

A case of diprosopiasis in *Trachemys scripta scripta*

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Summary

This short communication describes a case of diprosopiasis in *Trachemys scripta scripta* imported from Florida (USA) and farmed for about 4 months by a private owner in Palermo, Sicily, Italy. The water turtle showed the morphological and radiological features characterizing such deformity. This communication aims to advance the knowledge of the reptile's congenital anomalies and suggests the need for more detailed investigations to better understand its pathogenesis.

Su di un caso di diprosopia in *Trachemys scripta scripta*

Parole chiave

Autopsia,
Difetti congeniti,
Diprosopia,
Radiologia,
Trachemys scripta scripta.

Riassunto

Nel presente lavoro gli Autori riportano un caso di diprosopia in *Trachemys scripta scripta* importata dalla Florida (USA) e allevata per circa 4 mesi da un privato di Palermo, Sicilia, Italia. All'esame ispettivo e radiologico si evidenziavano caratteristiche deformità morfologiche e scheletriche. Tale comunicazione ha lo scopo di promuovere la conoscenza delle anomalie congenite dei rettili, suggerendo la necessità di indagini più approfondite per capire meglio la patogenesi.

Several congenital malformations affecting different human and animal species are widely described in the literature; they are the abnormalities of structure and function that are recognizable before birth (prenatally), at birth, or years later (Dennis and Leipold 1979). They may affect a single anatomic structure or function, an entire system, or part of several systems.

The majority of human and animal malformations are due to a multifactorial aetiology (Arthur 1980). Genetic and environmental factors, or their interaction, are the most common causes (Dennis and Leipold 1979). Several teratogens, such as viruses, chemicals, poisonous plants, and nutritional deficiencies are often responsible of endemic malformations in large animals (Coppock and Dziwenka 2011).

Conjoined twins and embryonic duplication – defined as a progressive series of malformations, ranging from a partial duplication of a part of the body to the almost total formation of 2 individuals

– is a subject of interest because it represents a rare event in veterinary practice and is often caused by pathogenetic discrepancies (Lanteri *et al.* 2013, Mazzullo *et al.* 2009).

Twinning has been reported in turtles, tortoises (Yntema 1970, Cohen 1986, Crooks and Smith 1958, Heimann 1993, Mähn 1996, Messinger and Patton 1995, Obst 1976, Stumpel 2007, Tucker and Funk 1976), crocodilians (Ferguson 1985), lizards (Carpenter and Yoshida 1986, Darevsky 1966, Mendyk 2007, Shaw 1954, Speer and Bayless 2000, Willis 1932), and snakes (Kinkaid 1996, Wallach, 2007).

Conjoined twin embryos in sea turtles usually die before pipping (Miller 1985) in the early stages of development (Kaska and Downie 1999), and their occurrence has been revealed by the post-hoc examination of nest contents. Nevertheless, a conjoined pair of green turtles that lived in captivity for some months has already been reported in the literature (Haft 1994).

Diprosopiasis is characterized by an alteration

of the cranial portion of embryo, resulting in a more or less severe and wide duplication of the face. It is an extremely rare malformation in both humans and domestic animals (Costa *et al.* 2014). Diprosopias represents the most severe form of facial malformation and, at the same time, the most simple of Teratology framework of parallel double monsters (Pelagalli 1982). However, a few cases of diprosopiasis have been reported in sheep (Kerr 2007, Kaçar *et al.* 2008, Fisher *et al.* 1986, Mazzullo *et al.* 2003), goats (Mukaratirwa *et al.* 2006), cattle (Schulze *et al.* 2006, Hishinuma *et al.* 1987), cats (Aharon *et al.* 1986), horses (Gotz 1991), and chicken (Saini *et al.* 1993).

The pathogenesis of diprosopiasis depends on a bifurcation of the cranial portion of the notochord, which causes duplication of the anterior part of the neural tube, resulting in the formation of 2 forebrains (Pelagalli and Castaldo 1998, Hemachandran *et al.* 2004).

This short communication describes the clinical, pathologic, and radiographic findings of a case of diprosopiasis in a water turtle occurred to the author's observation.

