

ZOOTAXA

2100

**Phylogenetic systematics of Glassfrogs (Amphibia: Centrolenidae)
and their sister taxon *Allophryne ruthveni***

JUAN M. GUAYASAMIN, SANTIAGO CASTROVIEJO-FISHER, LINDA TRUEB,
JOSÉ AYARZAGÜENA, MARCO RADA & CARLES VILÀ



Magnolia Press
Auckland, New Zealand

JUAN M. GUAYASAMIN, SANTIAGO CASTROVIEJO-FISHER, LINDA TRUEB,
JOSÉ AYARZAGÜENA, MARCO RADA & CARLES VILÀ

Phylogenetic systematics of Glassfrogs (Amphibia: Centrolenidae) and their sister taxon *Allophryne ruthveni*

(*Zootaxa* 2100)

97 pp.; 30 cm.

11 May 2009

ISBN 978-1-86977-353-3 (paperback)

ISBN 978-1-86977-354-0 (Online edition)

FIRST PUBLISHED IN 2009 BY

Magnolia Press

P.O. Box 41-383

Auckland 1346

New Zealand

e-mail: zootaxa@mapress.com

<http://www.mapress.com/zootaxa/>

© 2009 Magnolia Press

All rights reserved.

No part of this publication may be reproduced, stored, transmitted or disseminated, in any form, or by any means, without prior written permission from the publisher, to whom all requests to reproduce copyright material should be directed in writing.

This authorization does not extend to any other kind of copying, by any means, in any form, and for any purpose other than private research use.

ISSN 1175-5326 (Print edition)

ISSN 1175-5334 (Online edition)



Phylogenetic systematics of Glassfrogs (Amphibia: Centrolenidae) and their sister taxon *Allophryne ruthveni*

JUAN M. GUAYASAMIN^{†1,2}, SANTIAGO CASTROVIEJO-FISHER^{†3}, LINDA TRUEB², JOSÉ
AYARZAGÜENA^{4,5}, MARCO RADA⁶ & CARLES VILÀ^{3,7}

[†]These authors contributed equally to this work.

¹Museo de Zoología, Escuela de Ciencias Biológicas, Pontificia Universidad Católica del Ecuador, Apartado 17-01-2184, Quito, Ecuador; Email: jmguasamin@gmail.com

²Natural History Museum & Biodiversity Research Center, Department of Ecology and Evolutionary Biology, The University of Kansas, Lawrence, Kansas 66045-7561, USA.

³Evolutionary Biology Centre, Department of Evolution, Genomics and Systematics, Uppsala University, SE-752 36 Uppsala, Sweden; Email: santiago.castroviejo@ebc.uu.se

⁴Asociación Amigos de Doñana, Panama 6, 41012 Sevilla, Spain.

⁵Museo de Historia Natural, Fundación La Salle de Ciencias Naturales, Apartado 1930 Caracas 1010-A, Venezuela.

⁶Anfibios y Reptiles, Conservación Internacional-Colombia & Laboratorio de Herpetología, Pontificia Universidad Javeriana. Bogotá D.C., Colombia.

⁷Estación Biológica de Doñana-CSIC, Pabellón del Perú, Avd. María Luisa s/n, 41013 Sevilla, Spain.

Table of contents

Abstract	4
Resumen	4
Introduction	5
Centrolenidae, its monophyly and relationships with other anurans	7
Historical review of the systematics of Glassfrogs and <i>Allophryne ruthveni</i>	9
Material and Methods	17
Nomenclature and Terminology.....	17
Phylogenetic framework for the new classification	17
Criteria for taxon naming	17
Results	19
A monophyletic taxonomy	19
Unranked Taxon: Allocentroleninae	19
Family: Allophrynidae Goin, Goin, & Zug 1978.....	20
Genus: <i>Allophryne</i> Gaige 1926	22
Family: Centrolenidae Taylor 1951	22
Subfamily: Centroleninae Taylor 1951	23
Genus: <i>Centrolene</i> Jiménez de la Espada 1872	25
Genus: <i>Nymphargus</i> Cisneros-Heredia & McDiarmid 2007	26
Tribe: Cochranellini new tribe	29
Genus: <i>Chimerella</i> new genus	31
Genus: <i>Cochranella</i> Taylor 1951	32
Genus: <i>Espadarana</i> new genus	34
Genus: <i>Rulyrana</i> new genus	36
Genus: <i>Sachatamia</i> new genus	37
Genus: <i>Teratohyla</i> Taylor 1951	36
Genus: <i>Vitreorana</i> new genus	38
Subfamily: Hyalinobatrachinae new subfamily	39
Genus: <i>Celsiella</i> new genus	40

