

Agamiinae, a new family-group name for the Agami Heron *Agamia agami* (Ardeidae)

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ABSTRACT: Phylogenomic analysis has provided evidence that the Agami Heron *Agamia agami* represents a deeply divergent lineage which is sister to all other herons, except the tiger herons (*Tigrisoma*, *Tigriornis*) and Boat-billed Heron *Cochlearius cochlearius*. The name ‘Agamiinae’ Kushlan & Hancock, 2005, has been used for this lineage. However, this name does not meet the requirements of the ICZN Code (1999) and is therefore unavailable. We formally describe a family-group name for Agami Heron and make the name available for nomenclatural purposes.

KEYWORDS: Pelecaniformes, Ardeidae, *Agamia*, phylogeny, new subfamily.

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The Agami Heron *Agamia agami* (J.F. Gmelin, 1789) is a large heron (Ardeidae Leach, 1820) distributed from southern Mexico south to Amazonian Brazil and northern Bolivia (Sibley & Monroe, 1990; Dickinson & Remsen, 2013). With its distinctive, colourful plumage and uniquely sickle-shaped plumes along the sides of its neck, this species has long puzzled systematists (e.g., Bock, 1956). In the absence of reliable comparative data, the Agami Heron has been grouped with most other herons in a broadly-defined Ardeinae (Peters, 1931; Bock, 1956).

The first attempt to assess the relationships of the Agami Heron using quantitative methods was made by Payne and Risley (1976), who studied 33 osteological characters of 63 species of herons, plus outgroups. They concluded that the Agami Heron is most closely related to the day-heron genera *Syrigma*, *Pilherodius*, *Ardea*, *Egretta* and *Ardeola*. As a result of this study, the Agami Heron has been placed in a more restricted Ardeinae, which included the day-herons only (Payne, 1979; Hancock & Kushlan, 1984).

The Agami Heron was not included in a series of studies of heron phylogeny based on DNA-DNA hybridization (Sheldon, 1987a, 1987b; Sheldon *et al.*, 1995), vocalizations (McCracken & Sheldon, 1997), mitochondrial sequences (Sheldon *et al.*, 2000; Chang *et al.*, 2003) and complete mitochondrial genomes (Zhou *et al.*, 2014, 2016). The first study to assess the phylogenetic position of the Agami Heron using molecular data (Huang *et al.*, 2016) was based on mitochondrial COI sequences that were originally obtained by Schindel *et al.* (2011) and Tavares *et al.* (2011). The Agami Heron clustered with *Ardeola* (*A. bacchus*) but this relationship was poorly supported by branch testing, as were all other major branches in this study.

Recently, the relationships of 55 species of heron (plus outgroups) were reconstructed in a phylogenomic analysis based on thousands of ultraconserved elements (Hruska *et al.*, 2023). This study provided convincing evidence that the Agami Heron represents a deeply divergent lineage that is sister to all other herons, except the tiger herons (*Tigrisoma*, *Tigriornis*) and Boat-billed Heron *Cochlearius cochlearius* (Linnaeus, 1766). Hruska *et al.* (2023) proposed a new

classification of the herons in which they ranked the Agami Heron as a subfamily with the name 'Agamiinae' Kushlan & Hancock, 2005.

Family-group names introduced after 1999 must (i) be accompanied by a description or definition that states in words characters that are purported to differentiate the taxon, Article 13.1.1 (ICZN 1999), or be accompanied by a bibliographic reference to such a published statement, Article 13.1.2 (ICZN 1999), or be proposed expressly as a new replacement name (*nomen novum*) for an available name, Article 13.1.3 (ICZN 1999), and (ii) be accompanied by an explicit indication that the name is intentionally new (e.g., 'subfam. nov.' or 'new subfamily'; Article 16.1 (ICZN 1999), and (iii) be accompanied by a citation of the type genus, Article 16.2 (ICZN 1999).

It is doubtful whether Article 13.1.1 (ICZN, 1999) was met, because the paragraph in which the name 'Agamiinae' was introduced (i.e., 'subfamilies and tribes' in Kushlan & Hancock, 2005: 17–20) did not list any distinguishing features of the Agami Heron. However, the section on the Agami Heron elsewhere in the book presented a description of the species, and therefore one could argue that this satisfies Article 13.1.1 (ICZN, 1999). Kushlan and Hancock (2005) did not indicate in any way that the name 'Agamiinae' represents a new subfamily and therefore the requirement of Article 16.1 (ICZN, 1999) was not met. Kushlan and Hancock (2005) did not explicitly state that *Agamia* is the type genus of 'Agamiinae', although their Figure 2.1 (p. 17) shows that *Agamia* is the only genus included in 'Agamiinae'. Thus, one could argue that this satisfies Article 16.2 (ICZN, 1999). In any case, 'Agamiinae' Kushlan & Hancock, 2005 does not meet Article 16.1 (ICZN, 1999) and is therefore unavailable for nomenclatural purposes.