A 6 months-old water turtle (*Trachemys scripta scripta*), imported from Florida (USA) and reared for about 4 months by a private owner in Palermo (Sicily, Italy), was brought to the Department of Veterinary Science, University of Messina (Sicily, Italy). In the farm, the egg was incubated at temperature of 29 °C (84°F) for 80-90 days with a bedding of about 2 inches of vermiculite.

The subject was kept in a suitable terrarium heated to 28°C, with natural light (sunlight), fed with mosquito larvae, and a minimum vitamin supplementation.

The owner reported the failure of a normal growth of

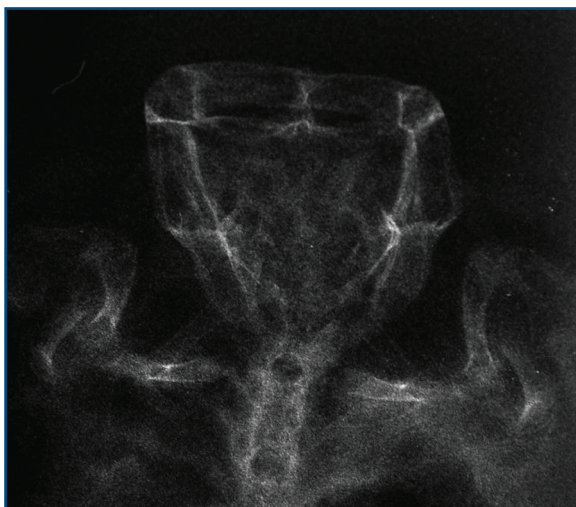


Figure 1. *Trachemys scripta scripta*: dorsoventral radiographic projection of the head.

the animal and food intake, probably due to a faulty sensory perception of sight, while maintaining the normal bilateral movements of the head.

Total body radiographic examination, performed in dorso-ventral projection without using anti-diffusion grid because of the small size of the animal, revealed the fusion at the level of the iugal (zigomatic) and post-frontal regions of the 2 crania in a single head joined to a single rachis. The latter appeared deformed at the level of the first vertebra. The cranium was assessed via dorsoventral projection using high definition film. The assessment showed the presence of a single large cranial vault without division septa (Figure 1). The presence of thin radio-transparent areas referable to eye cavities in the cranial and lateral portions, and the projection of a single trachea in the median region were also detected.

After spontaneous death, autopsy showed signs of delayed growth (Figure 2). The plastron was irregularly concave and carapace showed deformation on the right margin. Externally, the turtle showed a wide cranium, constituted of the fusion of both the 2 heads, with 4 ocular cavities: the medial ones (white arrows in Figure 2), normally sized for the species and filled with each eye globe, and the lateral ones (yellow arrows in Figure 2), filled with necrotic material. Two nasal regions (red arrows in Figure 2), each with its own mouth opening, were also present. Oral vestibules (blue arrows in Figure 2) were incomplete, although each contained its own tongue.

The left mouth cavity showed the presence of a small sized oral-pharyngeal canal as compared to the normally conformed right one.

On the ventral surface, jaws as well as medial and lateral maxillae of both the heads, were entirely developed, and provided of a normal temporo-mandibular joint.

On the basis of gross and radiological findings, the case here reported was classified as "Diprosopus", following the Duhamel's classification (Duhamel 1966).



Figure 2. *Trachemys scripta scripta*: frontal view of diprosopiasis.

Although diprosopiasis in turtles is a very known condition, the literature on this topic is extremely scarce, particularly in marine ones (Pezzullo 2000, WWF 2005). Also for this species, this anomaly is often considered as a particular form of incomplete twins (Ewert 1985), in which industrial and agricultural contaminants may play an important role (WWF 2005).

Anyway, considering the singularity of the case reported here, a possible aetio-pathogenesis is hard to be determined.

Most of animal malformations, especially in some species, are strictly linked to environmental pollutions and their knowledge to be used as important bio-indicators for the terrestrial pollutants.

