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CLEMMYDOPSIS BODA A VALID LINEAGE OF EMYDINE TURTLES FROM THE EUROPEAN TERTIARY

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In 1847 Hermann von Meyer gave the name *Emys turnauensis* to a small emydine turtle from the Upper (Sarmatian) Miocene of Turnau in Steyermark, Austria. He published no description at that time, but validated the name by a full description and figure in 1858.

Emys turnauensis was founded on an anterior fragment of carapace (nuchal and both first peripherals, second peripheral of the left side, both first pleurals, and parts of left pleurals 2, 3, and 4). Its most evident peculiarity was the absence on the first pleurals of any indication of grooves for the costal scutes. The first vertebral thus extended across the entire front of the shell back of the anterior marginals and the relatively broad nuchal scute. The second and third vertebrae less obviously but unmistakably had a similar great lateral expansion. Von Meyer commented: "Von allen mir bekannten Schildkröten mit Grenzeindrücken zeichnet sich vorliegende durch den Mangel an Seitenschuppen aus. . . . Der Verlauf der Grenzeindrücke sonst ist in dieser Schildkröte so regelmässig dass der Mangel an Seitenschuppen unmöglich für eine zufällige Erscheinung oder für eine Abnormität gehalten werden kann; er wird der Species wirklich zugestanden haben, und es wird sich eigentlich nur um Entscheidung der Frage handeln, ob der gänzliche Mangel einer Schuppenart in einer Schildkröte zur Errichtung eines eigenen Genus berechtigt oder nur zu den Kennzeichen gehört, welche bei der Unterscheidung von Species in Anwendung kommen. Mit der Beantwortung dieser Frage möchte ich um so mehr bis zur Kenntniss der fehlenden Theile der Schildkröte, namentlich des Bauchpanzers zurückhalten, da die hervorgehobene Abweichung im Hautskelet, so auffallend sie ist, mit einer Abweichung in der Zahl oder Form der knöchernen Theile, wenigstens so weit diese verliegen,

nicht verbunden sich zeicht; die knöchernen Theile sind vielmehr *Emys* entsprechend gebildet. Zur Errichtung jedoch einer neuen Species war wohl hinreichender Grund vorhanden."

