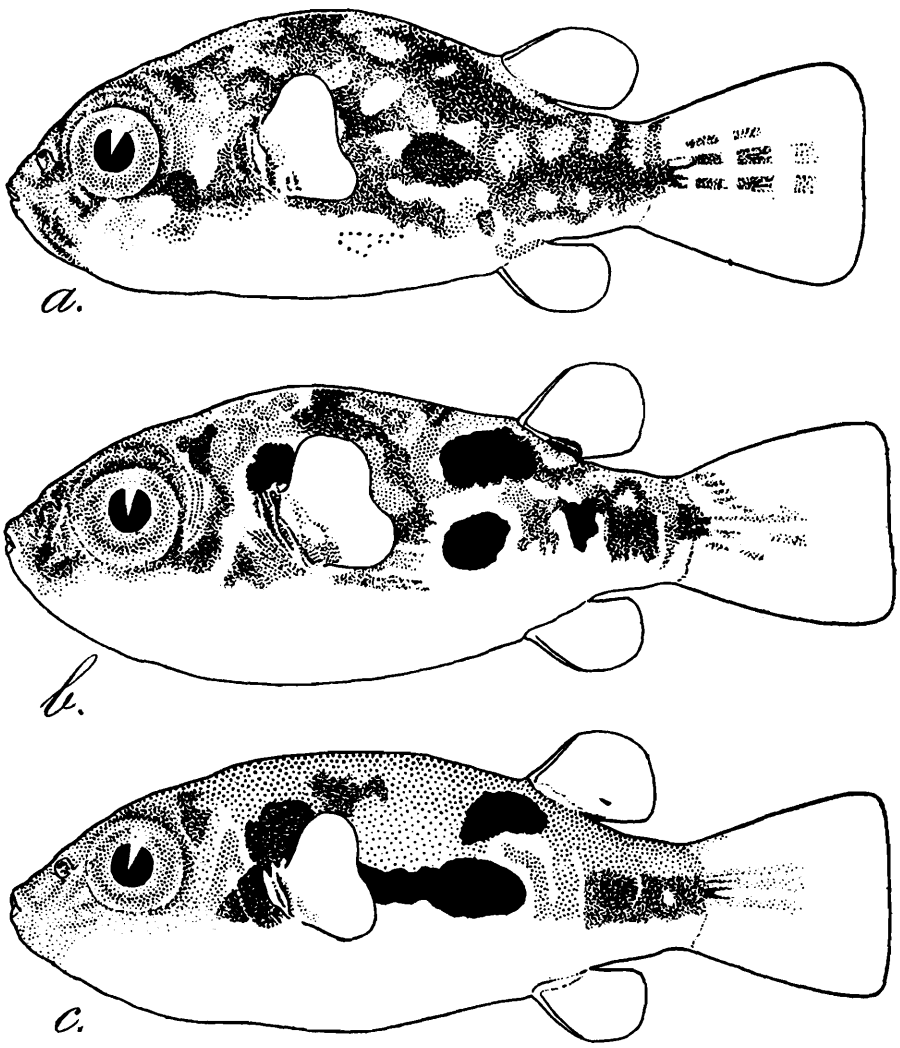
a. Lateral view of type-specimen : ×5 ; *b*. Dorsal view of same. ×5 ; *c*. Form of nasal opening of same : ×16.

of the body and is contained from 3·06 to 3·26 times in the total length and from 2·39 to 2·50 times in the standard length. The height of the head is somewhat greater than its width and is contained from 1·08 to 1·17 times in its length ; the width of the head is contained from 1·25 to 1·33 times in the length of the head. The eyes are large and lateral in position, and are situated almost in the middle of the head ; they are covered by adipose eyelids ; the diameter of the eye is contained from 2·36 to 2·69 times in the length of the head and from 0·93 to 1·04 times in the interorbital width. The interorbital space is flattened. The nostrils are represented by simple, solitary tubes, one on each side close to the anterior border of the eye. The lips of the tube are slightly curved inwards in the middle as short flaps. The mouth is small and surrounded by fleshy lips which form a tubular orifice ; the jaws are provided with median sutures. The gill-openings are small and restricted opposite to the bases of the pectoral fins.

The body is devoid of spinous outgrowths but there is a fine reticulation all over the surface. The depth of the body is contained from 2·93 to 3·33 times in the total length and from 2·21 to 2·58 times in the standard length. The caudal peduncle is well formed ; its least height is contained from 1·12 to 1·35 times in its length.

The dorsal and the anal fins are similar and situated opposite to each other in the posterior third of the body length. The distance between the gill-opening and the commencement of the dorsal fin is almost equal to the length of the head. The pectoral fin is short, slightly emarginate and fan-shaped. The caudal fin is well-formed and truncate ; its length is contained from 4·08 to 4·59 times in the total length.