References

- Aharon D.C., Wouda W. & van Weelden E. 1986. A case of diprosopus in the cat. *Tijdschrift voor Diergeneeskunde*, **111**, 588-591.
- Arthur G.H. 1980. Anomalie di sviluppo del prodotto di concepimento. Teratologia. In *Ostetricia e riproduzione degli animali domestici* (Mastronardi M. & Minoia P. eds). Grasso, Bologna, 91-119.
- Carpenter C.C. & Yoshida J.K. 1986. One-egg twins in *Agama agama*. *Herpetologica*, **23**, 57-59.
- Cohen H. 1986. *Terrapene carolina carolina* (eastern box turtle) twinning. *Herpetological Review*, **17**, 25.
- Coppock R.W. & Dziwenka M.M. 2011. Teratogenesis in livestock. In *Reproductive and developmental toxicology* (Gupta R.C. ed). Elsevier Press, USA.
- Costa M.A., Borzabadi-Farahani A., Lara-Sanchez P.A., Schweitzer D., Jacobson L., Clarke N., Hammoudeh J., Urata M.M. & Magee W.P. 2014. Partial craniofacial duplication: a review of the literature and case report. *J Craniomaxillofac Surg*, **42** (4), 290-296.
- Crooks F.D. & Smith P.W. 1958. An instance of twinning in the box turtle. *Herpetologica*, **14**, 170-171.
- Darevsky I.S. 1966. Natural parthenogenesis in a polymorphic group of Caucasian rock lizards related to *Lacerta saxicola* Eversmann. *Journal of the Ohio Herpetological Society*, **5**, 115-152.
- Dennis S.M. & Leipold H.W. 1979. Ovine congenital defects. *Vet Bull*, **49** (4), 233-239.
- Duhamel B. 1966. Morphogenèse pathologique. Masson & C. Editeurs, Paris.
- Ewert M.A. 1985. Embryology of turtles. In *Biology of the Reptilia* (Gans C., Billett F. & Maderson P.F.A. eds), vol. 14: Development A. John Wiley and Sons, New York, 75-267.
- Ferguson M.W.J. 1985. Reproductive biology and embryology of the crocodylians. In *Biology of the Reptilia* (Gans C., Billett F. & Maderson P.F.A. eds), vol. 14: Development A. John Wiley and Sons, New York, 329-491.
- Fisher K.R., Partlow G.D. & Walker A.F. 1986. Clinical and anatomical observations of a two-headed lamb. *Anat Rec*, **214**, 432-440.
- Gotz H.J. 1991. A case of diprosopus in a foal. *Tierärztl Prax*, **19**, 82-83.
- Haft J. 1994. Bemerkungen zu den Suppenschildkröten bei Xcabel, Halbinsel Yucatan, Mexiko. *Salamandra*, **30**, 254-259.
- Heimann E. 1993. Drei Zwillingspaare bei *Testudo marginata*. *Salamandra*, **29**, 167-172.
- Hemachandran M. & Radotra B.D. 2004. Partial duplication of head - a rare congenital anomaly. *Indian J Pathol Microbiol*, **47** (4), 537-539.
- Hishinuma M., Kohnose M.Y., Takahashi Y. & Kanagawa H. 1987. Diprosopus in a Holstein calf. *Jpn J Vet Res*, **35**, 287-293.
- Kaçar C., Özcan K., Takçi I., Gürbulak K., Ozen H. & Karaman M. 2008. Diprosopus, craniorachischisis, arthrogryposis, and other associated anomalies in a stillborn lamb. *J Vet Sci*, **9** (4), 429-431.
- Kaska Y. & Downie R. 1999. Embryological development of sea turtles (*Chelonia mydas*, *Caretta caretta*) in the Mediterranean. *Zoology in the Middle East*, **19**, 55-69.
- Kerr N.J. 2007. Diprosopus with multiple craniofacial, musculoskeletal, and cardiac defects in a purebred Suffolk lamb. *Can Vet J*, **48** (10), 1074-1076.
- Kinkaid J.F. 1996. *Pseudechis colletti* (Collett's Blacksnake). Twinning. *Herpetological Review*, **27** (1), 26.
- Lanteri G., Macrì F., Marino F., Caracappa S. & Mazzullo G. 2013. A rare case of *Deradelpus Cephalo - Thoracoomphalopagus* in lamb. *Anat Histol Embryol*, **42** (5), 394-397.
- Mähn M. 1996. Siamesische Zwillinge bei der Breitrandschildkröte *Testudo marginata* (Schöepff, 1792). *Salamandra*, **32**, 259-262.
- Mazzullo G., Germanà A., De Vico G. & Germanà G. 2003. Diprosopiasis in a lamb. A case report. *Anat Histol Embryol*, **32**, 60-62.
- Mazzullo G., Macrì F., Rapisarda G. & Marino F. 2009. *Deradelpus cephalothoracopagus* in kittens. *Anat Histol Embryol*, **38** (5), 327-329.
- Mendyk R.W. 2007. Dizygotic twinning in the blue tree monitor, *Varanus macraei*. *Biawak*, **1**, 26-28.
- Messinger M.A. & Patton G.M. 1995. Five years of nesting of captive *Terrapene carolina triunguis*. *Herpetological Review*, **26**, 193-195.
- Miller J.D. 1985. Embryology of marine turtles. In *Biology*