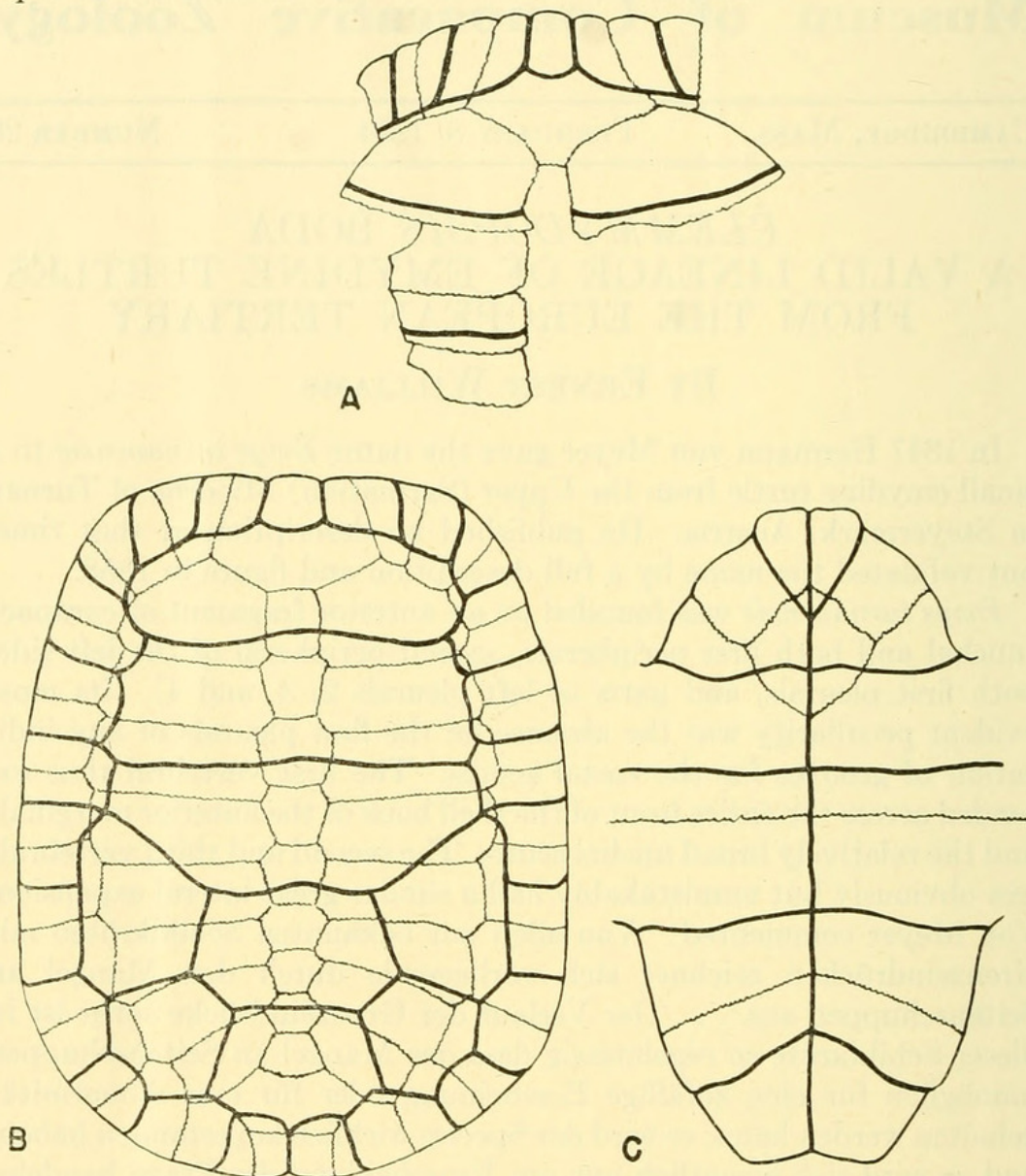


Fig. 1. *Clemmysopsis turnauensis* (von Meyer). A. Type specimen, after v. Meyer. B. Carapace, after Staesche. C. Plastron, after Staesche.

Von Meyer mentioned also that he had an anterior fragment from Tertiary formations at Chaux-de-fonds, Switzerland, which might belong to *Emys turnauensis*, but that he had never seen anything resembling this species elsewhere in Switzerland.

In 1927 Anton Boda described and figured from the Lower Pannonian (Lower Pliocene) beds near Sopron, Hungary, a complete

dorsal shell of a form which he recognized as similar in its vertebral pattern to *Emys turnauensis* but which he referred to a new genus and species as *Clemmydopsis sopronensis*. The new form differed from *Emys turnauensis* in the shape of the neurals. In *Clemmydopsis sopronensis* neurals one to three were hexagonal, short-sided behind, and neural four quadrilateral, while the first neural was oval, the second

