Science business

Marcus Clauss

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PhD Seminar Göttingen 2018

University of Zurich[UZH]

Clinic of Zoo Animals, Exotic Pets and Wildlife

‘publish or perish !’

Career steps

Clauss M (**1998**) Feeding Giraffe (*Giraffa camelopardalis*). MSc Thesis, Zoological Society of London/Royal Veterinary College (copy available on request) Qualification thesis

Clauss M, Suedmeyer WK, Flach EJ (**1999**) Susceptibility to cold in captive giraffe (*Giraffa camelopardalis*). Proceedings of the American Association of Zoo Veterinarians, 183-186 Conference contribution

Clauss M, Lechner-Doll M, Flach EJ, Tack C, Hatt JM (**2001**) The comparative use of four marker systems for the estimation of digestibility, and low food intake, in a group of captive giraffe (*Giraffa camelopardalis*). Zoo Biology 20: 315-329 Journal article

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Hummel J, Clauss M (**2006**) Feeding. In: EAZA husbandry and management guidelines for Giraffa camelopardalis. Burger's Zoo, Arnhem, pp. 29-61 Husbandry guidelines

Clauss M, Dierenfeld E (**2008**) The nutrition of browsers. In: Fowler ME, Miller RE (eds) Zoo and wild animal medicine. Current therapy 6. Saunders Elsevier, St. Louis, pp. 444-454 Book chapter

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Lindenau, Susanne

Yesterday 13:21

To mclauss@vetclinics.uzh.ch

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Sehr geehrter Herr Prof. Clauss,

wir, die Abteilung Schulbuch der VG Wort, wickeln Fremdtextnutzungen in Sammlungen nach §46 UrhG für Schulbuchverlag ab.

Ein Schulbuchverlag möchte einen Text von der Internetseite https://www.vzp.de/2017/01/27/studie-belegt-s%C3%A4ugetiere-leben-l%C3%A4nger-in-zoos/ nutzen, bei dem Sie als Urheber genannt sind.

Bitte teilen Sie uns für den Versand einer detaillierten Mitteilung Ihre Postadresse mit. Um Ihnen eine Vergütung zuzuweisen und Verwechslungen aufgrund von Namensgleichheit zu vermeiden, benötigen wir außerdem Ihr Geburtsdatum.

Für Rückfragen stehe ich gern zur Verfügung.

Vielen Dank.

Mit freundlichen Grüßen,

i. A. Susanne Lindenau
Schulbuch / Blindenbuch

Tel.Nr. 089-51 41 2 - 25
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Why publish ?

- Selfish reasons I
  - Publications are a prerogative for many career steps (PhD, Diplomate, Certified specialist) and very generally for a career in academia (but not necessarily for cool jobs)
  - Publications are a cornerstone of evaluations and of the reputation of a scientist or an institution; publications are therefore important for your own reputation, and you can make others your friends by publishing with/for them
- Public reasons
  - Most researchers are paid for by public funds. Not publishing your findings is like taking the cash without delivering in return.
  - It may be important for a nation / the human race that a certain proportion of the population generates new knowledge and saves it in an accessible way
- Selfish reasons II
  - be known (and remembered) ... be famous ... be human

‘Cathedrals of knowledge’

Referencing

Journal of Scholarly Publishing April 2013

Source References and the Scientist's Mind-Map: Harvard vs. Vancouver Style

MARCUS CLAUSS, DENNIS W. H. MÜLLER, and DARYL CODRON

TABLE 1. Major differences between the Harvard and Vancouver reference styles

Style element	Harvard style	Vancouver style
Citation in the text	Author(s) name and year of publication in parentheses; multiple sources sorted chronologically	Unique number assigned to source in parentheses or as superscript; multiple sources indicated by the their respective numbers (without a defined order)
Reference list	Sorted alphabetically by author name; various rules for sorting publications of the same first author (e.g., chronologically)	Sorted in the order in which they were cited in the text

you absorb important names while reading

you can easily check for missing citations or excessive self-citation

you absorb nothing

checks are extremely tedious

Harvard style

A large number of individual studies have reported the time food is retained in the intestinal tract of animals—the so called 'passage time' (Foose 1982; Clauss et al. 2005; Clauss et al. 2010). It has been suggested that this passage time increases with increasing body mass (Illius & Gordon 1992)—i.e., larger animal species should have longer passage times than smaller animal species. Because digestive efficiency is a function of the time available for digestion (Hume 2005; Clauss et al. 2007), it follows that larger animals should be able to achieve higher digestibilities than smaller animals. Surprisingly, empirical evidence does not support this line of reasoning (Justice & Smith 1992; Clauss et al. 2009).

Clauss M, Froeschle T, Castell J, Hummel J, Hatt JM, Ortmann S, Streich WJ (2005) Fluid and particle retention times in the black rhinoceros (*Diceros bicornis*), a large hindgut-fermenting browser. Acta Theriol 50:367–376

Clauss M, Schwarm A, Ortmann S, Streich WJ, Hummel J (2007) A case of non-scaling in mammalian physiology? Body size, digestive capacity, food intake, and ingesta passage in mammalian herbivores. Comp Biochem Physiol A 148:249–265

Clauss M, Nunn C, Fritz J, Hummel J (2009) Evidence for a tradeoff between retention time and chewing efficiency in large mammalian herbivores. Comp Biochem Physiol A 154:376–382

Clauss M, Lang-Deuerling S, Müller DWH, Kienzle E, Steuer P, Hummel J (2010) Retention of fluid and particles in captive tapirs (*Tapirus* spp.). Comp Biochem Physiol A 157:95–101

Foose TJ (1982) Trophic strategies of ruminant versus nonruminant ungulates. PhD Thesis, University of Chicago

Hume ID (2005) Concepts of digestive efficiency. In: Starck JM, Wang T (eds) Physiological and ecological adaptations to feeding in vertebrates. Science Publishers, Enfield NH, pp 43–58

Illius AW, Gordon IJ (1992) Modelling the nutritional ecology of ungulate herbivores: evolution of body size and competitive interactions. Oecologia 89:428–434

Justice KE, Smith FA (1992) A model of dietary fiber utilization by small mammalian herbivores, with empirical results for Neotoma. Am Nat 139:398–416

Length: 117 words (723 characters, including spaces)

Vancouver style

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Length: 93 words (594 characters including spaces)

The Citation

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The Reference List

The state of your reference list reflects your state of mind.

is it chaotic or well-ordered and consistent?

Clauss M, Hummel J (2005) The digestive performance of mammalian herbivores: why big may not be *that* much better. Mammal Review 35:174-187

Clauss M, Steuer P, Erlinghagen-Lückerath K, Kaandorp J, Fritz J, Südekum K-H, Hummel J (2015) Faecal particle size: Digestive physiology meets herbivore diversity. *Comparative Biochemistry and Physiology A* **179**,182-191.

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Hummel, J.; Suedekum, K. H.; Streich, W.J.; Clauss, M. 2006. Forage fermentation patterns and their implications for herbivore ingesta retention times. **Functional Ecology** 20(4), 989-1002.

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Hummel J, Südekum K-H, Streich WJ, Clauss M (2006) Forage fermentation patterns and their implications for herbivore ingesta retention times. Functional Ecology 20: 989-1002

The Citation

Giraffes in zoos often die from malnutrition (Clauss et al. 2001).

According to Clauss et al. (2001), giraffes in zoos often die from malnutrition.

Clauss et al. (2001) showed that some zoo giraffes consume amounts of food lower than expected based on extrapolations from other herbivores and from free-ranging giraffes, and speculated that this might be a cause for low body reserves and death associated with depleted adipose tissue stores often observed in this species in captivity.

The Citation

The basal metabolic rate of sauropod dinosaurs changed during ontogeny (Sander & Clauss 2008).

It has been speculated that the basal metabolic rate of sauropod dinosaurs might have changed during ontogeny (Sander & Clauss 2008).

The Citation

Browsing ruminants have only protozoa of the subfamily Entodiniinae in their rumen (Clauss & Lechner-Doll 2001).

Entodiniinae are mostly the only protozoa subfamily that is found in the rumen of browsing ruminants (reviewed by Clauss & Lechner-Doll 2001).

Berl. Münch. Tierärztl. Wschr. **110**, 161-165 (1997)

ISSN 0005-9366

Eingegangen am 3. 12. 1996

Institut für Biometrie und Informationsverarbeitung Fachbereich Veterinärmedizin, Freie Universität Berlin

Epidemiologische Studien zur Übertragung der Bovinen Spongiformen Encephalopathie (BSE) – Anmerkungen aus biometrischer Sicht

Epidemiological studies on the transmission of bovine spongiforme encephalopathy (BSE) – some remarks from a biometrical point of view

Susanne Dahms

Zusammenfassung: Anhand einer Fall-Kontroll-Studie zur Übertragung der Bovinen Spongiformen Encephalopathie (BSE) werden biometrische Aspekte der Planung und Auswertung solcher epidemiologischer Studien diskutiert. Bei dem Beispiel handelt es sich um eine retrospektive Untersuchung der Hypothese, daß BSE-Fälle als Kälber durch Fleisch- und Knochenmehl enthaltende Kraftfuttermittel infiziert worden sind. Dazu wurde als Studientyp eine Fall-Kontroll-Studie gewählt, deren Studiendesign und Datenerhebung zunächst vorgestellt werden. Zur Auswertung der Studie wurden rohe und mit Hilfe logistischer Regressionen adjustierte Odds-Ratios für den Risikofaktor „Fleisch- und Knochenmehl" geschätzt. Diese Auswertungsstrategie wird hier diskutiert und der gewählte Regressionsansatz mit einem alternativen Ansatz verglichen. Dabei zeigt sich, daß bei der Auswahl der Studienherden Probleme aufgetreten sind, die zu einem unausgewogenen Verhältnis von Kontroll- zu Fallherden geführt haben. Dieses Mißverhältnis und die unterschiedliche Datenqualität bei Fällen und Kontrollen erschweren die Interpretation der Studienergebnisse.
Schlüsselwörter: Biometrie, Epidemiologie, Fall-Kontroll-Studie, Bovine Spongiforme Encephalitis (BSE)

Summary: This contribution discusses biometrical aspects of the design and analysis of epidemiological case-control studies. The study chosen as an example was undertaken to investigate the transmission of bovine spongiform encephalopathy (BSE) to calves and the role of the inclusion of meat and bonemeal in proprietary feedstuffs. The hypothesis was examined by means of a case-control study which is summarized with emphasis on its study design and the collection of data. The analysis included the estimation of raw odds-ratios for the inclusion of meat and bonemeal in proprietary feedstuffs for calves as well as adjusted odds-ratios using logistic regression. This strategy is discussed and the chosen regression model is compared with an alternative one. Results show that problems occurred when recruiting herds for the study leading to uneven proportions of cases and controls. Because of these misproportions and due to different data quality for cases and controls the interpretation of the study results is difficult.

Key words: biometry, epidemiology, case control studies, bovine spongiforme encephalopathy (BSE)

Einleitung

Die Erforschung der Herkunft und Übertragung der Bovinen Spongiformen Encephalopathie – oder kurz BSE – stellt ein Problem mit vielfältigen Teilaspekten dar, die in unterschiedliche Gebiete der Veterinärmedizin fallen. Eine Aufgabe der Epidemiologie kann darin gesehen werden, das Erscheinungsbild der Krankheit insgesamt zu erfassen, um daraus Fragestellungen und Hypothesen für weiterführende, speziellere Studien abzuleiten. Dazu gehört aber auch, die einzelnen Forschungsergebnisse und die verschiedenen Erklärungsansätze dann wieder zusammenzuführen und kritisch zu prüfen, wie sie zueinander und zur Gesamterscheinung der Krankheit passen.

Die Arbeit eines Epidemiologen ist damit nicht primär auf die individuelle Erkrankung gerichtet, sondern auf das Geschehen in einer Population und die Randbedingungen, unter denen es zu beobachten ist. Daher gehören statistisches Denken und biometrische Methoden zum unverzichtbaren Handwerkszeug der Epidemiologie. Es erfordert allerdings eine sorgfältige Studienplanung, einen sachgerechten Umgang mit statistischen Methoden und eine Abstimmung auf die zu bearbeitende Fragestellung, damit epidemiologische Studien interpretierbare Ergebnisse liefern können.

Mit diesem Beitrag soll am Beispiel der BSE ein Eindruck davon vermittelt werden, wie sich die zu untersuchende Fragestellung auf die Planung epidemiologischer Studien auswirken kann, welche Probleme bei der Durchführung auftreten können und was dann bei der Interpretation der Ergebnisse zu beachten ist. Dazu soll zunächst kurz auf die beschreibenden epidemiologischen Untersuchungen der ersten BSE-Fälle eingegangen werden. Den Schwerpunkt wird dann eine Fall-Kontroll-Studie zu einer spezifischen Übertragungshypothese des BSE-Erregers bilden.

Nachdem Mitte der achtziger Jahre in Großbritannien die ersten BSE-Erkrankungen aufgefallen waren, führte ihre zunehmende Verbreitung bald zu umfangreichen epidemiologischen Untersuchungen, die ihre Herkunft klären sollten: Im Juni 1987 wurde mit einer deskriptiven Studie aller bis dahin in Großbritannien aufgetretenen BSE-Fälle begonnen, deren Ergebnisse 1988 von Wilesmith et al., (1988) veröffentlicht wurden.