Genus: <i>Hyalinobatrachium</i> Ruiz-Carranza & Lynch 1991a	41
Incertae sedis within Centrolenidae: <i>Ikakogi</i> new genus	43
Discussion	43
Centrolenidae, Allophrynidae, and Neobatrachia	43
The new taxonomy	44
Conclusions	46
Acknowledgments	46
References	47
Appendix I.	54
Appendix II.	60
Appendix III.	62
Appendix IV.	63

Abstract

Based on a molecular phylogeny, a new phylogenetic taxonomy that is compatible with both the International Code of Zoological Nomenclature (ICZN) and the PhyloCode is proposed for Glassfrogs and their sister taxon, *Allophryne ruthveni*. The arrangement presented herein emphasizes the recognition of clades having (i) significant statistical support and congruence among phylogenetic estimation methods (i.e., parsimony, maximum likelihood, and Bayesian inference criteria), (ii) congruence among genetic markers, and (iii) morphological and/or behavioral distinctiveness. Also, when previously recognized groups are recovered as monophyletic or nearly monophyletic, we propose taxa that minimize the number of name changes required to make these groups monophyletic, preserving the names and contents of previous classifications (i.e., nomenclatural stability). The evolutionary proximity of Centrolenidae and Allophrynidae is recognized by combining these families into an unraked taxon, Allocentroleniinae—a proposal that maintains the traditional names and species contents of Centrolenidae and Allophrynidae. We arrange centrolenid diversity in two subfamilies: Centroleninae and Hyalinobatrachinae. Within Centroleninae, the diagnosis and species content of the genera *Centrolene*, *Cochranella*, and *Nymphargus* are modified; *Teratohyla* is resurrected and modified, and *Chimerella*, *Espadarana*, *Rulyrana*, *Sachatamia*, and *Vitreorana* are proposed as new genera. The other subfamily, Hyalinobatrachinae, contains the new genus *Celsiella* and a modified *Hyalinobatrachium* that fully corresponds to the former *fleischmanni* Group. Additionally, the genus *Ikakogi* is described. *Ikakogi* could not be assigned with confidence to either subfamily and it is placed as *incertae sedis* in Centrolenidae. The data at hand suggest that *Ikakogi tayrona* is a lineage as old as the subfamilies Hyalinobatrachinae and Centroleninae. The revised taxonomy differs markedly from previous arrangements, which were based on phenetics and few morphological characters. Most of the genera defined herein are confined to distinct biogeographic regions, highlighting the importance of geography in the speciation of Glassfrogs. The principal limitation of this proposal is that it is based on an incomplete sampling of taxa (54% of the recognized Glassfrogs). Although diagnoses are based on phenotypic traits, there are several cases (16% of all species) in which the allocation of species is ambiguous because of morphological homoplasy and the lack of molecular data. Finally, in an attempt to facilitate species identification, comparison, and generic placement, we provide photographs for most (~ 96%) of the recognized centrolenid species.

Key words: Allophrynidae, Amazon, Andes, Anura, Centrolenid frogs, Classification, Cordillera de la Costa, Central America, Diversity, Guiana Shield, Hyloidea, Neobatrachia, Neotropics, Phylogeny, South America, Systematics

Resumen

[Sistemática filogenética de las ranas de cristal (Amphibia: Centrolenidae) y su taxón hermano *Allophryne ruthveni*]

Basándonos en una filogenia molecular, proponemos una nueva taxonomía para las ranas de cristal y su taxón hermano, *Allophryne ruthveni*, que es compatible con el Código Internacional de Nomenclatura Zoológica (ICZN) y el PhyloCode. La clasificación que presentamos aquí enfatiza el reconocimiento formal de clados que (i) tienen soporte estadístico significativo mediante diferentes métodos de inferencia filogenética (parsimonia, máxima verosimilitud y Bayesiano), (ii) son congruentes usando diferentes genes y (iii) son diagnosticables a través de su morfología y/o comportamiento.