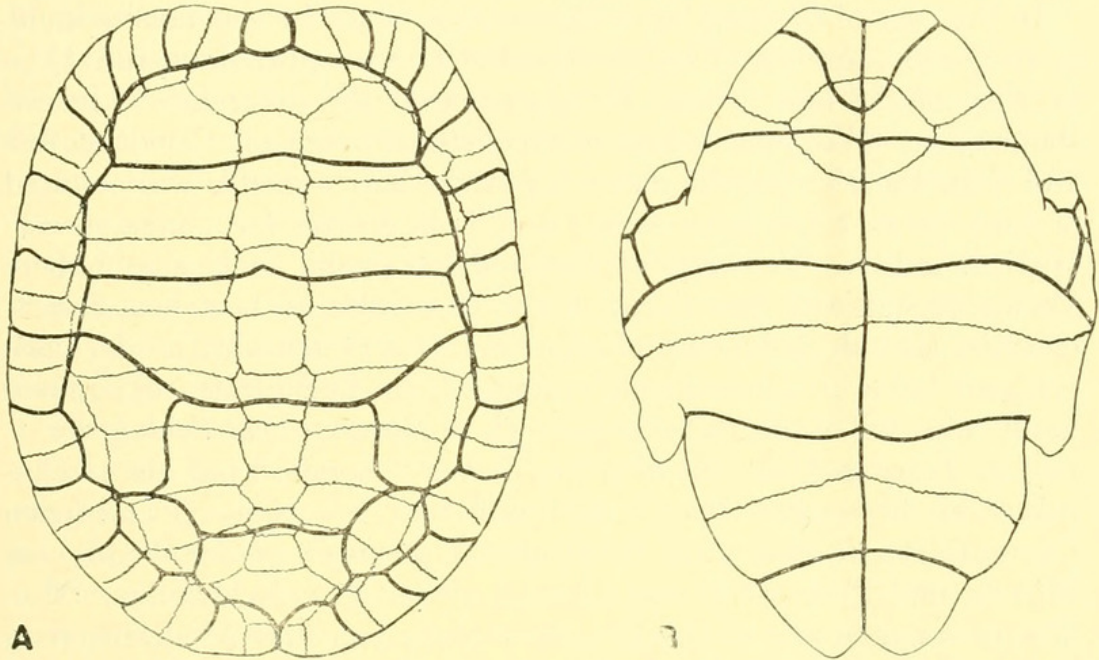


Fig. 2. *Clemmydopsis sopronensis* Boda. A. Type carapace, after Boda. B. Plastron, after Thenius.

to fourth hexagonal, short-sided in front, in *Emys turnauensis*. Boda assigned his new form to the section of the Emydinae which includes *Geoemyda* (*Nicoria* of authors), doing so on the basis of the character of neural shape to which great taxonomic weight had been given by Boulenger, Siebenrock and others.

In 1931, K. Staesche placed on record from the Sarmatian Miocene of Steinheim in Württemberg material very similar to the unique type of *Emys turnauensis* but which he regarded as new, giving it the name *Clemmys steinheimensis*. Staesche's material was much more nearly complete than that of either Boda or von Meyer. He had three specimens, none individually perfect but together providing satisfactory knowledge of both carapace and plastron.

Staesche described his material very fully and discussed the relationship of his species to *Emys turnauensis* and *Clemmydopsis sopronensis*. He admitted the possible synonymy of his species with

Emys turnauensis but considered that one minor difference might be of specific value: the marginal scutes did not encroach upon the first pleural of *turnauensis* as they quite clearly did in *steinheimensis*. He relegated both forms to the genus *Clemmys*, regarding the single point of difference from *Clemmys* as usually understood — the absence of the first and second costals — as of specific value only.

In the case of *Clemmydopsis sopronensis*, Staesche was not in doubt as to the distinctness of the species, but he was quite doubtful of the validity of the new genus. He argued that the difference in neural shape appeared to preclude inclusion of *steinheimensis* in *Clemmydopsis* and that, therefore, if the character of the horny shields was counted of much value, a new genus would need to be erected for *steinheimensis*. He concluded: "Vermutlich dürfte daher wohl auch eine nähere Verwandschaft zwischen *Clemmys* und *Clemmydopsis* bestehen, derart, dasz der Gestalt der Neuralplatten (kurzeste Seiten hinten oder vorn gelegen) keine so überragende systematische Bedeutung zukommen, kann, wie dies Boda nach Siebenrock annimmt. Das Fehlen der 1. und 2. Lateralschilder ist nicht als Genus — sondern nur als Artcharakter zu bewerten. Dieses Merkmal tritt bei zwei verschiedenen (Neuralplatten!) aber wohl verwandten Gattungen an der Wende von Miocän und Pliocän auf, um alsbald wieder zu verschwinden. Man könnte versucht sein in Dacque'schem Sinne von einer Modeströmung zu sprechen, denn ein besonderer Zweck dürfte dieser Einrichtung kaum zugrunde liegen. Mit der Annahme einer näheren Verwandschaft beider Gattungen kann man aber auf diese Deutung verzichten."

In 1934 T. Szalai in a list of the fossil turtles of Hungary synonymized *Clemmydopsis* Boda with *Geoemyda* Gray on the basis of the similar neural shapes, rejecting as not significant at the generic level the peculiarities of the horny shields.

Erich Thenius (1952) has followed Szalai's generic assignment (preferring, however, the synonymous name *Nicoria*) in reporting new finds of *sopronensis* from a new locality Brunn-Vösendorf near Vienna. Thenius' material is important in that it completes our knowledge of *sopronensis* by providing (from dissociated specimens of all the plastral parts) the characters of the plastron, heretofore unknown.