Das Ziel dieser Studie war einmal, das klinische Bild und die Pathologie der BSE-Erkrankung genauer zu beschreiben. Vor allem ging es aber auch darum, anhand der bekannten Fälle die epidemiologischen Merkmale der BSE herauszuarbeiten, das heißt zu klären, wo, wann, unter welchen Umständen und bei welcher Art von Tieren die Krankheit auftritt, um anhand dieser Merkmale mögliche ätiologische Arbeitshypothesen zu entwikkeln. Die Datenerhebung konzentrierte sich daher auf BSE-betroffene Tiere bzw. Herden. Zur ihrer Charakterisierung wurde

Eine Untersuchung der Produktionsverfahren in 46 Tierkörperbeseitigungsanlagen in Großbritannien (Wilesmith et al., 1991) ergab, daß seit Anfang der 80er Jahre vermehrt Umstellungen der Produktionstechnologie vorgenommen worden sind, die unzureichende Erhitzungstemperaturen und -zeiten zur Folge haben können. Außerdem wurde weitgehend die Fett-Extraktion mit organischen Lösungmitteln aufgegeben. Damit könnten Bedingungen geschaffen worden sein, die den Scrapie-Erreger nicht mehr inaktivieren. Da diese Produktionsumstellungen zeitlich mit dem geschätzten Beginn der BSE-Exposition zusammenfallen, erhärtet sich damit die Fleisch- und Knochenmehl-Hypothese weiter.

BMTW · Heft 5 161

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Wilesmith, J. W. (1993): BSE: Epidemiological approaches, trials and tribulations. Prev. Vet. Med. 18, 33–42.
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Wilesmith, J. W., G. A. H. Wells, M. P. Cranwell, J. B. M. Ryan (1988): Bovine spongiform encephalopathy: Epidemiological studies. Vet. Rec. **123**, 638–644.

Papers and Articles

Bovine spongiform encephalopathy: epidemiological studies on the origin

J. W. Wilesmith, J. B. M. Ryan, M. J. Atkinson

Veterinary Record (1991) **128**, 199-203

The results of further epidemiological studies of bovine spongiform encephalopathy (BSE) support the previous findings that the onset of exposure of the cattle population to a scrapie-like agent, sufficient to result in clinical disease, occurred in 1981/82. The onset of this exposure was related to the cessation, in all but two rendering plants, of the hydrocarbon solvent extraction of fat from meat and bone meal. A further possible explanation, related to the geographical variation in the reprocessing of greaves to produce meat and bone meal, was identified for the geographical variation in the incidence of BSE.

FOLLOWING the identification of the novel neurological disease of domestic cattle, bovine spongiform encephalopathy (BSE), in Great Britain in November 1986 (Wells and others 1987) an epidemiological study of the disease was begun in June 1987. The initial findings of this study were consistent with exposure of cattle sufficient to cause clinical disease, commencing in 1981/82, to a scrapie-like agent via cattle feedstuffs containing ruminant derived protein in the form of meat and bone meal (Wilesmith and others 1988). Meat and bone meal is a by-product of the rendering of animal carcases and waste animal material principally from abattoirs, a process which was, from very early times until the 1920s, used to prod[illegible] mainly tallow (MMC 1985). Meat and bone meal has been inc[illegible] porated into cattle feedstuffs as a source of animal protein [illegible] several decades. The initial epidemiological studies of BSE [illegible] identified changes in the rendering processes which were p[illegible] sibly significant in explaining why cattle became exposed t[illegible] scrapie-like agent. One of the objectives of the continuing [illegible] demiological studies was to investigate further the possible [illegible] sons for this exposure. To this end, the changes in the render[illegible] process were investigated in detail by means of a surve[illegible] rendering plants in production in Great Britain.

This paper describes the results of this survey to[illegible]ther w[illegible] the results of the epidemiological studies to investigate [illegible] the time of onset of effective exposure of cattle.

Materials and methods

Case definition and collection of data

The methods of case definition and collection of data [illegible] affected cases were those described previously (Wilesmith [illegible] others 1988).

Survey of past and present processes used in the rendering pla[illegible]

A survey of all rendering plants in Great Britain produc[illegible] products destined for animal feedstuffs was conducted during September and October 1988. The survey involved visits to all plants in operation at this time by veterinary officers to obtain data on the following: the tonnage of raw material currently processed, together with the species composition and the type of material; whether greaves, the product of the initial rendering process, are or have been purchased and, if so, the details of the further processing employed; the changes in the composition and type of material processed since 1980; the type of process currently used, its date of installation and the changes in the type of process during the history of the plant; the details of the process in use including the particle size of raw material entering the process, the maximum temperature applied and the time/temperature combinations of the process; the output of each plant in terms of the tonnage of greaves, meat and bone meal and tallow since 1980 and the purchasers of the products.

The maximum temperatures achieved by the material in the processes were determined from the temperature monitoring equipment in the plants and checked by means of remote sensing infrared thermometers directed at the material, and, or, thermocouple probes inserted into the material.

Additional information on the processes employed, and changes, in rendering plants which had ceased production before the survey was also obtained to assess the representativeness of the results of the survey.

herds are shown in Fig 1.

Survey of rendering processes

The survey of rendering plants revealed that, at some time in 1988, there were 46 plants in operation in Great Britain producing tallow and greaves and in many cases further processing

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BMTW · Heft 5

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gen und Hypothesen für weiterführende, speziel
zuleiten. Dazu gehört aber auch, die einzelner
gebnisse und die verschiedenen Erklärungsansätze
zusammenzuführen und kritisch zu prüfen, wie
und zur Gesamterscheinung der Krankheit pass
Die Arbeit eines Epidemiologen ist damit nicht
individuelle Erkrankung gerichtet, sondern auf
in einer Population und die Randbedingungen,
zu beobachten ist. Daher gehören statistisches
metrische Methoden zum unverzichtbaren Han
Epidemiologie. Es erfordert allerdings eine sorg
planung, einen sachgerechten Umgang mit stati
den und eine Abstimmung auf die zu bearbeit
lung, damit epidemiologische Studien interpr
nisse liefern können.
Mit diesem Beitrag soll am Beispiel der BS
davon vermittelt werden, wie sich die zu unten

The Veterinary Record, March 2, 1991

Papers and Articles

Bovine spongiform encephalopathy: epidemiological studies on the origin

J. W. Wilesmith, J. B. M. Ryan, M. J. Atkinson

Veterinary Record (1991) 128, 199-203

The results of further epidemiological studies of bovine spongiform encephalopathy (BSE) support the previous findings that the onset of exposure of the cattle population to a scrapie-like agent, sufficient to result in clinical disease, occurred in 1981/82. The onset of this exposure was related to the cessation, in all but two rendering plants, of the hydrocarbon solvent extraction of fat from meat and bone meal. A further possible explanation, related to the geographical variation in the reprocessing of greaves to produce meat and bone meal, was identified for the geographical variation in the incidence of BSE.

FOLLOWING the identification of the novel neurological disease of domestic cattle, bovine spongiform encephalopathy (BSE), in Great Britain in November 1986 (Wells and others 1987) an epidemiological study of the disease was begun in June 1987. The initial findings of this study were consistent with exposure of cattle sufficient to cause clinical disease, commencing in 1981/82, to a scrapie-like agent via cattle feedstuffs containing ruminant derived protein in the form of meat and bone meal (Wilesmith and others 1988). Meat and bone meal is a product of the rendering of animal carcases and waste material produced primarily from abattoirs, a process which was used from very early times until the 1920s, used to produce animal fodder (Stott 1985). Meat and bone meal has been incorporated into cattle feedstuffs as a source of animal protein for several months. The initial epidemiological studies of BSE also identified changes in the rendering processes which were possibly significant in explaining why cattle became exposed to a scrapie-like agent. One of the objectives of the continuing epidemiological studies was to investigate further the possible reasons for this exposure. To this end, the changes in the rendering process were investigated in detail by means of a survey of all rendering plants in production in Great Britain.

September and October 1988. The survey involved visits to all plants in operation at this time by veterinary officers to obtain data on the following: the tonnage of raw material currently processed, together with the species composition and the type of material; whether greaves, the product of the initial rendering process, are or have been purchased and, if so, the details of the further processing employed; the changes in the composition and type of material processed since 1980; the type of process currently used, its date of installation and the changes in the type of process during the history of the plant; the details of the process in use including the particle size of raw material entering the process, the maximum temperature applied and the time/temperature combinations of the process; the output of each plant in terms of the tonnage of greaves, meat and bone meal and tallow since 1980 and the purchasers of the products.

The maximum temperatures achieved by the material in the processes were determined from the temperature monitoring equipment in the plants and checked by means of remote sensing infrared thermometers directed at the material, and, or, thermocouple probes inserted into the material.

Additional information on the processes employed, and changes, in rendering plants which had ceased production before the survey was also obtained to assess the representativeness of the results of the survey.

Analyses of data

Age specific incidences of BSE within herds which had experienced at least one confirmed case in 1987 and within herds with at least one confirmed case of BSE in 1988 and the percentage of dairy herds, by region, which had at least one confirmed case of BSE in the period from November 1986 to July 1989 were calculated as described previously (Wilesmith and others 1988).

?

... of using hydrocarbon solvent extraction of fat from meat and bone meal. The present study does not support the original suggestion that the introduction of continuous processes has been the principal reason for the exposure of cattle in 1981/82 sufficient to cause clinical disease at a detectable incidence. The time course of the change to continuous rendering is not consistent with the estimated time of the onset of exposure.

Wolstencroft, Wolverhampton WV6 8TQ

ducing tallow and greaves and in many cases further processing

The Citation

Although it has been repeatedly suggested that a change in the processing protocols at rendering plants was responsible for the onset of the British BSE epidemic (e.g. Dahms 1997), the original source usually cited for this claim (Wilesmith et al. 1991) does not substantiate it.

Marine Mammal Science

Notes

MARINE MAMMAL SCIENCE, 33(1): 386–388 (January 2017)

DOI: 10.1111/mms.12364

The blue whale brain misrepresented by an alcohol dehydrated brain of 3,636 grams

SAM H. RIDGWAY[1] AND KAITLIN R. VAN ALSTYNE, National Marine Mammal Foundation, 2240 Shelter Island Drive, Suite 200, San Diego, California 92106, U.S.A.

We recently noticed an outlier in the available data on blue whale brain mass in the supplemental data of a recent paper (Montgomery *et al.* 2013). The authors listed a brain mass of 3,636 g as the only representative of the blue whale species as a whole. In several papers, the blue whale is represented by only this one brain (von Bonin 1937, Jerison 1978, Glezer 2002, Hof *et al.* 2005, Manger 2006, Marino *et al.* 2006, Marino 2009, Montgomery *et al.* 2013, Gersenowies-Rodriguez 2014). After discovering a large discrepancy between the 3,636 g value and blue whale brain mass data (Table 1) that we had extracted from the literature, we conducted an investigation to determine the source of this outlier blue whale value.

Marine Mammal Science

Notes

MARINE MAMMAL SCIENCE, 33(1): 386–388 (January 2017)

DOI: 10.1111/mms.12364

The blue whale brain misrepresented by an alcohol dehydrated brain of 3,636 grams

SAM H. RIDGWAY[1] AND KAITLIN R. VAN ALSTYNE, National Marine Mammal Foundation, 2240 Shelter Island Drive, Suite 200, San Diego, California 92106, U.S.A.

We began our reversed chronological tracking of the 3,636 g blue whale brain with Montgomery *et al.* 2013, who cited Manger (2006). From Manger, the trail led to Jerison (1978), Gihr and Pilleri (1969), von Bonin (1937), and on to Warncke (1908) and Wilson (1933), who credited the original source: Guldberg (1885, p. 128). Also, Gihr and Pilleri (1969) cited the 3,636 g brain as well as a 6,700 g brain as two separate specimens, crediting von Bonin (1937) as the source for the former and Guldberg (1885) as the source for the latter. After consulting a German speaking colleague, we are confident in our understanding of the methods that Guldberg (1885) spelled out in his original German publication.