To make a family-group name available under Articles 13.1.1, 16.1 and 16.2 (ICZN, 1999), we propose:

Agamiinae new subfamily

Diagnosis: Medium-sized heron (mean total length 71 cm) with short legs, a very long neck, a long, thin bill and colourful plumage. Differs from all other herons by the combination of (i) entire neck with pale blue-grey plumes, which are short, slender and sickle-shaped; (ii) crown and (in breeding adults) scapulars with pale blue plumes, formed by broad, lanceolate feathers; (iii) forehead, crown, ear-coverts, and hindneck dark blue to black; (iv) upperparts dark glossy green; (v) line down throat and foreneck, sides of neck and lower scapulars chestnut; and (vi) underparts bright chestnut (Bock, 1956; Payne & Risley, 1976; Hancock & Kushlan, 1984; Figure 1). Some of the courtship display behaviours differ from those used by other herons. This includes 'rocking', during which the bird stands tall and sways, turning slightly from side to side smoothly and even rhythmically, showing off the chestnut belly, expanded silvery-blue neck feathers, long silver crest and distinctive wing-covert lines, and 'bill snapping', when the bird sharply closes its bill with a snapping pop (Kushlan & Hines, 2016).

Type genus, by original designation: *Agamia* Reichenbach, 1853.

Contents: *Agamia agami* (J.F. Gmelin, 1789) is the only species.

ZooBank LSID for new subfamily: 4EDA2F68-6A3A-4100-BA86-063E05216BE0

Comment: The name Agamiinae differs by only one letter from the name Agaminae von Spix, 1825 (Squamata; based on *Agama* Daudin, 1802). Such one-letter differences in family-group names are potentially confusing but are allowed by Article 55.4 (ICZN, 1999) and are inevitable when the stems of the relevant genus names also differ by one letter (i.e., Agami- versus Agam-). Another example in birds concerns the names Icteridae Vigors, 1825 (Passeroidea; based on *Icterus* Brisson, 1760) and Icteriidae Baird, 1858 (Passeroidea; based on *Icteria* Vieillot, 1808). It is possible that the family-group name Agaminae von Spix, 1825 has been misspelled in the literature. However, the presence of homonymous spellings as a result



Figure 1. *Agamia agami*, Costa Rica (Chris Jimenez/Wikimedia CC BY-SA 2.0)

of a *lapsus* in the past is not of any formal relevance. Any use of ‘Agamiinae’ or ‘Agamiidae’ for the squamate reptiles would be deemed to be based on an incorrect spelling of the generic name as ‘*Agamia*’ and must be corrected under Article 35.4.1 (ICZN, 1999).

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REFERENCES

- Baird, S.F., 1858. *Birds. Report of explorations and surveys to ascertain the most practical and economical route for a railroad from the Mississippi River to the Pacific Ocean*. Vol. 9. i–lvi + 1–1055. – U.S. Congress, Washington.
- Bock, W.J., 1956. A generic review of the family Ardeidae. – *American Museum Novitates*, 1779: 1–49.
- Brisson, M.-J., 1760. *Ornithologia sive synopsis methodica sistens avium divisionem in ordines*, vol. 1. i–xxiv, 1–526 – C.J.B. Bauche, Paris.
- Chang, Q., B. Zhang, H. Jin, L. Zhu & K. Zhou, 2003. Phylogenetic relationships among 13 species of herons inferred from mitochondrial 12S rRNA gene sequences. – *Acta Zoologica Sinica*, 49: 205–210.
- Daudin, F.M., 1802. *Histoire Naturelle, générale et particulière, des reptiles; ouvrage faisant suite, a l’histoire naturelle, générale et particulière, composée par Leclerc de Buffon, et redigée par C. S. Sonnini*, vol. 3. 1–452. – F. Dufart, Paris.
- Dickinson, E.C. & J.V. Remsen (eds.), 2013. *The Howard and Moore complete checklist of the birds of the world*, vol. 1. Fourth edition. i–l, 1–461. – Aves Press, Eastbourne.
- Gmelin, J.F., 1789. *Caroli a Linné ... Systema Naturae per Regna Tria Naturae, Secundum Classes, Ordines, Genera, Species, Cum Characteribus, Differentiis, Synonymis, Locis*, 13th edition, vol. 1, part 2. 1–1032. – Impensis Georg Emanuel Beer, Lipsiae.
- Hancock, J. & J. Kushlan, 1984. *The Herons Handbook*. 1–288. – Croom Helm, London.
- Hruska, J.P., J. Holmes, C. Oliveros, S. Shakya, P. Lavretsky, K.G. McCracken, F.H. Sheldon & R.G. Moyle, 2023. Ultraconserved elements resolve the phylogeny and corroborate patterns of molecular rate variation in herons (Aves: Ardeidae). – *Ornithology*, 140: ukad005.
- Huang, Z.H., M.F. Li & J.W. Qin, 2016. DNA barcoding and phylogenetic relationships of Ardeidae (Aves: Ciconiiformes). – *Genetics and Molecular Research*, 15(3): gmr.15038270.
- ICZN [International Commission on Zoological Nomenclature], 1999. *International Code of Zoological Nomenclature*. 4th edition. i–xxix, 1–306. – International Trust for Zoological Nomenclature, London.
- Kushlan, J. & J. Hancock, 2005. *Herons*. 1–456. – Oxford University Press, Oxford.
- Kushlan, J.A. & K. Hines, 2016. Behavior of the Agami Heron (*Agamia agami*). – *Waterbirds*, 39(2): 187–192.
- Leach, W.E., 1820. Eleventh Room. In: *Synopsis of the Contents of the British Museum*. 17th Edition. 65–70. – British Museum, London.
- Linnaeus, C., 1766. *Systema Naturae per Regna Tria Naturae secundum Classes, Ordines, Genera, Species cum characteribus, differentiis, synonymis, locis*, 12th ed. Vol. 1. 1–532. – Empensis L. Salvii, Stockholm.
- McCracken, K.G. & F.H. Sheldon, 1997. Avian vocalizations and phylogenetic signal. – *Proceedings of the National Academy of Sciences USA*, 94: 3833–3836.
- Payne, R.B., 1979. Order Ciconiiformes, family Ardeidae, pp. 193–244. In: *Check-list of Birds of the World, a revision of the work of James L. Peters*, Vol. 1. E. Mayr & G.W. Cottrell (Eds.). – Museum of Comparative Zoology, Cambridge, Massachusetts.

