



Order Testudines: 2013 update*

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The present paper presents an update of a list of chelonian taxa published in 2011 (Fritz 2011), which generally has followed the “Checklist of chelonians of the world” by Fritz & Havaš (2007). Although chelonians (terrapins, turtles and tortoises) do not constitute a species-rich group, there exists considerable interest in their taxonomy and systematics, a fact being related with the unique morphology, the debated phylogenetic relationships and the delicate conservations status of these reptiles. Consequently, quite a number of taxonomic changes has been proposed in the past two years.

Compared to the 2011 list including 14 families, 94 genera and 317 species of chelonians, the numbers of recognized families and genera increased slightly to 15 and 96. The number of species remained constant, despite some changes as described below. The count of 317 species includes a few island-endemics which became extinct in historical times (see review in Stuckas *et al.* 2013). It could be argued that another extinct island species, *Meiolania damelipi* White *et al.*, 2010, should be added. *Meiolania damelipi* was the last representative of the famous giant ‘horned turtles’ (Meiolaniidae) and disappeared from Efate island (Vanuatu, Southwest Pacific) approximately 3000 years before present, within 300 years after the arrival of humans (White *et al.* 2010).

Order Testudines Batsch, 1788 (2 suborders)

Suborder **Cryptodira** Cope, 1868 (12 families)¹

Family **Carettochelyidae** Boulenger, 1887 (1 genus, 1 species)

Family **Cheloniidae** Oppel, 1811 (5 genera, 6 species)

Family **Chelydridae** Gray, 1831 (2 genera, 4 species)²

Family **Dermatemydidae** Gray, 1870 (1 genus, 1 species)

Family **Dermochelyidae** Fitzinger, 1843 (1 genus, 1 species)

Family **Emydidae** Rafinesque, 1815 (12 genera, 46 species)³

1. Compared to the 2011 list, one additional family is recognized, see under footnote 5.
2. Hoser (2013) named a new species and a new subspecies of *Macrochelys*. These taxa are not recognized here until the situation associated with taxa descriptions by Hoser is clarified (*cf.* Kaiser *et al.* 2013).
3. Species number within *Trachemys* (12 instead of formerly 15) follows the revision of Fritz *et al.* (2012a). However, McCranie *et al.* (2013) suggested that the number of West Indian *Trachemys* species is inflated. Likewise, the current species delimitations within the genus *Pseudemys* seem to be questionable (Spinks *et al.* 2013). In the light of the well known broad-scale intergradation of *Terrapene carolina triunguis* with other subspecies of *T. carolina* (Ernst & Lovich 2009; Butler *et al.* 2011), the recent proposal to treat *T. mexicana* as a distinct polytypic species (with the subspecies *T. m. mexicana*, *T. m. triunguis* and *T. m. yucatanana*; Martin *et al.* 2013) is not followed here.

- Family **Geoemydidae** Theobald, 1868 (19 genera, 68 species)⁴
 Family **Kinosternidae** Agassiz, 1857 (3 genera, 24 species)⁵
 Family **Platysternidae** Gray, 1869 (1 genus, 1 species)
 Family **Staurotypidae** Gray, 1869 (2 genera, 3 species)⁶
 Family **Testudinidae** Batsch, 1788 (16 genera, 53 species)⁷
 Family **Trionychidae** Gray, 1825 (13 genera, 31 species)
 Suborder **Pleurodira** Cope, 1864 (3 families)
 Family **Chelidae** Gray, 1825 (15 genera, 52 species)⁸
 Family **Pelomedusidae** Cope, 1868 (2 genera, 18 species)⁹
 Family **Podocnemididae** Cope, 1868 (3 genera, 8 species)

