Konsequenzen der Diskrepanz von natürlicher und menschenbestimmter Ernährung -- Reptilien / Ziervögel

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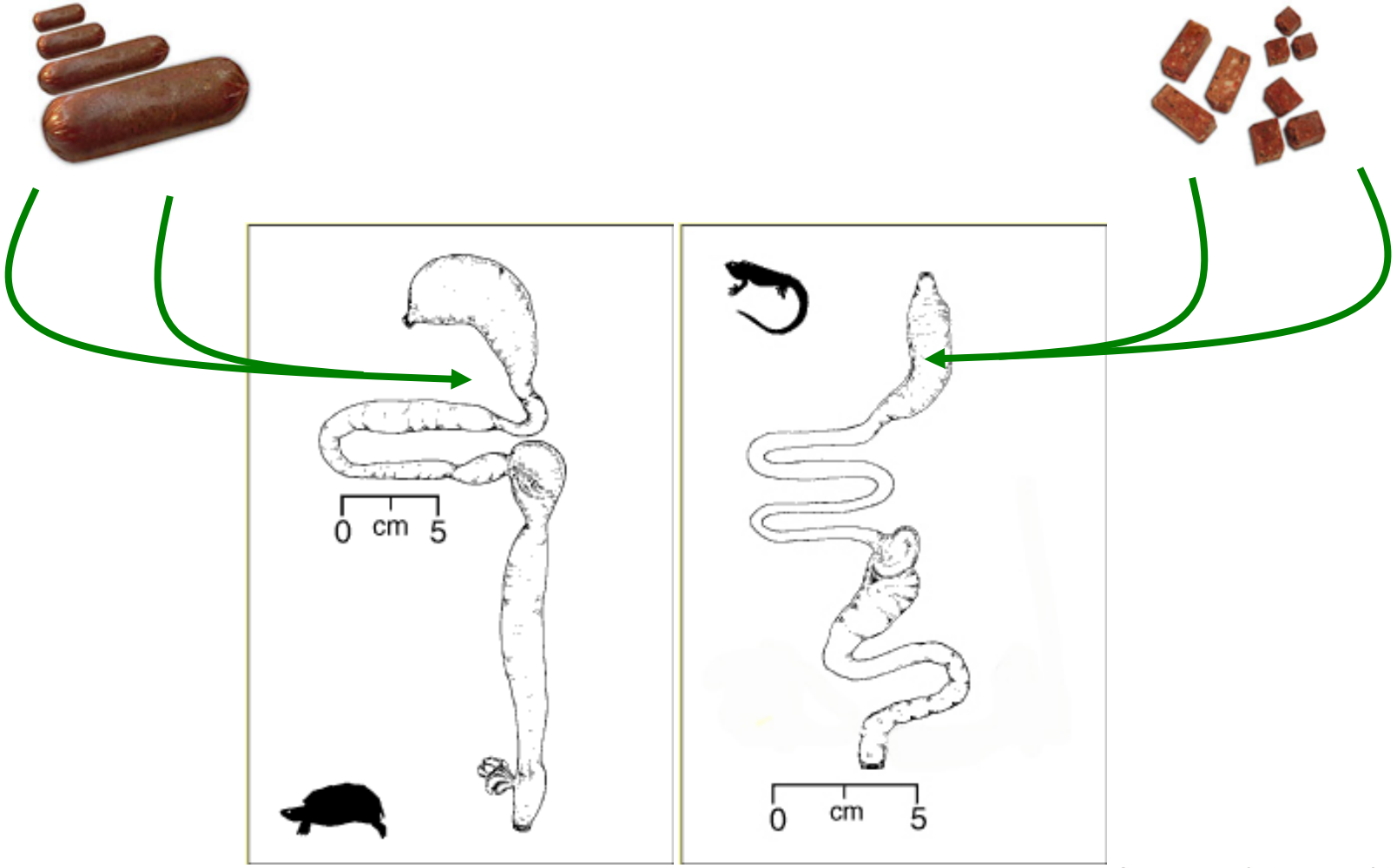
Gliederung

- Reptilien
  - Gicht
- Reptilien & Ziervögel
  - Adipositas
- Reptilien
  - Wachstum
  - Pyramidenpanzer bei Schildkröten
- Reptilien & Ziervögel
  - Calcium-Mangel
  - Vitamin A-Mangel
  - andere Mangelerscheinungen

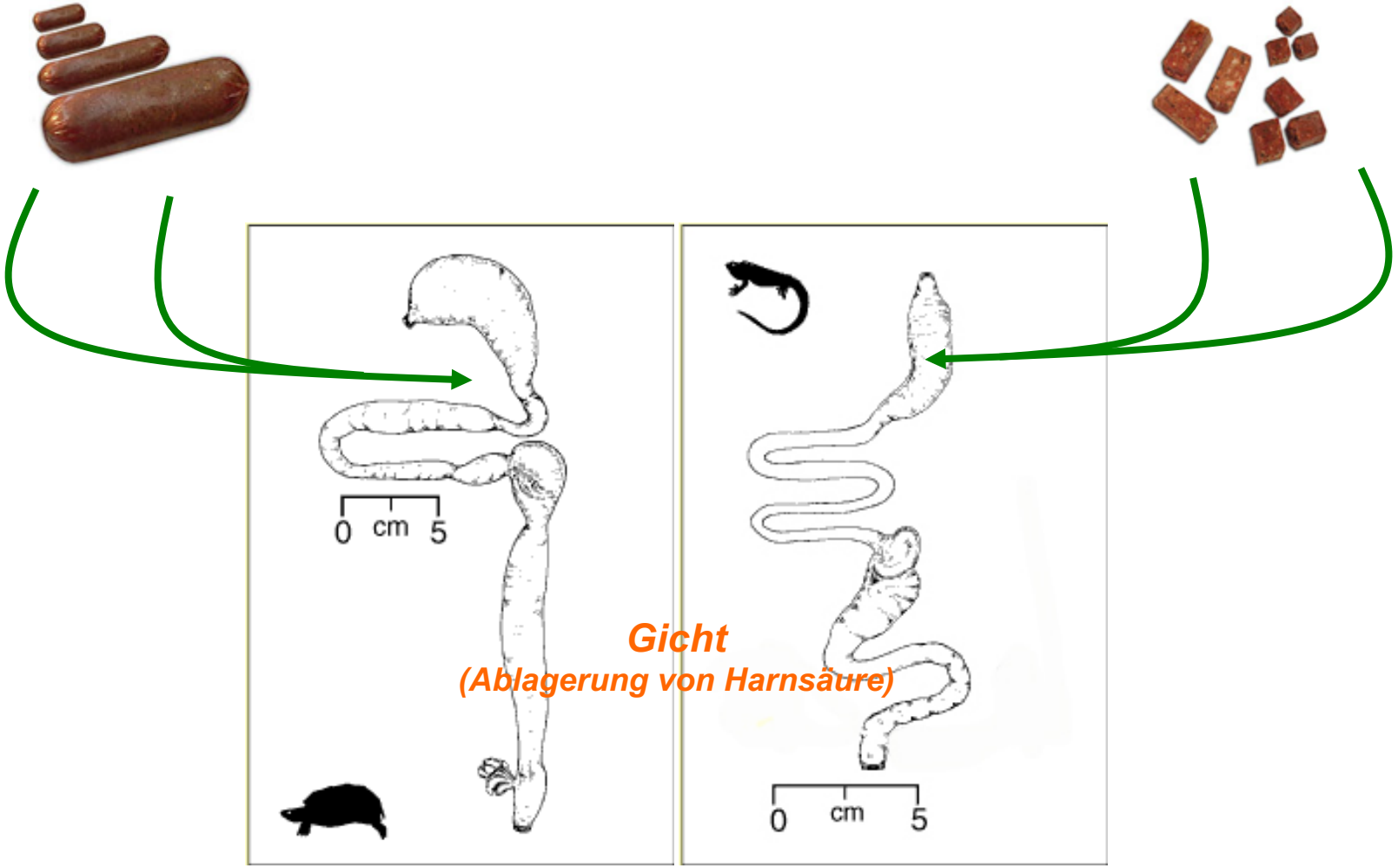
Reptilien - Gicht

Einsatz von Fleisch / ‘Katzenfutter’ bei Herbivoren



Stevens & Hume (1995)

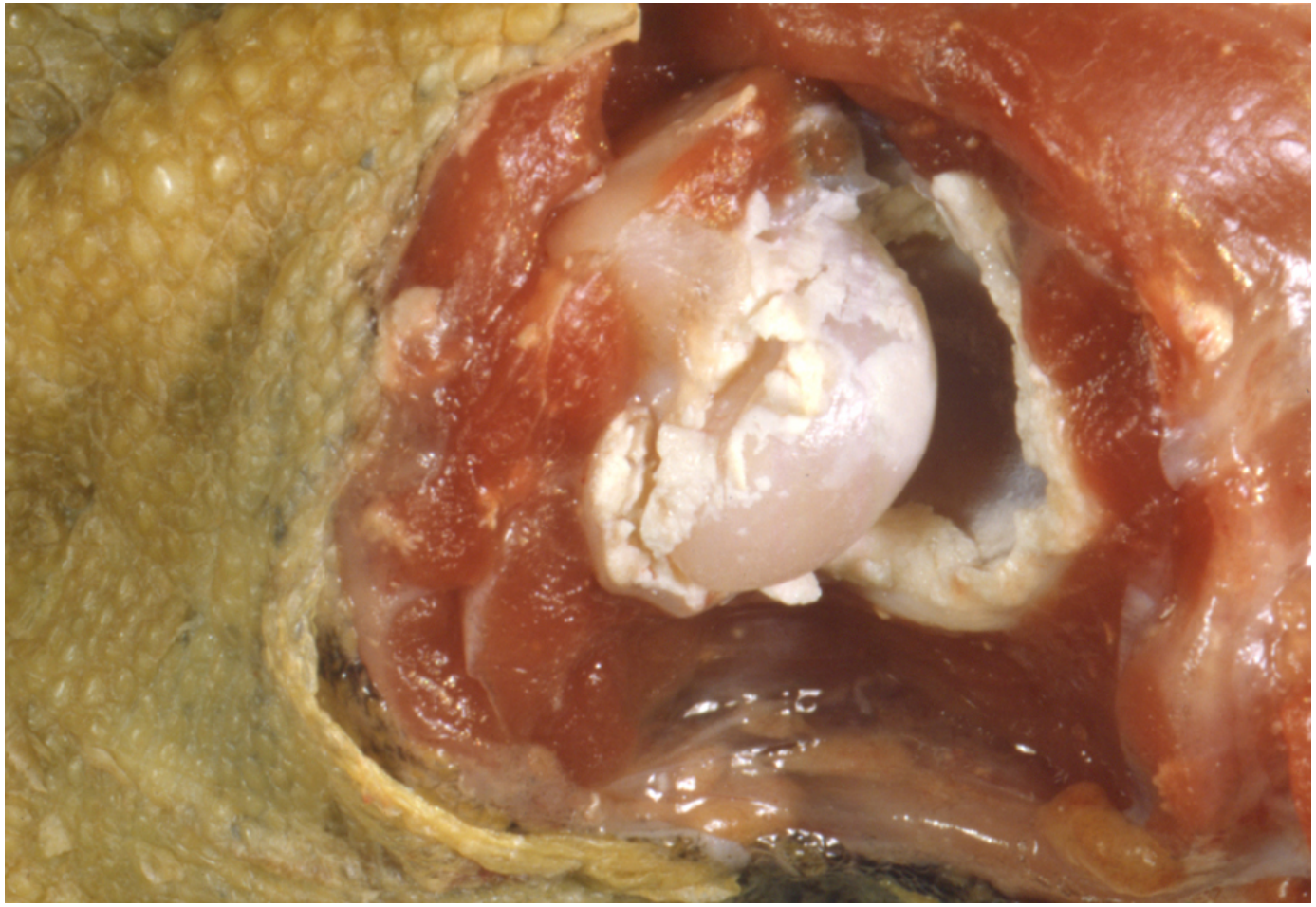
Einsatz von Fleisch / ‘Katzenfutter’ bei Herbivoren



Gicht
(Ablagerung von Harnsäure)

Stevens & Hume (1995)

Gicht



Hatt pers. comm.

Gicht

Hatt pers. comm.

Gicht

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Gicht

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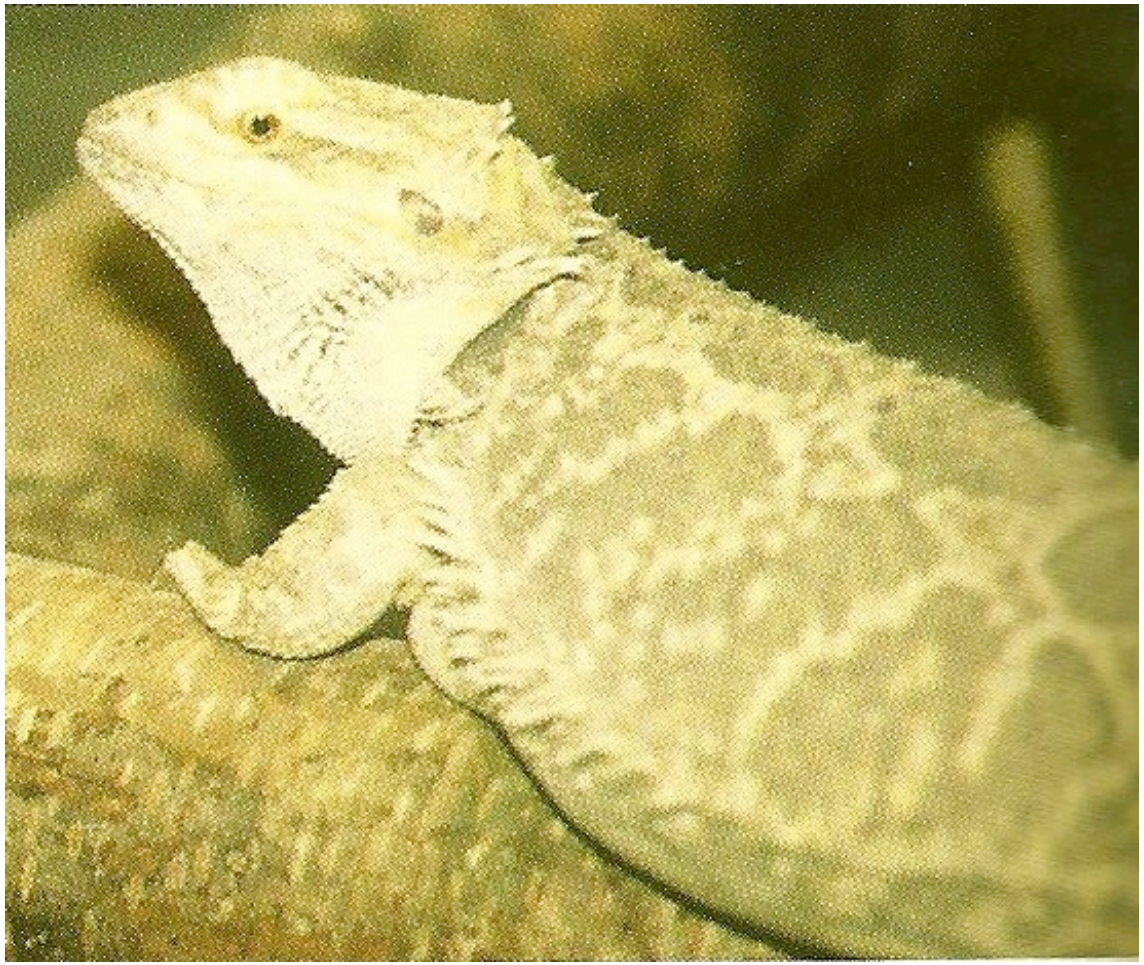
Reptilien & Ziervögel - Adipositas

Adipositas

Adipositas



Adipositas

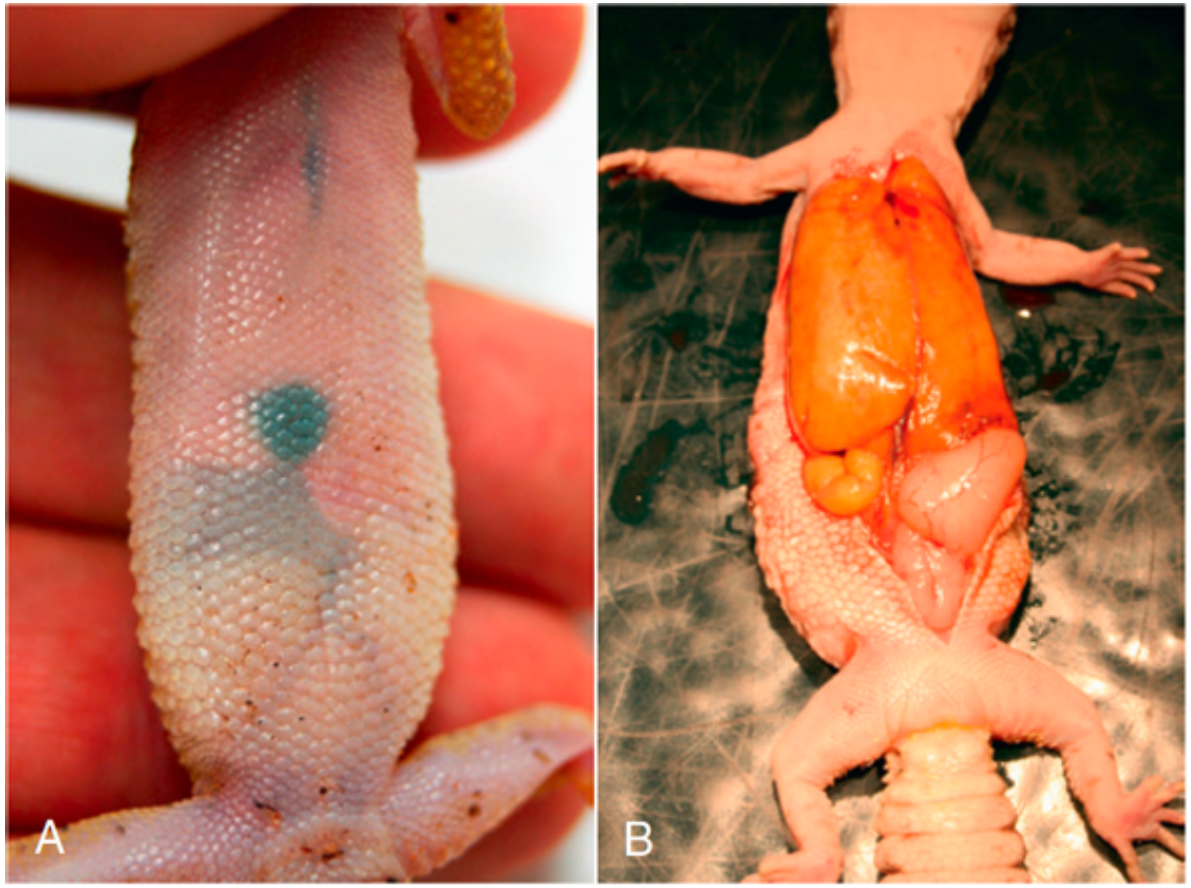
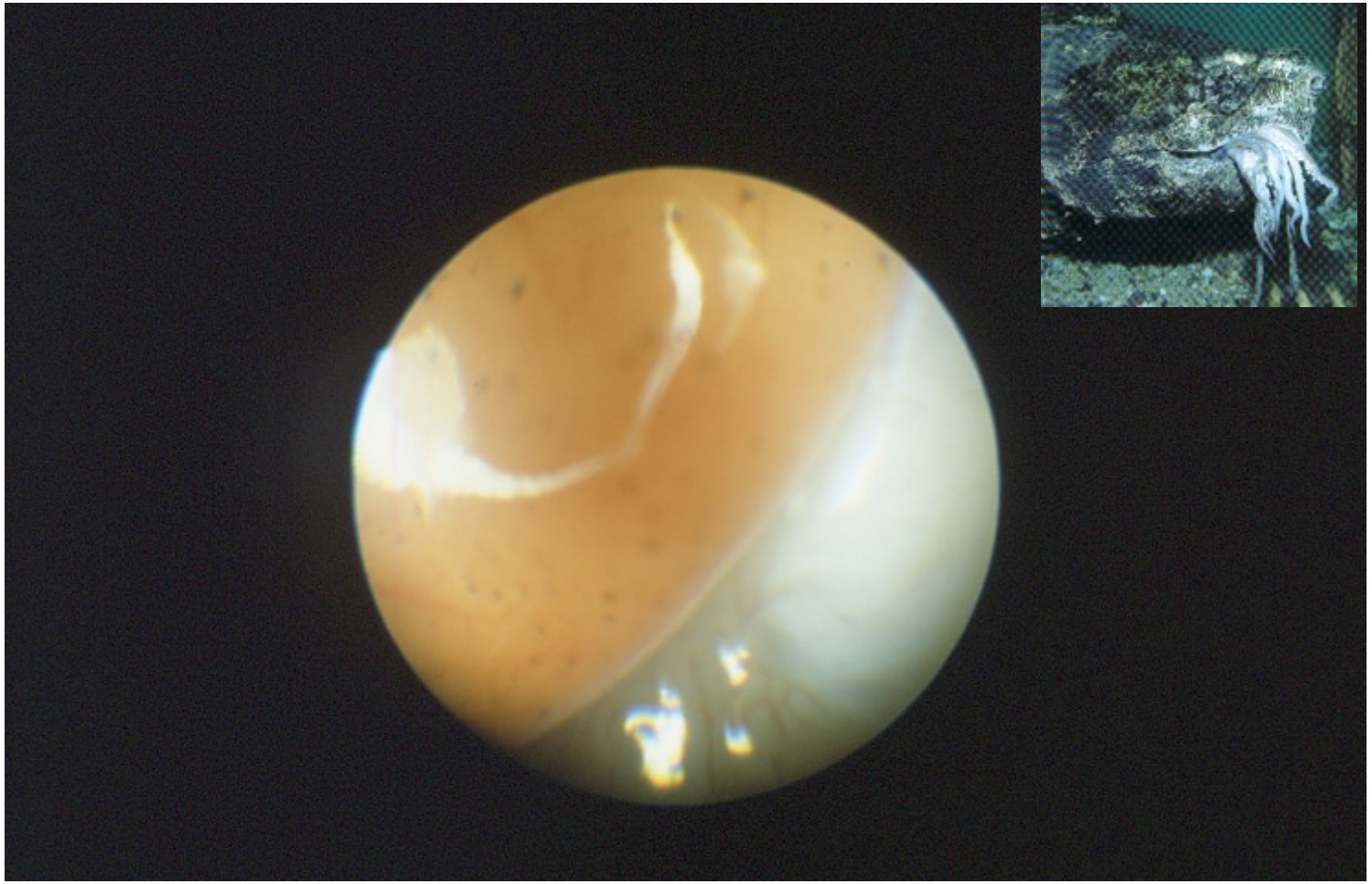


FIG 84.21 Hepatic lipidosis in leopard geckos (*Eublepharus macularius*) visible through ventrum (A) and at necropsy (B); note the dark green gall bladder in (A). (Courtesy of Thomas H. Boyer.)

Boyer & Scott (2019)

Adipositas

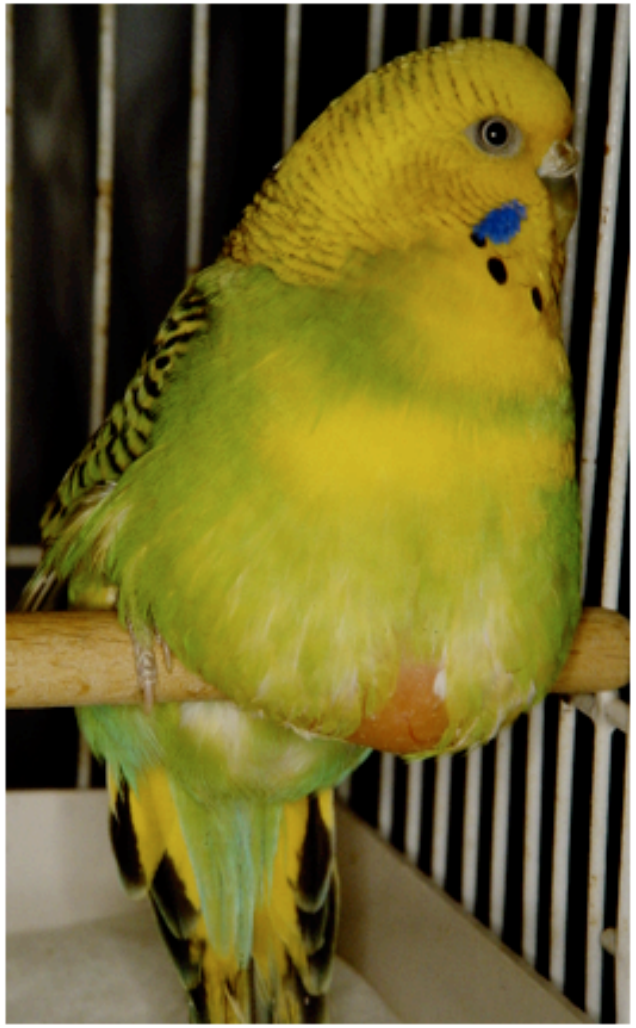


Adipositas

FIGURE 4-1 Delayed molt associated with obesity in a Green-cheeked amazon *(Amazona viridigenalis)*. Note the old, worn and blackened contour feathers. (Photo courtesy B. Speer.)