Global Ecology and Biogeography, (Global Ecol. Biogeogr.) (2016)

CONCEPT PAPER

Flawed citation practices facilitate the unsubstantiated perception of a global trend toward increased jellyfish blooms

Marina Sanz-Martín[1,2]*, Kylie A. Pitt[3], Robert H. Condon[4], Cathy H. Lucas[5], Charles Novaes de Santana[6] and Carlos M. Duarte[7]

Analyses showed that 48.9% of publications misinterpreted the conclusions of cited sources, with a bias towards claiming jellyfish populations are increasing, with a single review having the most influence on the network. Collectively, these disparities resulted in a network based on unsubstantiated statements

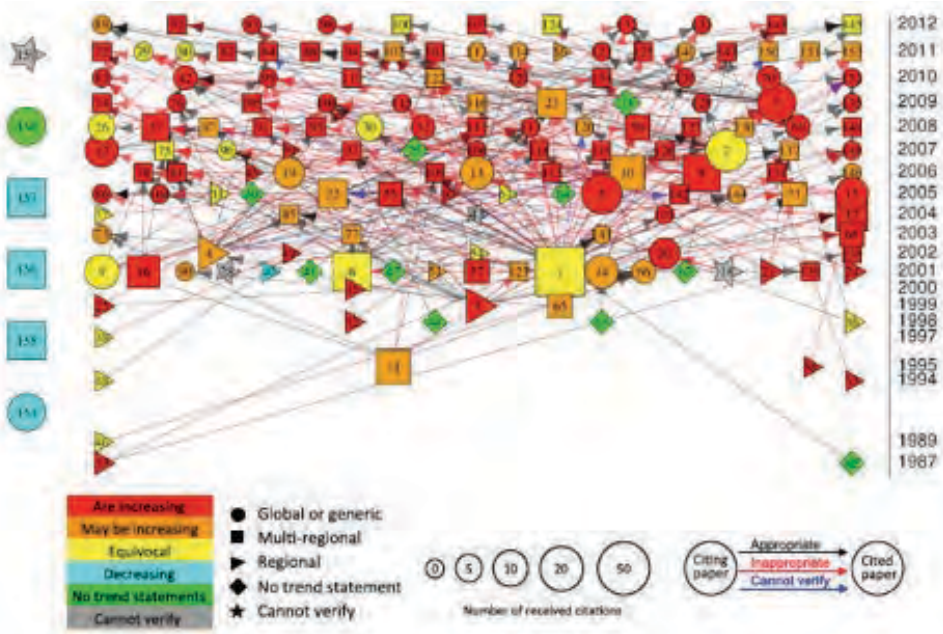
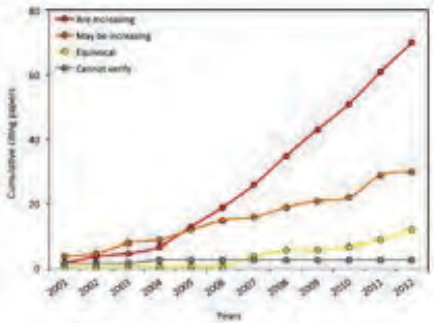


Figure 1 Chronological network of citation threads regarding jellyfish population trends. Nodes represent papers, their size and their numerical label represent the frequency at which they have been cited by other papers in the network, their shape represents the spatial category and their colours/shades represent the affirmation degree stated in support of jellyfish trends. Arrows represent the appropriateness assessment of the citations. Data set available in Sanz-Martín *et al.* (2016).



Forum

Editor's Choice

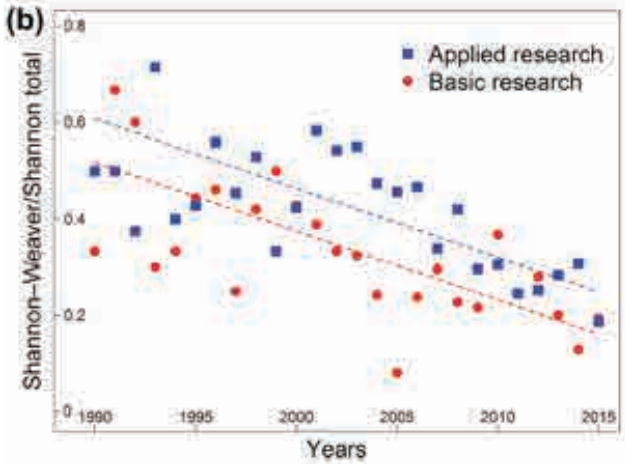
Oikos 126: 1523–1532, 2017
doi: 10.1111/oik.04400

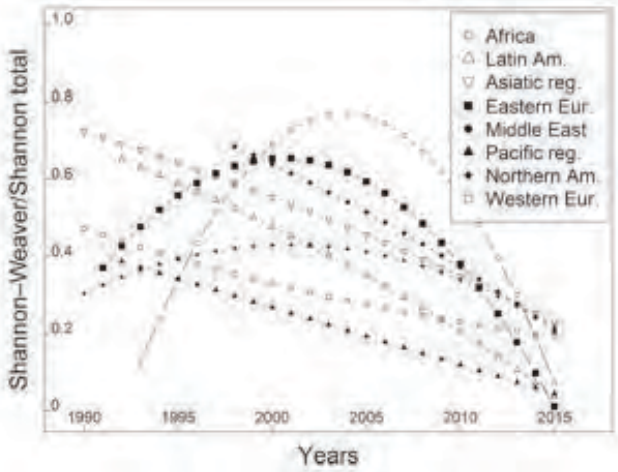
Subject Editor: Christopher Swan. Editor-in-Chief: Dustin Marshall. Accepted 10 April 2017

Avoiding erroneous citations in ecological research: read before you apply

Martin Šigut, Hana Šigutová, Petr Pyszko, Aleš Dolný, Michaela Drozdová and Pavel Drozd

The Shannon–Wiener index is a popular nonparametric metric widely used in ecological research as a measure of species diversity. We used the Web of Science database to examine cases where papers published from 1990 to 2015 mislabelled this index. We provide detailed insights into causes potentially affecting use of the wrong name 'Weaver' instead of the correct 'Wiener'. Basic science serves as a fundamental information source for applied research, so we emphasize the effect of the type of research (applied or basic) on the incidence of the error. Biological research, especially applied studies, increasingly uses indices, even though some researchers have strongly criticized their use. Applied research papers had a higher frequency of the wrong index name than did basic research papers. The mislabeling frequency decreased in both categories over the 25-year period, although the decrease lagged in applied research. Moreover, the index use and mistake proportion differed by region and authors' countries of origin. Our study also provides insight into citation culture, and results suggest that almost 50% of authors have not actually read their cited sources.





How do you know what you read is true?

Check the sources!

Frustration I: it is all about humans

- What else would it be about?

- 'if you are still looking for a miracle you better be one'

Frustration II: they all just cook with water

- What else would you expect people to cook with in the first place?

Frustration III: How can I, a student/ a beginner, know when to trust a scientific text ?

- Being in this uncertainty is a normal human condition
- Think of:
  - having your car repaired
  - having your appendix removed by a human surgeon
  - have your bank consultant screen your options to get a bank loan
  - have a wedding gown made by a tailor
  - falling in love and wondering whether that feeling is reciprocated

- Why should SCIENCE be the one thing that you can do without a lot of effort and uncertainty?

Learning process

facts, concepts, policies, practice

(graduation)

(scientific work:) how to produce facts, concepts, policies, recipies

(postgrad education)

how to be happy

(?)

How new knowledge is generated

How new knowledge is generated

Experience and knowledge in a topic

(new) idea

Literature research

Formulation of a question/hypothesis

Design a study

Apply for funding

Evaluation of the application by “peers”

Do the study: finances, material

personnel

create starting conditions

experimental stage: generation of samples

lab stage: analysis of samples

computer stage: data evaluation (graphics, statistics)

How new knowledge is made public

Present at a conference:

- secure funding for conference
- Write an "Abstract"
- Submit
  - Evaluation by conference committee (peers)
- Design a presentation (Power-Point)
- Present (oral/poster) at conference
- others perceive the presentation/ read the abstract

Produce a manuscript

- cooperation with co-authors
- internal corrections (e.g. by boss, supervisor)

Choice of a publication outlet

Submission of manuscript

- Evaluation by peers

Revision of manuscript

- Manuscript is accepted

Correction of page proofs

- Manuscript is printed

Others read the manuscript ->

Discussion
Media appearance
Repetition

Inclusion into Textbooks

How scientists are evaluated ...

‘Impact Factor’

IF = mathematical parameter (calculated!)

The average number of times a publication of the journal in question is cited in the first two years following the publication year (i.e. today’s IF refers to publications three years old).

The more prestigious a journal = the more it is read = the more its articles are cited = the more prestigious it is

Impact Factors 2006 - 2018

CA-A Cancer Journal for Clinicians	50	187
Science	31	37
Nature	29	40
The Veterinary Record	1.06	1.74
Journal of Zoo and Wildlife Medicine	0.36	0.59
Schweizer Archiv für Tierheilkunde	0.32	0.59

‘h-Factor’

HF = mathematical parameter (calculated!)

The number of publications of a researcher which have been cited as least as often as this number.

Example: 7 publications, one is cited 5 times, one is cited 2 times, the other ones are cited once or not at all => HF=2

HF of Noble Price winners 30-70

HF should increase with age and has to be corrected for age if different people are compared.

Note that the HF can never go down even if you don’t work any more.

ELSEVIER

self -

Comparative Biochemistry and Physiology - A Molecular and Integrative Physiology Top Cited Article 2008 - 2010

Awarded to:

Schwarm, A., Ortmann, S., Wolf, C., Jürgen Streich, W., Clauss, M.

For the paper entitled:

"Excretion patterns of fluid and different sized particle passage markers in banteng (Bos javanicus) and pygmy hippopotamus (Hexaprotodon liberiensis): Two functionally different foregut fermenters"

This paper was published in:

Comparative Biochemistry and Physiology - A Molecular and Integrative Physiology, Volume 150, Issue 1, 2008

Judy Bai
Publisher - Life Sciences
Elsevier, Beijing, China

How is academic work evaluated ?

Codron, Daryl Return to Search Page | Get A Badge | ResearcherID Labs

ResearcherID: B-8867-2008
URL: http://www.researcherid.com/rid/B-8867-2008
Subject: Environmental Sciences & Ecology; Evolutionary Biology
Keywords: stable isotopes; mammal herbivores; animal ecology; palaeoecology

My Institutions (more details)
Primary Institution: National Museum
Sub-org/Dept: Florisbad Quaternary Research
Role: Researcher (Academic)
Joint Affiliation: University of Zurich
Sub-org/Dept: Clinic for Zoo Animals, Exotic Pets and Wildlife
Role: Postdoctoral Fellow
Past Institutions: University of KwaZulu-Natal

My Publications

My Publications (53)
View Publications
Citation Metrics

ResearcherID labs
Create A Badge
Collaboration Network
Citing Articles Network

My Publications: View

This list contains papers that I have authored.

53 publication(s) Page 1 of 6 Go

1. Title: Hominins, sedges, and termites: new carbon isotope data from the Sterkfontein valley and Kruger National Park
Author(s): SPONHEIMER, M; LEE-THORP, J; DE RUITER, D; et al.
Source: JOURNAL OF HUMAN EVOLUTION Volume: 48 Issue: 3 Pages: 301-312 Published: MAR 2005
Times Cited: 80

2. Title: Taxonomic, anatomical, and spatio-temporal variations in the stable carbon and nitrogen isotopic compositions of plants from an African savanna
Author(s): CODRON, J; CODRON, D; LEE-THORP, JA; et al.
Source: JOURNAL OF ARCHAEOLOGICAL SCIENCE Volume: 32 Issue: 12 Pages: 1757-1772 Published: DEC 2005
Times Cited: 74

3. Title: Diets of savanna ungulates from stable carbon isotope composition of faeces
Author(s): CODRON, D; CODRON, J; LEE-THORP, JA; et al.
Source: JOURNAL OF ZOOLOGY Volume: 273 Issue: 1 Pages: 21-29 Published: SEP 2007
Times Cited: 62

4. Title: Do "savanna" chimpanzees consume C-4 resources?
Author(s): SPONHEIMER, M; LOUDON, JE; CODRON, D; et al.
Source: JOURNAL OF HUMAN EVOLUTION Volume: 51 Issue: 2 Pages: 128-133 Published: AUG 2006
Times Cited: 59

5. Title: Strontium isotope evidence for landscape use by early hominins
Author(s): Copeland, SR; Sponheimer, M; de Ruiter, DJ; et al.
Source: Nature Volume: 474 Issue: 7349 Pages: 76-U100 Published: 2011
Times Cited: 50

How is academic work evaluated ?

Codron, Daryl Return to Search Page | Get A Badge | ResearcherID Labs

ResearcherID: B-8867-2008
URL: http://www.researcherid.com/rid/B-8867-2008
Subject: Environmental Sciences & Ecology; Evolutionary Biology
Keywords: stable isotopes; mammal herbivores; animal ecology; palaeoecology

My Institutions (more details)
Primary Institution: National Museum
Sub-org/Dept: Florisbad Quaternary Research
Role: Researcher (Academic)
Joint Affiliation: University of Zurich
Sub-org/Dept: Clinic for Zoo Animals, Exotic Pets and Wildlife
Role: Postdoctoral Fellow
Past Institutions: University of KwaZulu-Natal

My Publications

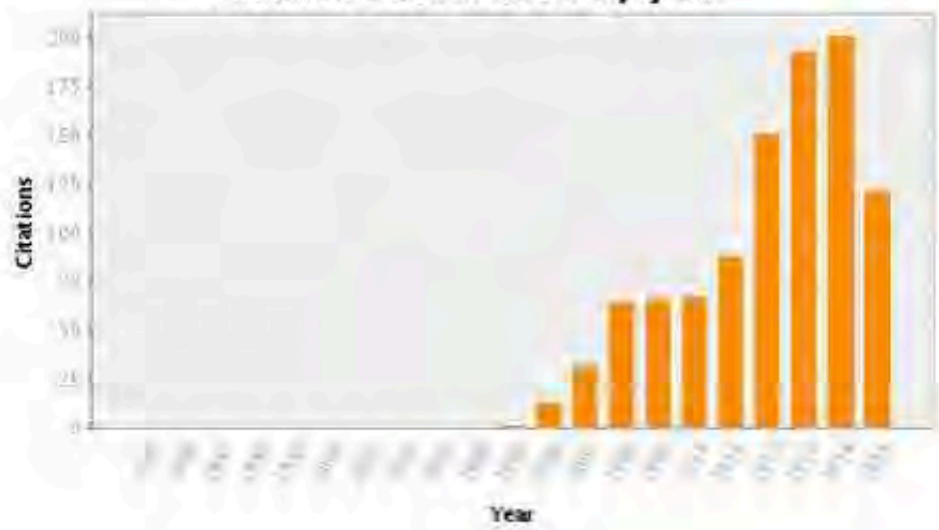
My Publications (53)
View Publications
Citation Metrics

ResearcherID labs
Create A Badge
Collaboration Network
Citing Articles Network

My Publications: Citation Metrics

This graph shows the number of times the articles on the publication list have been cited in each of the last 20 years.
Note: Only articles from Web of Science Core Collection with citation data are included in the calculations. More information about these data.