References

- Butler, J.M., Dodd, C.K., Aresco, M. & Austin, J.D. (2011) Morphological and molecular evidence indicates that the Gulf Coast box turtle (*Terrapene carolina major*) is not a distinct evolutionary lineage in the Florida Panhandle. *Biological Journal of the Linnean Society*, 102, 889–901.
<http://dx.doi.org/10.1111/j.1095-8312.2011.01625.x>
- Ernst, C.H. & Lovich, J.E. (2009) *Turtles of the United States and Canada*. Second Edition. The Johns Hopkins University Press, Baltimore, Maryland, xii + 827 pp.
- Fritz, U. (2011) Order Testudines Batsch, 1788. In: Zhang, Z.-Q. (Ed.), *Animal biodiversity: An outline of higher-level classification and survey of taxonomic richness*. *Zootaxa*, 3148, 61–62.
- Fritz, U. & Havaš, P. (2007) Checklist of chelonians of the world. *Vertebrate Zoology*, 57, 149–368.
- Fritz, U., Branch, W.R., Hofmeyr, M.D., Maran, J., Prokop, H., Schleicher, A., Široký, P., Stuckas, H., Vargas-Ramírez, M., Vences, M. & Hundsdörfer, A.K. (2011) Molecular phylogeny of African hinged and helmeted terrapins (Testudines: Pelomedusidae: *Pelusios* and *Pelomedusa*). *Zoologica Scripta*, 40, 115–125.
<http://dx.doi.org/10.1111/j.1463-6409.2010.00464.x>
- Fritz, U., Stuckas, H., Vargas-Ramírez, M., Hundsdörfer, A.K., Maran, J. & Päckert, M. (2012a) Molecular phylogeny of Central and South American slider turtles: implications for biogeography and systematics (Testudines: Emydidae: *Trachemys*). *Journal of Zoological Systematics and Evolutionary Research*, 50, 125–136.
<http://dx.doi.org/10.1111/j.1439-0469.2011.00647.x>
- Fritz, U., Alcalde, L., Vargas-Ramírez, M., Goode, E.V., Fabius-Turoblin, D.U. & Praschag, P. (2012b) Northern genetic richness and southern purity, but just one species in the *Chelonoidis chilensis* complex. *Zoologica Scripta*, 41, 220–232.
<http://dx.doi.org/10.1111/j.1463-6409.2012.00533.x>
- Fritz, U., Branch, W.R., Gehring, P.-S., Harvey, J., Kindler, C., Meyer, L., Du Preez, L., Široký, P., Vieites, D.R. &

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4. Based on genetic evidence, Vargas-Ramírez *et al.* (2013) questioned that *Rhinoclemmys diademata*, *R. funerea*, *R. melanosterna* and *R. punctularia* represent distinct species under the Biological Species Concept. However, since these authors did not synonymize the four species, our count still includes the four taxa as distinct species.
5. Iverson *et al.* (2013) elevated the Staurotypinae to the family level. Consequently, *Staurotypus* (containing two species) and the monotypic genus *Claudius* were removed from Kinosternidae. Furthermore, Iverson *et al.* (2013) erected the new genus *Cryptochelys* for the species *C. acuta*, *C. angustipons*, *C. creaseri*, *C. dunni*, *C. herrerai* and *C. leucostoma*, formerly in *Kinosternon*. The former subspecies *K. subrubrum steindachneri* and *K. scorpioides abaxillare* were reclassified in the same paper as full species.
6. Newly recognized family (Iverson *et al.* 2013), see under footnote 5.
7. Species count includes now *Kinixys nogueyi* and *K. zombensis*, formerly subspecies of *K. belliana* (Kindler *et al.* 2012). The synonymy of *Chelonoidis chilensis*, *C. donosobarrosi* and *C. petersi* was confirmed (Fritz *et al.* 2012b).
8. The monotypic genus *Flaviemys* was described by Le *et al.* (2013) to accommodate the species *F. purvisi*, by thus avoiding the paraphyly of *Myuchelys*.
9. *Pelusios seychellensis*, previously thought to be an extinct species endemic to Mahé, Seychelles, was shown to be a junior synonym of the widely distributed West African species *P. castaneus* (Stuckas *et al.* 2013), which is why *Pelusios* contains now only 17 recognized species. However, according to genetic data the existence of additional *Pelusios* species is very likely (Fritz *et al.* 2011, 2013). The second genus of the family, *Pelomedusa*, contains approximately 10 deeply divergent genetic lineages (Vargas-Ramírez *et al.* 2010; Wong *et al.* 2010; Fritz *et al.* 2011), which represent most probably distinct species. However, their taxonomic status needs to be formally assessed and until then, *Pelomedusa* remains monotypic.