Koutsos et al. (2016)

Adipositas



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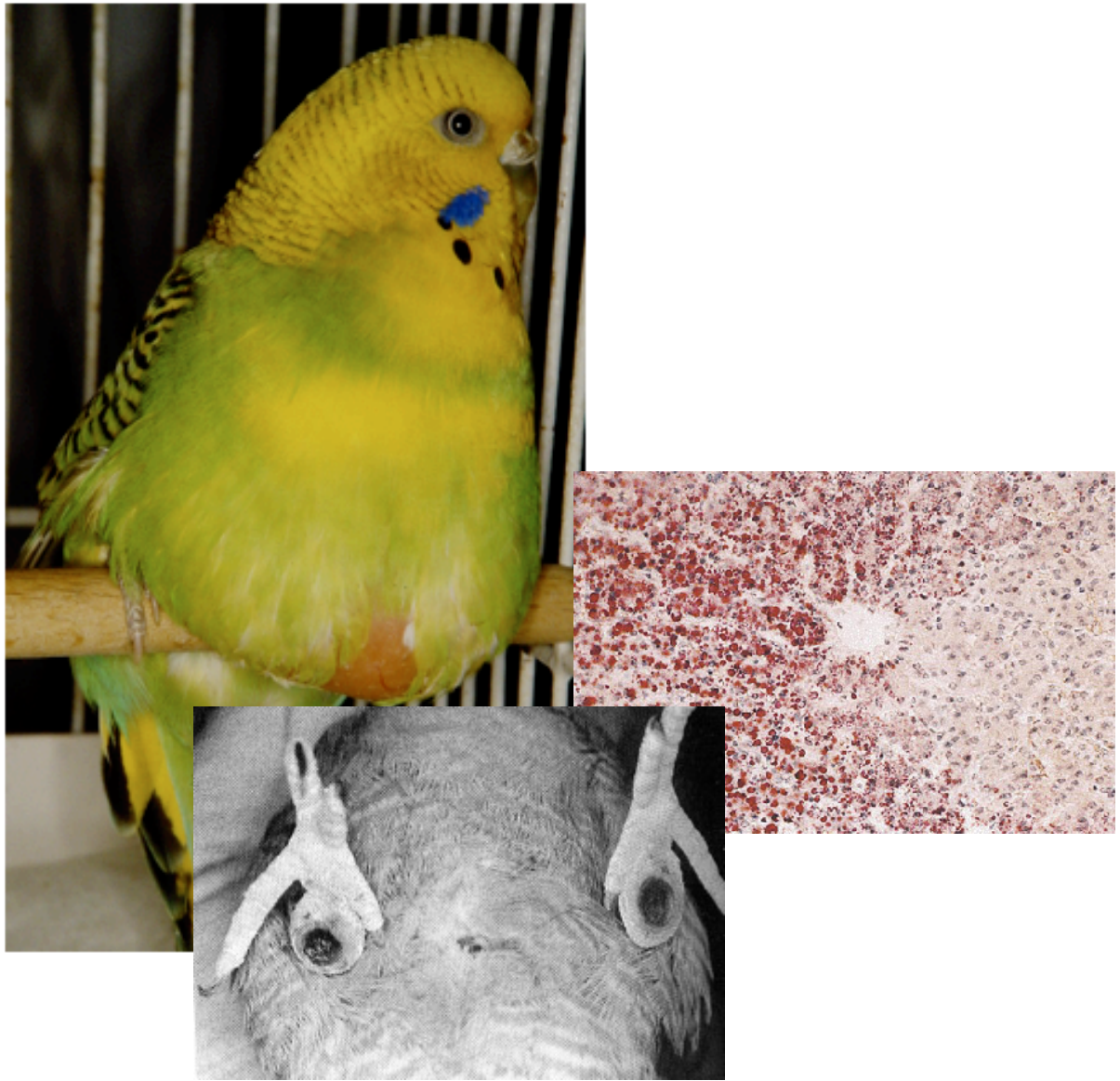
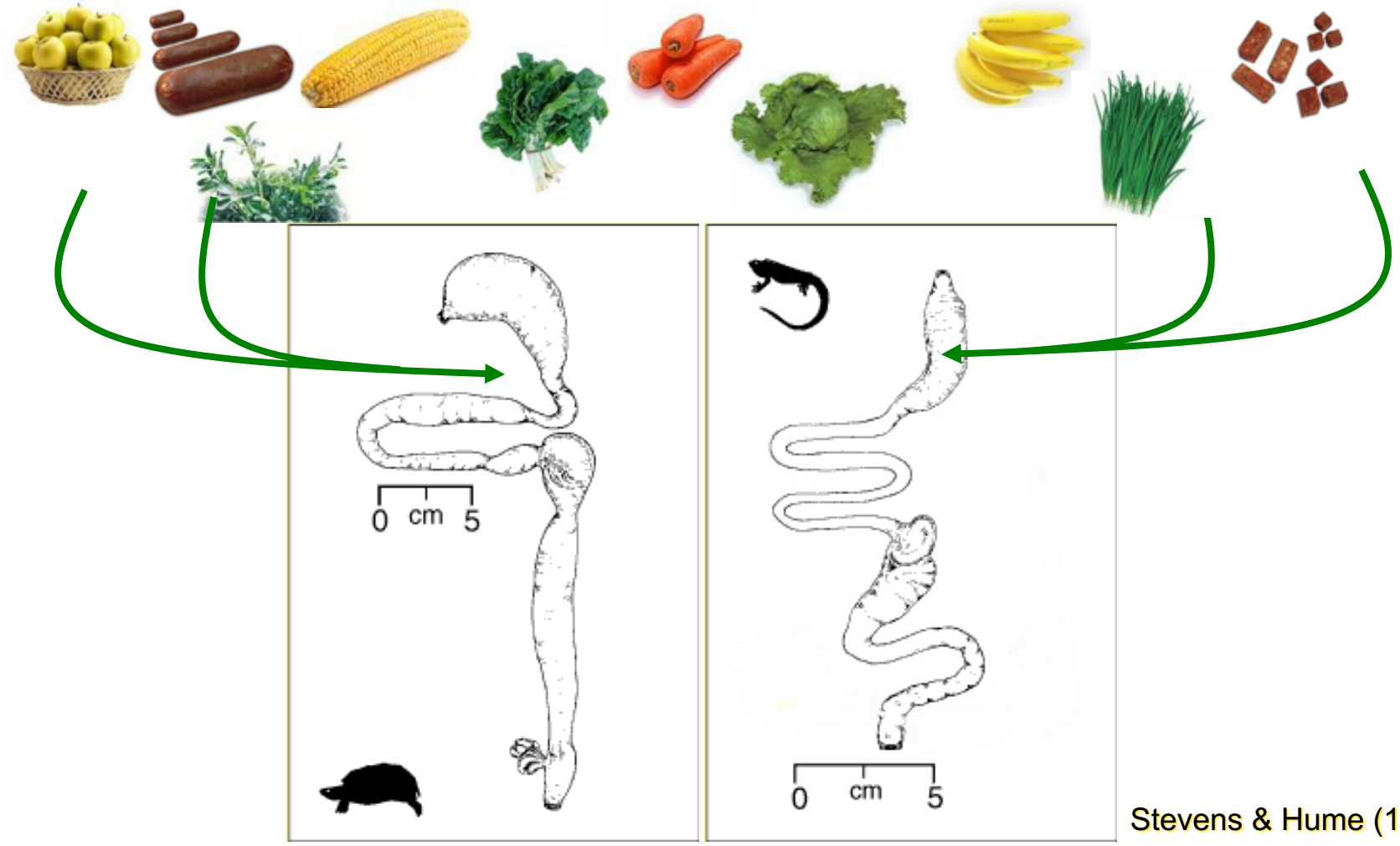
Adipositas



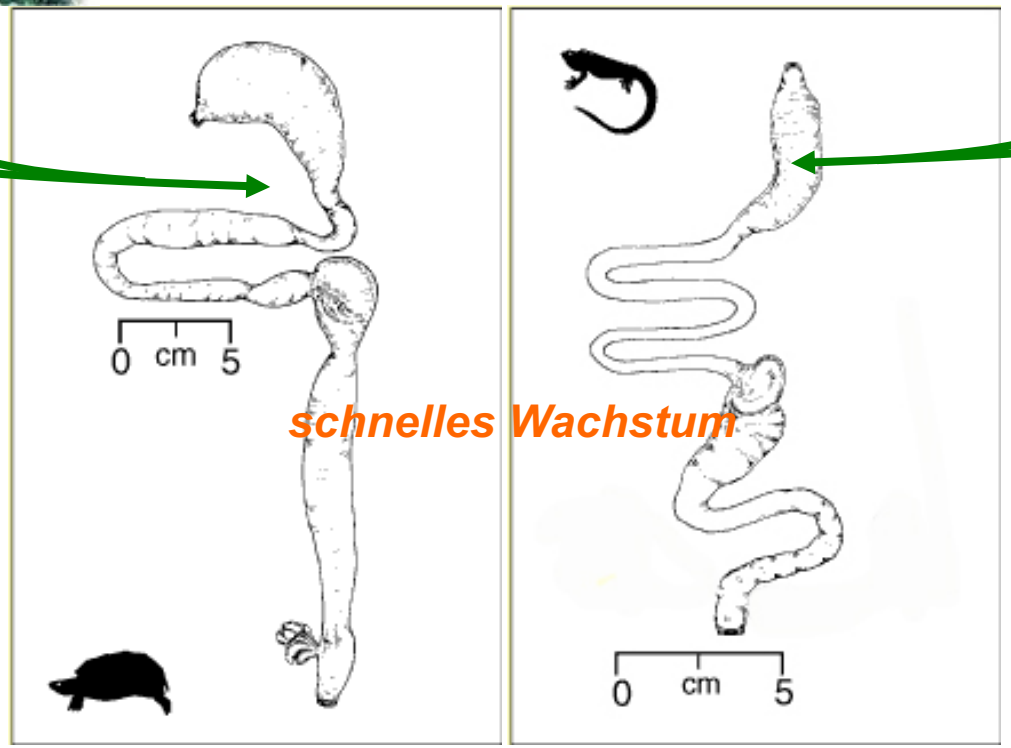
Reptilien - Wachstum

Fütterung mit energiedichten Futtermitteln oder unbegrenzte Mengen gut verdaulicher, adäquater Futtermittel



Stevens & Hume (1995)

Fütterung mit energiedichten Futtermitteln oder unbegrenzte Mengen gut verdaulicher, adäquater Futtermittel

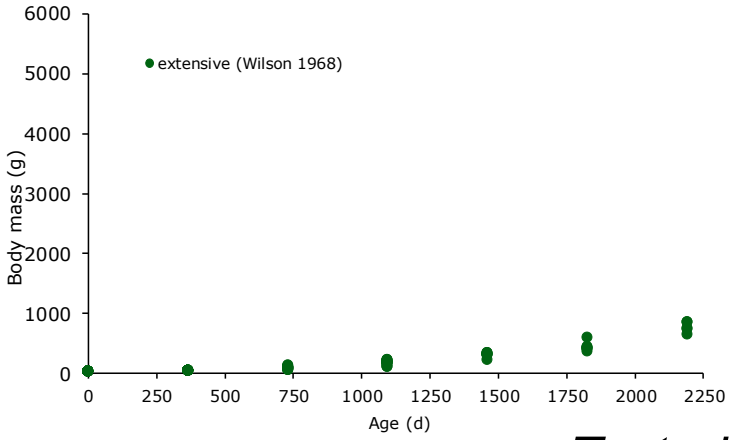


schnelles Wachstum

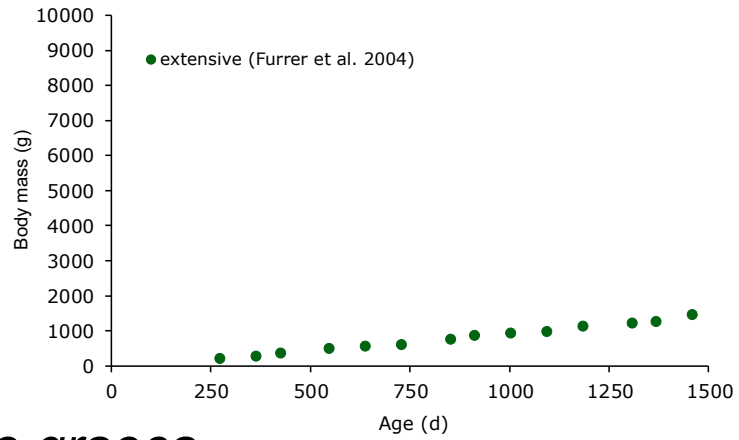
Stevens & Hume (1995)

Wachstum bei Schildkröten

Geochelone pardalis

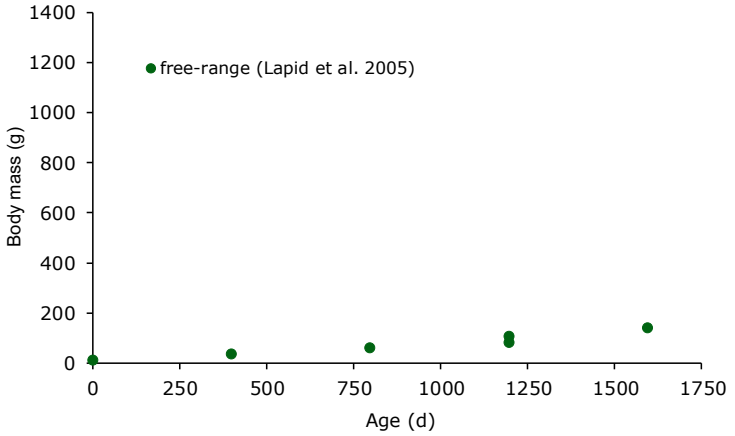


Geochelone nigra



- extensive or free-range

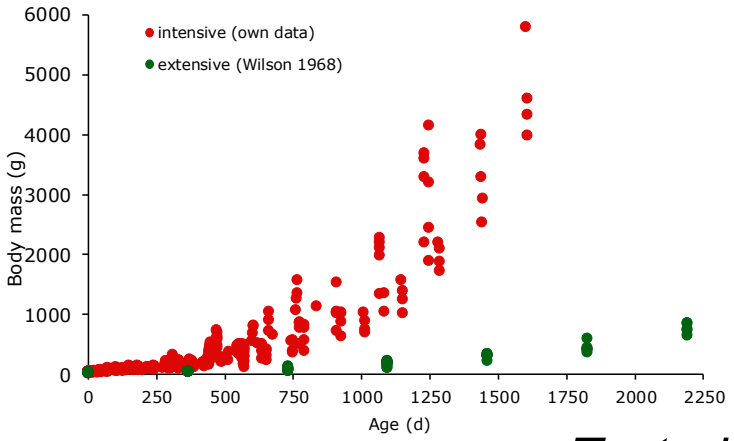
Testudo graeca



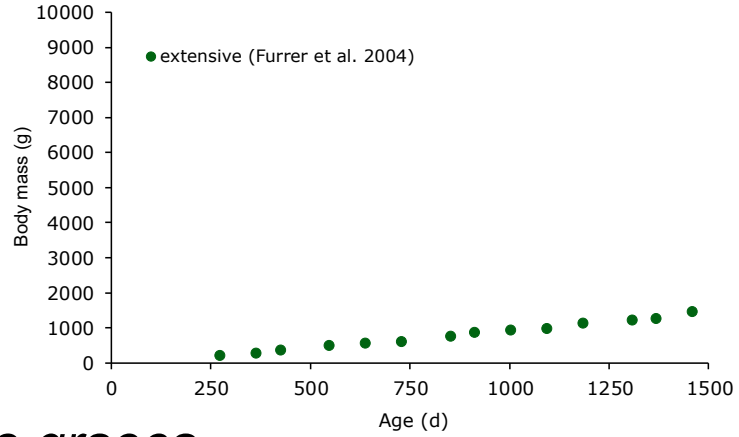
Ritz et al. (2010ab, 2012)

Wachstum bei Schildkröten

Geochelone pardalis

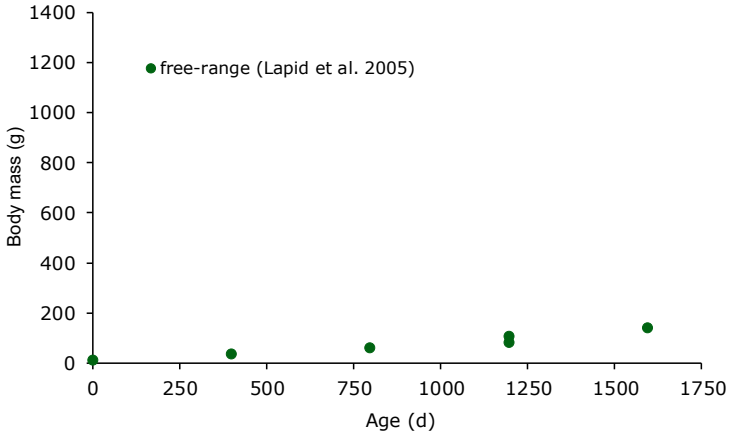


Geochelone nigra



Testudo graeca

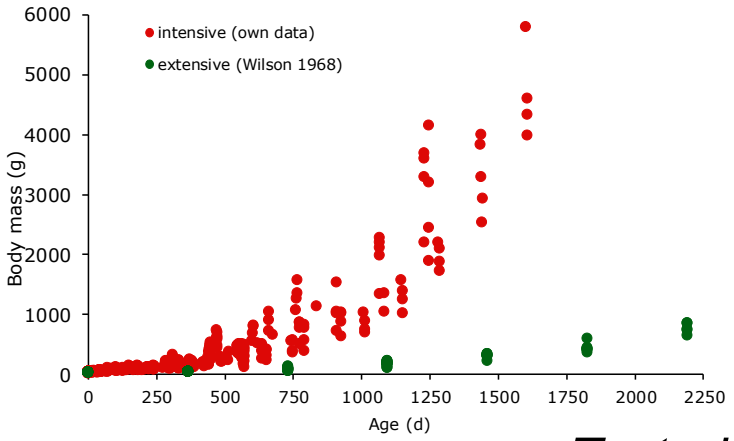
- extensive or free-range
- intensive



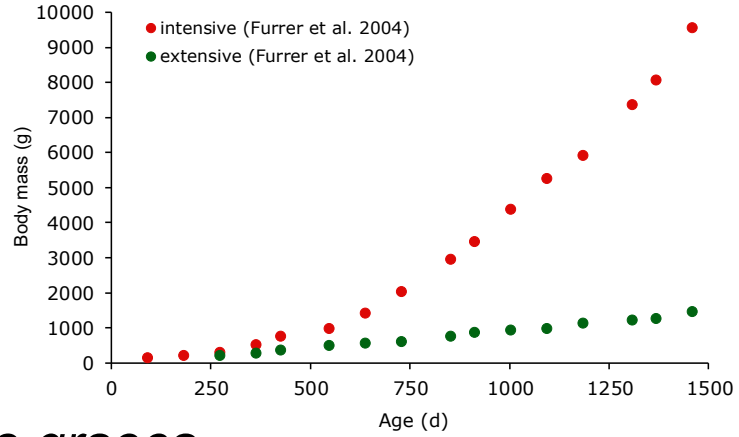
Ritz et al. (2010ab, 2012)

Wachstum bei Schildkröten

Geochelone pardalis

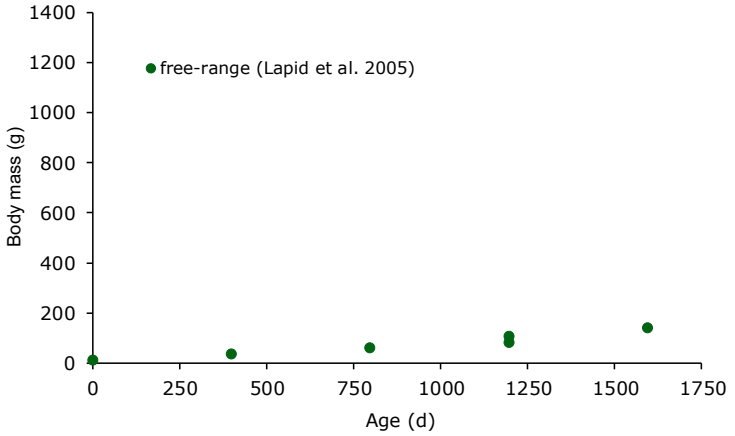


Geochelone nigra



Testudo graeca

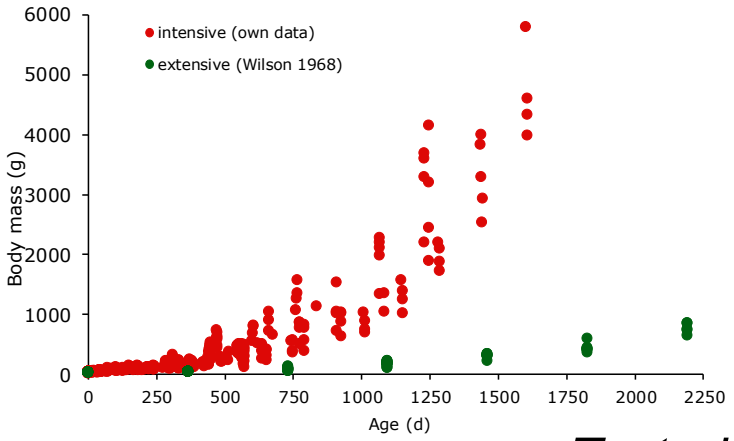
- extensive or free-range
- intensive



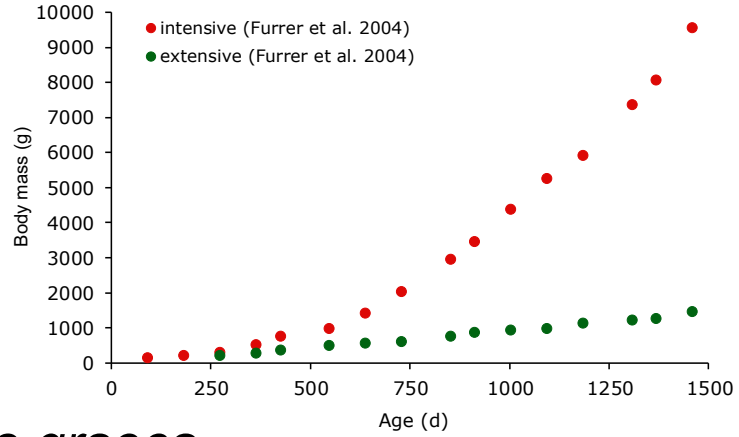
Ritz et al. (2010ab, 2012)

Wachstum bei Schildkröten

Geochelone pardalis



Geochelone nigra



Testudo graeca

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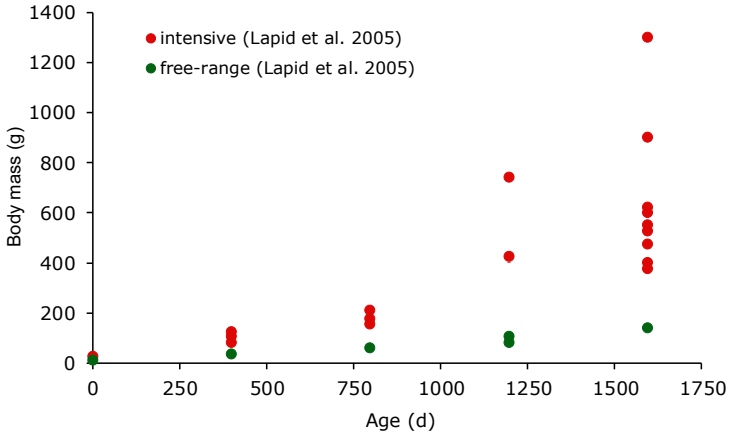
- intensive



Ritz et al. (2010ab, 2012)

Wachstum bei Schildkröten

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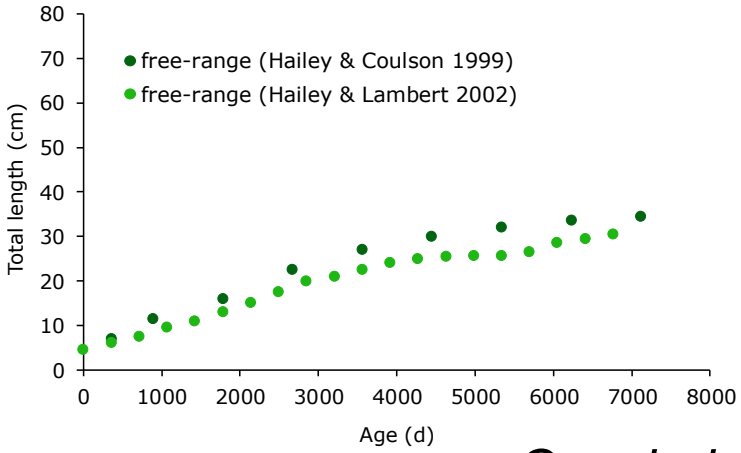
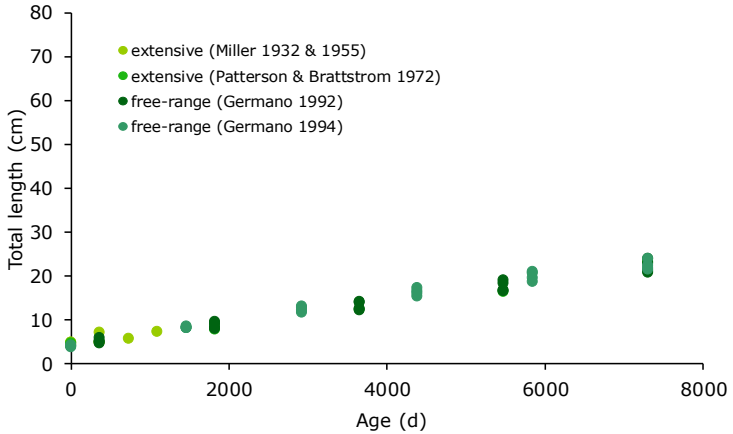
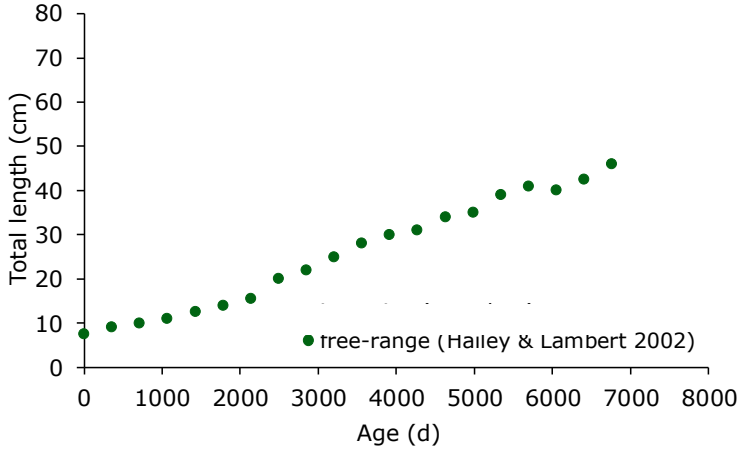