Citation Distribution by year



Total Articles in Publication List: **53**
Articles With Citation Data: **51**
Sum of the Times Cited: **1009**
Average Citations per Article: **19.78**
h-index: **20**
Last Updated: **09/25/2015 06:17 GMT**

How is academic work evaluated ?

By any kind of success in the “peer-review-process”,

- successful grant applications
- **“peer-reviewed” publications and their citations**

(- awards)

Indirect measures such as successful application for a job position, editorship for a journal, writing a book, producing highly qualified students ...

How is academic work evaluated ?

The number of peer-reviewed pubications (as such or in combination with a weighting for impact factor or h-factor) is currently the most important evaluation criterium in academia.

Acquiring grant money is the second most important criterium – or the most important one in some places!

Other potential criteria revolve around media presence or the influence on 'policy making'.

This is something one has to know, even if one need not welcome it.

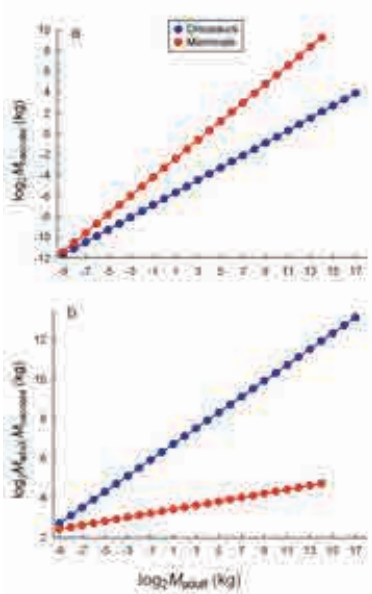
… and what really counts

Scientific debate

biology letters
Evolutionary biology
Biol. Lett. (2012) **8**, 620–623
doi:10.1098/rsbl.2012.0240
Published online 18 April 2012

Ontogenetic niche shifts in dinosaurs influenced size, diversity and extinction in terrestrial vertebrates

Daryl Codron[1–4,*], Chris Carbone[5], Dennis W. H. Müller[1] and Marcus Clauss[1]



Ecological modelling, size distributions and taphonomic size bias in dinosaur faunas: a comment on Codron *et al.* (2012)

Caleb Marshall Brown[1], Nicolás E. Campione[1], Henrique Corrêa Giacomini[1], Lorna J. O'Brien[1], Matthew J. Vavrek[2] and David C. Evans[1,2]

Ecological modelling, size distributions and taphonomic size bias in dinosaur faunas: reply to Brown *et al.*

Daryl Codron[1,2], Chris Carbone[3], Dennis W. H. Müller[1] and Marcus Clauss[1]

SCIENCE • VOL. 276 • 4 APRIL 1997

A General Model for the Origin of Allometric Scaling Laws in Biology

Geoffrey B. West, James H. Brown,* Brian J. Enquist

Functional Ecology 2004
18, 283–289

FORUM

Is West, Brown and Enquist's model of allometric scaling mathematically correct and biologically relevant?

J. KOZŁOWSKI*† and M. KONARZEWSKI‡

Functional Ecology 2005
19, 735–738

FORUM

Yes, West, Brown and Enquist's model of allometric scaling is both mathematically correct and biologically relevant

J. H. BROWN,*†¶ GEOFFREY B. WEST†‡ and B. J. ENQUIST§

Functional Ecology 2005
19, 739–743

FORUM

West, Brown and Enquist's model of allometric scaling again: the same questions remain

J. KOZŁOWSKI*‡ and M. KONARZEWSKI†

The Evolution of Social Monogamy in Mammals

2 AUGUST 2013 VOL 341 SCIENCE

D. Lukas[1]* and T. H. Clutton-Brock[1]

BIOLOGY LETTERS

rsbl.royalsocietypublishing.org

Opinion piece

Cite this article: Valomy M, Hayes LD, Schradin C. 2015 Social organization in Eulipotyphla: evidence for a social shrew. *Biol. Lett.* 11: 20150825.

Animal behaviour

Social organization in Eulipotyphla: evidence for a social shrew

M. Valomy[1,2,3], L. D. Hayes[4] and C. Schradin[2,5]

[1]Département de Licence Sciences de la Vie, Université Pierre et Marie Curie, UPMC, 75252 Paris Cedex 05, France
[2]IPHC-DEPE, Université de Strasbourg, 67087 Strasbourg, France
[3]CNRS, UMR7178, 67087 Strasbourg, France
[4]Department of Biology, Geology and Environmental Sciences, University of Tennessee at Chattanooga, Chattanooga, TN, USA
[5]School of Animal, Plant and Environmental Sciences, University of the Witwatersrand, Johannesburg, Wits 2050, South Africa

	primary literature search	database Lukas & Clutton-Brock	*mammals of the World*
family Erinaceidae (hedgehogs and moonrats)			
number of species	24	14	20
social organization unknown	23	0	6
solitary	1	14	13
group-living	0	0	0
solitary and group-living	0	0	1
family Talpidae (moles)			
number of species	41	17	42
social organization unknown	37	0	33
solitary	2	17	4
group-living	0	0	5
solitary and group-living	2	0	0

The Evolution of Social Monogamy in Mammals

2 AUGUST 2013 VOL 341 SCIENCE

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[4]Department of Biology, Geology and Environmental Sciences, University of Tennessee at Chattanooga, Chattanooga, TN, USA
[5]School of Animal, Plant and Environmental Sciences, University of the Witwatersrand, Johannesburg, Wits 2050, South Africa

ROYAL SOCIETY OPEN SCIENCE

rsos.royalsocietypublishing.org

Research

Cite this article: Lukas D, Clutton-Brock T. 2017 Climate and the distribution of cooperative breeding in mammals. *R. Soc. open sci.* 4: 160897.

Climate and the distribution of cooperative breeding in mammals

Dieter Lukas and Tim Clutton-Brock

Department of Zoology, University of Cambridge, Downing Street, Cambridge CB2 3EJ, UK

DL, 0000-0002-7141-3545; TC-B, 0000-0001-8110-8969

ROYAL SOCIETY OPEN SCIENCE

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Comment

Cite this article: Schradin C. 2017 Comparative studies need to rely both on sound natural history data and on excellent statistical analysis. *R. Soc. open sci.* 4: 170346. http://dx.doi.org/10.1098/rsos.170346

Comparative studies need to rely both on sound natural history data and on excellent statistical analysis

Carsten Schradin[1,2]

[1]Université de Strasbourg, CNRS, IPHC UMR 7178, 67000 Strasbourg, France
[2]School of Animal, Plant and Environmental Sciences, University of the Witwatersrand, Johannesburg, Wits 2050, South Africa

CS, 0000-0002-2706-2960

species	origins	Lukas & Clutton-Brock	Valomy *et al.*	agreement?
Crocidura leucodon	Europe	solitary	pair	no
Crocidura russula	Europe	solitary	pair	no
Crocidura shantungensis	China	solitary	solitary	yes
Cryptotis parva	North America	solitary	group	no
Neomys fodiens	Eurasia	solitary	solitary	yes
Sorex araneus	Eurasia	solitary	solitary	yes
Sorex cinereus	North America	solitary	group	no
Sorex coronatus	Europe	solitary	pair	no
Sorex ornatus	North America	solitary	group	no
Sorex unguiculatus	Russia and China	solitary	solitary	yes
Suncus varilla	South Africa	solitary	pair	no
Suncus etruscus	Europe	monogamous	no primary information found	no
355 other Soricidae species		solitary	no primary information found	no

ROYAL SOCIETY OPEN SCIENCE

rsos.royalsocietypublishing.org

Comment

Cite this article: Schradin C. 2017 Comparative studies need to rely both on sound natural history data and on excellent statistical analysis. *R. Soc. open sci.* **4**: 170346. http://dx.doi.org/10.1098/rsos.170346

Comparative studies need to rely both on sound natural history data and on excellent statistical analysis

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[2]School of Animal, Plant and Environmental Sciences, University of the Witwatersrand, Johannesburg, Wits 2050, South Africa

CS, 0000-0002-2706-2960

The Evolution of Socia
in Mammals

2 AUGUST 2

D. Lukas[1]* and T. H. Clutton-Brock[1]

ROYAL SOCIETY OPEN SCIENCE

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Invited reply

Cite this article: Lukas D, Clutton-Brock T. 2017 Comparative studies need to rely both on sound natural history data and on excellent statistical analysis. *R. Soc. open sci.* **4**: 171211.

Comparative studies need to rely both on sound natural history data and on excellent statistical analysis

Dieter Lukas and Tim Clutton-Brock

Department of Zoology, University of Cambridge, Downing Street, Cambridge CB2 3EJ, UK

BIOLOGY LETTERS

rsbl.royalsocietypublishing.org

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[5]School of Animal, Plant and Environmental Sciences, University of the Witwatersrand, Johannesburg, Wits 2050, South Africa

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Research

Cite this article: Lukas D, Clutton-Brock T. 2017 Climate and the distribution of cooperative breeding in mammals. *R. Soc. open sci.* **4**: 160897.

Climate and the distribution of cooperative breeding in mammals

Dieter Lukas and Tim Clutton-Brock

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DL, 0000-0002-7141-3545; TC-B, 0000-0001-8110-8969

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Comment

Cite this article: Schradin C. 2017 Comparative studies need to rely both on sound natural history data and on excellent statistical analysis. *R. Soc. open sci.* **4**: 170346. http://dx.doi.org/10.1098/rsos.170346

Comparative studies need to rely both on sound natural history data and on excellent statistical analysis

Carsten Schradin[1,2]

[1]Université de Strasbourg, CNRS, IPHC UMR 7178, 67000 Strasbourg, France
[2]School of Animal, Plant and Environmental Sciences, University of the Witwatersrand, Johannesburg, Wits 2050, South Africa

CS, 0000-0002-2706-2960

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Invited reply

Cite this article: Lukas D, Clutton-Brock T. 2017 Comparative studies need to rely both on sound natural history data and on excellent statistical analysis. *R. Soc. open sci.* **4**: 171211.

Comparative studies need to rely both on sound natural history data and on excellent statistical analysis

Dieter Lukas and Tim Clutton-Brock

Department of Zoology, University of Cambridge, Downing Street, Cambridge CB2 3EJ, UK

In retrospect, it would have been useful to have included a more detailed description and discussion of our classification of these eight species in our 2017 paper and to have explained the reasons why we did not follow Valomy *et al.*'s classifications.

species	Do breeding females aggregate in groups?	Are aggregrations during the breeding season stable and cohesive?	Are individuals seen in mixed sex pairs during the breeding season?	Do males remain with the same female throughout the breeding season?	Do pairs remain stable across breeding seasons?	classification Lukas & Clutton-Brock	classification Valomy *et al.*
Cryptotis parva	no: aggregations dissolve and females build territories [14]	no	no	no	no	solitary	group
Sorex cinereus	no: aggregations appear to be of males chasing females [15]	no	no	no	no	solitary	group
Sorex ornatus	yes	no: frequent changes [16], and females intolerant [14]	no	no	no	solitary	group
Crocidura leucodon	no	no	yes	potentially	no: in autumn, shift to a gregarious way of life [17]	solitary	pair
Crocidura russula	no	no	uncertain: pairs occur, but high frequency of polygyny [18]	uncertain	no: during winter, shift to mixed sex aggregations [19]	solitary	pair
Sorex coronatus	no	no	yes	no: male home-ranges change during breeding season [20]	no: in autumn, males separate from females [20]	solitary	pair
Suncus varilla	no	no	yes	possibly, but there is only a single breeding attempt per year [21]	uncertain: partners appear to separate after breeding season [21]	solitary	pair

information). However, the paper contains a subsidiary comparison between the habitats occupied by cooperative breeders and those occupied by all other mammals, including 51 shrews for which we could find published information and 87 whose social organization we inferred to be similar (see electronic supplementary material, appendix S2). Here, we included data for the second group of species because

esa

ECOSPHERE

March 2011 ❖ Volume 2(3) ❖ Article 37

Do rebuttals affect future science?

JEANNETTE A. BANOBI,† TREVOR A. BRANCH, AND RAY HILBORN

School of Aquatic and Fishery Sciences, Box 355020, University of Washington, Seattle, Washington 98195 USA

Abstract. In theory, rebuttals play a vital role in the progression of science, pointing out flaws in published articles, and ensuring that science self-corrects. However, the effect of rebuttals has not been tested in practice. We examined seven high-profile original articles and their rebuttals, finding that original articles were cited 17 times more than rebuttals, and that annual citation numbers were unaffected by rebuttals. When citations did not mention rebuttals, 95% accepted the thesis of the original article uncritically, and support remained high over time. On the rare occasions when rebuttals were cited, the citing papers on average had neutral views of the original article, and 8% actually believed that the rebuttal agreed with the original article. Overall, only 5% of all citations were critical of the original paper. Our results point to an urgent need to change current publishing models to ensure that rebuttals are prominently linked to original articles.