Thanks to the kindness of the authorities of the Staatliche Museum für Naturkunde in Stuttgart and especially to the friendly cooperation and diligence of Dr. Karl Dietrich Adam of that museum I have been able to examine the type specimens of *Clemmys steinheimensis* Staesche. There is little to add to Staesche's accurate description and excellent

photographs. There are, however, some points of interest in regard to the interpretation and systematic position of the fossils.

I wish first to suggest that *steinheimensis* may best be synonymized with *turnauensis*. The two named forms are equivalent in age, not far distant in locality and distinguished by a single quite trivial character which may well be only an individual peculiarity of the unique type of *turnauensis*.

If this synonymy is correct we are dealing then with four occurrences of only two forms. Yet these two forms have received from the very few authors who have written about them four different generic assignments: "*Emys*", "*Clemmydopsis*, new genus", "*Clemmys*", and "*Geoemyda* (= *Nicoria*)".

Of these generic names the first may be dismissed at once; it belongs to a period in which almost all fossil emydine species and even some forms not belonging to the family Testudinidae or the suborder Cryptodira were placed in the genus *Emys*.

More serious discussion must be accorded the other generic assignments, but it appears to me that previous authors have failed to consider one important possibility: that the two forms, which are after all chronologically consecutive, are phyletically related.

The absence of the first two costal scutes in the two forms *turnauensis* and *sopronensis* is a quite extraordinary phenomenon apparently not closely approached by any recorded aberration of the horny shields. The similarities in detail shown by the two forms are fantastically close if they are the result of parallelism only. There is a real difficulty in the plural occurrence of so improbable an event. The difficulty, however, ceases to exist if we assume the event happened only once and if we explain the similarity of the two forms by direct inheritance. The evolutionary and therefore the taxonomic dilemma which the two forms have appeared to present is in all essentials solved by the hypothesis of phyletic relationship.

There are, of course, real differences between the two species, and, in fact, one of the differences — neural shape — has been considered of high taxonomic value and is still used in the taxonomy of Recent forms to discriminate genera.

Without question in the Recent emydine turtles the character of neural shape tends to have utility in segregating natural groups, although not without some instances of difficulty, but, granting to the character the maximum of utility for Recent forms it must still be used with discretion when dealing with fossil forms. It can never be

forgotten that neurals which are hexagonal, short-sided in front, are primitive and that other types have evolved from that condition. Inevitably then some of the ancestors of genera showing the modified types of neurals would be placed — if that character were alone considered — in a more primitive genus. Quite certainly *Geoemyda* and its relatives have evolved from a form with *Clemmys* type neurals. There are indeed a number of examples of evolution in neural shape displayed in the fossil record. The fossil tortoise *Styemys nebrascensis* of the Oligocene of North America regularly has all the neurals after the first hexagonal short-sided in front: the more highly evolved species of the same genus from the John Day beds (lowest Miocene) regularly have one or more octagonal neurals. *Hadrianus* with primitive neurals evolved into later subgenera of *Testudo* with modified neurals. There is also among Recent forms considerable intraspecific variation in neural shape.

In the present instance *turnauensis* is temporally antecedent to *sopronensis* and in the matter of neural shape structurally more primitive. It is surely a possibility worth attention that the one has a phyletic relationship to the other.

Except for neural shape there are no known differences between *turnauensis* and *sopronensis* which are not at the specific level or below it, and, since none of fossils is quite perfect, it is possible in fact that some of the recorded differences are matters of interpretation and reconstruction and not real. I tabulate the differences below:

| <i>turnauensis</i> | <i>sopronensis</i> |
|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. gulars narrow, not overlapping humerals | 1. gulars broad, overlapping humerals |
| 2. femoral scutes longer than pectorals | 2. pectoral scutes longer than femorals |
| 3. no anal notch | 3. a distinct though narrow anal notch |
| 4. first vertebral encroaching on at least the first, second and third peripherals | 4. first vertebral encroaching only on the first and second peripherals |
| 5. first neural rectangular-oval, neurals 2-8 hexagonal, short-sided in front, all moderately broad | 5. neurals 1-3 hexagonal, short-sided behind, neural 4 quadrilateral, neurals 5-8 hexagonal, short-sided in front, all still broader than in <i>turnauensis</i> |
| 6. fifth vertebral and fourth costal moderate in size | 6. fifth vertebral and fourth costal quite small relatively to the other scutes |

These differences will serve — even if one or two should fail — to distinguish the species.