- Vences, M. (2013) Weak divergence among African, Malagasy and Seychellois hinged terrapins (*Pelusios castanoides*, *P. subniger*) and evidence for human-mediated oversea dispersal. *Organisms Diversity & Evolution*, 13, 215–224.
<http://dx.doi.org/10.1007/s13127-012-0113-3>
- Hoser, R.T. (2013) An updated taxonomy of the living Alligator snapping turtles (*Macrochelys* Gray, 1856), with descriptions of a new tribe, new species and new subspecies. *Australasian Journal of Herpetology*, 16, 53–63.
- Iverson, J.B., Le, M. & Ingram, C. (2013) Molecular phylogenetics of the mud and musk turtle family Kinosternidae. *Molecular Phylogenetics and Evolution*, published online ahead of print.
<http://dx.doi.org/10.1016/j.ympev.2013.06.011>
- Kaiser, H., Crother, B.I., Kelley, C.M.R., Luiselli, L., O’Shea, M., Ota, H., Passos, P., Schleip, W.D. & Wüster, W. (2013) Best practices: in the 21st century, taxonomic decisions in herpetology are acceptable only when supported by a body of evidence and published via peer-review. *Herpetological Review*, 44, 8–23.
- Kindler, C., Branch, W.R., Hofmeyr, M.D., Maran, J., Široký, P., Vences, M., Harvey, J., Hauswaldt, J.S., Schleicher, A., Stuckas, H. & Fritz, U. (2012) Molecular phylogeny of African hinge-back tortoises (*Kinixys*): implications for phylogeography and taxonomy (Testudines: Testudinidae). *Journal of Zoological Systematics and Evolutionary Research*, 50, 192–201.
<http://dx.doi.org/10.1111/j.1439-0469.2012.00660.x>
- Le, M., Reid, B.N., McCord, W.P., Naro-Maciel, E., Raxworthy, C.J., Amato, G. & Georges, A. (2013) Resolving the phylogenetic history of the short-necked turtles, genera *Elseya* and *Myuchelys* (Testudines: Chelidae) from Australia and New Guinea. *Molecular Phylogenetics and Evolution*, 68, 251–258.
<http://dx.doi.org/10.1016/j.ympev.2013.03.023>
- Martin, B.T., Bernstein, N.P., Birkhead, R.D., Koukl, J.F., Musmann, S.M. & Placyk, J.S. (2013) Sequence-based molecular phylogenetics and phylogeography of the American box turtles (*Terrapene* spp.) with support from DNA barcoding. *Molecular Phylogenetics and Evolution*, 68, 119–134.
<http://dx.doi.org/10.1016/j.ympev.2013.03.006>
- McCranie, J.R., Köhler, F., Gutsche, A. & Valdés Orellana, L. (2013) *Trachemys grayi emolli* (Testudines, Emydidae) in Honduras and its systematic relationships based on mitochondrial DNA. *Zoosystematics and Evolution*, 89, 21–29.
<http://dx.doi.org/10.1002/zoos.201300003>
- Spinks, P.Q., Thomson, R.C., Pauly, G.B., Newman, C.E., Mount, G. & Shaffer, H.B. (2013) Misleading phylogenetic inferences based on single-exemplar sampling in the turtle genus *Pseudemys*. *Molecular Phylogenetics and Evolution*, 68, 269–281.
<http://dx.doi.org/10.1016/j.ympev.2013.03.031>
- Stuckas, H., Gemel, R. & Fritz, U. (2013) One extinct turtle species less: *Pelusios seychellensis* is not extinct, it never existed. *PLOS ONE*, 8, e57116.
<http://dx.doi.org/10.1371/journal.pone.0057116>
- Vargas-Ramírez, M., Vences, M., Branch, W.R., Daniels, S.R., Glaw, F., Hofmeyr, M.D., Kuchling, G., Maran, J., Papenfuss, T.J., Široký, P., Vieites, D.R. & Fritz, U. (2010) Deep genealogical lineages in the widely distributed African helmeted terrapin: evidence from mitochondrial and nuclear DNA (Testudines: Pelomedusidae: *Pelomedusa subrufa*). *Molecular Phylogenetics and Evolution*, 56, 428–440.
<http://dx.doi.org/10.1016/j.ympev.2010.03.019>
- Vargas-Ramírez, M., Carr, J.L. & Fritz, U. (2013) Complex phylogeography in *Rhinoclemmys melanosterna*: conflicting mitochondrial and nuclear evidence suggests past hybridization (Testudines: Geoemydidae). *Zootaxa*, 3670, 238–254.
<http://dx.doi.org/10.11646/zootaxa.3670.2.8>
- White, A.W., Worthy, T.H., Hawkins, S., Bedford, S. & Spriggs, M. (2010) Megafaunal meiolaniid horned turtles survived until early human settlement in Vanuatu, Southwest Pacific. *Proceedings of the National Academy of Sciences of the USA*, 107, 15512–15516.
<http://dx.doi.org/10.1073/pnas.1005780107>
- Wong, R.A., Fong, J.J. & Papenfuss, T.J. (2010) Phylogeography of the African helmeted terrapin, *Pelomedusa subrufa*: genetic structure, dispersal, and human introduction. *Proceedings of the California Academy of Sciences*, 61, 575–585.