But what does really count ?

Do others read, use, build on, deal with your publications?

Do you have a vision, or do you ‘just’ work on some tiny detail?

The scope of your story

Conceptualizing science: two types

storytellers

historians of all scales: history of mankind, all life, the universe

explainers of all scales:

function of atoms, concepts, organs, organisms, ecosystems, the universe

engineers

applied sciences

& preparing basic research

patents, solutions, products, procedures

medicine, pharmacists, engineers, architects, agriculturists, lawyers

funding (and justification) for this ...

... by claiming this

Conceptualizing science: two types

storytellers

historians of all scales: history of mankind, **all life, the universe**

explainers of all scales:

function of atoms, concepts, organs, organisms, ecosystems, the universe

engineers

applied sciences

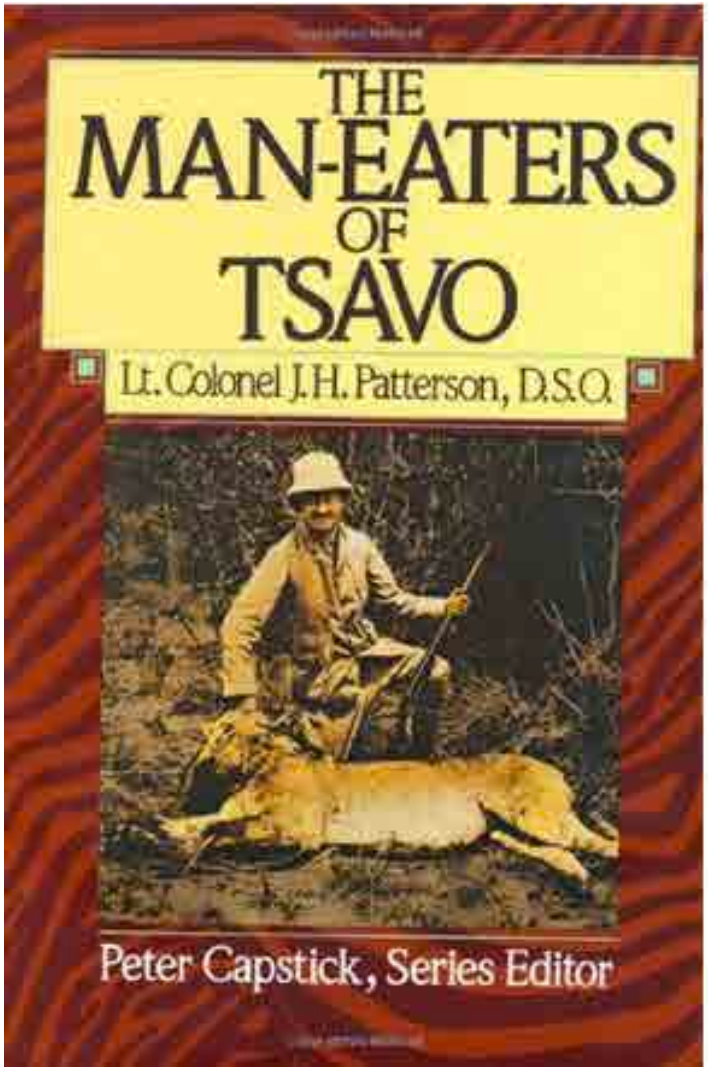
& preparing basic research

patents, solutions, products, procedures

medicine, pharmacists, engineers, architects, agriculturists, lawyers

this is not a distinction between humanities/arts and natural sciences

Stories


THE
MAN-EATERS
OF
TSAVO
Lt. Colonel J.H. Patterson, D.S.O.
Peter Capstick, Series Editor

Stories


The world's FIRST FEATURE LENGTH
motion picture in
NATURAL VISION
3 DIMENSION
Arch Oboler's
BWANA DEVIL
in THRILLING COLOR
starring ROBERT STACK · BARBARA BRITTON · NIGEL BRUCE

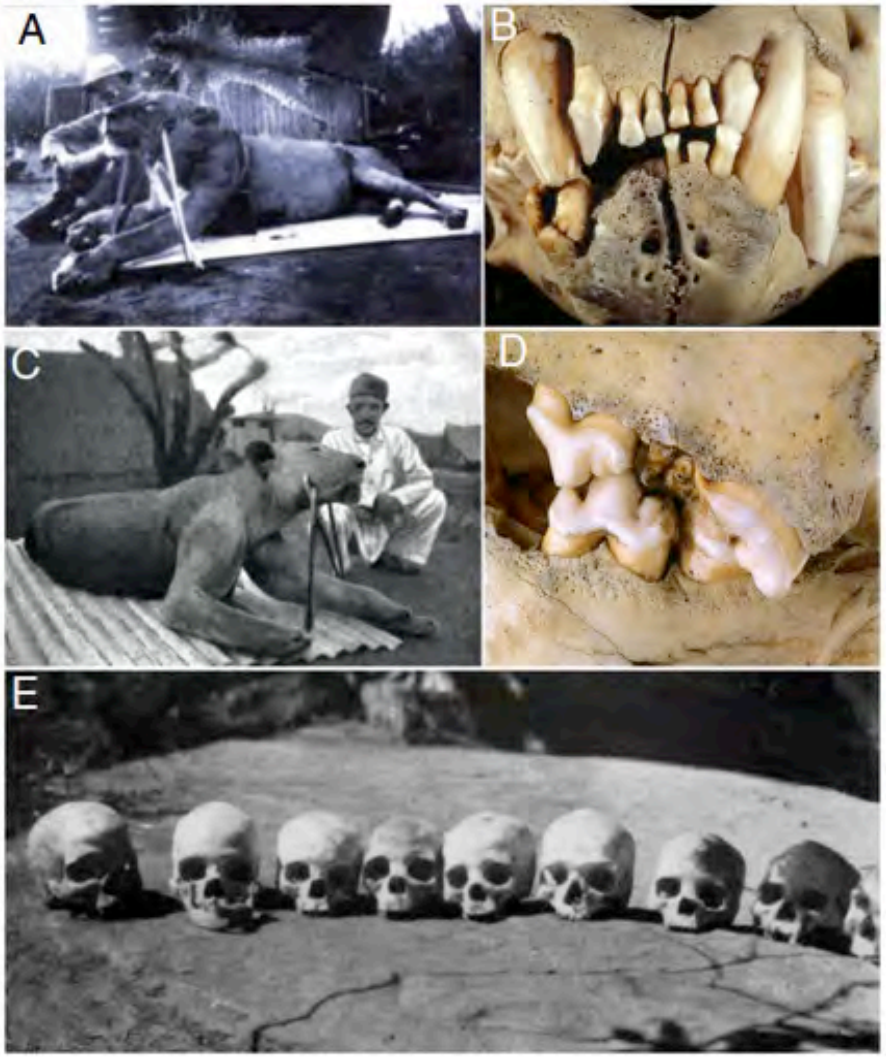

Robert TAYLOR
KILLERS OF KILIMAN
Anthony Newley · Anne Aub


MICHAEL DOUGLAS
VAL KILMER
PREY
FOR
THE
HUNTERS
THE GHOST
AND THE DARKNESS

Cooperation and individuality among man-eating lions

Justin D. Yeakel[a,1], Bruce D. Patterson[b], Kena Fox-Dobbs[c], Mercedes M. Okumura[d], Thure E. Cerling[e], Jonathan W. Moore[f], Paul L. Koch[g], and Nathaniel J. Dominy[a,h,1]

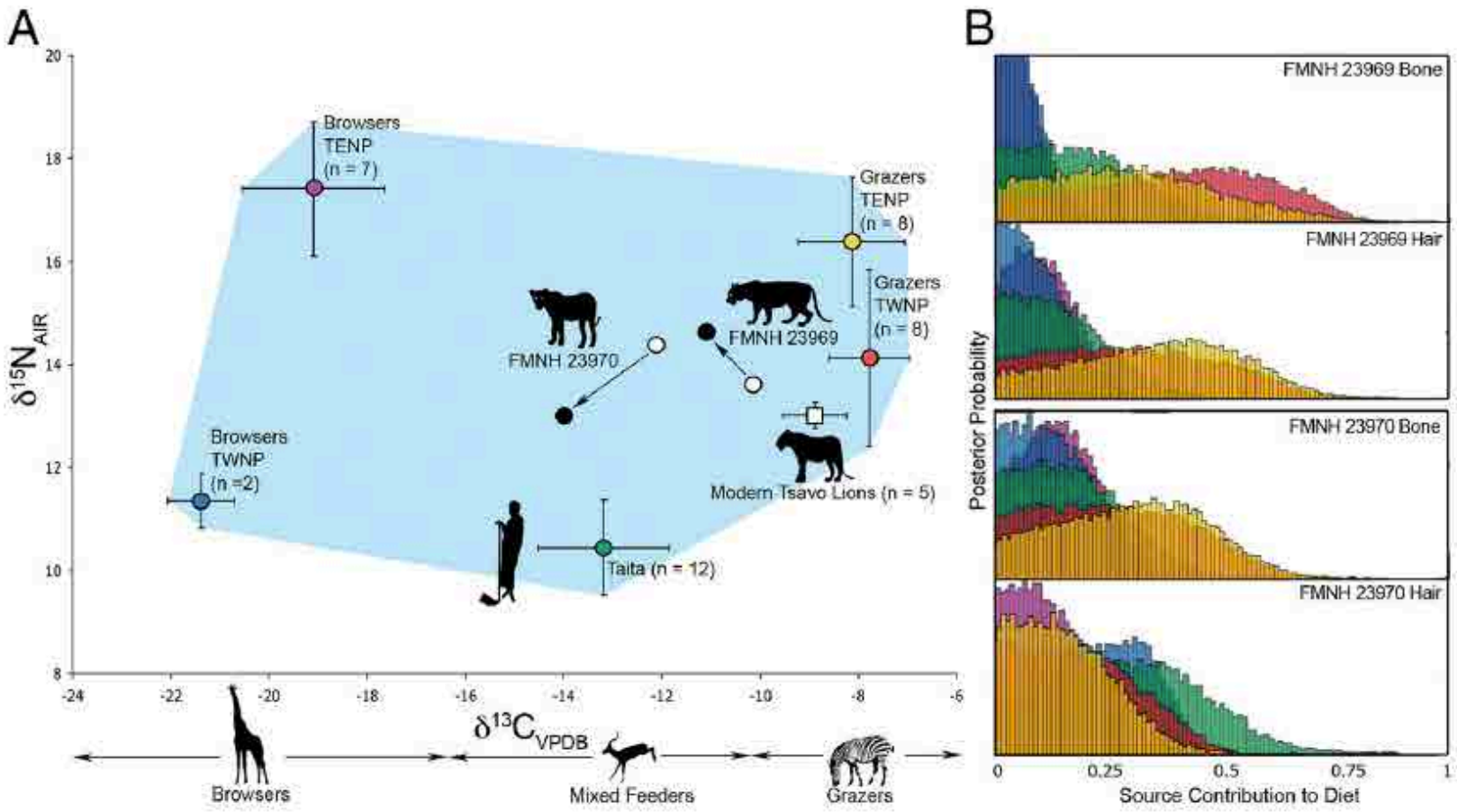
19040–19043 | PNAS | November 10, 2009 | vol. 106 | no. 45



Cooperation and individuality among man-eating lions

Justin D. Yeakel[a,1], Bruce D. Patterson[b], Kena Fox-Dobbs[c], Mercedes M. Okumura[d], Thure E. Cerling[e], Jonathan W. Moore[f], Paul L. Koch[g], and Nathaniel J. Dominy[a,h,1]

19040–19043 | PNAS | November 10, 2009 | vol. 106 | no. 45



Counting the books while the library burns: why conservation monitoring programs need a plan for action

David B Lindenmayer[1*], Maxine P Piggott[1], and Brendan A Wintle[2]

Conservation monitoring programs are critical for identifying many elements of species ecology and for detecting changes in populations. However, without articulating how monitoring information will trigger relevant conservation actions, programs that monitor species until they become extinct are at odds with the primary goal of conservation: avoiding biodiversity loss. Here, we outline cases in which species were monitored until they suffered local, regional, or global extinction in the absence of a preplanned intervention program, and contend that conservation monitoring programs should be embedded within a management plan and characterized by vital attributes to ensure their effectiveness. These attributes include: (1) explicit articulation of how monitoring information will inform conservation actions, (2) transparent specification of trigger points within monitoring programs at which strategic interventions will be implemented, and (3) rigorous quantification of the ability to achieve early detection of change.

Front Ecol Environ 2013; 11(10): 549–555, doi:10.1890/120220 (published online 11 Nov 2013)

The continuing loss of biodiversity is a serious global problem (Butchart *et al.* 2010). Of the 63 837 species assessed worldwide using the International Union for Conservation of Nature (IUCN) Red List criteria, 865 are extinct or extinct in the wild and 19 817 are listed as critically endangered, endangered, or vulnerable to extinction (IUCN 2012). Since the start of the 21st century alone, at least 10 species of vertebrates are known to have gone extinct, although this is likely to be a substantial underestimate. The only way to know whether populations of a species are declining is by monitoring them, thus making monitoring an essential conservation activity.