Gopherus agassizi



- extensive or free-range

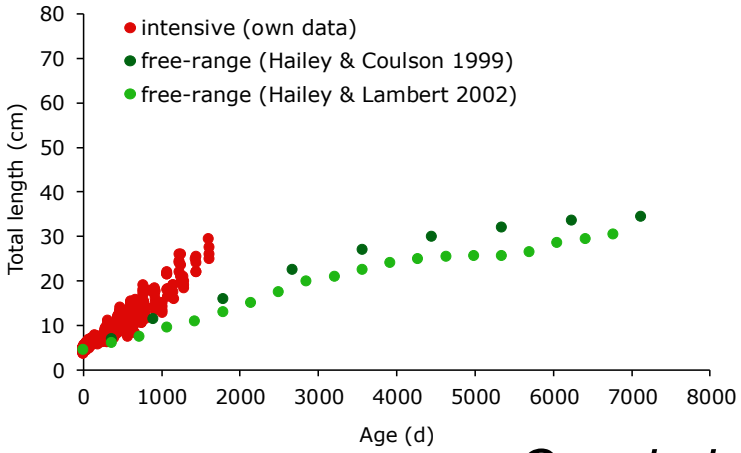
Geochelone sulcata



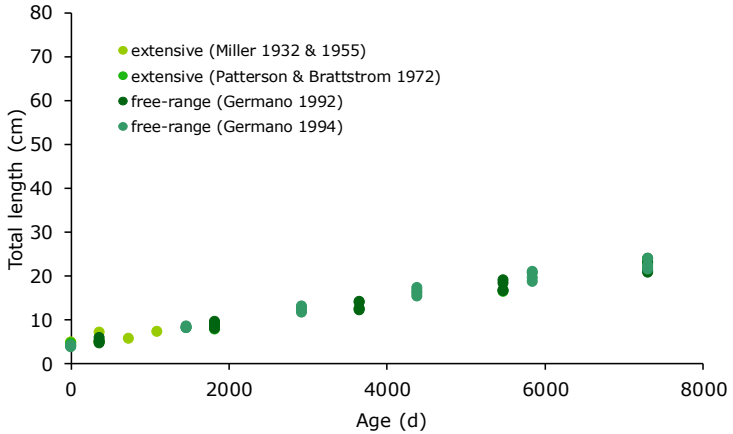
Ritz et al. (2010ab, 2012)

Wachstum bei Schildkröten

Geochelone pardalis

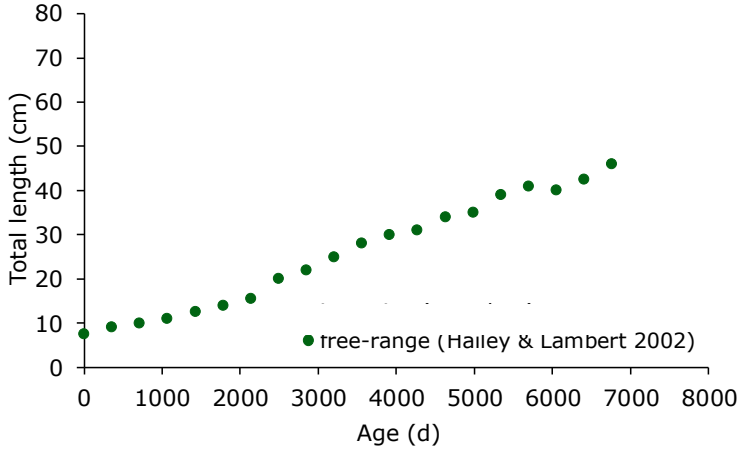


Gopherus agassizi



- extensive or free-range
- intensive

Geochelone sulcata



Ritz et al. (2010ab, 2012)

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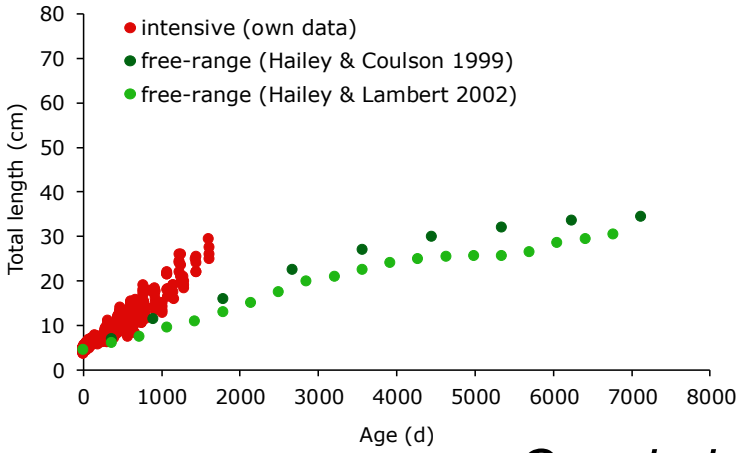
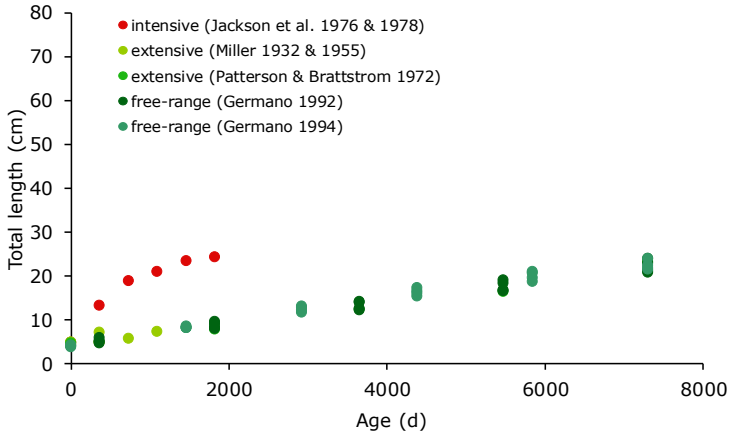


Gopherus agassizi



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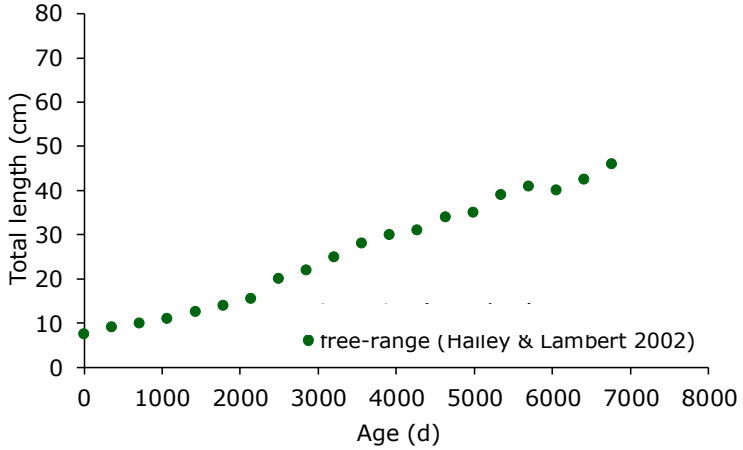
Geochelone sulcata



Ritz et al. (2010ab, 2012)

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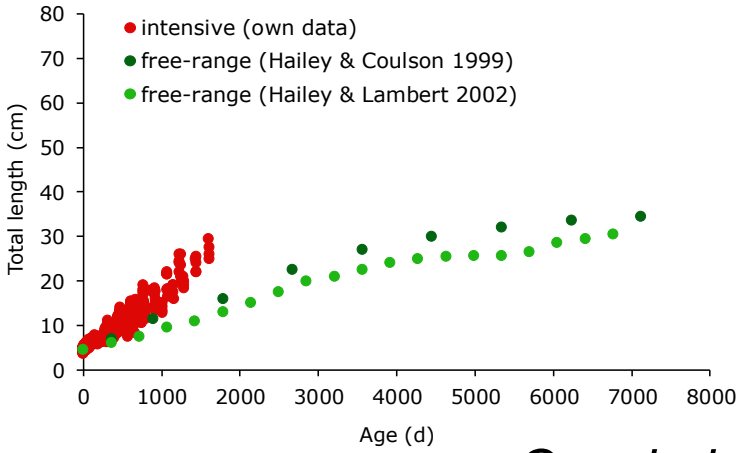

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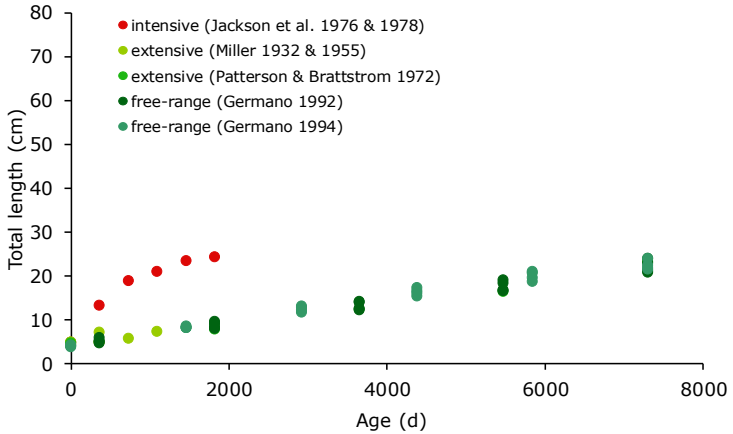
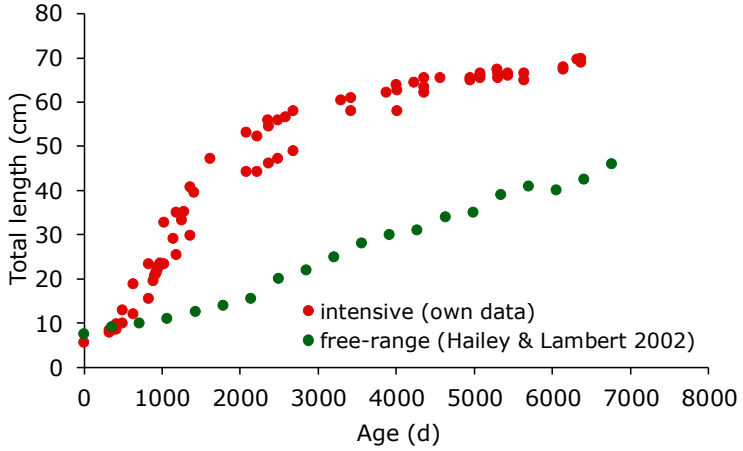


- extensive or free-range
- intensive

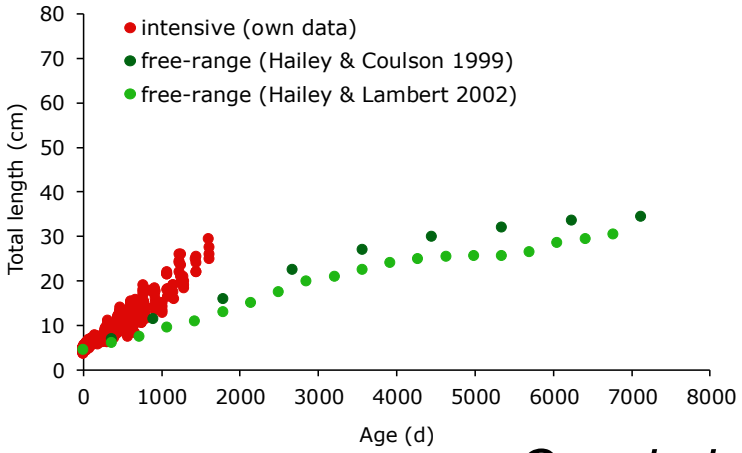
Geochelone sulcata



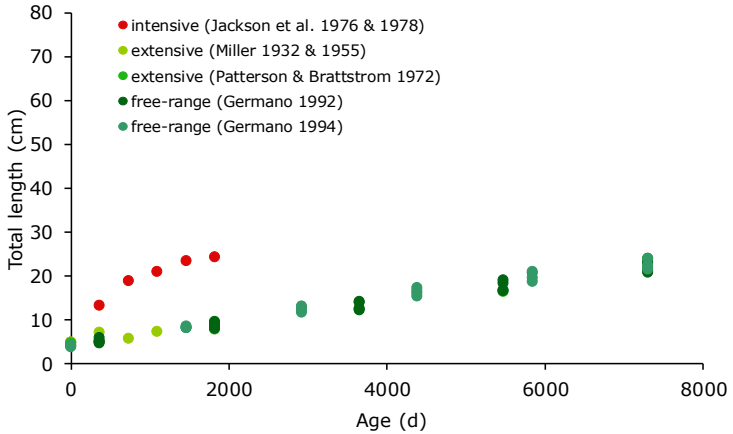
Ritz et al. (2010ab, 2012)

Wachstum bei Schildkröten

Geochelone pardalis



Gopherus agassizi



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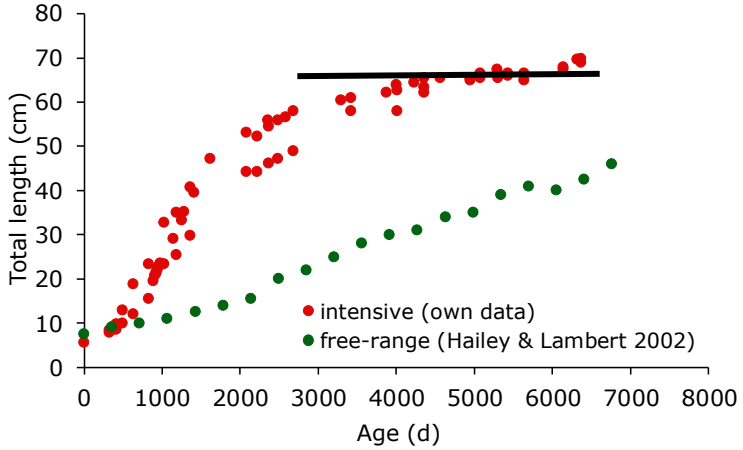
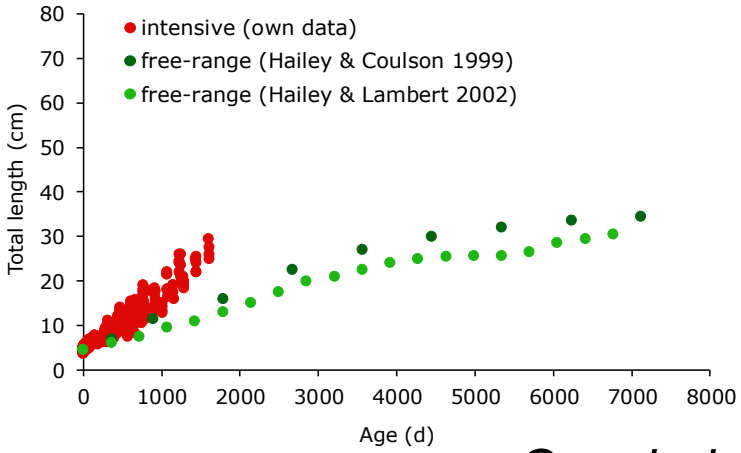
Geochelone sulcata



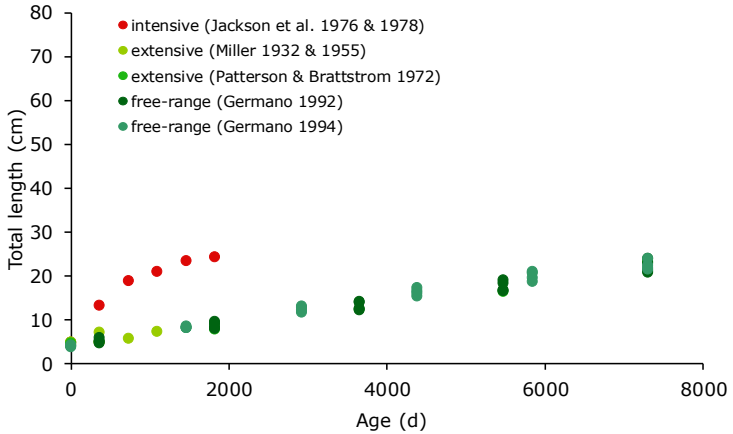
Ritz et al. (2010ab, 2012)

Wachstum bei Schildkröten

Geochelone pardalis



Gopherus agassizi



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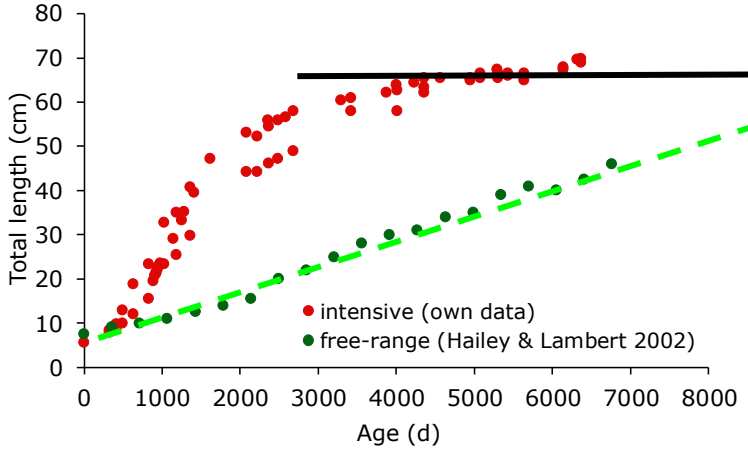
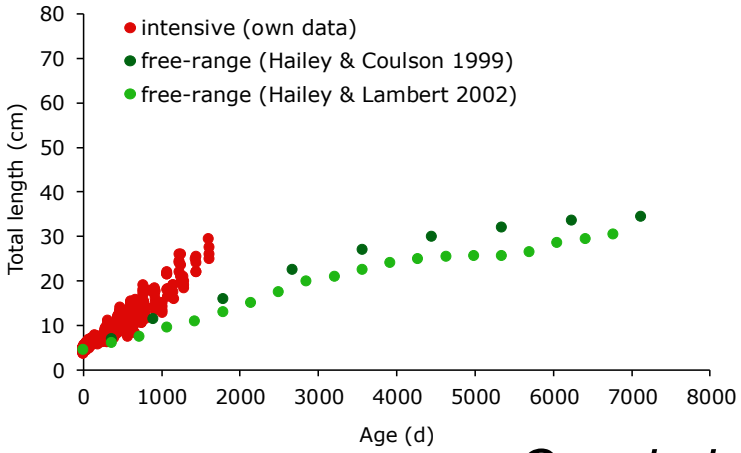
Geochelone sulcata



Ritz et al. (2010ab, 2012)

Wachstum bei Schildkröten

Geochelone pardalis



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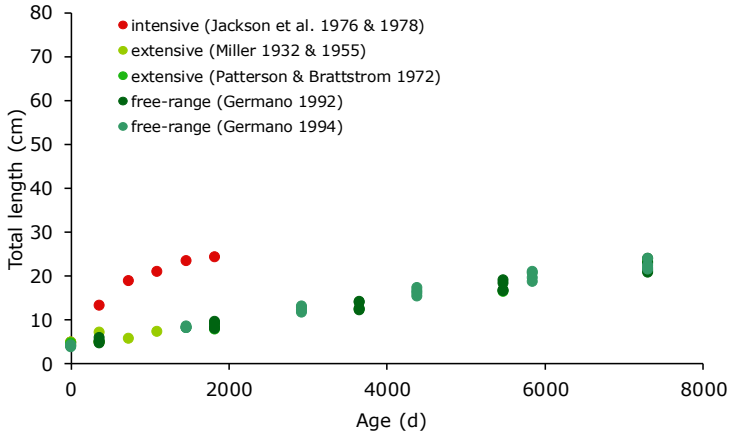

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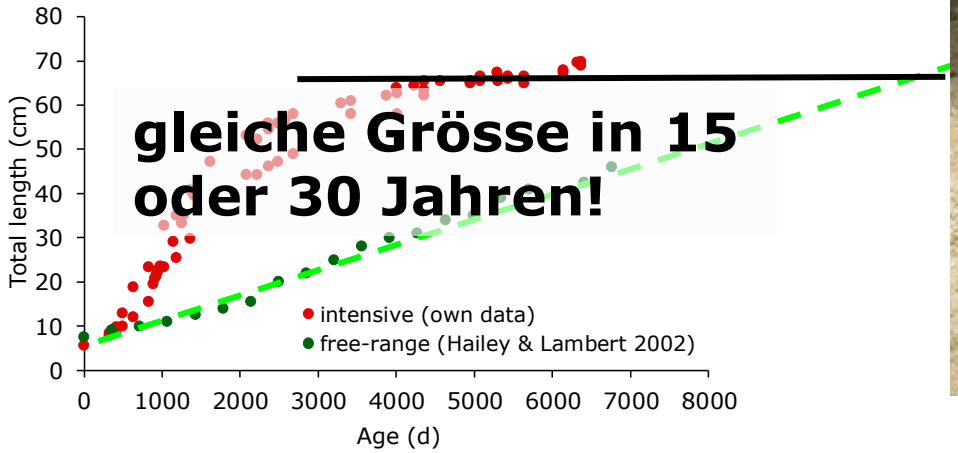
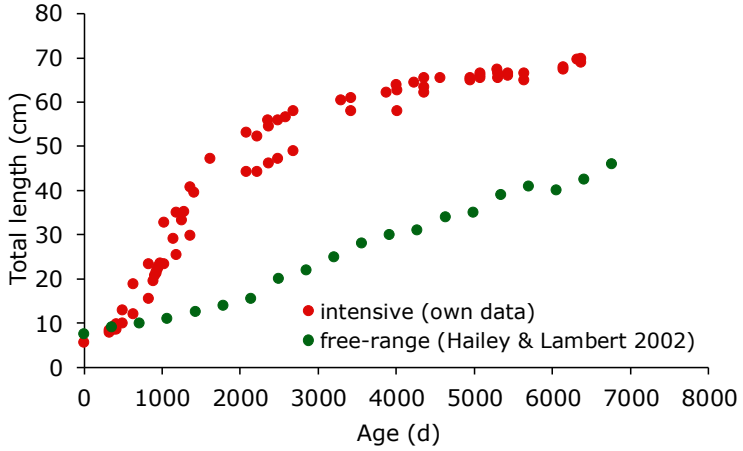


Ritz et al. (2010ab, 2012)

Ist schnelles Wachstum ein Problem ?

- extensive or free-range
- intensive

Geochelone sulcata



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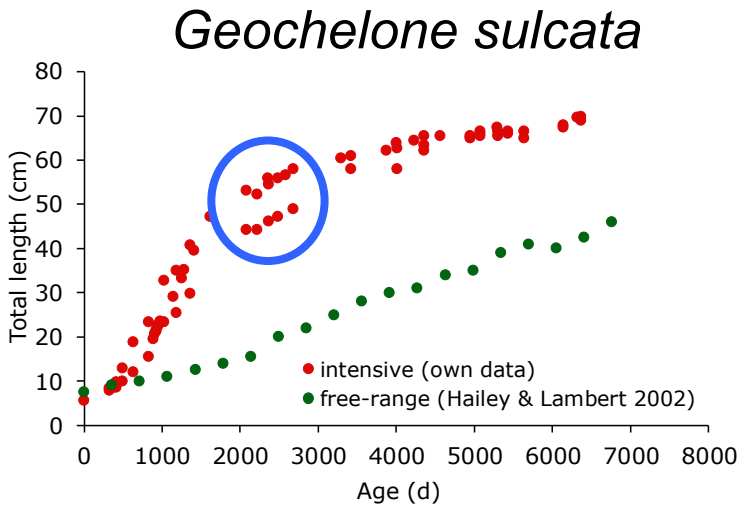

Ritz et al. (2010ab, 2012)

Ist schnelles Wachstum ein Problem ?

Geochelone sulcata

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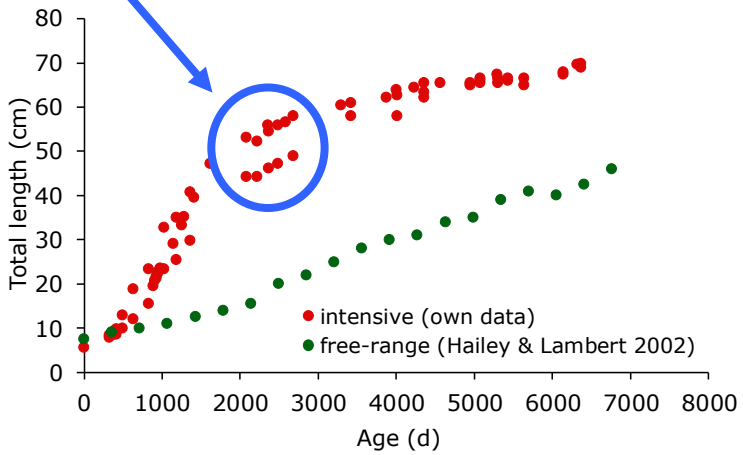
- intensive



Ritz et al. (2010ab, 2012)

Reptilien - Pyramidenwachstum

Ist schnelles Wachstum ein Problem ?
Hat es etwas mit der Panzerform zu tun ?

Ist schnelles Wachstum ein Problem ?
Hat es etwas mit der Panzerform zu tun ?

Ist schnelles Wachstum ein Problem ?
Hat es etwas mit der Panzerform zu tun ?

Wegehaupt (2012)

‘Pyramidenwachstum’

———, R. W. McDiarmid, and D. L. Weigmann. 1975. Tadpoles, predation and pond habitats in the tropics. Biotropica 7:100–111.

Rivero, J. A., and A. E. Esteves. 1969. Observations on the agonistic and breeding behavior of *Leptodactylus pentadactylus* and other amphibian species in Venezuela. Breviora (321):1–14.

Venton, K. W. 1951. Observations on the life history of *Leptodactylus pentadactylus*. Herpetologica 7:73–75.

Received: 6 October 1975
Accepted: 27 February 1976
(Full page charges borne by authors)

Amphibians and Reptiles, Smithsonian Institution, Washington, D.C. 20560, USA

ACCELERATED GROWTH RATE AND EARLY MATURITY IN *GOPHERUS AGASSIZI* (REPTILIA: TESTUDINES)

Crawford G. Jackson, Jr., John A. Trotter, Thomas H. Trotter and Mary W. Trotter

Abstract: A group of sibling desert tortoises (*Gopherus agassizi*) were measured at hatching and at intervals afterwards for 3 years. Extraordinary mean increases in carapace length of 176% (156.3%–226%), 43% (39%–48%), and 11% (10%–13%) were observed for the first 3 years of growth, respectively. Mean carapace lengths at the end of the 1st, 2nd, and 3rd years corresponded approximately with those of *G. agassizi* measured previously by other investigators after 11, 17, and 18 years of growth, posthatching. The weight and length relationship is described by a geometric type curve whose equation is: wt (grams) = 0.00049 × carapace length$^{3.166}$. All tortoises appear to be ♂♂ at or very near sexual maturity as judged by gular development, tail size, enlarged chin glands, and increasing aggressiveness. The phenomenal growth rate and early maturity is ascribed to (1) not entering dormancy during the first two winters, and (2) being provided with continuous high quality nutrition.