- of the Reptilia (Gans C., Billett F. & Maderson P.F.A. eds), vol. 14: Development A. John Wiley & Sons, New York, 269-328.
- Mukaratirwa S. & Sayi S.T. 2006. Partial facial duplication (diprosopus) in a goat kid. *J S Afr Vet Assoc*, **77** (1), 42-44.
- Obst F.J. 1976. Ein siamesischer Zwilling der Vierzehenschildkröte *Agrionemys horsfieldii* (Gray). *Aquarien Terrarien*, **23**, 174-175.
- Pelagalli G. 1982. Embriologia e teratologia. Idelson, Napoli.
- Pelagalli G.V. & Castaldo L. 1998. Embriologia morfogenesi e anomalie dello sviluppo. Gnocchi Editore, Napoli.
- Pezzullo E. 2000. Two-faced turtle first known of its kind. The Free Lance-Star Region, October 28 2000. <http://news.google.com/newspapers?nid=2472&dat=20001028&id=PDUzAAAAIIBAJ&sjid=kggGAAAAIIBAJ&pg=3287,8038788>.
- Saini S.S., Khehra R.S. & Kwatra M.S. 1993. A diprosopus in a domestic chicken embryo. *Avian Dis*, **37**, 898-899.
- Schulze U., Kuiper H., Doleke R., Ulrich R., Gerdwilker A. & Distl O. 2006. Familial occurrence of diprosopus in German Holstein calves. *Berl Munch Tierarztl Wochenschr*, **119** (5-6), 251-257.
- Shaw C.E. 1954. Captive-bred Cuban iguanas *Cyclura macleayi macleayi*. *Herpetologica*, **10**, 73-78.
- Speer R.J. & Bayless M.K. 2000. The first report of mangrove monitor twins in captivity: the remarkable reproduction and disappointing result. *Reptiles*, **8**, 30-31.
- Stumpel J. 2007. Identical twins at a steppe turtle (*Testudo horsfieldii*). *Schildkröten im Fokus*, **4**, 21-23.
- Tucker J.K. & Funk R.S. 1976. Twinning in the Gulf Coast box turtle, *Terrapene carolina major*. *Florida Scientist*, **39**, 238-239.
- Wallach V. 2007. Axial bifurcation and duplication in snakes. Part I. A synopsis of authentic and anecdotal cases. *Bulletin of the Maryland Herpetological Society*, **43**, 57-95.
- Willis R.A. 1932. A monstrous twin embryo in a lizard, *Tiliqua scincoides*. *J Anat*, **66**, 189-201.
- World Wide Fund For Nature (WWF). 2005. Two-headed marine turtle found in Costa Rica. *Marine Turtle Newsletter*, **112**, <http://www.wwfca.org/index.cfm?uNewsID=52481>.
- Yntema C.L. 1970. Twinning in the common snapping turtle, *Chelydra serpentina*. *Anat Rec*, **166** (3), 491-496.