In a nutshell:

- Monitoring is a critical part of effective species conservation, but many species are being monitored until they go extinct
- Management intervention should be triggered when it becomes apparent that a monitored species is in decline
- Most conservation monitoring programs lack preplanned interventions and a clear statement about how the information derived from monitoring will help to conserve the species
- Conservation monitoring programs and management plans should identify trigger points for prespecified management interventions

[1]*Fenner School of Environment and Society; Australian Research Council Centre of Excellence for Environmental Decisions; and National Environmental Research Program, The Australian National University, Canberra, Australia* [*](david.lindenmayer@anu.edu.au); [2]*School of Botany; Australian Research Council Centre of Excellence for Environmental Decisions; and National Environmental Research Program, University of Melbourne, Melbourne, Australia*

There are a variety of reasons to monitor biodiversity, including learning about a species' ecology and population biology, reporting on the state of biodiversity, and estimating the state of (or detecting changes in) populations so that appropriate actions can be taken (Yoccoz *et al.* 2001). However, when a monitoring program is funded under the specific objective of conserving a species that has been identified as imperiled, it would seem reasonable to expect that the monitoring would, at the very least, aim to detect population changes that trigger specific and timely conservation actions, and/or clarify aspects of the species' ecology or population biology that are most immediately relevant to improving the effectiveness of conservation actions. Unfortunately, conservation monitoring programs commonly (1) track the state of a population without any plan for what will be done if a given change is observed or (2) collect information on the species' ecology or population biology that has no immediate relevance to decisions about the most appropriate course of action to prevent extinction. The end result may be that the decline and extinction of species is accurately recorded without any effective attempts at mitigation.

Monitoring a species until it becomes extinct is clearly not a conservation policy that would ever be earnestly proposed. Yet the conservation literature contains many examples of threatened or endangered species being monitored until they went locally, regionally, or globally extinct (WebTable 1). This unfortunate phenomenon may become more frequent in the future, given both the large number of imperiled species globally (IUCN 2012) and the prevalence of poorly designed and implemented biodiversity monitoring programs (Nichols and Williams 2006; Lindenmayer and Likens 2010) that lack a sound

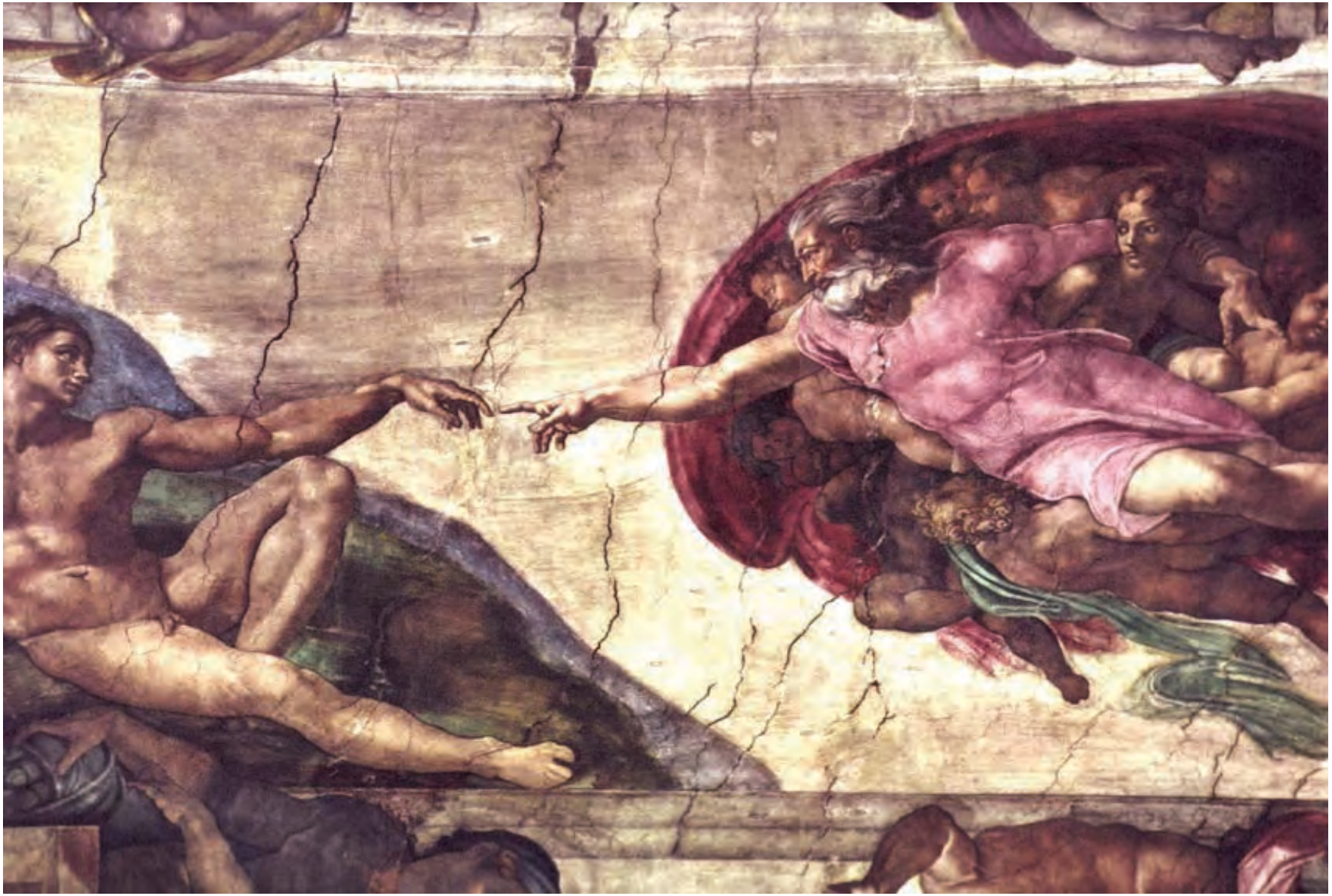
Stories of different scope

Natural sciences	Humanities/Arts
The rodents of the southern Kalahari	The relationships of the Vatican to Poland during WW2
Diversification of desert rodents: mechanisms and contingencies	Fundamentals of christian catechism
Diversification of desert mammals	Human religiosity
Mammalian diversification	Human universals
Principles of diversification: a comparison of plants and animals	
From higgs-bosons to black holes: the construction of everything	

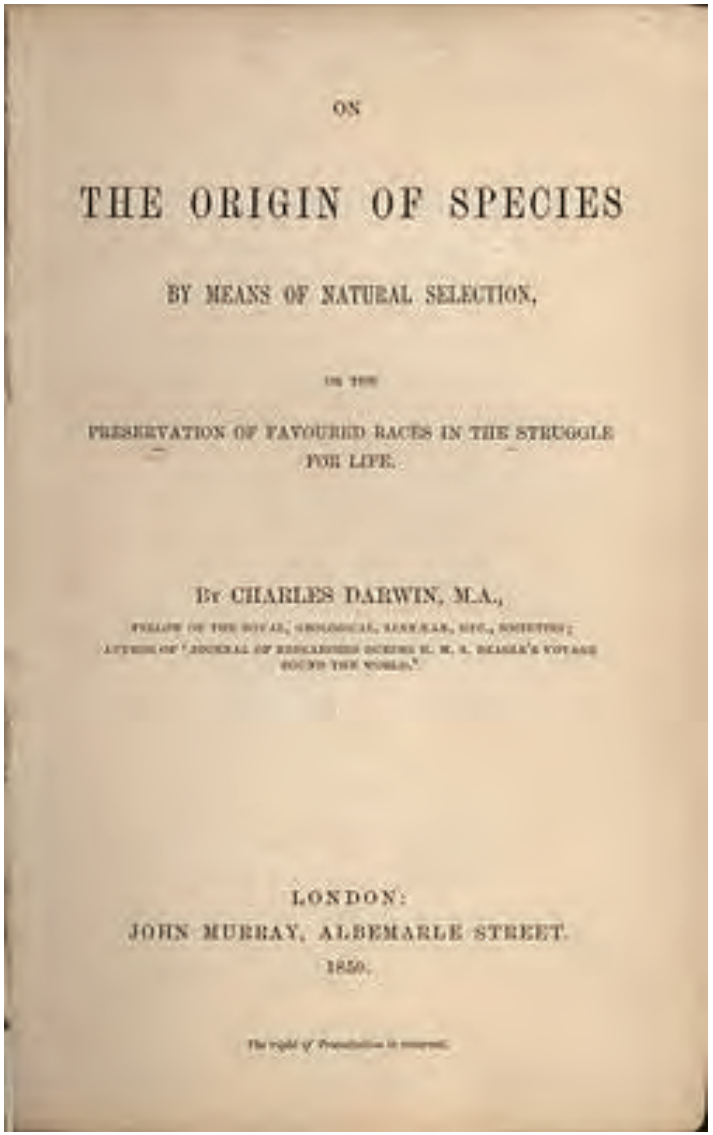
Humanities/arts cannot compete in the scope-of-the-story race.

Storytellers: competing for scope

The greatest story ever told



The greatest story ever told



ON

THE ORIGIN OF SPECIES

BY MEANS OF NATURAL SELECTION,

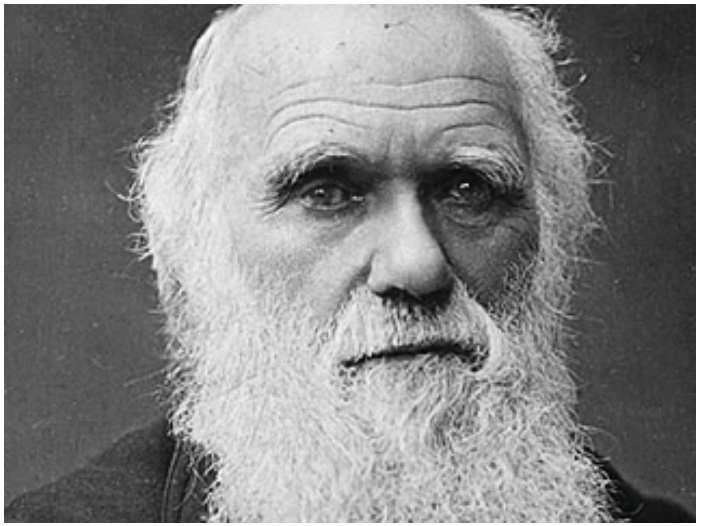
OR THE

PRESERVATION OF FAVOURED RACES IN THE STRUGGLE FOR LIFE.

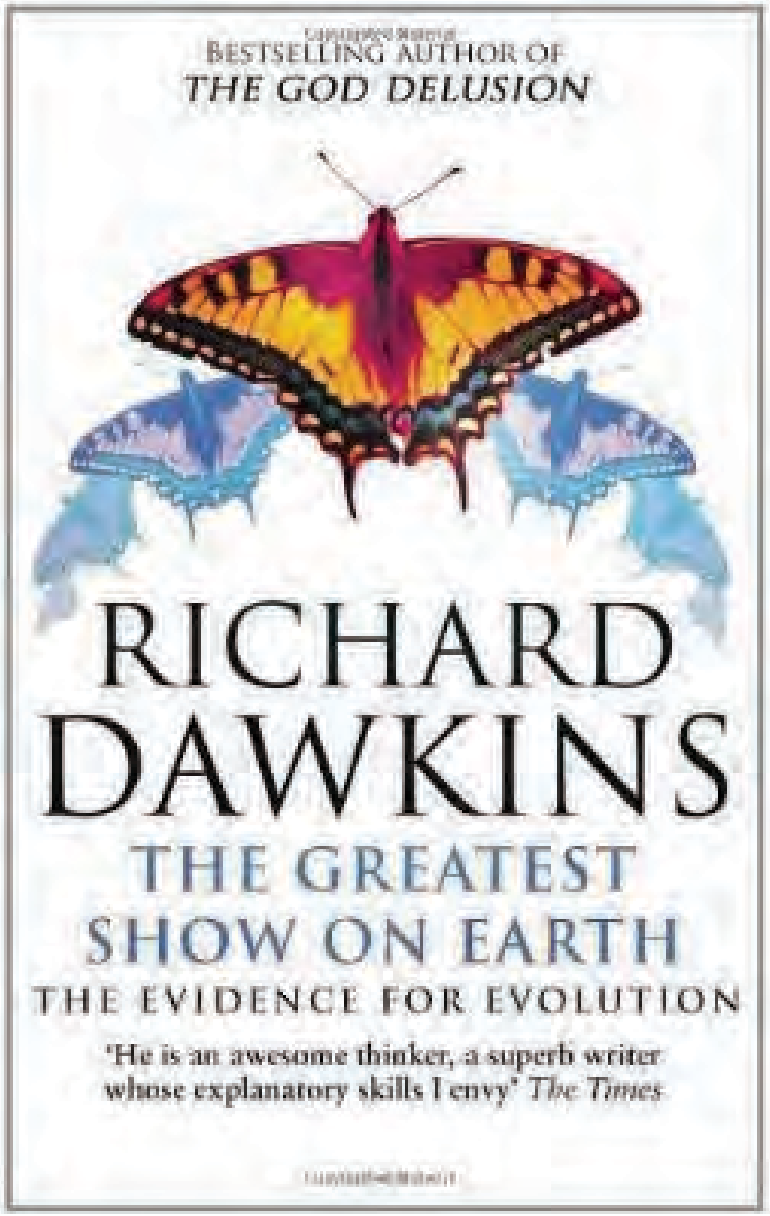
BY CHARLES DARWIN, M.A.,

FELLOW OF THE ROYAL, GEOLOGICAL, LINNEAN, ETC., SOCIETIES;
AUTHOR OF 'JOURNAL OF RESEARCHES DURING H. M. S. BEAGLE'S VOYAGE ROUND THE WORLD.'