It is generally accepted by herpetologists that many turtle species (especially terrestrial forms) have relatively slow growth rates, often requiring a number of years to reach sexual maturity.

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Received: 6 October 1975
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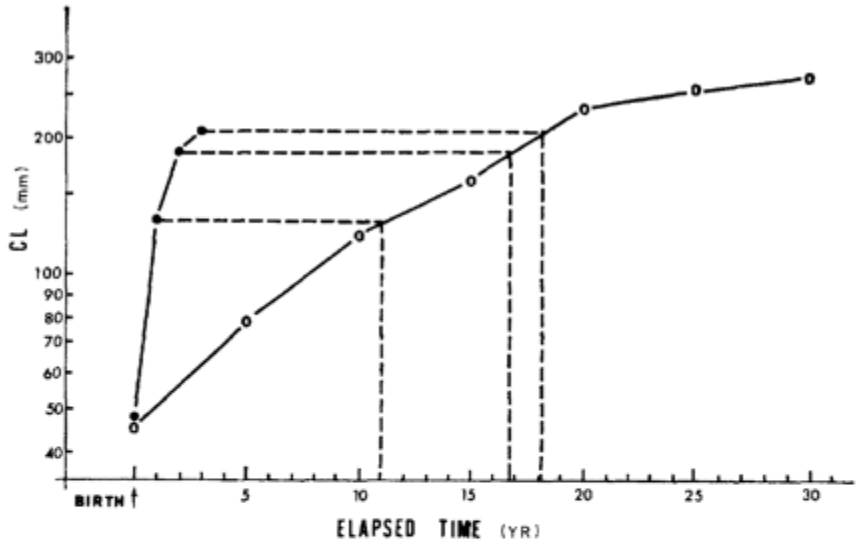

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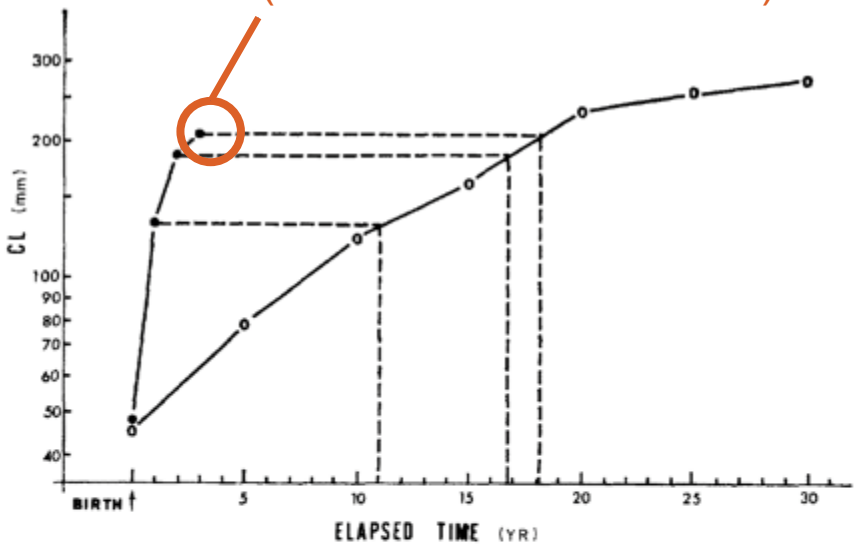

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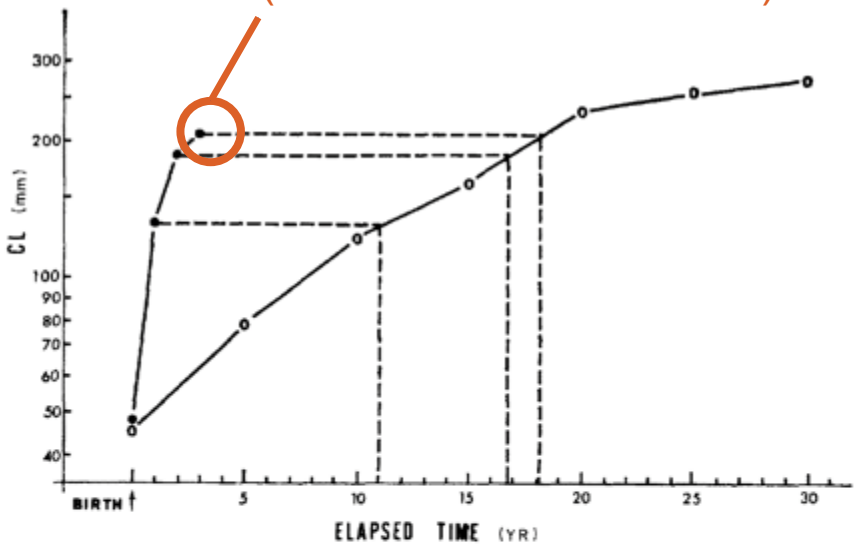

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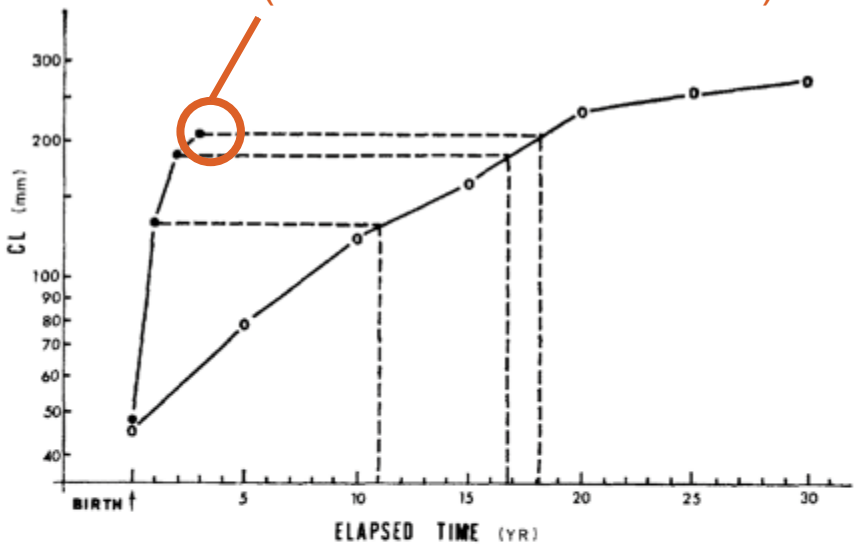

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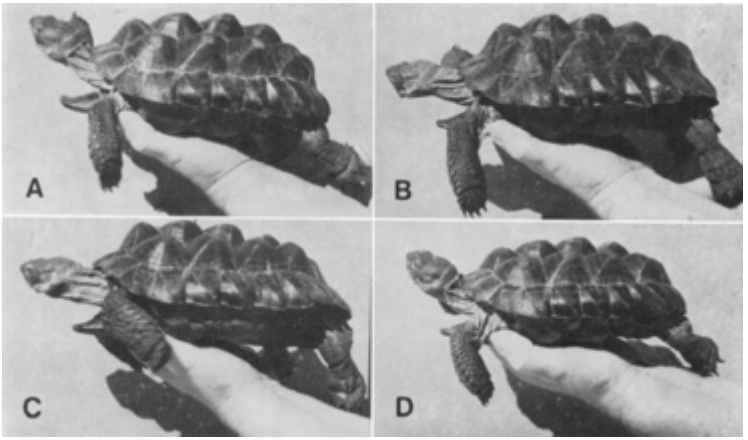

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Key words: Carapacial scute pyramiding; chelonian; deformity; pyramidal growth syndrome; shell; temperature

The order Chelonia is unique in the animal kingdom based on possession of an external shell composed of the dorsal carapace, the intermediate bridge, and the ventral plastron. Furthermore, chelonians are the only vertebrates whose limbs exist deep to their ribs. Shell growth is manifested via dynamics lacking in other vertebrates. Developmentally, the ribs become associated with carapacial dermis that eventually becomes the bony part of the shell. The vertebral neural arches are also incorporated in the shell at the carapacial midline.[1] Epidermal scutes are formed long before ossification of the dermal layer of the shell.[1] Although ossification of the ribs begins embryologically, dermal plates of the carapace do not ossify until after hatch. Complete ossification of the carapace may take several years in captive-raised tortoises (Heinrich ML, unpublished data). Despite lack of a congruency between epidermal scutes and dermal bony plates, the dermal layer is thought to play a major role in epidermal scute formation.[1]

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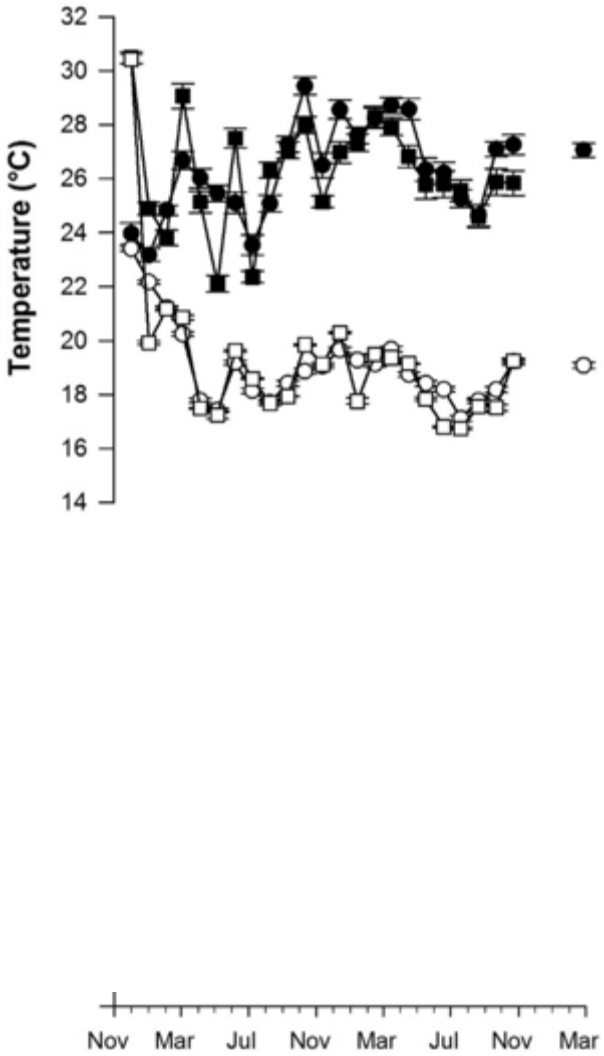

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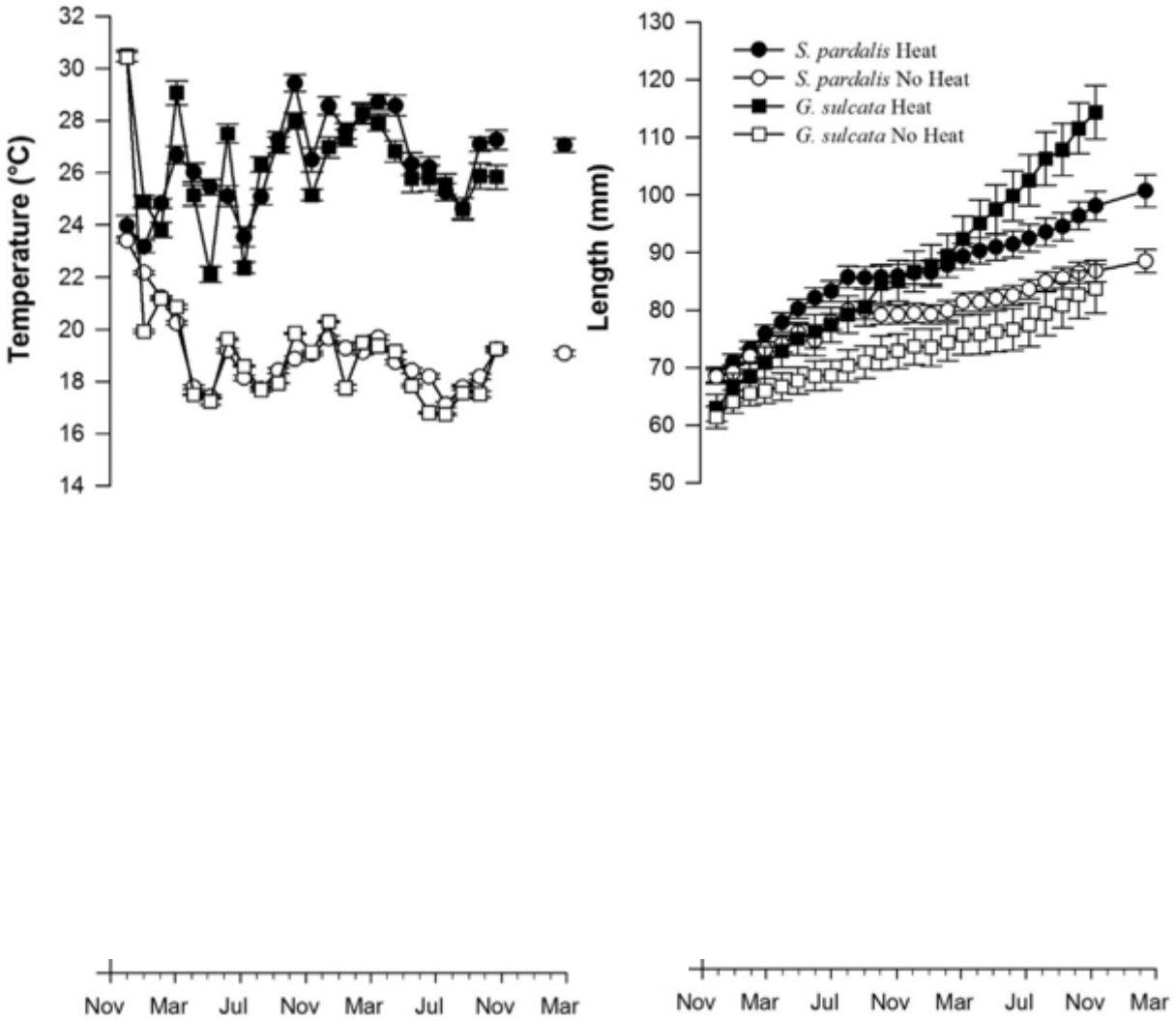

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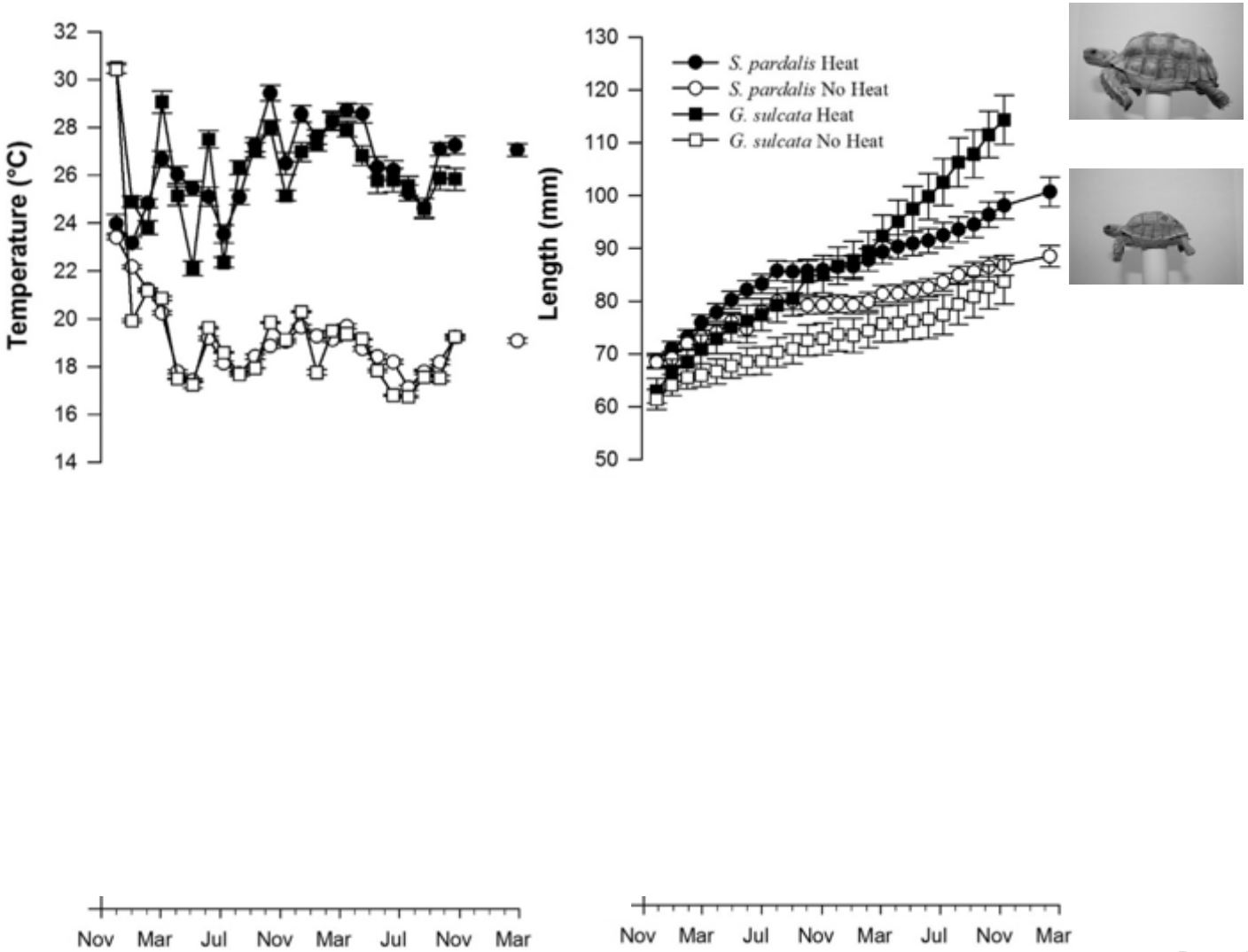

‘Pyramidenwachstum’

RESEARCH

EFFECT OF SUPPLEMENTAL HEAT IN CAPTIVE AFRICAN LEOPARD TORTOISES (*STIGMOCHELYS PARDALIS*) AND SPURRED TORTOISES (*CENTROCHELYS SULCATA*) ON GROWTH RATE AND CARAPACIAL SCUTE PYRAMIDING

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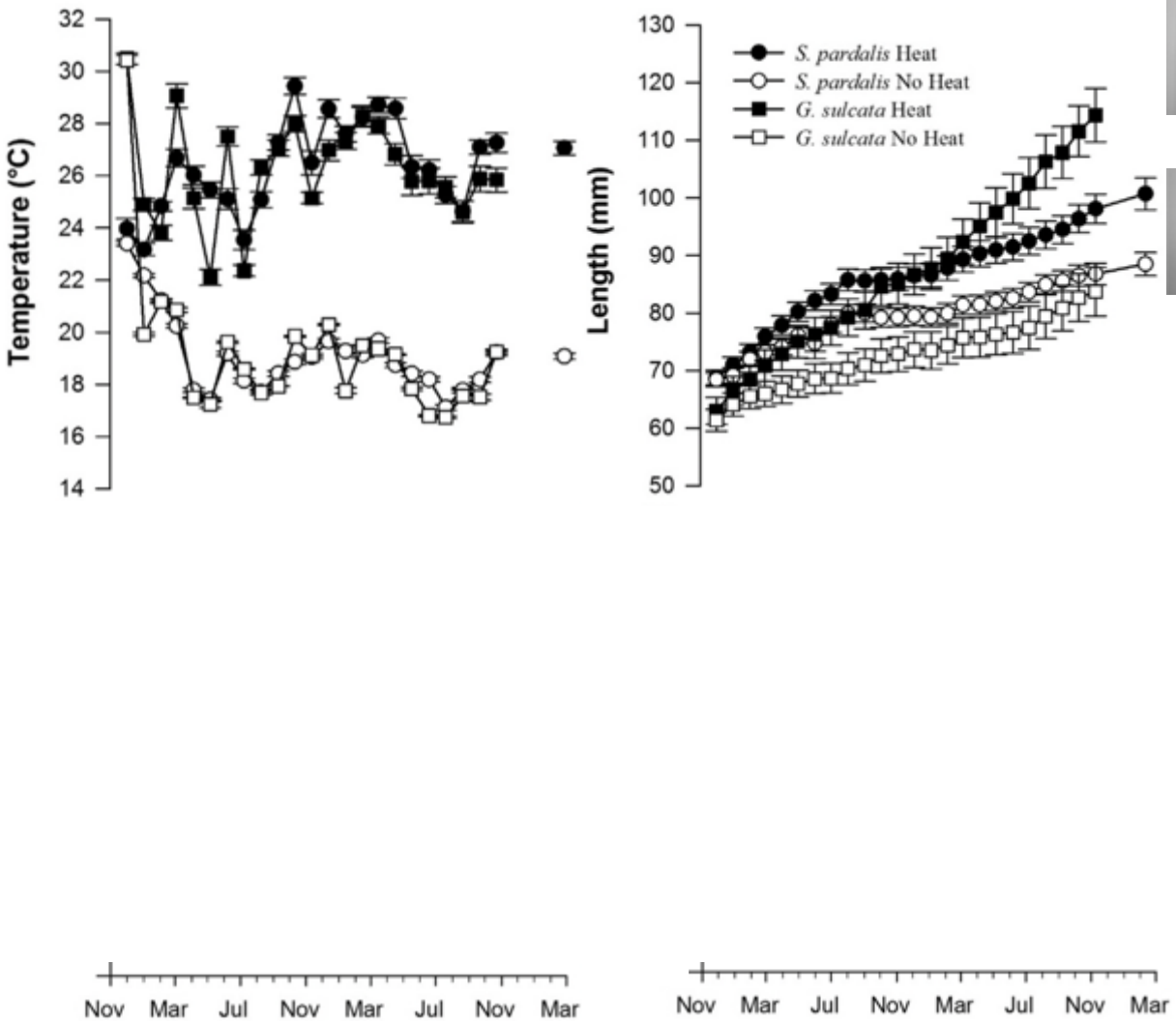

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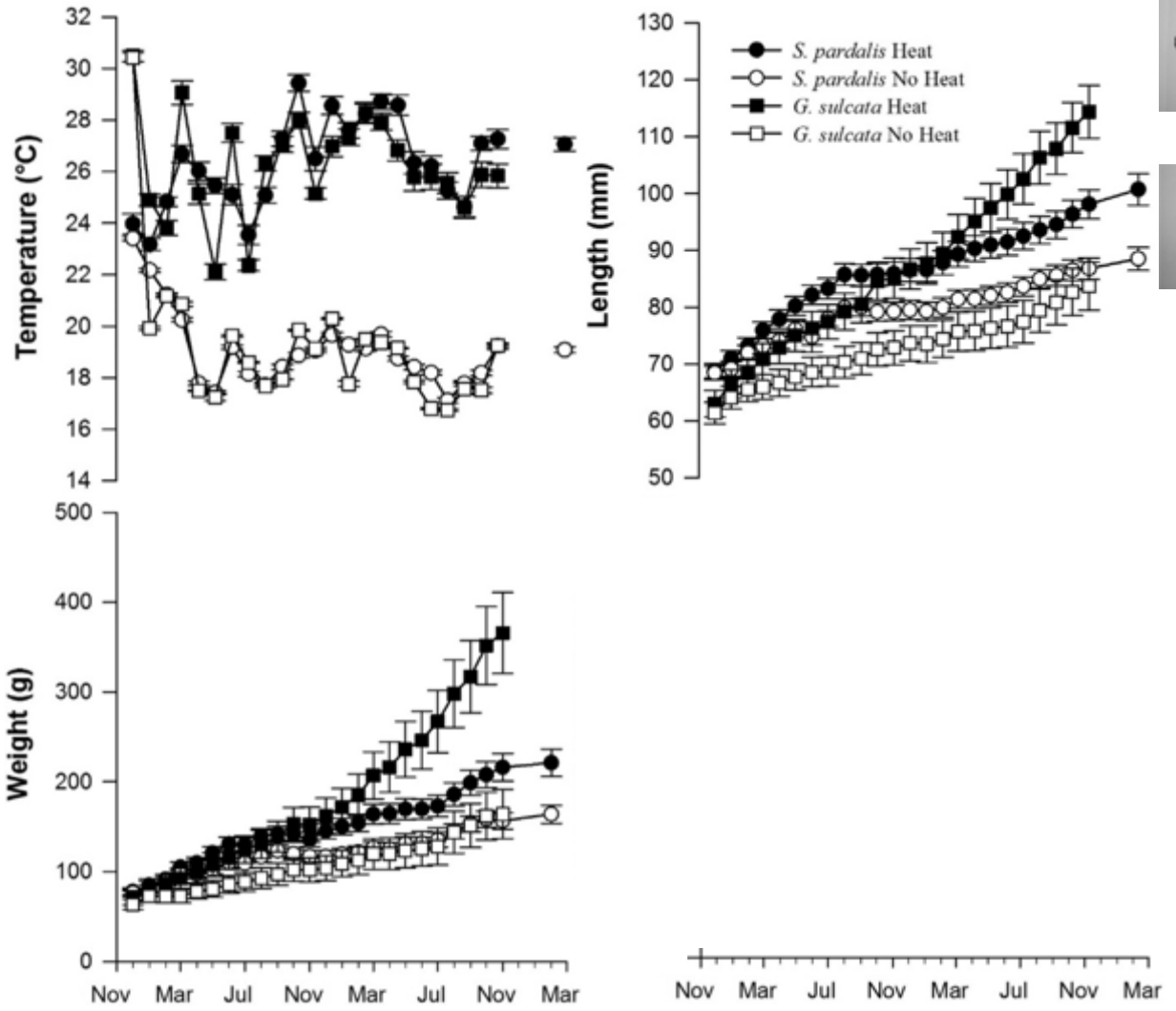