The colour in spirit is grayish on the dorsal surface and sides and much lighter on the ventral surface. There are usually two black,



TEXT-FIG. 4.—Lateral views of the three paratypes of *Tetraodon* (*Monotretus*) *travancoricus*, sp. nov., showing variations in colour pattern : ×5.

oval patches on the upper lateral surface of the body in front of the dorsal fin ; these are situated in an area of much lighter colour. Behind this light area, there is a dark, broad band running to the caudal fin and continued for some distance on its central rays. There is usually a dark spot in the middle of its course and another at the base of the caudal fin. There is also a dark spot at the base of the last two dorsal rays. A prominent dark patch above the pectoral fin and a spot behind it are also characteristic features of the species. Along the dorsal surface, there is a narrow, light band between the eyes, two irregular patches behind the eyes which do not meet in the middle line and followed posteriorly by a V-shaped marking. Between the V-shaped marking and the dorsal fin there is another irregular band across the dorsal surface and

triangular patches in front of and behind the dorsal fin. The fins are without any markings.

From the specimens examined it seems that the colouration varies considerably and no two specimens are alike in this respect. In order to give an idea of the variation in colouration the lateral views of three other specimens are given (text-fig. 4).

Locality.—Pamba River, Central Travancore.

On an enquiry regarding the maximum size of the fish, Mr. K. Bhaskaran Nair wrote as follows :

" As regards the maximum size of the fish, I do not think that it grows any bigger than the specimens I have sent you. I have on innumerable occasions seen the catches of fishermen in the locality and have never come across bigger ones. Neither has anyone else there. As the fish is very well known to them because it is such a favourite of children, I am sure bigger specimens, if there were any, would not have been overlooked."

Type-specimen.—F. 13601/1, Zoological Survey of India (*Ind. Mus.*), Calcutta.

Relationships.—In the following table we give a list of points in which the new species differs from *M. cutcutia* (Hamilton).

	Monotretus cutcutia (Hamilton).	*Monotretus travancoricus*, sp. nov.
1.	D. 10-11 ; P. 21 ; A. 10 ; C. 7.	D. 7-8 ; P. 16-17 ; A. 8 ; C. 9.
2.	Caudal fin is contained 6 times in total length.	Caudal fin is contained 4 to 4·5 times in total length.
3.	Eyes slightly behind the middle of the length of the head.	Eyes in the middle of the length of the head.
4.	Interorbital space flat and broad.	Interorbital space flat but not very broad.
5.	All the fins are rounded.	The pectorals are slightly emarginate and the caudal is almost truncate.
6.	Greenish yellow above, becoming white on the abdomen. A light band passes from eye to eye. A large black ocellus, surrounded by a light edge, on the side anterior to the origin of the dorsal and anal fins. The whole of the back marked with dark greenish reticulations enclosing lighter spaces ; fins grayish : caudal tipped with carmine : a red spot on the throat.	Dark greenish yellow above and yellowish below. A light band between the eyes. There are varying numbers of dark patches surrounded by lighter areas on the dorsal and lateral sides and there are no reticulations. Fins without markings, except the middle rays of the caudal fin.
7.	Maximum size about 3½ inches.	Maximum size about an inch.

Measurements in millimetres and number of fin rays.

Total length ..	20·8	21·1	21·5	21·8	22·0
Caudal length	5·1	4·6	5·0	5·1	5·0
Depth of body	7·1	6·7	7·1	6·7	6·6
Length of head	6·7	6·9	6 6	6·8	7·0
Width of head	5·3	5·2	5·3	5·3	5·4
Height of head	5·9	6·0	6·1	5·8	6·0
Diameter of eye	2·6	2·6	2·8	2·6	2·6
Interorbital distance	2·5	2·4	2·8	2·7	2·2
Length of caudal peduncle	3·1	2·9	3·4	3·1	2·9
Least height of caudal peduncle	2·3	2·2	2·7	2·6	2·6
Distance between gill opening and commencement of dorsal fin.	6·8	6·6	6·7	6·8	7·1
Longest ray of dorsal fin	2·4	2·2	2·2	2·1	2·5
Length of pectoral fin	2·2	2·1	2·1	2·0	2·8
Length of anal fin	2·3	2·2	2·2	2·2	2·2
Number of rays in dorsal fin	8	8	7	8	8
Number of rays in pectoral fin	17	17	17	17	16
Number of rays in anal fin	8	8	8	8	8
Number of rays in caudal fin	9	9	9	9	9

MGIPC—M—III-8-3—22-9-41—370.