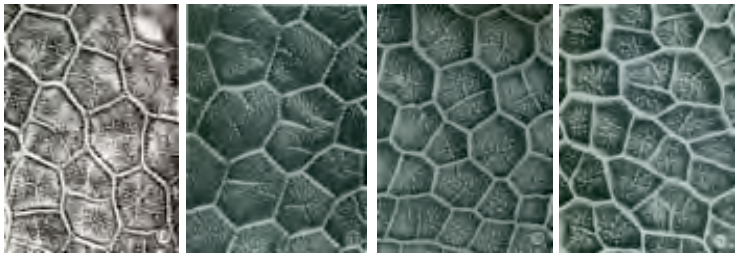
LONDON:
JOHN MURRAY, ALBEMARLE STREET.
1859.



The greatest story ever told



Why does the depth of the reticular honeycomb pattern vary among different ruminant species?



from Hofmann (1969 & 1973)

Journal of Zoology

ZSL
LIVING CONSERVATION

Journal of Zoology. Print ISSN 0952-8369

Convergence in the macroscopic anatomy of the reticulum in wild ruminant species of different feeding types and a new resulting hypothesis on reticular function

M. Clauss[1], R. R. Hofmann[2*], W. J. Streich[3], J. Fickel[3] & J. Hummel[4]


Do I look like
someone
who cares
Journal o
Converge
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M. Clauss[1], R. F
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Why did dinosaurs die out?

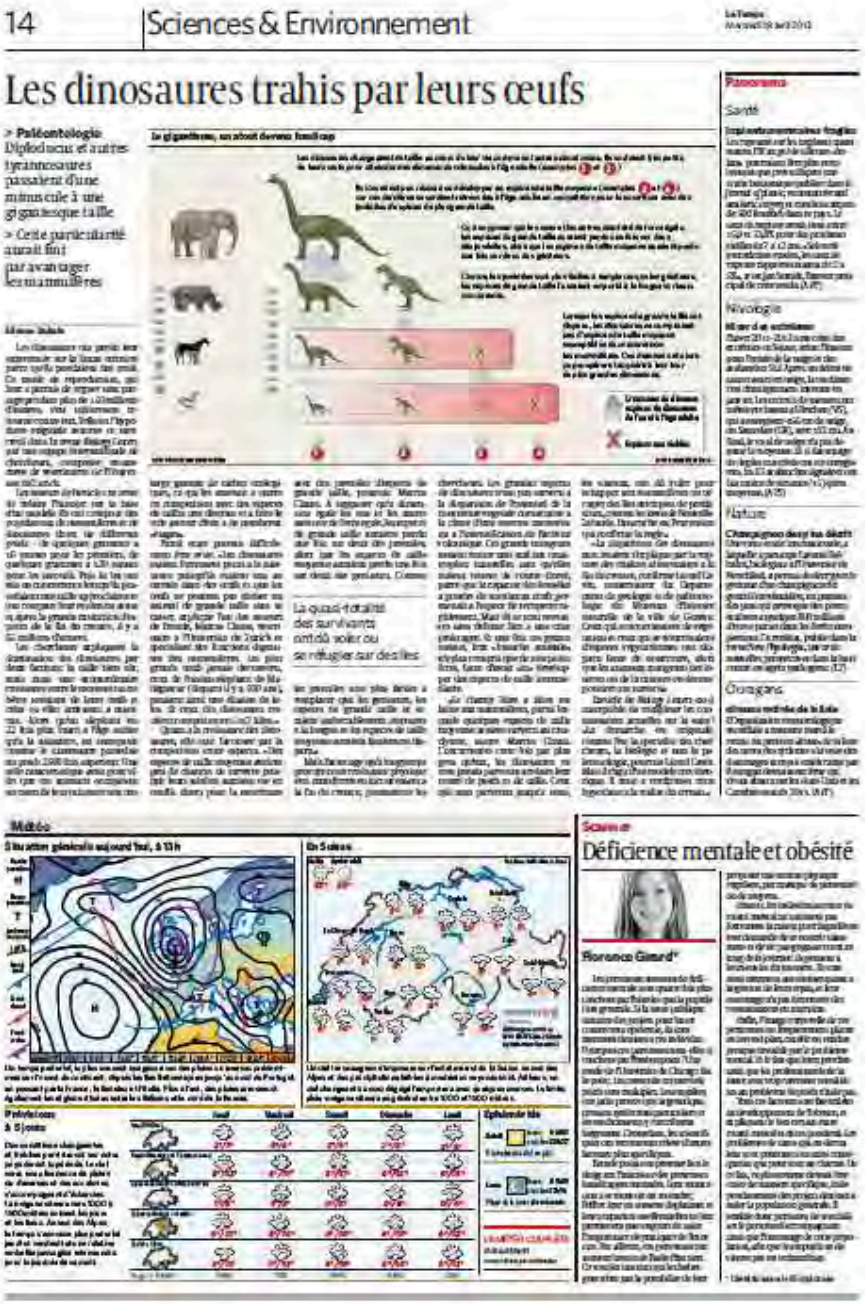
biology letters

Biol. Lett. (2012) 8, 620–623
doi:10.1098/rsbl.2012.0240
Published online 18 April 2012

Evolutionary biology

Ontogenetic niche shifts in dinosaurs influenced size, diversity and extinction in terrestrial vertebrates

Daryl Codron[1–4,*], Chris Carbone[5], Dennis W. H. Müller[1] and Marcus Clauss[1]



14 | Sciences & Environnement

Les dinosaures trahis par leurs œufs

Déficience mentale et obésité

But what does really count ?

Do others read, use, build on, deal with your publications?

Do you have a vision, or do you ‘just’ work on some tiny detail?

Do you do research in an elegant, cool, beautiful, simple way?

Elegance

Basing a story on data

Non-convincing interpretations

A high standard metabolic rate constrains juvenile growth

Anthony C. Steyermark*

Zoology **105** (2002): 147–151

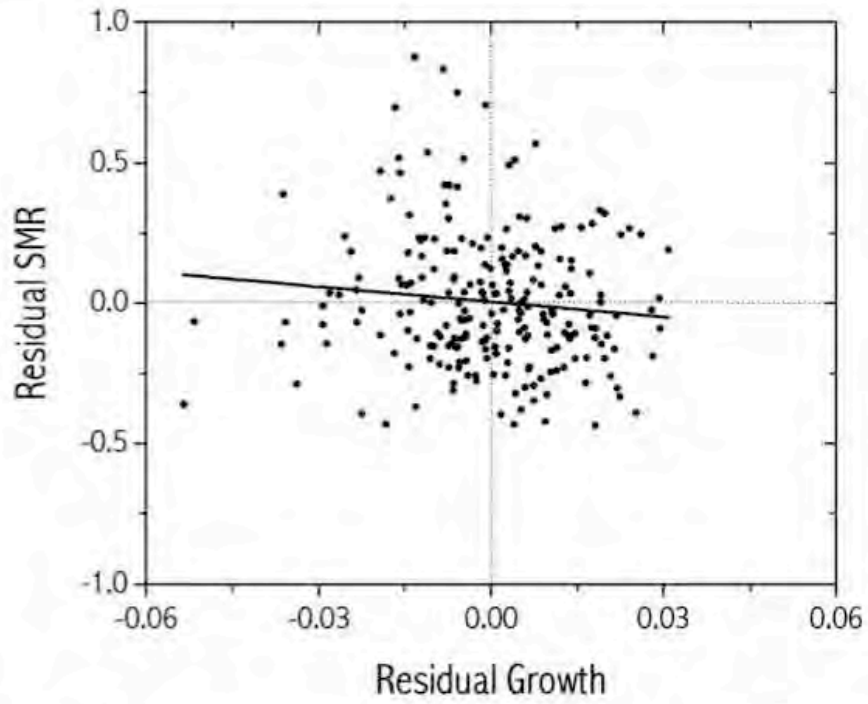


Fig.1. A negative relationship exists between the residuals of growth and standard metabolic rate (SMR; $P = 0.04$; $R = 0.13$), indicating a tradeoff in energy expenditure. Growth was measured from hatching to approximately six months of age, and growth rate was calculated as change in body mass per day. Oxygen consumption of each individual was measured immediately after growth measurements ended, and was used to calculate SMR.

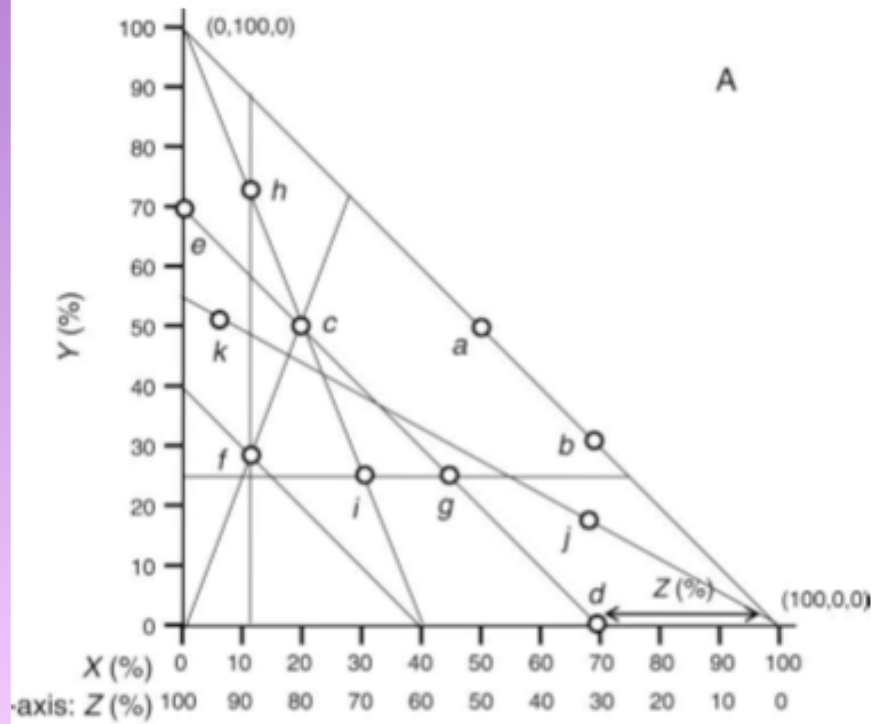
Basing a story on concept

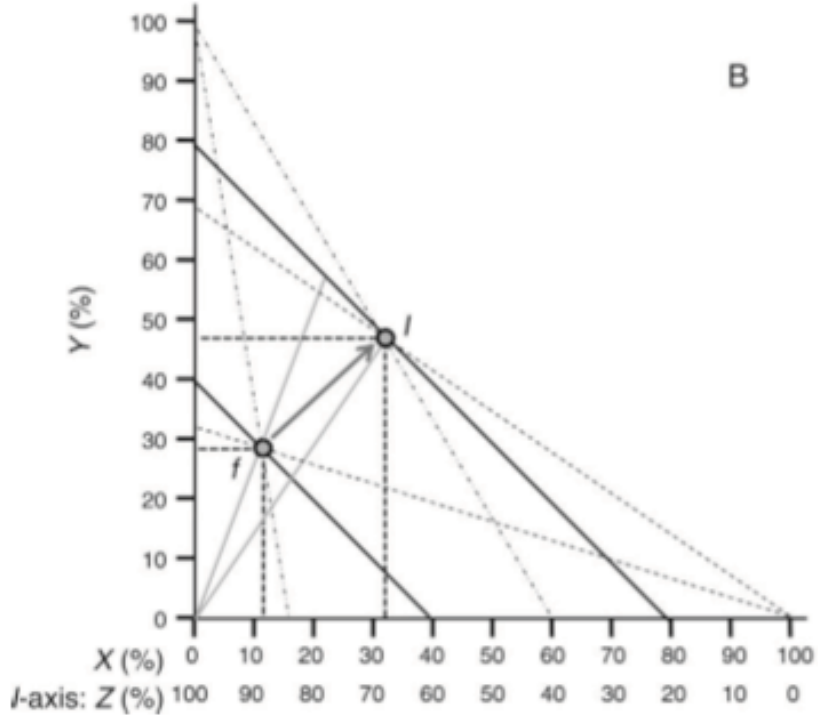
Un-intuitive concepts

Toward a quantitative nutritional ecology: the right-angled mixture triangle

DAVID RAUBENHEIMER[1]

Ecological Monographs, 81(3), 2011, pp. 407–427





Storytelling

Ecological Monographs, 76(1), 2006, pp. 73–92

MANIFOLD INTERACTIVE INFLUENCES ON THE POPULATION DYNAMICS OF A MULTISPECIES UNGULATE ASSEMBLAGE

NORMAN OWEN-SMITH[1,3] AND M. G. L. MILLS[2]

[1]*Centre for African Ecology, School of Animal, Plant and Environmental Sciences, University of the Witwatersrand, Wits 2050 South Africa*

[2]*South African National Parks, Endangered Wildlife Trust and Mammal Research Institute, University of Pretoria, Private Bag X402, Skukuza 1350 South Africa*

Abstract. The dynamics of animal populations can be influenced directly by prevailing resources, population density, and environmental conditions, and through the delayed effects of trophic interactions and abiotic effects on habitat conditions. For large mammals, lagged effects can extend several years back in time. We attempted to establish the causal processes governing the population changes shown by 11 ungulate species counted annually over a 20-year period in South Africa's Kruger National Park. Kudu, waterbuck, warthog, sable, tsessebe, roan, and eland declined progressively in abundance after 1986, while zebra, wildebeest, impala, and giraffe maintained high abundance levels. To identify lagged influences, we used statistical probes indexing (1) inferred changes in predator abundance as a consequence of past food availability, (2) effects on habitat conditions of prior rainfall, and (3) competitor impacts on shared food resources. Multiple linear regression models were fit to estimates of annual population growth derived from the count totals subdivided among four regions. The temporal pattern of the population declines by five species was most consistent with a lagged effect from past predator food, in addition to the direct effects of seasonal rainfall. However, models including the lagged effect of prior rainfall fit nearly as well. Species that maintained high abundance responded mainly to an immediate or lagged density feedback. Changing rainfall conditions apparently affect the relative susceptibility of ungulate species to predation. Hence, the top-down interaction with predators cannot readily be disentangled from extrinsic influences on population dynamics, mediated through resources. Population declines by some species became extreme because a prolonged period of low rainfall, especially in the dry-season component, followed a doubling in the food base supporting lions, and was coupled with widened prey distribution as a consequence of the augmentation of water points by managers. Changes in population abundance within this multi-prey, generalist predator system arose from a complex interplay between changing climatic conditions, variable food production, shifting habitat conditions, varying vulnerability to predation, and spillover effects on other species.