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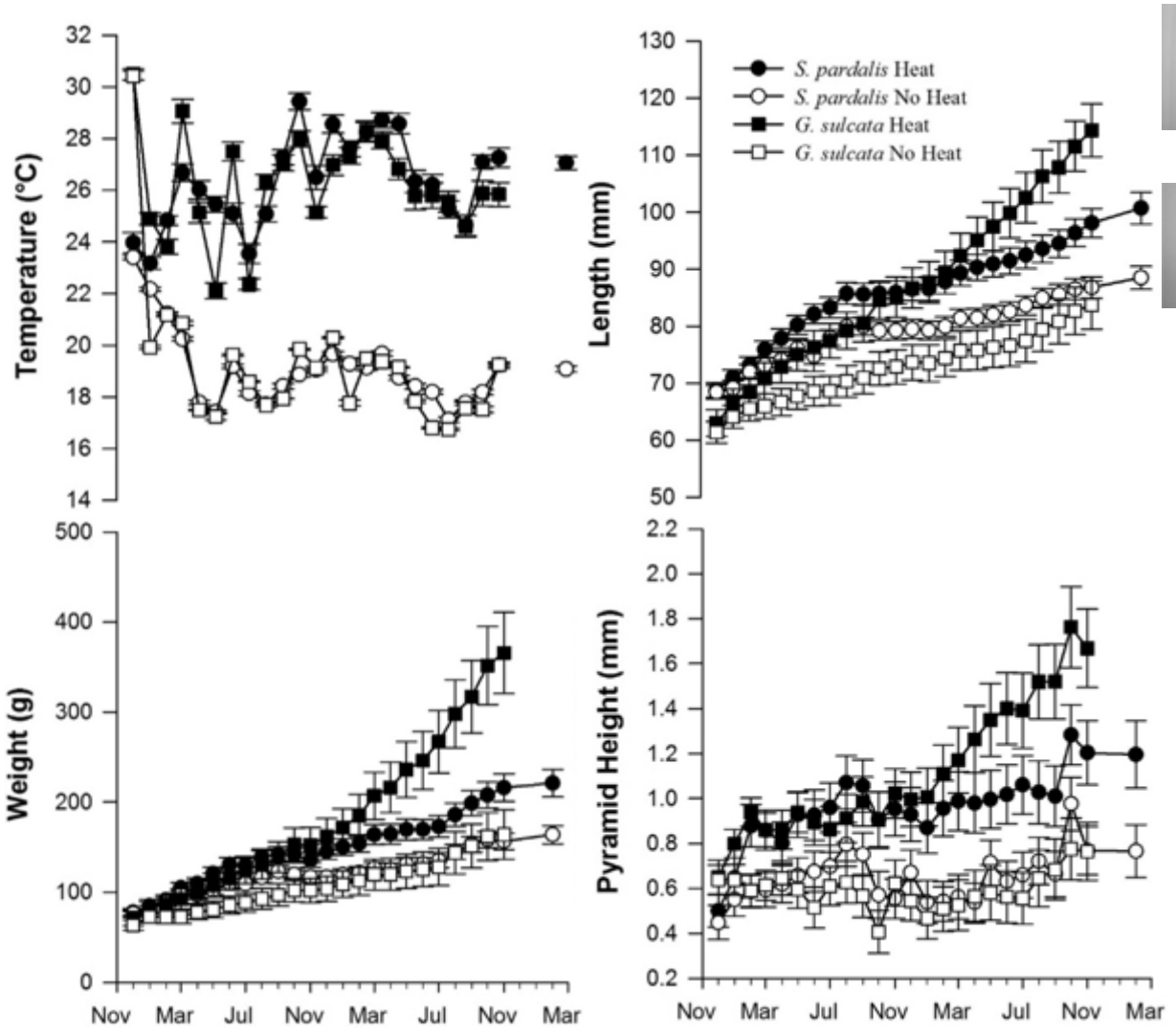

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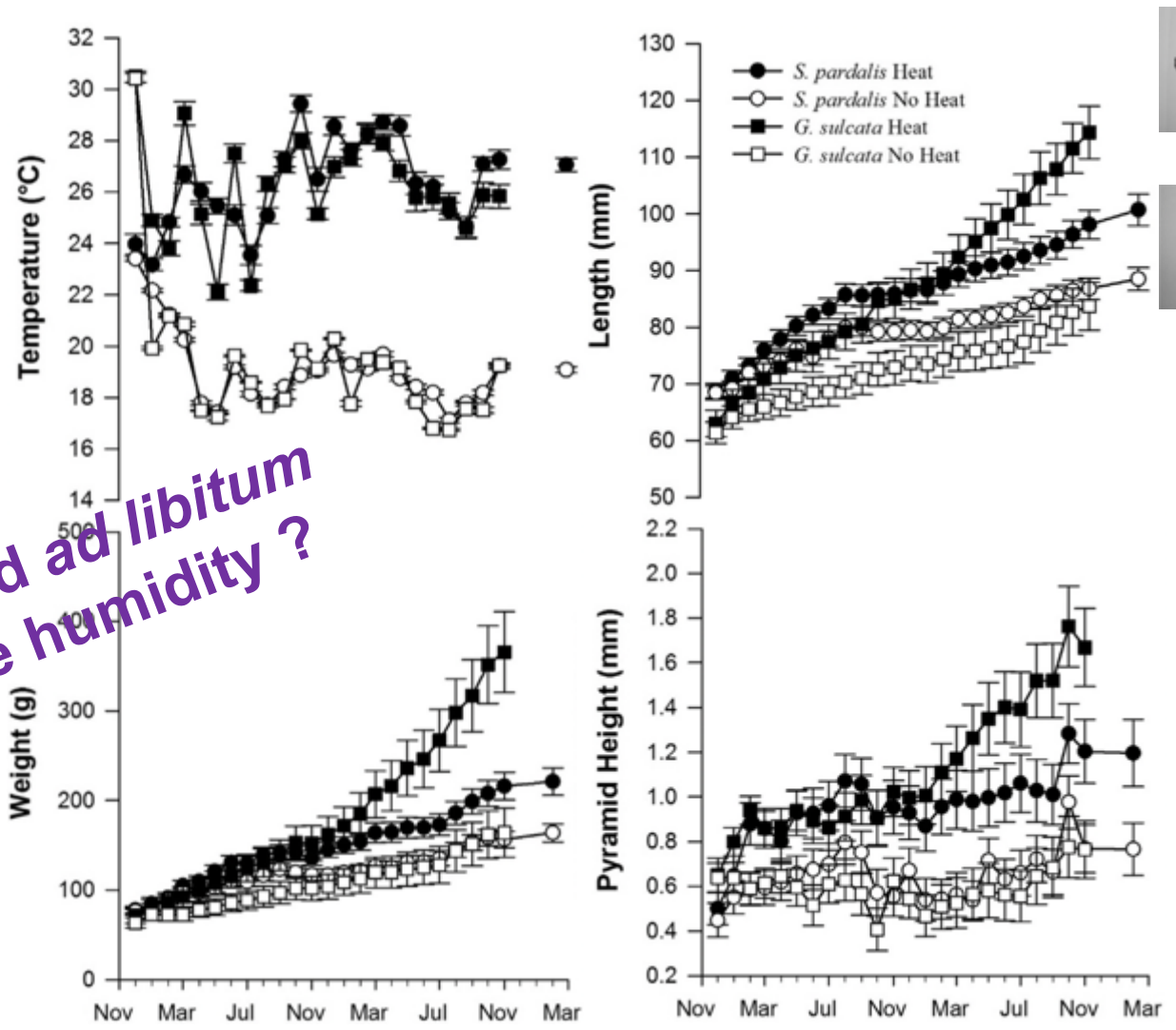

appropriate food ad libitum
really the same humidity ?




‘Pyramidenwachstum’

Assessment of dual-energy x-ray absorptiometry for use in evaluating the effects of dietary and environmental management on Hermann’s tortoises (*Testudo hermanni*)

Matteo Gramanzini, DVM; Nicola Di Girolamo, DVM; Sara Gargiulo, DVM, PhD; Adelaide Greco, DVM, PhD; Natascia Cocchia, DVM, PhD; Mauro Delogu, DVM, PhD; Isabella Rosapane, DVM; Raffaele Liuzzi, PhD; Paolo Selleri, DVM, PhD; Arturo Brunetti, MD

Objective—To assess dual-energy x-ray absorptiometry (DXA) for evaluating effects of diet and environment on bone mineral density in Hermann’s tortoises (*Testudo hermanni*).

Animals—26 Hermann’s tortoises within 1 month after hatching.

Procedures—Group 1 was housed in an artificial setting and fed naturally growing vegetation. Group 2 was housed in an artificial setting and fed vegetables grown for human consumption. Group 3 was maintained in an outside enclosure and fed naturally growing vegetation. After 10 months, pyramidal growth, body weight, and adverse conditions were assessed. Bone mineral density (BMD) of the axial and appendicular skeleton, shell, vertebral column, and pelvis was measured via DXA.

Results—Group 2 had the highest mean ± SD body weight (65.42 ± 30.85 g), followed by group 1 (51.08 ± 22.92 g) and group 3 (35.74 ± 7.13 g). Mean BMD of the shell varied significantly among groups (group 1, 0.05 ± 0.03 g/cm²•m; group 2, 0.09 ± 0.15 g/cm²•m; and group 3, undetectable). The BMD of the axial and appendicular skeleton, vertebral column, and pelvis did not differ significantly among groups. Pyramidal growth was highest in group 1 and not evident in group 3.

Conclusions and Clinical Relevance—Tortoises raised in artificial conditions did not have deficits in BMD, compared with results for outdoor-housed hibernating tortoises. Supplemental calcium was apparently not necessary when an adequate photothermal habitat and plant-based diet were provided. Higher BMD of captive-raised tortoises was morphologically associated with a higher incidence of pyramidal growth in captive-raised groups. (*Am J Vet Res* 2013;74:918–924)

Mortality rates attributable to nutritional and housing-induced disorders historically have been extremely high in captive tortoises.[1–3] Information in several reports[4–6] and the lack of evidence in necropsy surveys[7,8] suggest that nutritional disorders such as calcium deficiencies and subsequent metabolic bone diseases are rare in wild chelonians. Although a considerable amount of evidence-based information has been obtained on reptile physiology-biology[9–11] and management,[12,13] practitioners often offer a vast number of recommendations to reptile owners that are based on anecdotal information because of the lack of specific data. In juvenile chelonians, inadequate diets or inappropriate husbandry conditions often result in mineral deficiencies.[14] However, pathophysiologic processes are still unknown[15,16] and are usually extrapolated from information for other species.[14,17]

Abbreviations

AAS	Axial and appendicular skeleton
BMC	Bone mineral content
BMD	Bone mineral density
BSA	Body surface area
DXA	Dual-energy x-ray absorptiometry

Received September 7, 2012.
Accepted November 26, 2012.

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This manuscript represents a portion of a thesis submitted by Dr. Di Girolamo to the Department of Veterinary Sciences of Bologna University as partial fulfillment of the requirements for a Master of Science degree.
Presented in abstract form at the 18th Annual Conference of the Association of Reptilian and Amphibian Veterinarians, Seattle, August 2011.

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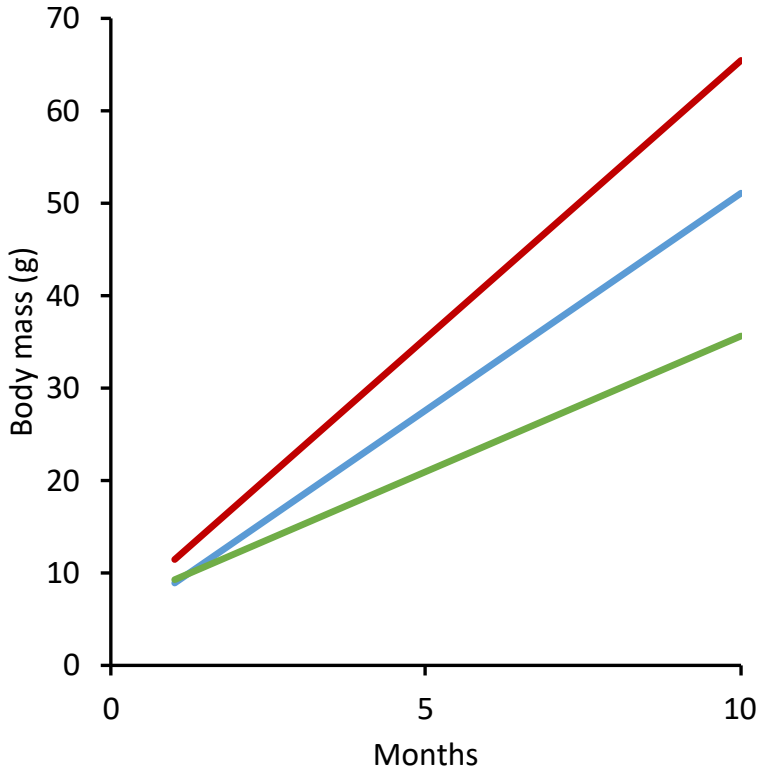

n=9, Innengehege, Gemüse,
2 Tiere mit Pyramiden

n=10, Innengehege, natürliches Futter,
10 Tiere mit Pyramiden

n=7, Aussengehege, natürliches Futter, keine Pyramiden

‘Pyramidenwachstum’

JOURNAL OF APPLIED ANIMAL WELFARE SCIENCE
2019, VOL. 22, NO. 2, 159–170
https://doi.org/10.1080/10888705.2018.1453814

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ARTICLE

Nutrition and husbandry conditions of Palearctic tortoises (*Testudo* spp.) in captivity

Thomas Bauer, Sven Reese, and Petra Koelle

Department of Veterinary Sciences, Faculty of Veterinary Medicine, Ludwig-Maximilians-University Munich, Munich, Germany

ABSTRACT

Mediterranean and Russian tortoises (*Testudo* spp.) are popular companion animals (pets), despite ongoing controversy concerning privately keeping reptiles. The arguments used during these controversial discussions have often been based on outdated facts. Therefore, a survey was developed to evaluate the current population structure, husbandry conditions, diet regime, and health status of *Testudo* species in captivity. More than 75% of the 1075 respondents housed their tortoises in an outdoor enclosure containing a greenhouse or cold frame, which is considered the most species-appropriate way of husbandry. Of the respondents, 67.7% fed their tortoises with the optimum diet of more than 80% grasses and weeds during the summer vegetation period. Only 8.2% of respondents owned a tortoise with a diagnosed disease. According to the results, the likelihood of tortoises developing pyramidal growth syndrome, which can be used as an indicator of the quality of tortoise husbandry, was high in tortoises kept in a terrarium and/or fed a diet of less than 80% grasses and weeds in summer. This likelihood varied among species, with a higher incidence in Hermann's tortoises (*Testudo hermanni*).

KEYWORDS
Chelonian; diet; keeping; European tortoises; pyramidal growth syndrome

Introduction

It has been estimated that 44% of households in Germany own companion animals (pets), and 1% (0.7 million) own a terrarium (Zentralverband-Zoologischer-Fachbetriebe-Deutschlands-e.V, 2017). Among reptiles, Palearctic tortoises of the genus *Testudo* are particularly popular. As stated in a survey on the husbandry of commonly kept reptiles, 38.7% of all evaluated reptiles belonged to this genus (Pees et al., 2014).

According to Commission Regulation (EC) No. 318/200, all *Testudo* spp. are listed in Appendix A, with the exception of *T. horsfieldii*, which is listed in Appendix B (Commission Regulation (EC), 2008). Except for *T. horsfieldii*, the demand for these tortoises in Germany is completely met by tortoises who have been bred in captivity by German or other European Union (EU) breeders or who have been imported from other non-EU breeders and farms. Only *T. horsfieldii* can still be taken from populations in the wild (Bundesamt für Naturschutz, 2016).

There is ongoing controversy among reptile caregivers (owners), reptile associations, government representatives, and nonhuman animal welfare groups concerning the acceptance of keeping reptiles as pets. Historically, the mortality rates of Palearctic tortoises in captivity were high, with annual mortality rates of 29% for *T. hermanni* and 23% for *T. graeca* in the United Kingdom during 1982 to 1986 (Lawrence, 1988). This issue of high mortality rates is still used as an argument against reptile keeping. However, recent studies have shown that annual reptile mortality rates are very low

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Color versions of one or more of the figures in the article can be found online at www.tandfonline.com/haww.

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Mediterranean and Russian tortoises (*Testudo* spp.) are popular companion animals (pets), despite ongoing controversy concerning privately keeping reptiles. The arguments used during these controversial discussions have often been based on outdated facts. Therefore, a survey was developed to evaluate the current population structure, husbandry conditions, diet regime, and health status of *Testudo* species in captivity. More than 75% of the 1075 respondents housed their tortoises in an outdoor enclosure containing a greenhouse or cold frame, which is considered the most species-appropriate way of husbandry. Of the respondents, 67.7% fed their tortoises with the optimum diet of more than 80% grasses and weeds during the summer vegetation period. Only 8.2% of respondents owned a tortoise with a diagnosed disease. According to the results, the likelihood of tortoises developing pyramidal growth syndrome, which can be used as an indicator of the quality of tortoise husbandry, was high in tortoises kept in a terrarium and/or fed a diet of less than 80% grasses and weeds in summer. This likelihood varied among species, with a higher incidence in Hermann's tortoises (*Testudo hermanni*).

KEYWORDS
Chelonian; diet; keeping; European tortoises; pyramidal growth syndrome

Introduction

It has been estimated that 44% of households in Germany own companion animals (pets), and 1% (0.7 million) own a terrarium (Zentralverband-Zoologischer-Fachbetriebe-Deutschlands-e.V, 2017). Among reptiles, Palearctic tortoises of the genus *Testudo* are particularly popular. As stated in a survey on the husbandry of commonly kept reptiles, 38.7% of all evaluated reptiles belonged to this genus (Pees et al., 2014).

According to Commission Regulation (EC) No. 318/200, all *Testudo* spp. are listed in Appendix A, with the exception of *T. horsfieldii*, which is listed in Appendix B (Commission Regulation (EC), 2008). Except for *T. horsfieldii*, the demand for these tortoises in Germany is completely met by tortoises who have been bred in captivity by German or other European Union (EU) breeders or who have been imported from other non-EU breeders and farms. Only *T. horsfieldii* can still be taken from populations in the wild (Bundesamt für Naturschutz, 2016).

There is ongoing controversy among reptile caregivers (owners), reptile associations, government representatives, and nonhuman animal welfare groups concerning the acceptance of keeping reptiles as pets. Historically, the mortality rates of Palearctic tortoises in captivity were high, with annual mortality rates of 29% for *T. hermanni* and 23% for *T. graeca* in the United Kingdom during 1982 to 1986 (Lawrence, 1988). This issue of high mortality rates is still used as an argument against reptile keeping. However, recent studies have shown that annual reptile mortality rates are very low

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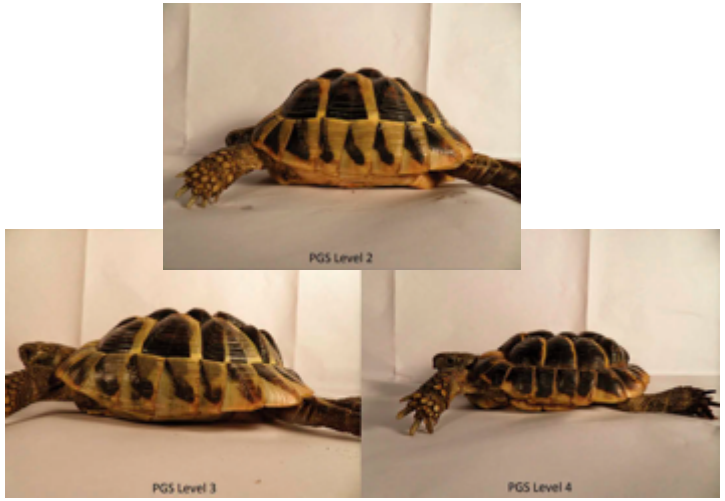

‘Pyramidenwachstum’

JOURNAL OF APPLIED ANIMAL WELFARE SCIENCE
2019, VOL. 22, NO. 2, 159–170
https://doi.org/10.1080/10888705.2018.1453814

Routledge
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ARTICLE

Nutrition and husbandry conditions of Palearctic tortoises (*Testudo* spp.) in captivity

Thomas Bauer, Sven Reese, and Petra Koelle

Department of Veterinary Sciences, Faculty of Veterinary Medicine, Ludwig-Maximilians-University Munich, Munich, Germany

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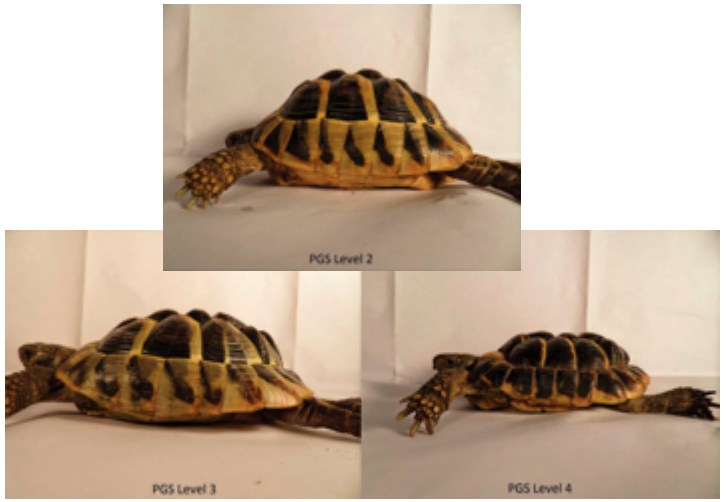

Risikofaktoren:

- weniger als 80% Grünfutter im Sommer
- Haltung im Terrarium

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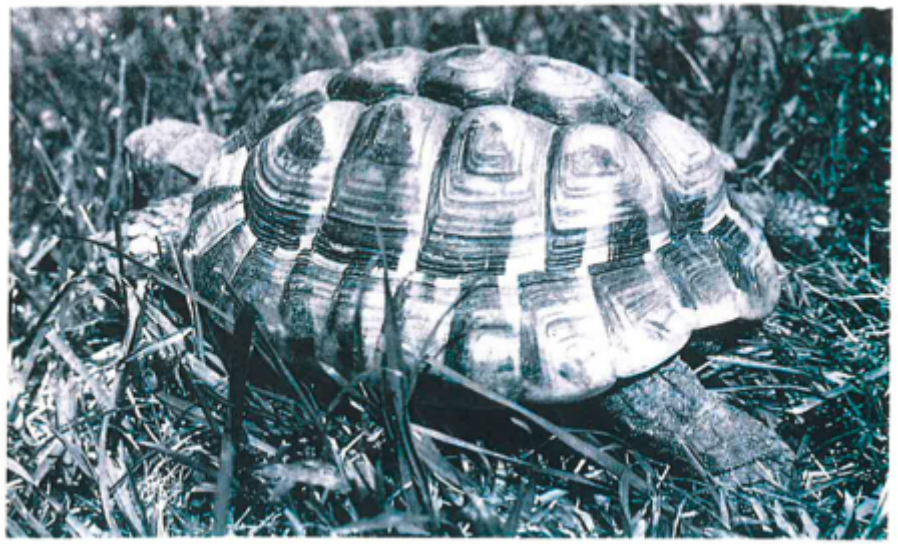

T. hermanni aus Terrariennachzucht mit Höckerbildung trotz Kalk- und Vitaminfütterung sowie UV-Bestrahlung

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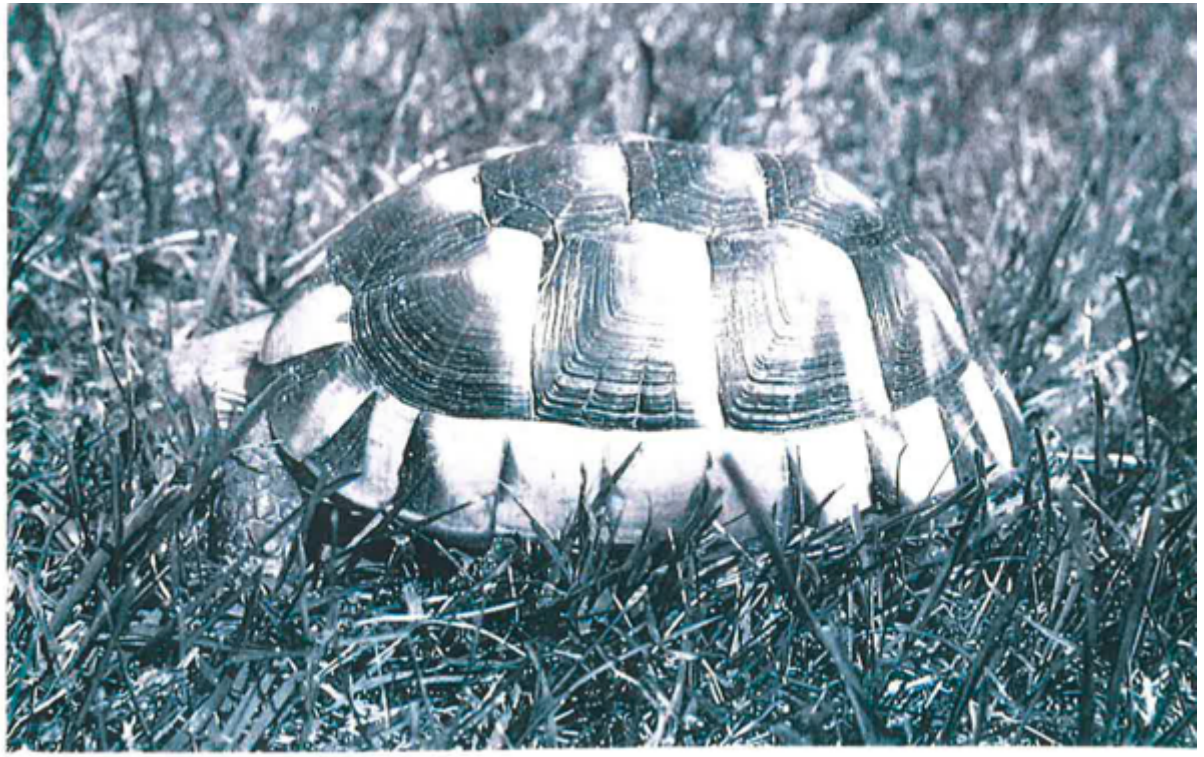

T. marginata in der hier beschriebenen Weise gepflegt, 2 Jahre alt, Carapaxlänge 15 cm, Gewicht 600 g

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J. Anim. Physiol. a. Anim. Nutr. 87 (2003), 66–74
© 2003 Blackwell Verlag, Berlin
ISSN 0931–2439

Receipt of Ms.: 03. 06. 2002
Accepted: 23. 10. 2002

Institute of Nutrition, University of Veterinary Medicine, Vienna, Austria

Influence of environmental humidity and dietary protein on pyramidal growth of carapaces in African spurred tortoises (*Geochelone sulcata*)

