

# Phylogenetic relationships of old world ratsnakes based on visceral organ topography, osteology, and allozyme variation

(by Notker Helfenberger, a review by Rex Knight)

Recently Mr. N. Helfenberger published his most recent work on the *Elaphe* complex in the Russian Journal of Herpetology. (Supplement to the Journal, ISSN 1026-2296). This paper is 62 pages long and contains several tables and charts, diagrams of "likelihood trees" and some diagrams of vertebral structures. There are no photographs, except the cover, which shows five preserved specimens arranged together for the photo titled "Pedigree Required".

Foreword: Phylogenetic relationships of 30 species and subspecies of Old World ratsnakes, are estimated using visceral topography, vertebrae and allozyme variation. Distances between the taxa were calculated from positions and lengths of vertebra, and frequencies of proteins encoded by 19 gene loci. The Indo-Malayan species group with conservative features has large phylogenetic distances to the Euro-Mediterranean and Siberian, and to the East and High Asian species. The latter cluster exhibits parallel evolution with species from the Euro-Mediterranean and Siberian region.

The East Asian *Elaphe rufodorsata* and the Mediterranean *Elaphe scalaris* show derived features and large distances to related taxa.

This study represents a step towards a definitive reconstruction of phylogenetic relationships within Old World *Elaphe* species.

The geographical terms used are from Banareescu, (1992).

There are several chapters including "Material and Methods", "Results", "Discussion", "Conclusions", "Taxonomic changes" and "Summary".

Species of *Elaphe* used for this study include *Elaphe bella*, *E. bimaculata*, *E. cantoris*, *E. carinata*

,  
*E. climacophora*

,  
*E. conspicillata*

,  
*E. davidi*

,  
*E. dione*

,  
*E. erythrurus*  
,  
*E. flavolineata*  
,  
*E. frenata*  
,  
*E. helena*  
,  
*E. hodgsoni*  
,  
*E. hohenackeri*  
,  
*E. janseni*  
,  
*E. longissima*  
,  
*E. mandarina*  
,  
*E. moellendorffi*  
,  
*E. persica*  
,  
*E. porphyracea*  
,  
*E. quadrivirgata*  
,  
*E. quatuorlineata*  
,  
*E. radiata*  
,  
*E. schrencki*  
,  
*E. situla*  
,  
*E. subradiata*  
, and  
*E. taeniura*

,  
*Elaphe perlace*

a was not listed. Mr. Helfenberger also used more than just species of

*Elaphe*

for this study, also included were specimens of the Genus

*Coronella*

,  
*Gonyosoma*

,  
*Hierophis*

, and

*Ptyas*

for comparisons.

I'm not going to get into all of this, as far as discussions, but rather just give you the main changes within this work. If you need to know more of the technical aspects of this paper, I will include information below on obtaining a copy.

The species are broken into different groups based on the methods used.

The Mediterranean and Siberian taxa result in three different groups or branches:

1. "Quatuorlineata group" which includes *E. quatuorlineata*, *E. anomala*, *E. dione*, *E. sauromates*,  
and  
*E. schrencki*

He states that "Genetic distances" argue for Specific status of *E. anomala* and *E. sauromates*.

2. The "Longissima group", which includes *E. longissima*, *E. hohenackeri*, *E. persica*, and *E. situla*

3. *Rhinechis scalaris*, stating that *scalaris* is outstanding with large distances from the other groups and is therefore separated from the *Elaphe* Genus. He further states that this species should be compared to racers of the genera

*Coluber*

and

*Hierophis*

East and High Asian taxa result in four groups:

1. The "Moellendorffi-group", which includes *E. moellendorffi*, *E. cantoris*, *E. frenata*, *E. hodgsoni*

,  
*E. mandarina*

,  
*E. prasina*

,and

*E. taeniura*

2. The "Carinata group" which includes *E. carinata*, *E. davidi*, and *E. quadrivirgata*.

3. The "Porphyracea group" which includes *E. porphyracea* and *E. conspicillata*.
4. The "Climacophora group" which includes *E. climacophora* and *E. bimaculata*.

He states here that the "Climacophora group also shows close affinities to the Quatuorlineata group." Also, "the molecular data suggest that the Euro-Mediterranean and Siberian groups evolved slowly from a common ancestor shared with the East and High Asian species, which evolved rapidly."

*Oocatochus rufodorsatus*: "In all investigated aspects, the egg-retending, semiaquatic *O. rufodorsatus* is outstanding", and is removed from the *Elaphe* genus. He states that "this species probably split from a common ancestor shared with East and High Asian

*Elaphe*

and evolved rapidly". The name *Oocatochus* is derived and "latinised" from the Greek words "oon" = egg and "katochos" = retending, egg-retending.

*Gonyosoma* is accepted as a valid Genus and includes *G. janseni* and *G. oxycephala*.

*Coelognathus*: *C. erythrurus*, *C. flavolineata*, *C. helena*, *C. radiatus*, and *C. subradiatus* the Indo-Malayan species (formerly *E. erythrurus*, *E. flavolineata*, *E. helena*, *E. radiatus*, and *E. subradiatus*

) are separated from the

*Elaphe*

Genus and referred to the revalidated Genus

*Coelognathus*

. This name was first used by Fitzinger for *radiatus* in 1843. He states here that *Coelognathus* species evolved slowly compared to Asian

*Elaphe*

, and also that

*Gonyosoma*

and

*Coelognathus*

show affinities to the

*Elaphe moellendorffi*

-group.

Now remember these groups are based on the methods used: organ topography, vertebrae,

Phylogenetic Analysis and such. You may be like me and when you read that *E. prasina* and *E. frenata* are grouped with *E. moellendorff* i, you think "How can this be?!" But these are the findings from his study, and I'm sure this is not the last word on the very complex *Elaphe* Genus. I fully agree with all the taxonomic changes herein, but I, like most of you, have my own ideas, and with keeping and working with both *E. conspicillata* and *E. mandarina* , I see them more related than *E. mandarina* and *E. moellendorffi* . BUT, again, the methods used.....

A note on other works, Urs Utiger of the Zoological Museum, Zurich, Switzerland recently completed a mtDNA study of the three endemic *Elaphe* species of Japan and found that the construed trees show a close relationship between *E. climacophora* and *E. quadrivirgata* with each other and to the mainland species *E. carinata* . The distance of *E. conspicillata* to the other Japanese species as well as mainland species was very large. Stating that "the possibly close relationship of *E. climacophora* and *E. quadrivirgata* with palearctic mainland species is explained by a scenario in which their ancestors crossed the unique land bridge between Korea and Southwest Japan in the Pleistocene, 160,000 years ago, while the ancestor of *E. conspicillata* reached the islands long ago, most likely in tertiary times." And speaking of the "Last Word" on the *Elaphe* , there are three more works to be published in the near future. Two separate studies based on DNA sequences (nuclear and mitochondrial genes) and a study of the hemipenial morphology of Old and New World *Elaphe* .