Now, granting that the two species are directly related, to what genus or to which genera should they be referred?

Admittedly, if the genus *Clemmydopsis* is recognized, it will be solely on the pattern of the vertebrals and costals. It is, of course, possible that some of the skeletal parts which are not known — skulls, limbs, or vertebrae — might show striking differences from the related forms, *Geoemyda* or *Clemmys*, but this is an untestable hypothesis, which it is useless to consider. The question is then a simple one: Is a single character — at once striking and superficial — adequate for generic distinction?

There is unfortunately no objective way to evaluate such a question. Characters involving quite radical differences are in some cases infra-specific, while other characters which to the non-specialist are utterly trivial separate suprageneric groups. That the rank of supraspecific categories is wholly subjective or nearly so is a point generally agreed upon. In practice it is necessary to steer a middle course between those who would reduce genera arbitrarily on mnemonic grounds — deploring the necessity of remembering so many names — and those who tend to regard as generic any differences which are recognizable immediately and as specific any differences which are determinable with more difficulty.

In the present case there are several grounds for accepting — at least for the present — *Clemmydopsis* as a valid genus.

1. The peculiar modification of the horny scutes, though a single character, is also one without parallel in the normal characters or the known variants of the chelonian order. Anomalies of the plates and scutes of turtles have been studied intensively by Gadow, Newman, Coker, Grant, Lynn and others using literally many hundreds of specimens, yet nowhere does there appear to be any record of a scute anomaly resembling that seen in these forms from the Miocene and Pliocene of central Europe. The closest parallel is with two cases cited by Grant, one in *Testudo denticulata* and one in *Chrysemys picta* in which the vertebrals do touch the marginals. But even here the similarity is verbal only, the marginals being enlarged and not the vertebrals while the grossest asymmetries and distortions indicate the abnormality of the condition.

2. There is currently recognized a Recent genus *Notochelys* with the single species *N. platynota* which differs from *Clemmys* primarily by

the intercalation of a small scute between the usual fourth and fifth vertebrae. But this condition, while a population character in *platynota*, is a rather common variant in numbers of other members of the Testudinidae. This variation is especially common in *Homopus* in which a very substantial fraction of at least *H. areolatus* shows a similar condition. Thus while there is a weak argument for *Clemmydopsis* on the grounds of symmetry in generic discrimination, it may in this case be countered by a demand for suppression of the generic separation for *N. platynota*, which, while certainly a distinct species, does not obviously merit more than subgeneric distinction.

3. However, the best ground for separating *Clemmydopsis* as a genus is the impossibility of placing the two central European forms, directly related though they seem to be, in any one currently recognized genus. On the current definitions of emydine genera the Miocene form belongs in *Clemmys*, where Staesche has already placed it, and the Pliocene form in *Geoemyda* (= *Nicoria*) to which Szalai and Thenius have already referred it. This, however, is an inadmissible solution since it would make the genus *Geoemyda* polyphyletic.

It is entirely possible, indeed probable, that *Clemmys* and *Geoemyda* as at present defined are mere form-genera, but the true relationships within the *Clemmys*-*Geoemyda* section of the Emydinae are still to be analyzed and promise to be difficult of analysis. Thus while it is perhaps possible to look forward to a time when relationships will become known, and larger genera may be recognizable within the Emydinae, it is not now desirable to randomly unite emydine genera, in so doing pretending to a knowledge which is not at hand. Rather it is preferable to split rather finely at the moment, counting the present as that period of analysis which must precede a synthesis.

We need first to discover the correct phyletic sequences. We must first recognize the family tree; afterward we may dispute the nomenclatorial rank of the several twigs and branches.

Clemmydopsis Boda should then be retained at present for an apparently short-lived but uniquely specialized lineage of emydine turtles from the later Tertiary of middle Europe. Whether or not it should ultimately be retained as a genus in formal nomenclature, it is certainly a "gens" in the sense of Vaughan 1905 (in Cain 1952) (a lineage or phyletic line).

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