By C. S. Wiesner and C. Iben

Summary

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© 2003 Blackwell Verlag, Berlin
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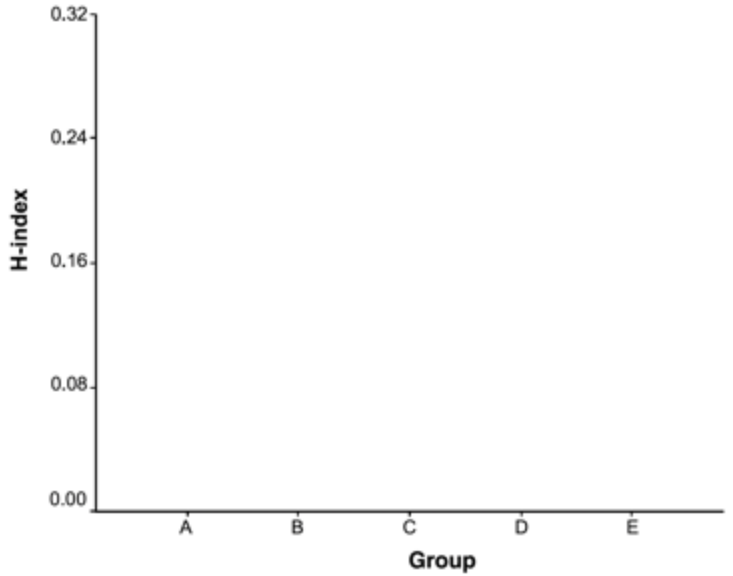

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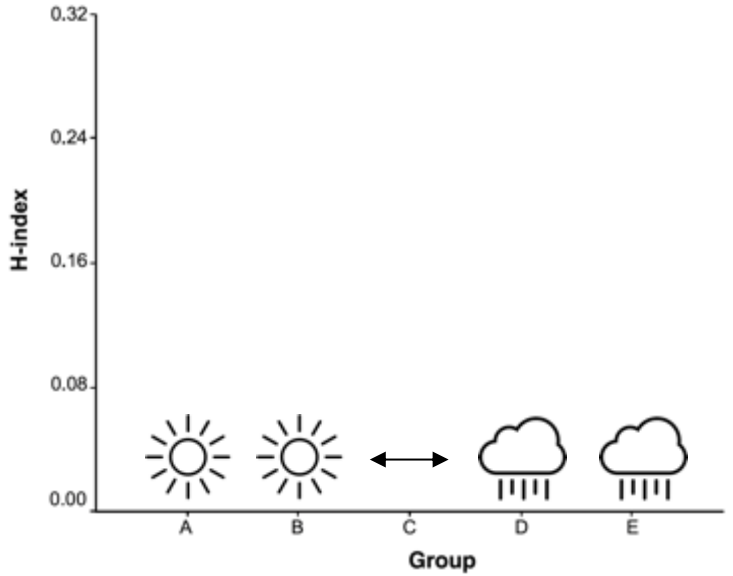

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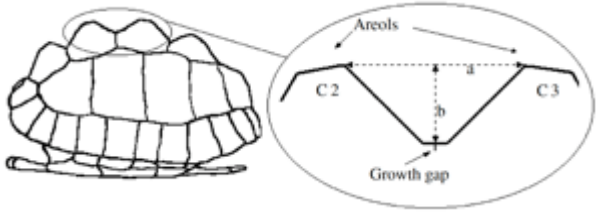

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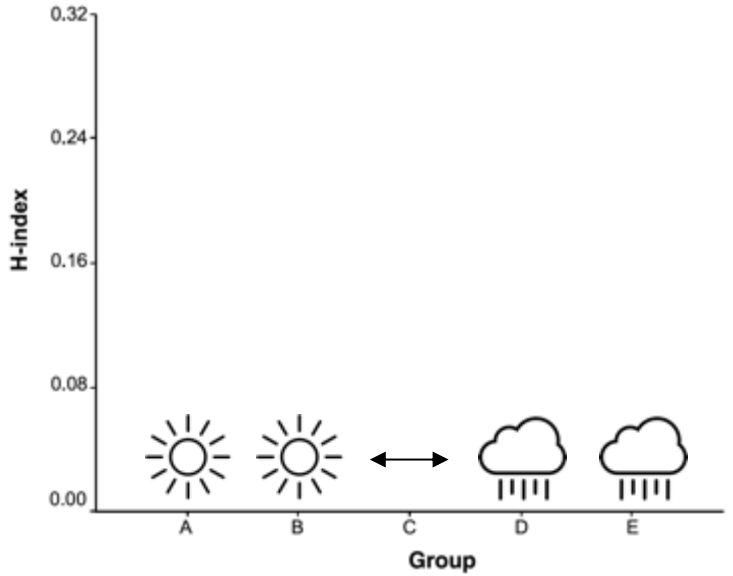

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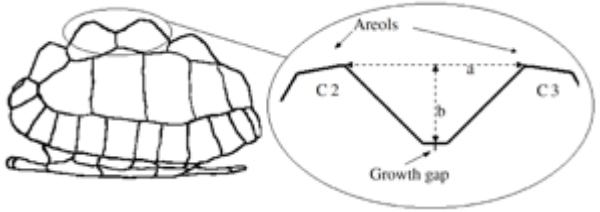

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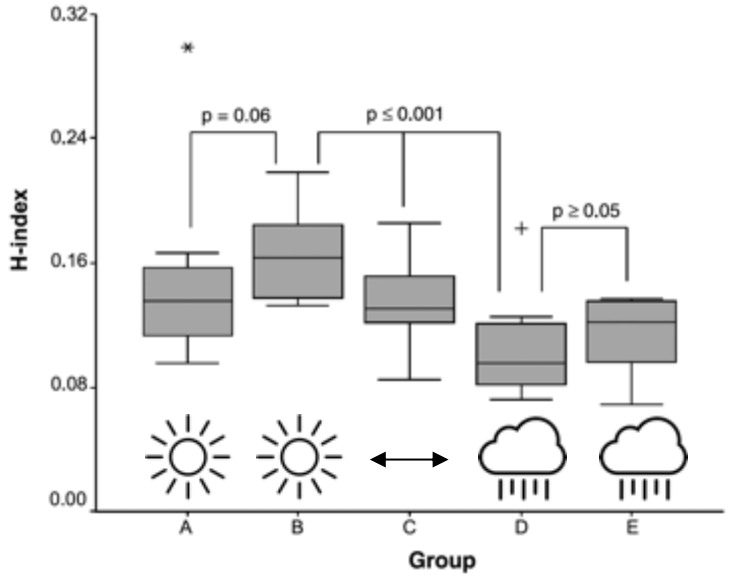

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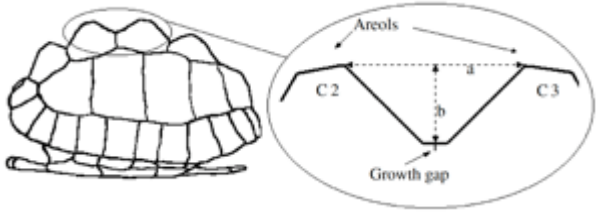

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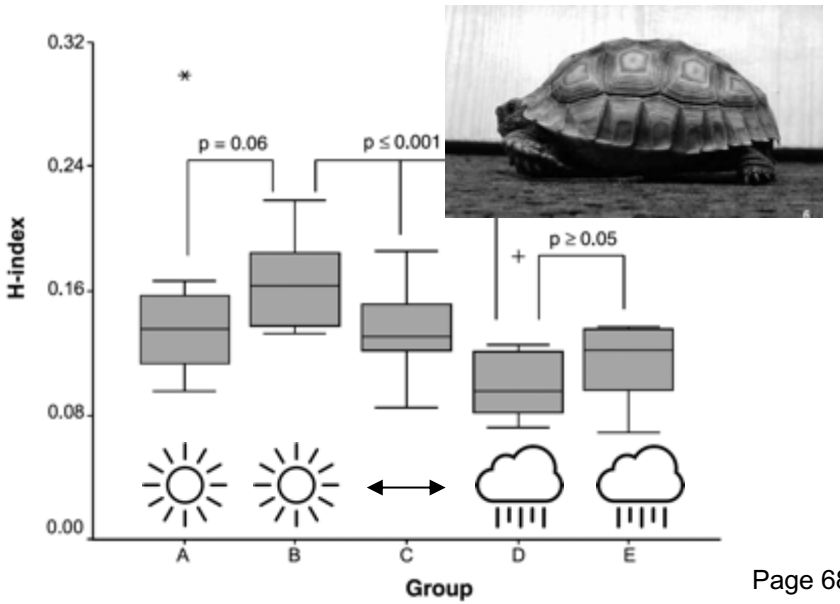

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J. Anim. Physiol. a. Anim. Nutr. 87 (2003), 66–74
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ISSN 0931–2439

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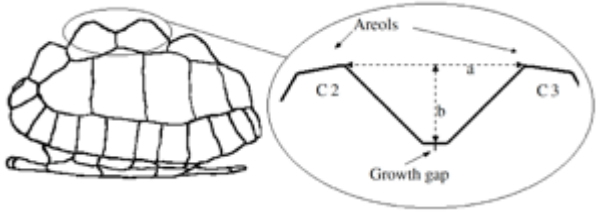

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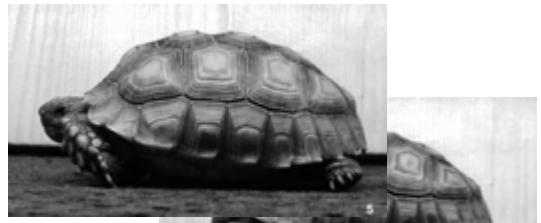

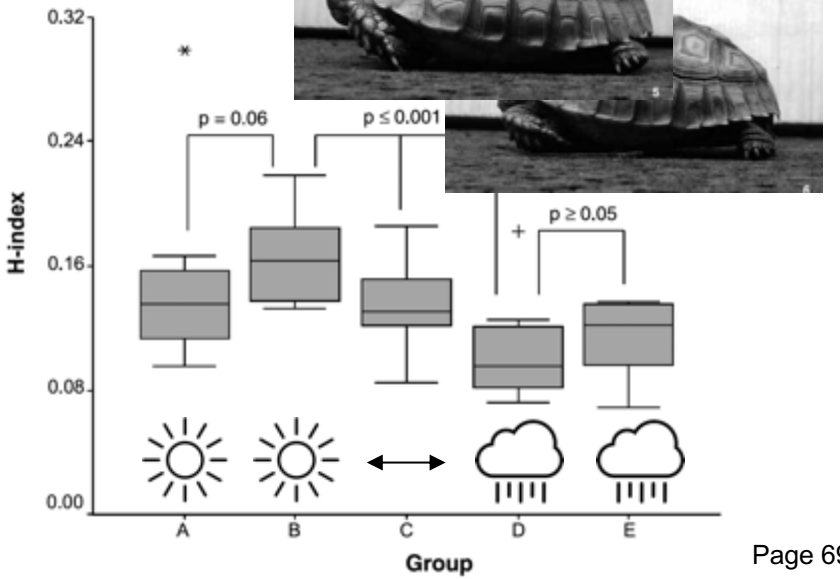

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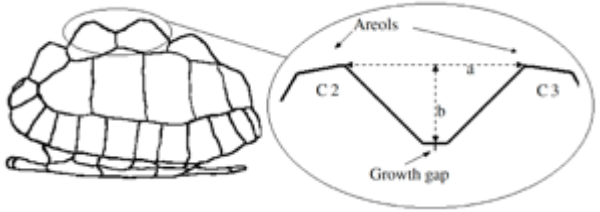

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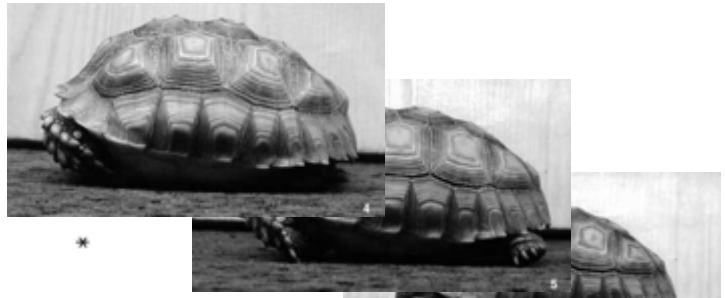

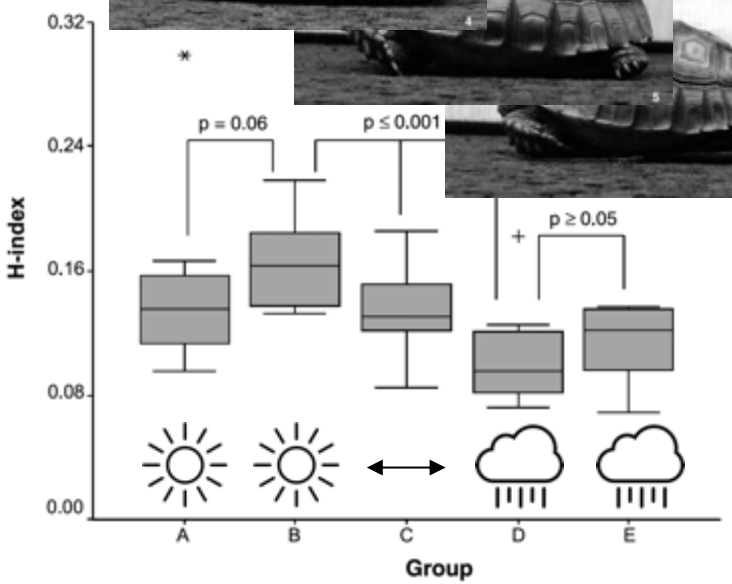

‘Pyramidenwachstum’

https://reptilesmagazine.com/pyramiding-in-tortoises/

Pyramiding in Tortoises

Richard Fife January 23, 2014 1:24 pm

Is Humidity Causing Pyramiding?

Over the years I have tried all kinds of tortoise diets only to become more confused when there were no consistent results in eliminating pyramiding. I understood that the diet was extremely important in raising a healthy tortoise, but it didn’t seem to have a whole lot of affect on reducing pyramiding. About five or six years ago, my wife decided to try a new method for rearing hatching tortoises.

She set up two groups of new hatching red-foot tortoises for her experiment. The first group was set up in a plastic shoebox with dry paper towels (low humidity). The second group was set up in a plastic shoebox with moist paper towels (high humidity). The two groups were kept side by side and fed identically.

Within a few months the difference was astounding. The tortoises in the dry setup had the typical pyramiding we see in captive-hatched tortoises. The second group had no pyramiding whatsoever and looked identical to wild-caught tortoises. We began to try increasing the humidity on several other species of tortoises with the same positive results.

In January 2001 I presented my work at the International Turtle and Tortoise Symposium held in Vienna, Austria. I was excited to learn that many European tortoise breeders had come to the same conclusion and were beginning to raise hatchlings in an environment with more moisture.

‘Pyramidenwachstum’

Zoo Biology 31: 705–717 (2012)

RESEARCH ARTICLE

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Julia Ritz,[1] Marcus Clauss,[1]* W. Jürgen Streich,[2] and Jean-Michel Hatt[1]

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[2] Leibniz Institute of Zoo and Wildlife Research (IZW), Berlin, Germany

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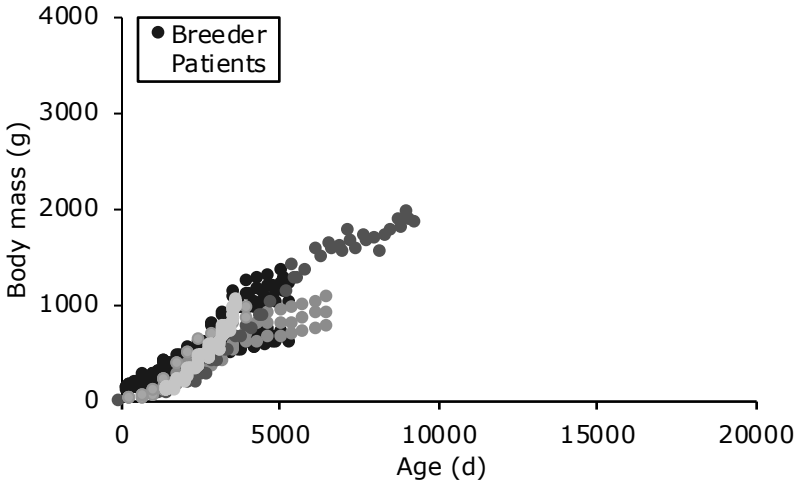

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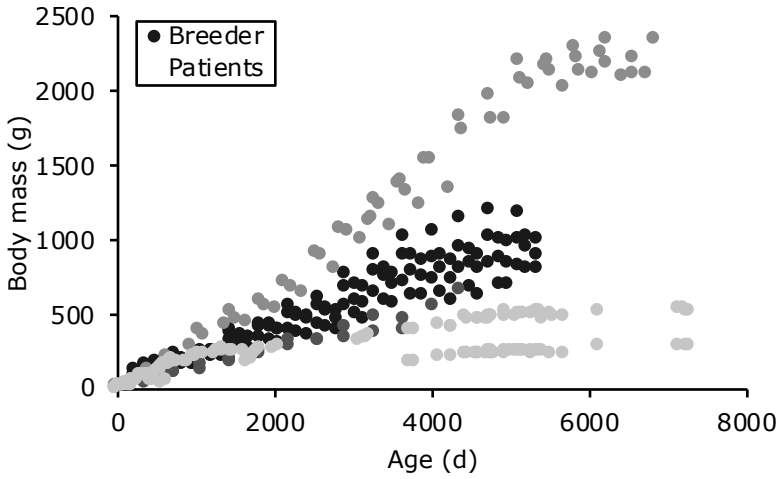

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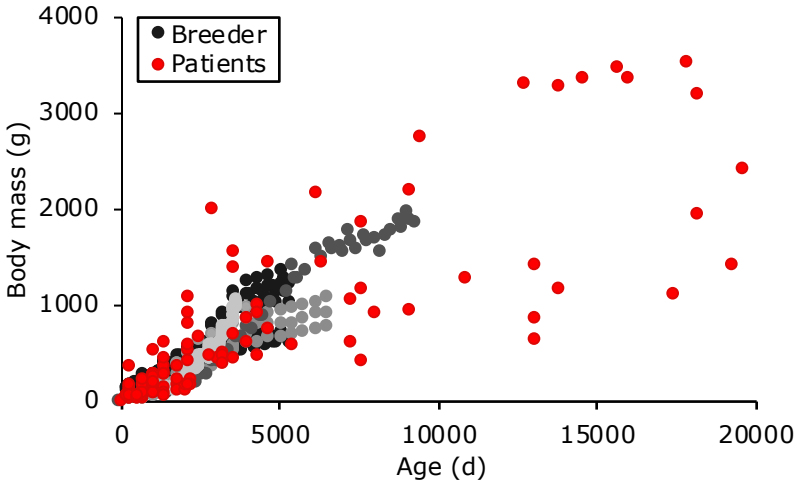

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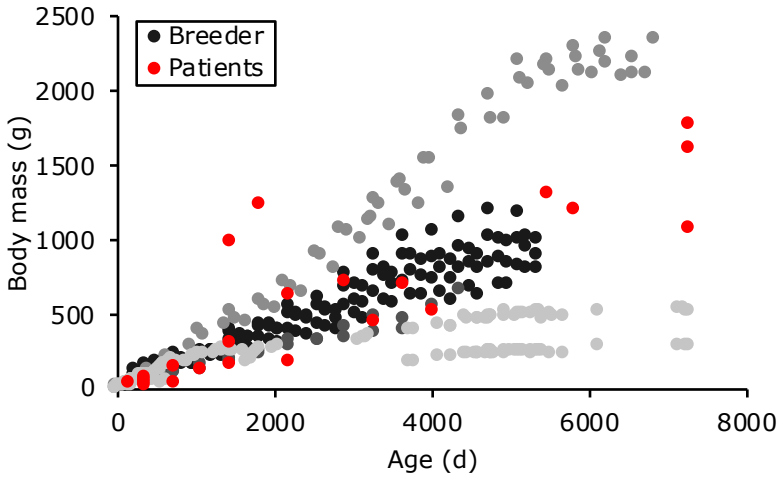

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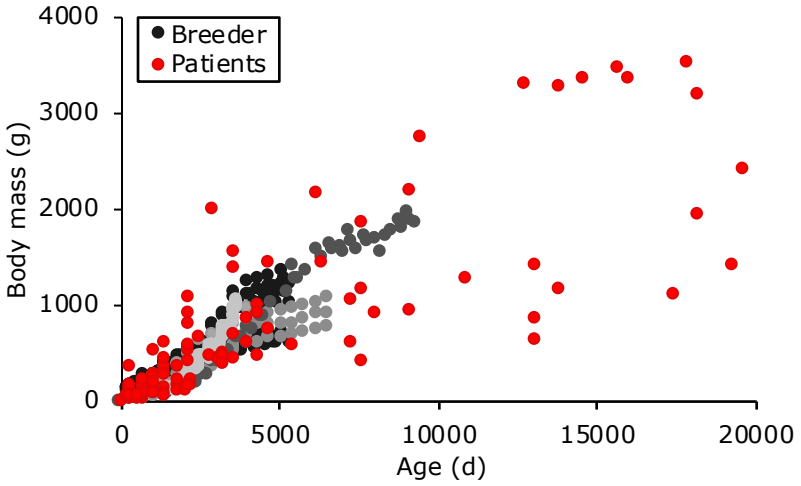

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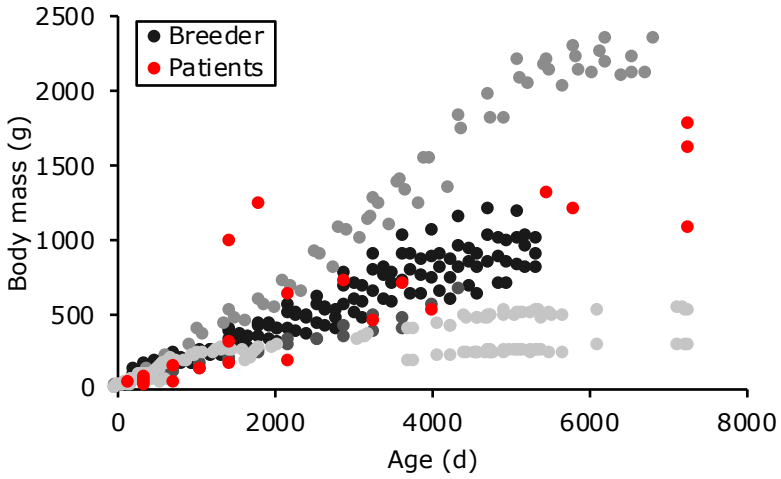

effect on age-mass relationship:
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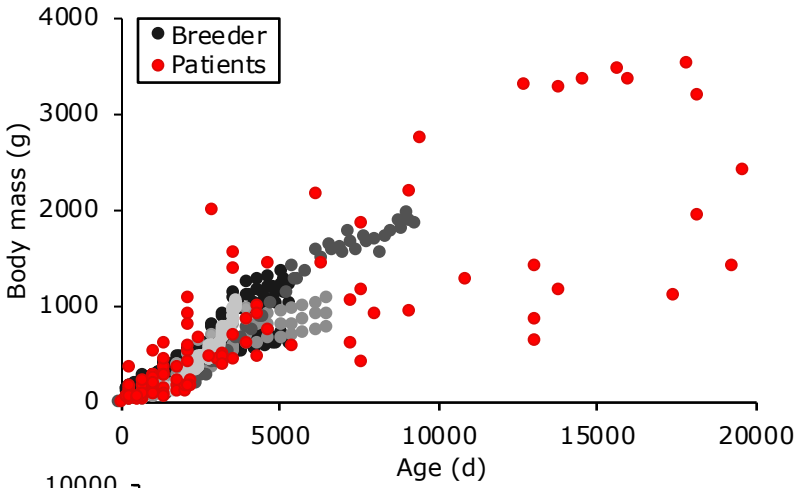
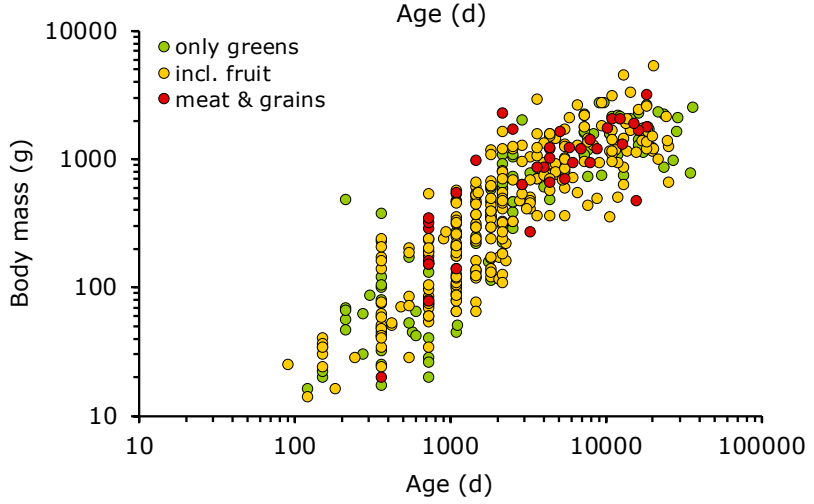
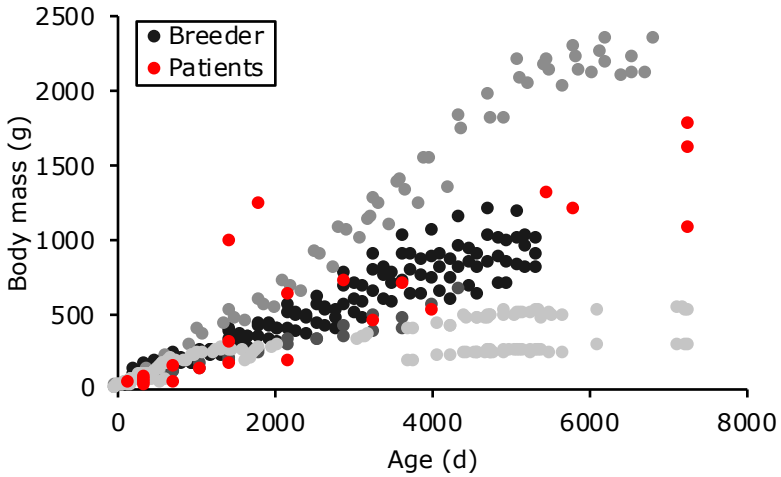