Payne, R.B. & C.J. Risley, 1976. Systematics and evolutionary relationships among the herons (Ardeidae). – *Miscellaneous Publications of the Museums of Zoology, University of Michigan*, 150: 1–115.

Peters, J.L., 1931. *Check-list of Birds of the World*, Vol. 1. 1st ed. i–xviii, 1–345. – Harvard University Press, Cambridge, Massachusetts.

Reichenbach, H.G.L., 1853. *Avium Systema Naturale*. i–viii, 1–36, i–xxxi. – Friedrich Hofmeister, Leipzig.

Sibley, C.G. & B.L. Monroe, 1990. *Distribution and taxonomy of birds of the world*. 1–1111. – Yale University Press, New Haven.

Schindel, D.E., M.Y. Stoeckle, C. Milensky, M. Trizna, B. Schmidt, C. Gebhard & G. Graves, 2011. Project description: DNA barcodes of bird species in the National Museum of Natural History, Smithsonian Institution, USA. – *Zookeys*, 152: 87–92.

Sheldon, F.H., 1987a. Phylogeny of herons estimated from DNA-DNA hybridization studies. – *Auk*, 104(1): 97–108.

Sheldon, F.H., 1987b. Rates of single-copy DNA evolution in herons. – *Molecular Biology and Evolution*, 4: 56–69.

Sheldon, F.H., K.G. McCracken & K.D. Stuebing, 1995. Phylogenetic relationships of the Zigzag Heron (*Zebriulus undulatus*) and White-crested Bittern (*Tigriornis leucolophus*) estimated by DNA-DNA hybridization. – *Auk*, 112(3): 672–679.

Sheldon, F.H., C.E. Jones & K.G. McCracken, 2000. Relative patterns and rates of evolution in heron nuclear and mitochondrial DNA. – *Molecular Biology and Evolution*, 17: 437–450.

Spix, J.B. von, 1825. *Animalia nova sive species nova Lacertarum, quas in itinere per Brasiliam annis MDCCCXVII-MDCCCXX jussu et auspicii Maximiliani Josephi I. Bavariae Regis suscepto collegit et descripsit Dr. J. B. de Spix*. 1–26. – F.S. Hübschmanni, Monachii.

Tavares, E.S., P. Gonçalves, C.Y. Miyaki & A.J. Baker, 2011. DNA barcode detects high genetic structure within Neotropical bird species. – *PLoS ONE*, 6(12): e28543.

Vieillot, L.P., 1808. *Histoire naturelle des oiseaux de l'Amérique Septentrionale*, vol. 1. 1–90. – Paris.

Vigers, N.A., 1825. Observations on the natural affinities that connect the orders and families of birds. – *Transactions of the Linnean Society of London*, 14: 395–517.

Zhou, X, Q. Lin, W. Fang & X. Chen, 2014. The complete mitochondrial genomes of sixteen ardeid birds revealing the evolutionary process of the gene rearrangements. – *BMC Genomics*, 15(1): 573.

Zhou, X., C. Yao, Q. Lin, W. Fang & X. Chen, 2016. Complete mitochondrial genomes render the night heron genus *Gorsachius* non-monophyletic. – *Journal of Ornithology*, 157(2): 505–513.

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