T. graeca



effect on age-mass relationship:
- diet

‘Pyramidenwachstum’

Zoo Biology 31: 705–717 (2012)

RESEARCH ARTICLE

Variation in Growth and Potentially Associated Health Status in Hermann’s and Spur-Thighed Tortoise (*Testudo hermanni* and *Testudo graeca*)

Julia Ritz,[1] Marcus Clauss,[1]* W. Jürgen Streich,[2] and Jean-Michel Hatt[1]

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Received 28 September 2011; Revised 22 November 2011; Accepted 30 November 2011

DOI 10.1002/zoo.21002
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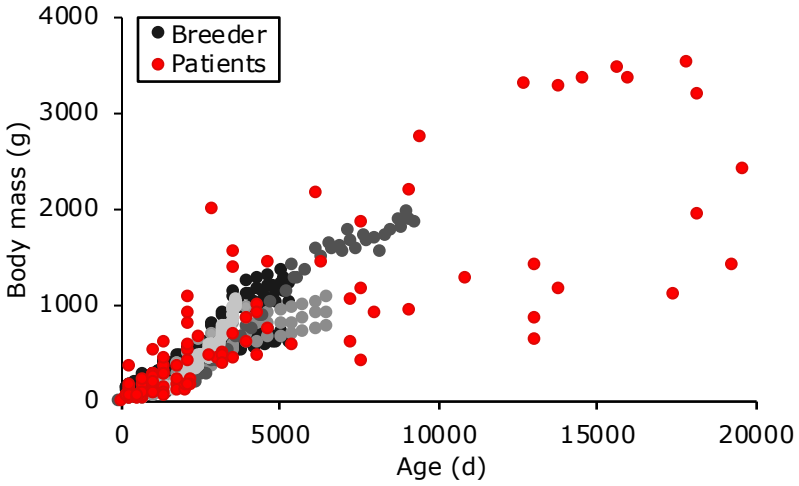

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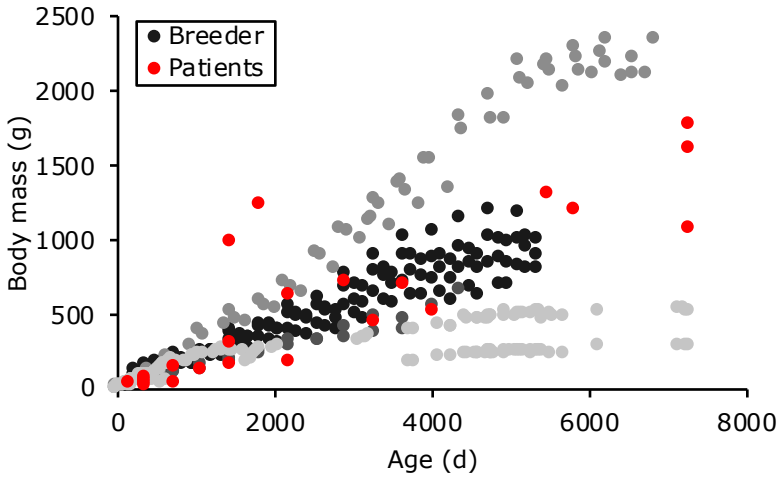

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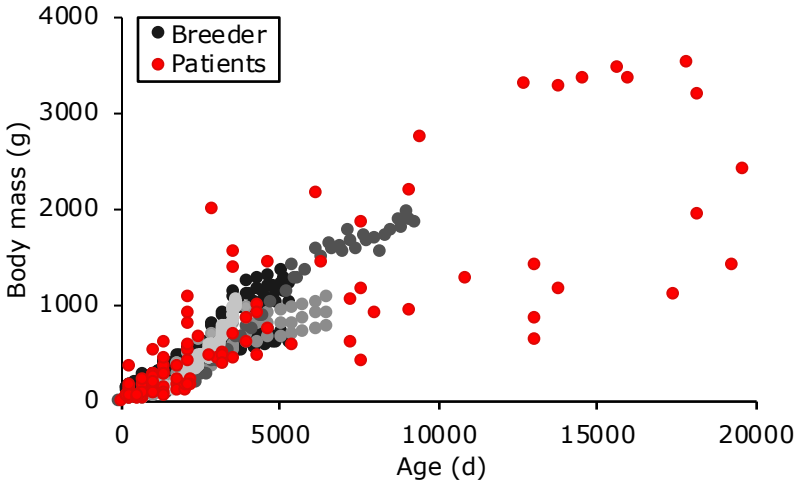

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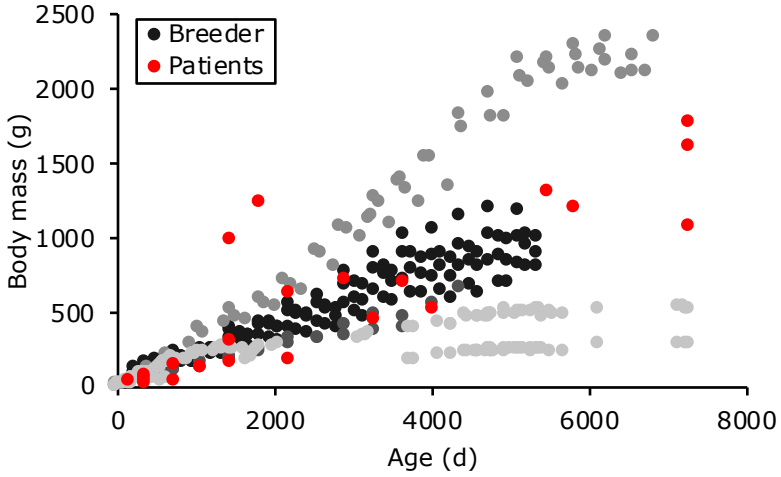

effect on age-mass relationship:
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- parasites

no effect on age-mass relationship:
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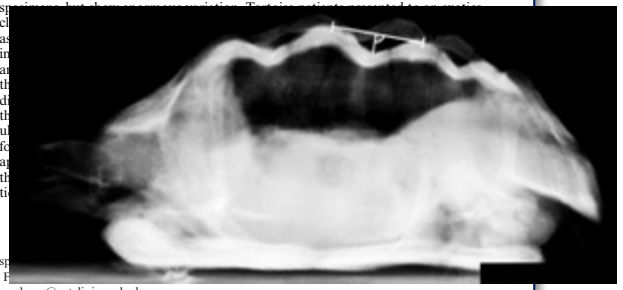

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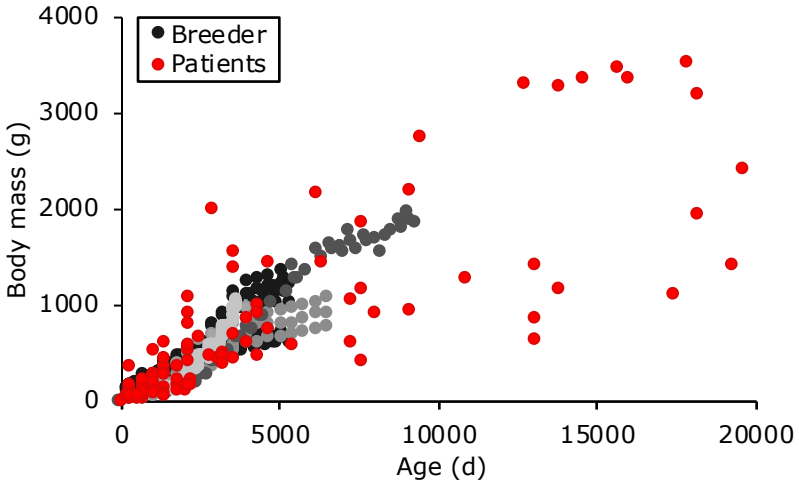

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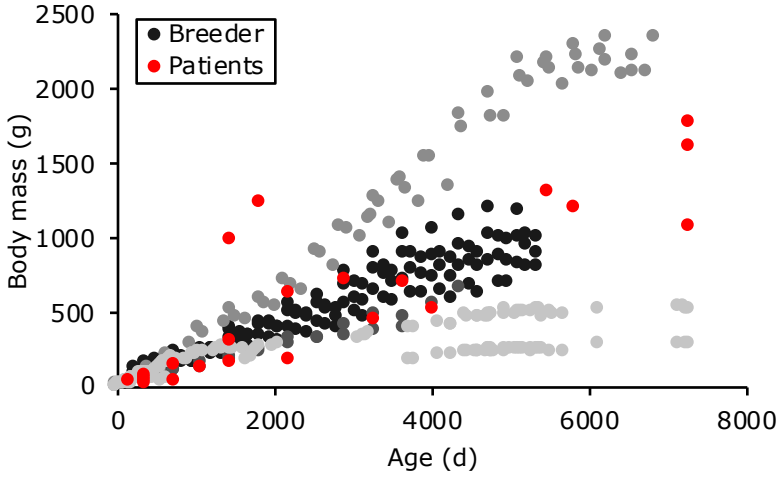

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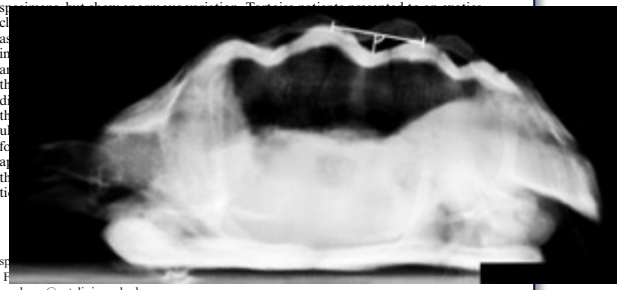

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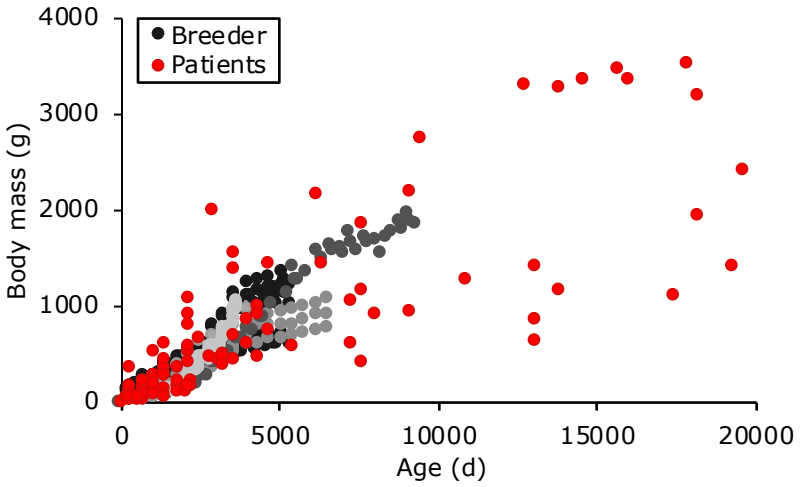

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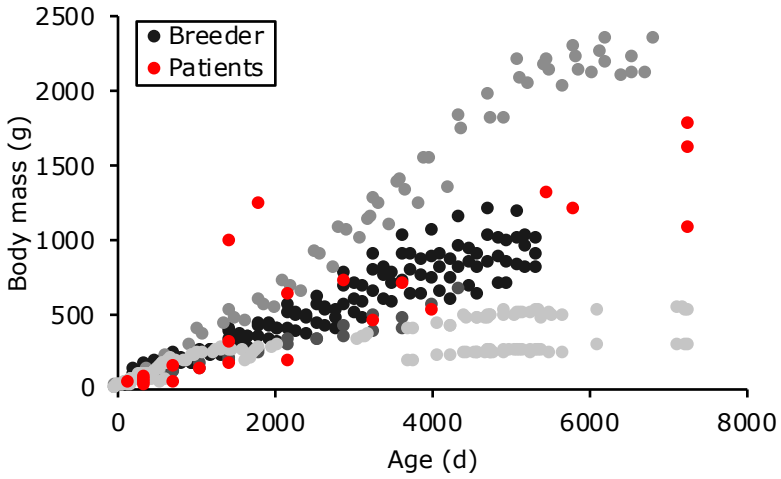

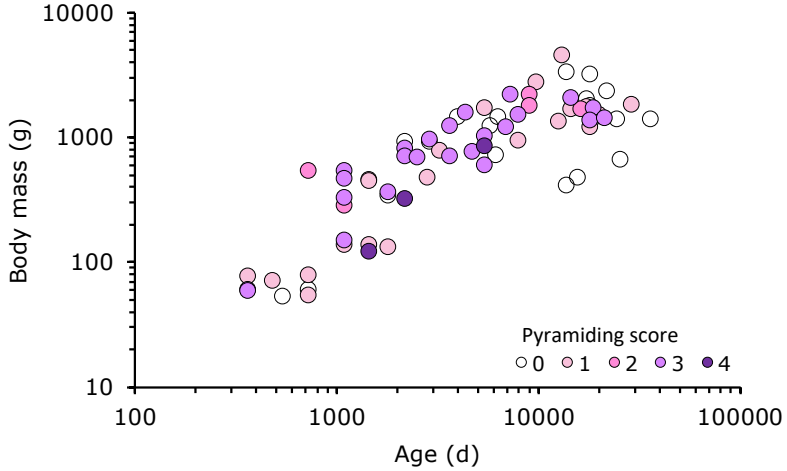

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Fazit:
Flexibles Wachstum und ‘Pyramidenwachstum’

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- gute Gesundheit vermutlich bei verschiedenen Wachstumsraten möglich (biologisch sinnvoll), Geschlechtsreife variabel

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- Mischformen bei gleichzeitigem Auftreten von Calcium-Mangel (metabolic bone disease)

University of Zurich[UZH]

Clinic for Zoo Animals, Exotic Pets and Wildlife

Reptilien & Ziervögel - Calcium-Mangel

Calcium- / (UVB-) Mangel

Calcium- / (UVB-) Mangel

FIG 84.2 Sprawl (A–C) and lack of truncal (A and B) or shell lifting (D) are common signs of nutritional secondary hyperparathyroidism in lizards and chelonians. (Courtesy of Thomas H. Boyer.)

Calcium- / (UVB-) Mangel

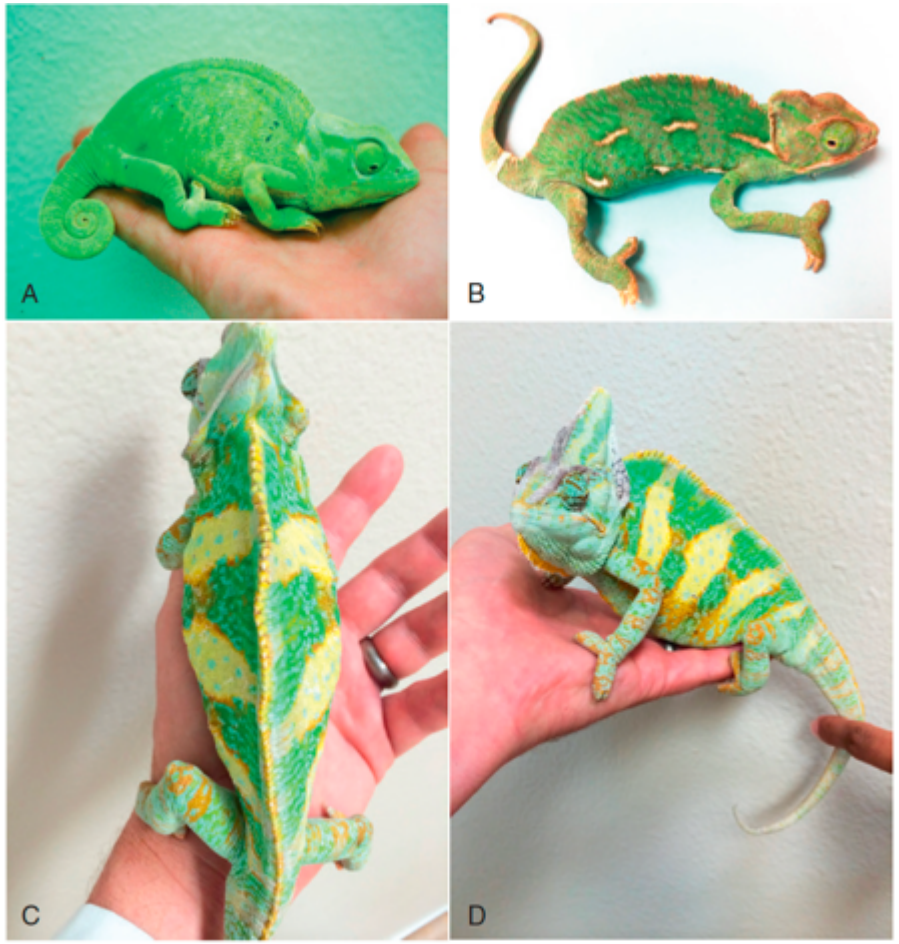


FIG 84.5 Chameleons with nutritional secondary hyperparathyroidism have a weakened grip; fall repeatedly; have bowed, fractured, or grossly distorted long bones (A and B); spinal kyphoscoliosis (C), lordosis (B), or rhoecosis; and tail weakness (D). A healthy chameleon would normally wrap its tail around the finger. (Courtesy of Thomas H. Boyer.)

Boyer & Scott (2019)

Calcium- / (UVB-) Mangel

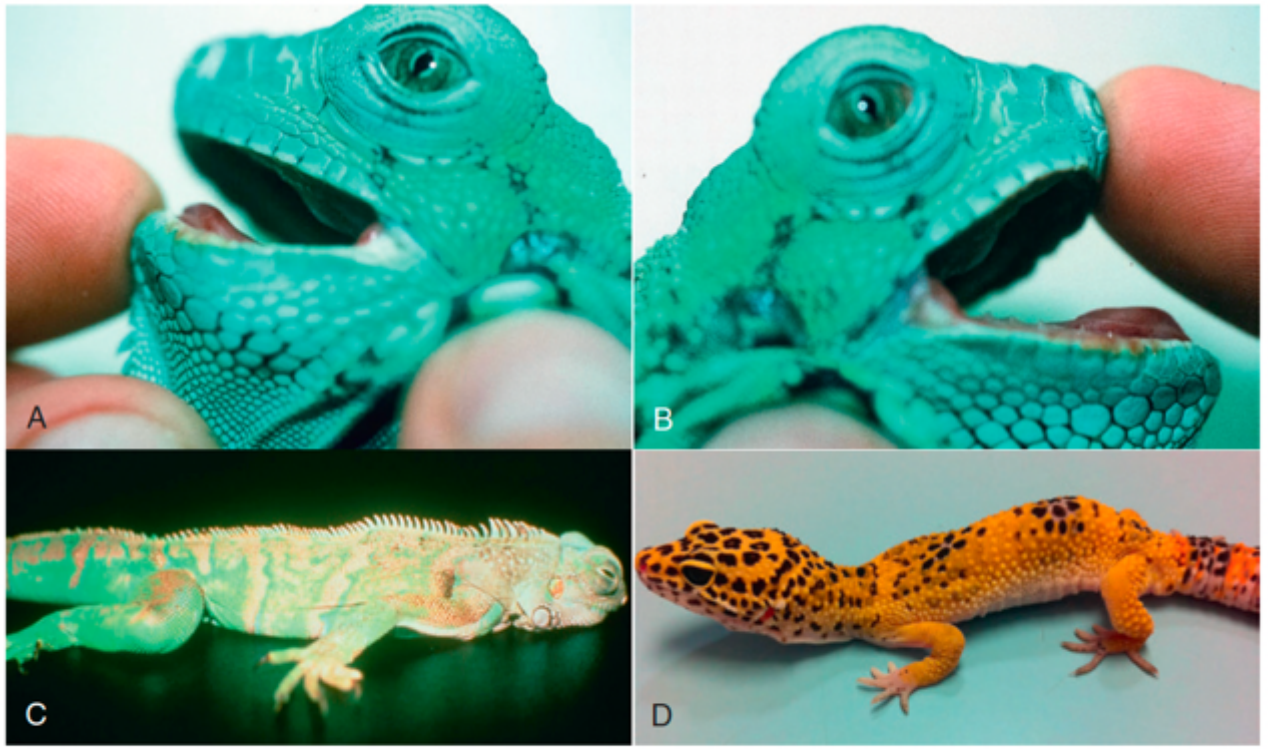
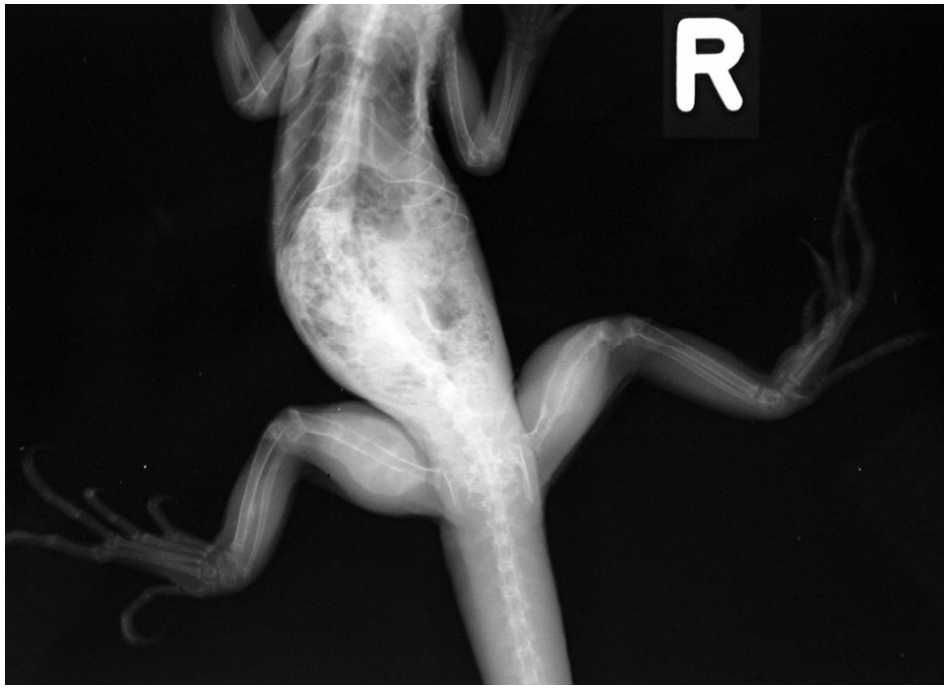


FIG 84.3 Iguanas (*Iguana iguana*) and leopard geckos (*Eublepharis macularius*) have similar clinical signs of nutritional secondary hyperparathyroidism, including pliable mandibles and maxillae (A and B); kyphoscoliosis, lordosis, or rhoecosis (C and D); bowed long bones (especially the radius and ulna, D); and walking on the antebrachium (not plantigrade, D). (Courtesy of Thomas H. Boyer.)

Calcium- / (UVB-) Mangel

FIG 84.4 Fibrous osteodystrophy (in the left femur and right tibia/fibula of this iguana [*Iguana iguana*]) is common in lizards with nutritional secondary hyperparathyroidism but is not seen in chelonians. (Courtesy of Thomas H. Boyer.)



Calcium- / (UVB-) Mangel


Calcium- / (UVB-) Mangel


Calcium- / (UVB-) Mangel

Calcium-arme Nahrungsmittel:

- Obst / buntes Gemüse
- Samen / Körner / Getreide
- reines Fleisch
- Insekten

Boyer & Scott (2019)

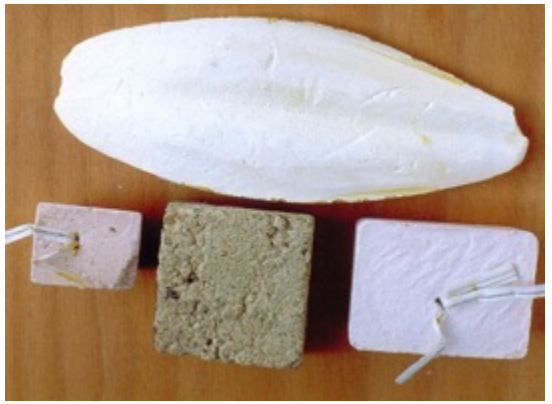

Calcium- / (UVB-) Mangel

Calcium-arme Nahrungsmittel:

- Obst / buntes Gemüse
- Samen / Körner / Getreide
- reines Fleisch
- Insekten

Lösungen:

- Grünfutter / nur wenig zu Alleinfutter
- meiden
- ganze Beutetiere / Alleinfutter
- gut loading / dusting



Boyer & Scott (2019)

Calcium- / (UVB-) Mangel

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Reptilien & Ziervögel – Vitamin A


Vitamin A Mangel

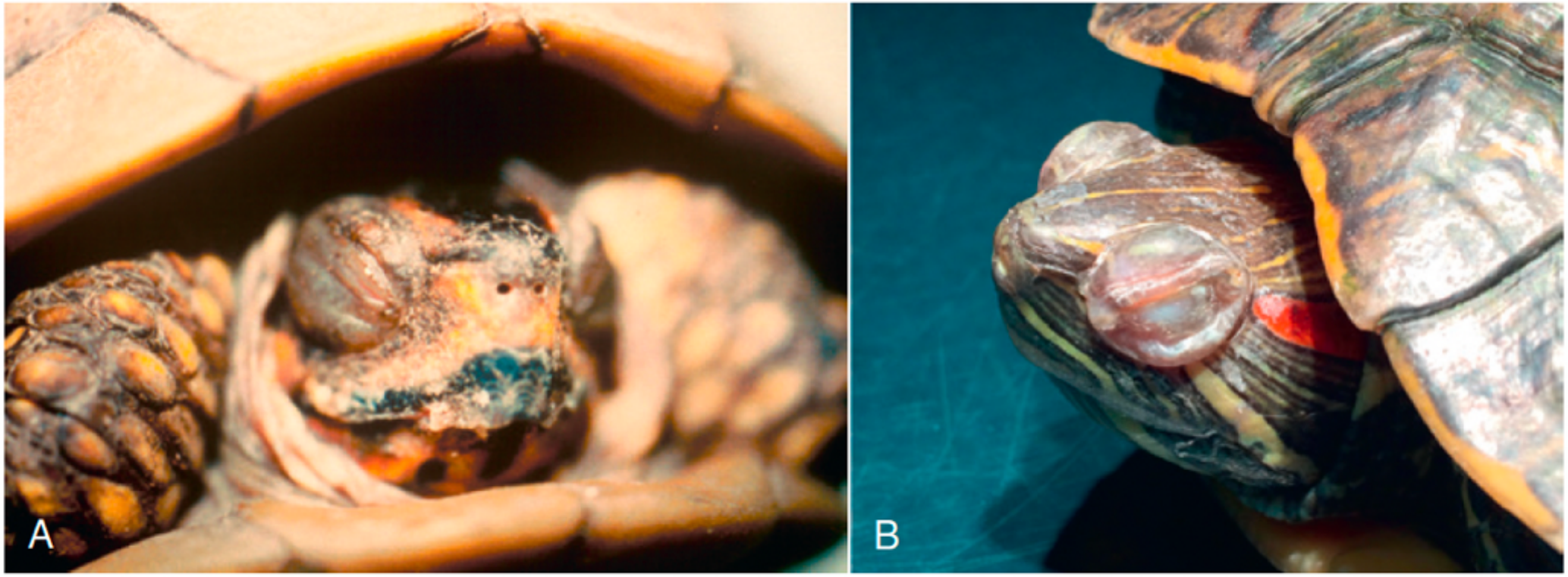

FIG 84.12 (A) Hypovitaminosis A in a three-toed box turtle (*Terrapene carolina triunguis*) and (B) a red-eared slider (*Trachemys scripta elegans*); note the blepharedema. (Courtesy of Thomas H. Boyer.)


Vitamin A Mangel

Pflanzenfresser können in der Regel ß-Carotin in Vitamin A umwandeln

Viele Faunivoren können dies nicht und benötigen direkt Vitamin A

Insekten: wenig ß-Carotin / Vitamin A

viele (v.a. fettreiche) Samen: wenig ß-Carotin


Boyer & Scott (2019)

Vitamin A Mangel

The Ocular Disease of Young Terrapins Caused by Vitamin A Deficiency

E. Elkan and P. Zwart

Path. vet. *4:* 201–222 (1967)

Vitamin A Mangel

The Ocular Disease of Young Terrapins Caused by Vitamin A Deficiency

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Path. vet. *4:* 201–222 (1967)

In vain do the textbooks on herpetology mention the exacting dietary requirements of juvenile terrapins, in vain their advice on how to meet these requirements. Neither the sellers nor the buyers read these books, presuming that a plastic bowl and some 'ant's eggs' suffice to keep a juvenile terrapin alive. The annual holocaust among the imported terrapins proves the error of this assumption.

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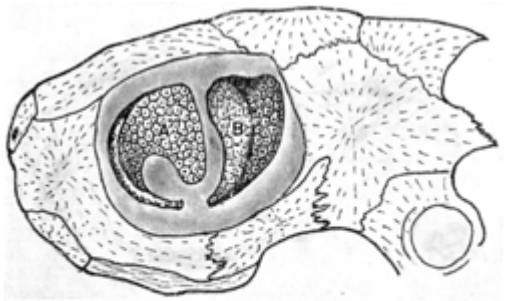

Fig. 1. Topography of the ophthalmic glands in the terrapin (diagrammatic). The Harderian gland (A) is anteromedial or rostral. The lacheymal gland (B) is posterolateral or temporal. The globe fits into the cup formed by the two glands.

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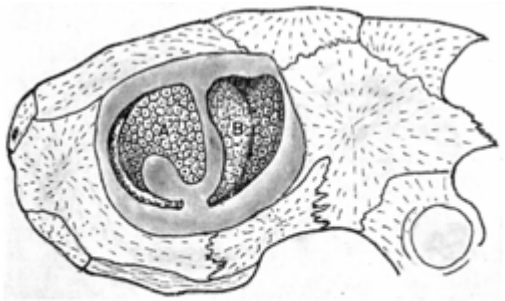

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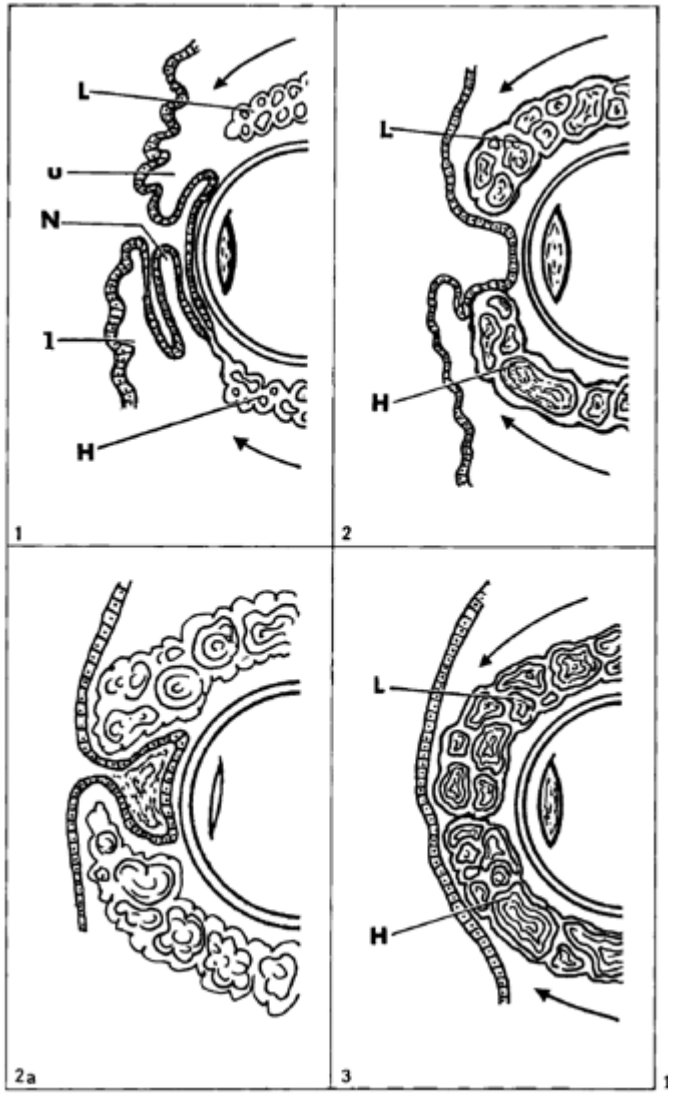


Vitamin A Mangel

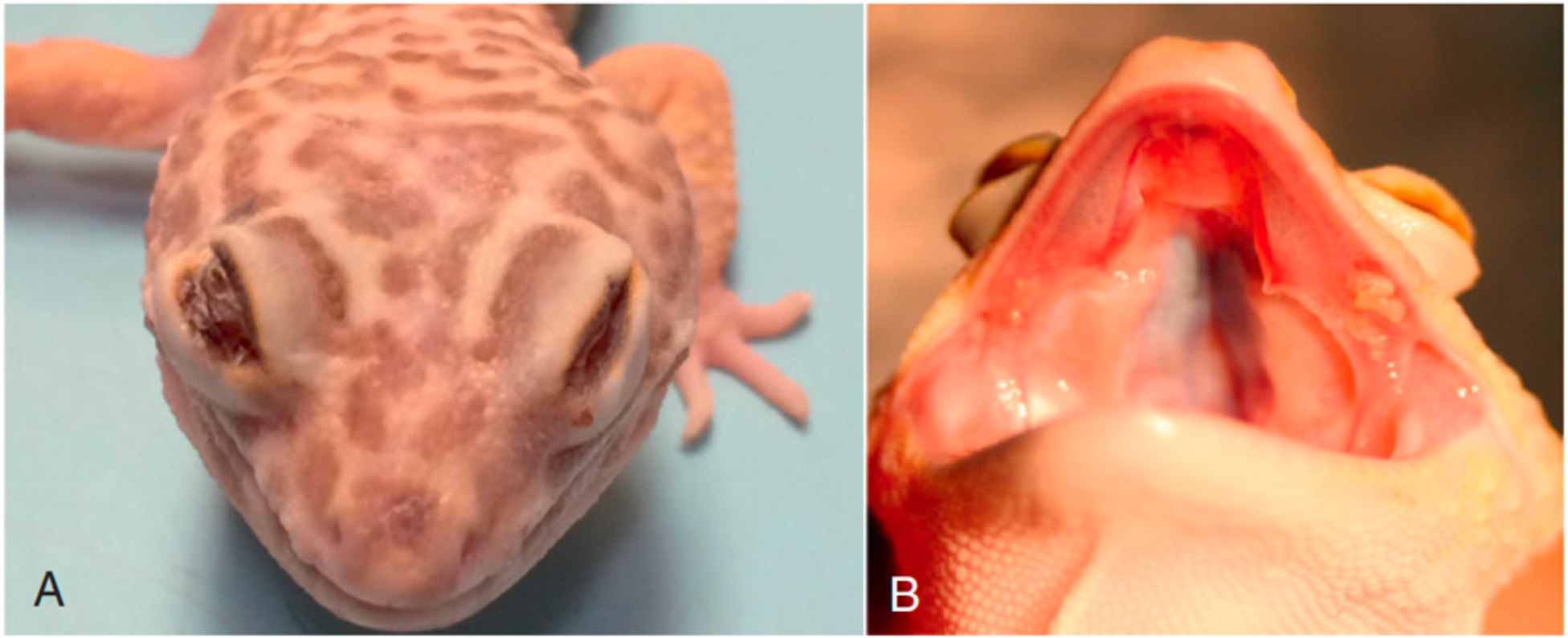

FIG 84.13 Hypovitaminosis A in a leopard gecko (*Eublepharus macularius*) with blepharedema (A), buildup of oral solid cellular debris, which is one of the few causes of stomatitis (B). (Courtesy of Thomas H. Boyer.)

Vitamin A Mangel

Boyer & Scott (2019)


Vitamin A Mangel

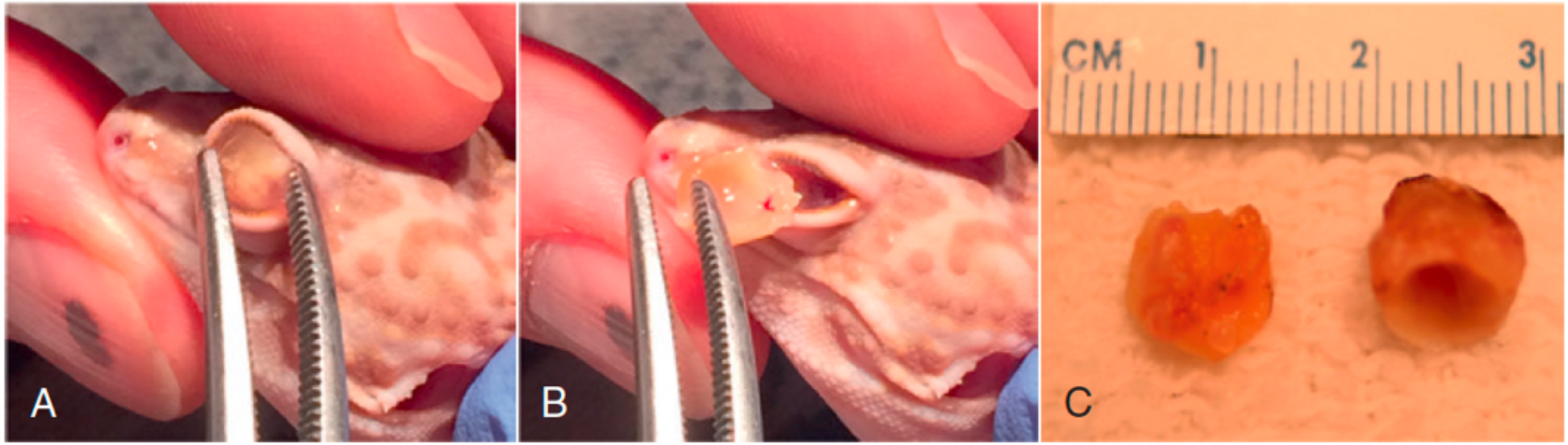

FIG 84.17 (A) Leopard gecko (Eublepharis macularius) with solid cellular debris under the palpebrae from chronic vitamin A deficiency. (B) The debris is gently removed after moisturizing with saline and grasping with hemostats or blunt probe, while applying digital ocular pressure. (C) The solid cellular debris can be larger than the patient's eye. (Courtesy of Thomas H. Boyer.)

Vitamin A Mangel


Vitamin A Mangel


Vitamin A Mangel

Vitamin A Mangel

Hypervitaminose A

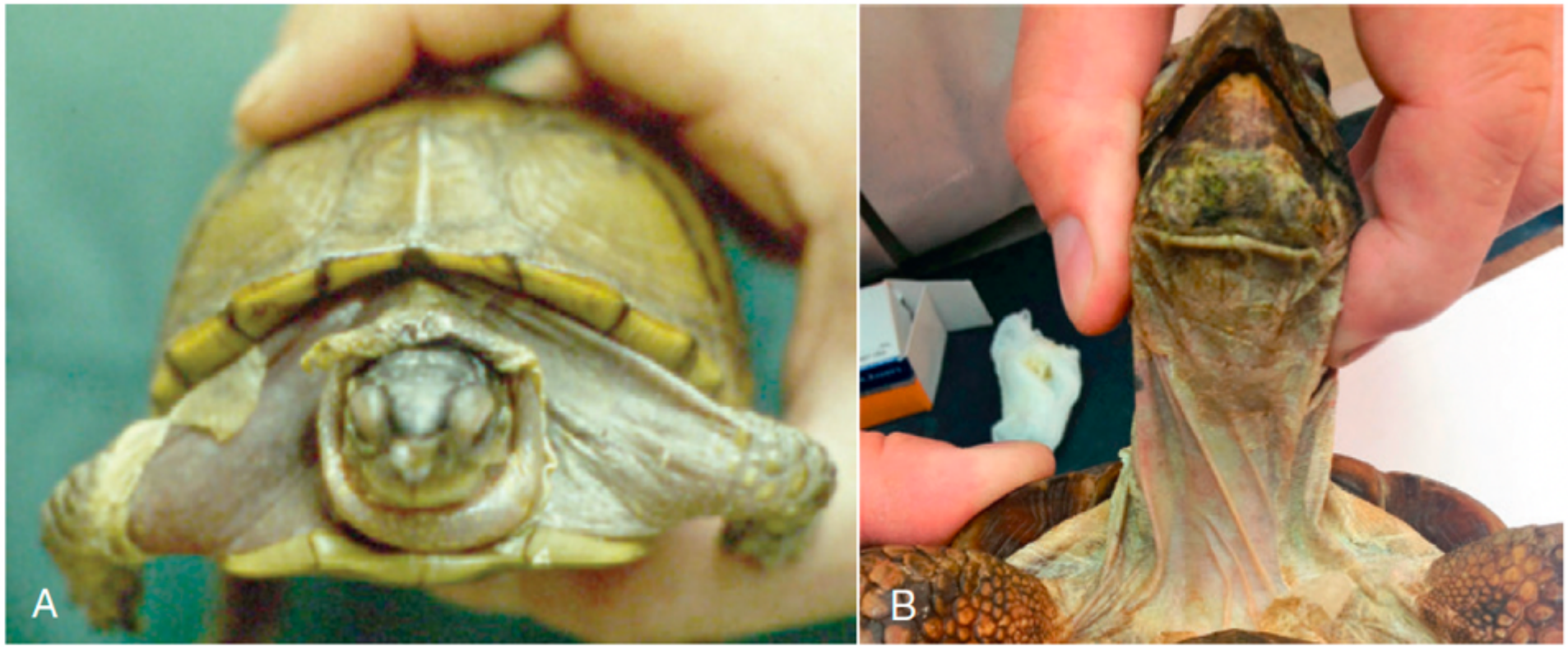

FIG 84.19 Epidermal sloughing in a three-toed box turtle (*Terrapene carolina triunguis*), caused by overdosage with water-soluble vitamin A (A), and in a tortoise (B), caused by fat-soluble vitamin A. Tortoises rarely, if ever, develop hypovitaminosis A and do not require vitamin A injections. (Courtesy of Thomas H. Boyer.)

University of Zurich[UZH]

Clinic for Zoo Animals, Exotic Pets and Wildlife

Reptilien & Ziervögel – andere Mangelerkrankungen

Vitamin B Mangel – Fischfütterung (Thiaminasen)

FIG 84.23 Neurological deficits and mydriasis in a mole kingsnake (*Lampropeltis calligaster*) fed goldfish (*Carassius auratus*). The clinical signs resolved within 24 hours of an injection of 100 mg/kg thiamin B1 and were prevented by converting to a rodent diet. (Courtesy of Stephen J. Divers.)

Boyer & Scott (2019)

Jodmangel

Full Scientific Report

Journal of Veterinary Diagnostic Investigation
2015, Vol. 27(1) 18–24

DOI: 10.1177/1040638714559025
jvdi.sagepub.com

An outbreak of thyroid hyperplasia (goiter) with high mortality in budgerigars (*Melopsittacus undulatus*)

Panayiotis Loukopoulos, Adrienne C. Bautista, Birgit Puschner, Brian Murphy, Beate M. Crossley, Ian Holser, Lucy Gomes, H. L. Shivaprasad, Francisco A. Uzal[1]

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Full Scientific Report

Journal of Veterinary Diagnostic Investigation
2015, Vol. 27(1) 18–24

DOI: 10.1177/1040638714559025
jvdi.sagepub.com

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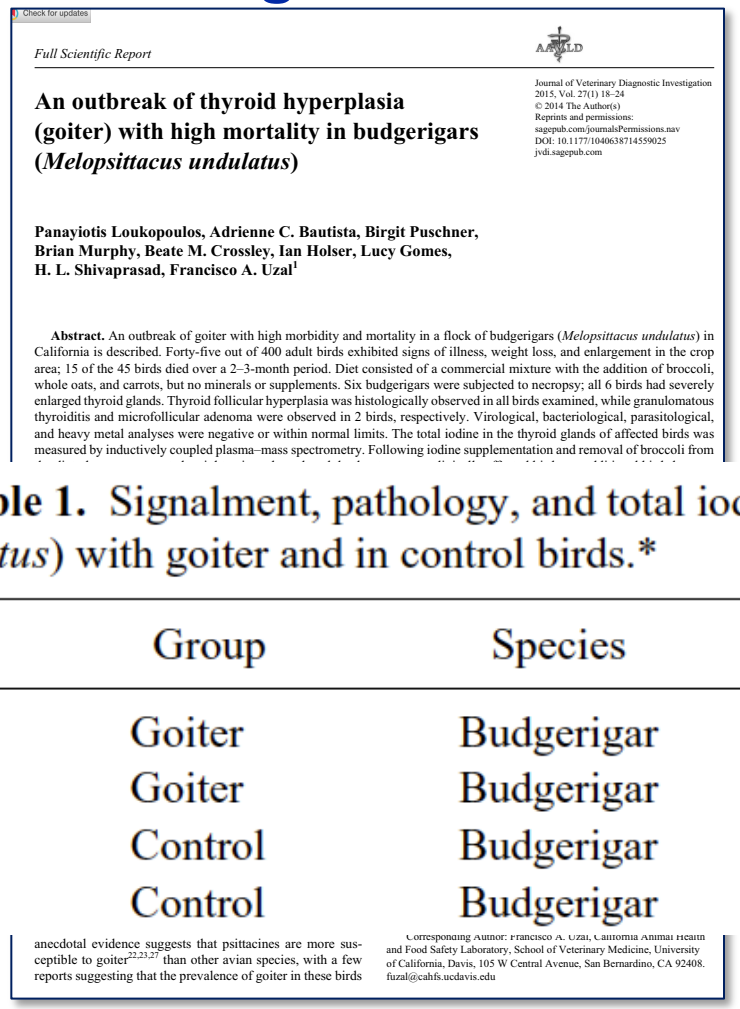

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Table 1. Signalment, pathology, and total iodine concentrations (mg/kg wet weight) in the thyroid gland of budgerigars (*Melopsittacus undulatus*) with goiter and in control birds.*

Bird	Group	Species	Iodine	Pathology	Signalment
1	Goiter	Budgerigar	780	Goiter	1 year old, sex not recorded
3	Goiter	Budgerigar	660	Goiter	1 year old, sex not recorded
23	Control	Budgerigar	1,000	Pulmonary hemorrhage	Adult, male
24	Control	Budgerigar	4,200	Pulmonary hemorrhage	Adult, male

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Broccoli, as well as other members of the *Brassicaceae* family, contains goitrogenic compounds, which can interfere with the uptake and organification of iodine, and subsequently lead to the inability to form active thyroid hormones.

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Um die Tierhalter für die neue Ernährung ihrer Lieblinge zu begeistern, griff die Werbung mitunter zu recht drastischen Mitteln. Da wurde im Fernsehen auch schon mal ein Wellensittich gezeigt, der wegen fehlender Jod-S-11-Körnchen tot auf dem Boden seines Käfigs lag. Wetzel offenbarte seinen Zuhörern sogar, was hinter dieser geheimnisvollen Formel steckt. S-11 ist einfach eine Abkürzung für „Sonnenschein-Körnchen". Nach dem „S" folgen noch 11 Buchstaben.

Einzelhaltung vs. Zucht

Nutrition of Caged Birds

Formulated Diets Versus Seed Mixtures for Psittacines[1,2]

DUANE E. ULLREY,[3] MARY E. ALLEN[4] AND DAVID J. BAER[5]

Comparative Nutrition Group, Department of Animal Science, Michigan State University, East Lansing, MI 48824

ABSTRACT Psittacines are often classified as seed eaters despite studies that have established great diversity in food habits in the wild. While seeds are consumed, so are flowers, buds, leaves, fruits and cambium. Some psittacines consume parts of >80 species of grasses, forbs, shrubs and trees. In addition, insects may be important. Although there are few controlled studies of the requirements of psittacines, it is probable that most nutrient needs are comparable to those of domesticated precocial birds that have been thoroughly studied. Commercial seed mixes for psittacines commonly contain corn, sunflower, safflower, pumpkin and squash seeds, wheat, peanuts, millet, oat groats and buckwheat, although other seeds may be present. Because hulls/shells comprise 18–69% of these seeds and they are removed before swallowing, a significant proportion of typical seed mixtures is waste. Some of the seeds also are very high in fat and promote obesity. Common nutrient deficiencies of decorticated seeds include lysine, calcium, available phosphorus, sodium, manganese, zinc, iron, iodine, selenium, vitamins A, D, E and K, riboflavin, pantothenic acid, available niacin, vitamin B-12 and choline. Attempts to correct these deficiencies by incorporating pellets into seed mixes are usually thwarted by rejection of the pellets and disproportionate consumption of items that are more highly favored. An extruded diet formulated to meet the projected nutrient needs of psittacines was fed with fruits and vegetables to eight species of psittacines for 1 y. Fledging percentage was increased to 90% from the 66% observed during the previous 2 y when these psittacines were fed seeds, fruits and vegetables. Although this extruded diet was well accepted in a mixture of fruits and vegetables and met nutrient needs, analyses have shown that not all commercial formulated diets are of equal merit. J. Nutr. 121: S193–S205, 1991.

INDEXING KEY WORDS:

• *symposium* • *birds* • *psittacines* • *seed composition* • *nutrient requirements* • *formulated diet* • *gout*

Aviculturists often classify caged birds on the basis of their apparent food preferences in captivity (1). The Psittacidae comprise a family of birds with stout, hooked bills commonly called seed eaters despite field studies (2–5) establishing great diversity in food habits in the wild. Psittacines are widespread in tropical and south temperate areas of the world, with major populations in the neotropics and Australia. These regions vary widely in rainfall and temperature and in the food plants that the environment will support (6). Since indigenous psittacines coevolved with their food supply, their food choices in an undegraded habitat represent a nutritional wisdom built on generations of experience. However, studies of caged psittacines suggest that the nutritional wisdom of wild birds does not transfer to captive birds offered cultivated seeds as their principal food. In fact, specific instances of failed dietary husbandry based on seed mixtures have led to this review of natural dietary habits of certain psittacines, the nutritional limitations of seeds and the development of diets formulated to be nutritionally complete.

FOOD SELECTION BY CERTAIN WILD PSITTACINES

Biologists with significant field experience will testify how difficult it is to gather quantitative food intake data on free-living birds. Even qualitative information is difficult to gather. Nevertheless, the follow-

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INDEXING KEY WORDS:

• *symposium* • *birds* • *psittacines* • *seed composition* • *nutrient requirements* • *formulated diet* • *gout*

Aviculturists often classify caged birds on the basis of their apparent food preferences in captivity (1). The Psittacidae comprise a family of birds with stout, hooked bills commonly called seed eaters despite field studies (2–5) establishing great diversity in food habits in the wild. Psittacines are widespread in tropical and south temperate areas of the world, with major populations in the neotropics and Australia. These regions vary widely in rainfall and temperature and in the food plants that the environment will support (6). Since indigenous psittacines coevolved with their food supply, their food choices in an undegraded habitat represent a nutritional wisdom built on generations of experience. However, studies of caged psittacines suggest that the nutritional wisdom of wild birds does not transfer to captive birds offered cultivated seeds as their principal food. In fact, specific instances of failed dietary husbandry based on seed mixtures have led to this review of natural dietary habits of certain psittacines, the nutritional limitations of seeds and the development of diets formulated to be nutritionally complete.

FOOD SELECTION BY CERTAIN WILD PSITTACINES

Biologists with significant field experience will testify how difficult it is to gather quantitative food intake data on free-living birds. Even qualitative information is difficult to gather. Nevertheless, the follow-

[1] Presented as part of the Waltham International Symposium on Nutrition of Small Companion Animals, at University of California, Davis, CA 95616, on September 4–8, 1990. Guest editors for the symposium were James G. Morris, D'Ann C. Finley and Quinton R. Rogers.

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Fledging percentage associated with feeding of seeds, fruit and vegetables or an extrusion, fruit and vegetables to 8 species of psittacines

Food item	Diet strategy: Seeds, fruit, veg[3]	Diet strategy: Extrusion, fruit, veg[4]
	%	
Yellow-headed Amazon *(Amazona ochrocephala ortrix)*	75	100
Forsten's Lorikeet *(Trichoglossus haematodus forsteni)*	62	100
Goldie's Lorikeet *(Trichoglossus goldiei)*	45	83
Blue and Gold Macaw *(Ara ararauna)*	62	80
Scarlet Macaw *(Ara macao)*	62	100
Ring-necked Parakeet *(Psittacula krameri manillensis)*	80	100
Rock Peplar Parakeet *(Polytelis anthopeplus)*	88	80
Blue-crowned Hanging Parrot *(Loriculus galgulus)*	50	75
Total	66	90[5]

Vielen Dank für Ihre Aufmerksamkeit!