Key words: climatic influences; density dependence; declining populations; large herbivores; predator–prey interactions; rainfall effects; time-series analysis; trophic interactions.

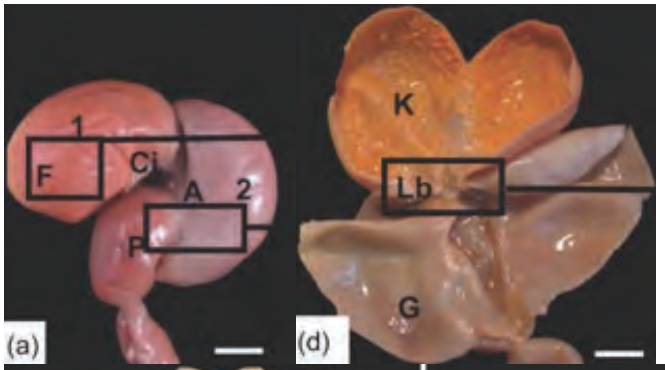
Excessive complexity

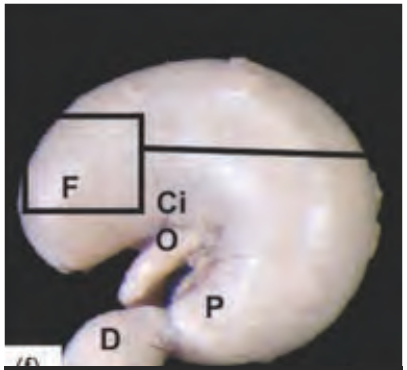
Elegant visuals

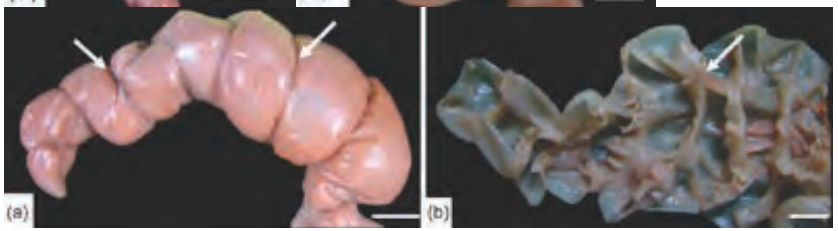
Comparative gastrointestinal morphology of *Tachyoryctes splendens* (Rüppell, 1835) and *Heliophobius emini*, (Noack, 1894) two species of East African mole-rats

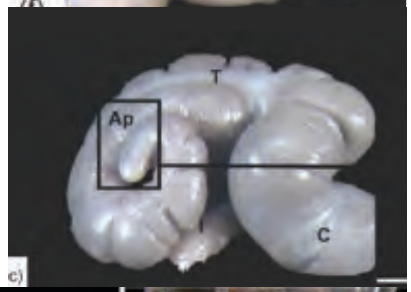
Journal of Morphology. 2017;

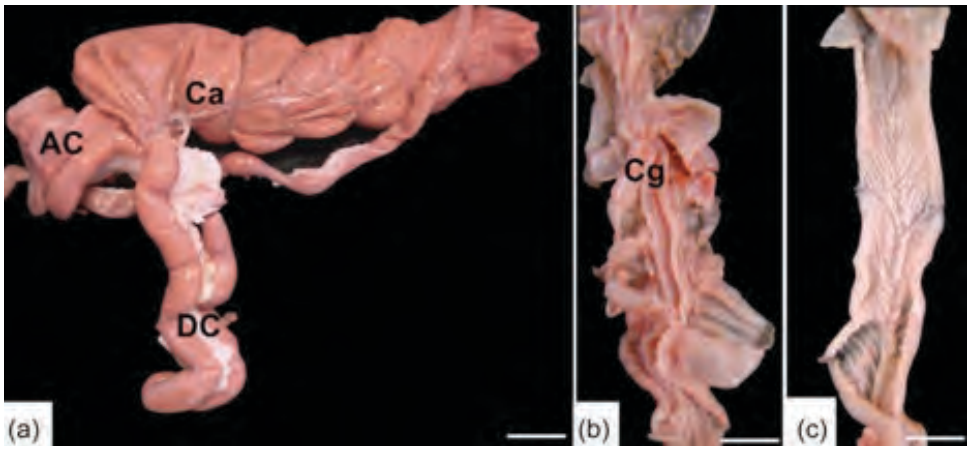
Lauren Sahd[1] | Daniella L. Pereira[1] | Nigel C. Bennett[2] | Sanet H. Kotzé[1]

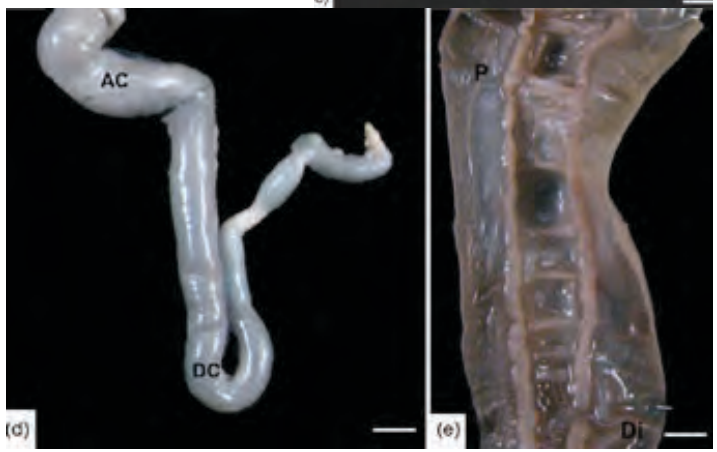












Functional Ecology

British Ecological Society

Functional Ecology 2014, **28**, 1059–1060 doi: 10.1111/1365-2435.12301

FE SPOTLIGHT

Do we ditch digestive physiology in explaining the classic relationship between herbivore body size diet and diet quality?

Clare McArthur*

(among other measures) as a diagnostic tool, they test an elegant set of predictions arising from hypotheses associ-

Elegant hypothesis testing

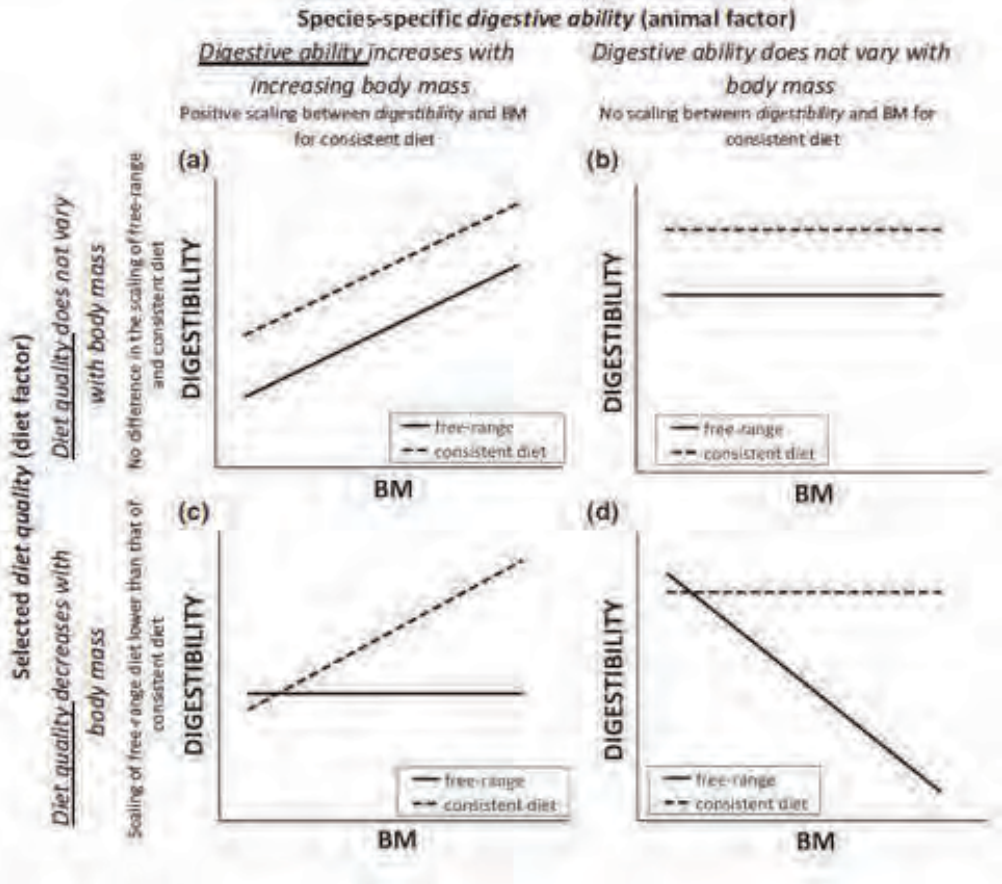
Functional Ecology

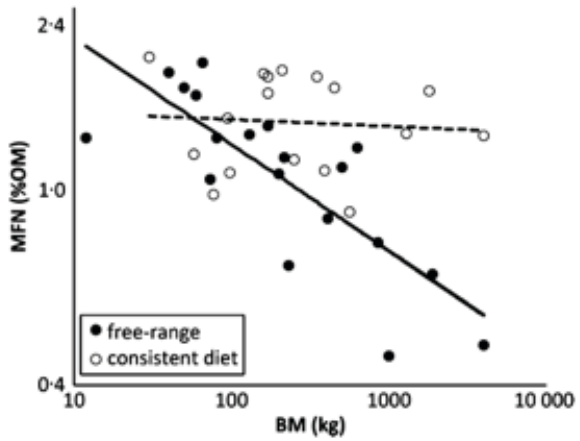
British Ecological Society

Functional Ecology 2014, **28**, 1127–1134 doi: 10.1111/1365-2435.12275

Does body mass convey a digestive advantage for large herbivores?

Patrick Steuer[1], Karl-Heinz Südekum[1], Thomas Tütken[2,†], Dennis W. H. Müller[3,4], Jacques Kaandorp[5], Martin Bucher[6], Marcus Clauss[3] and Jürgen Hummel*[,1,7]

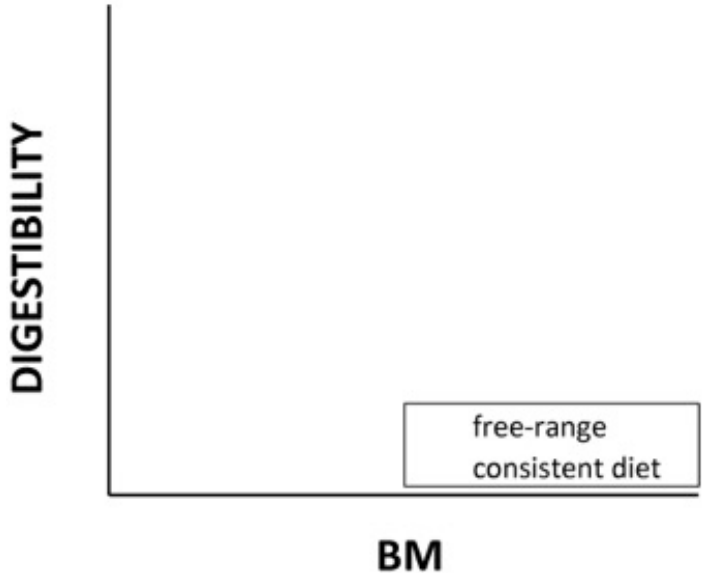




An old question:

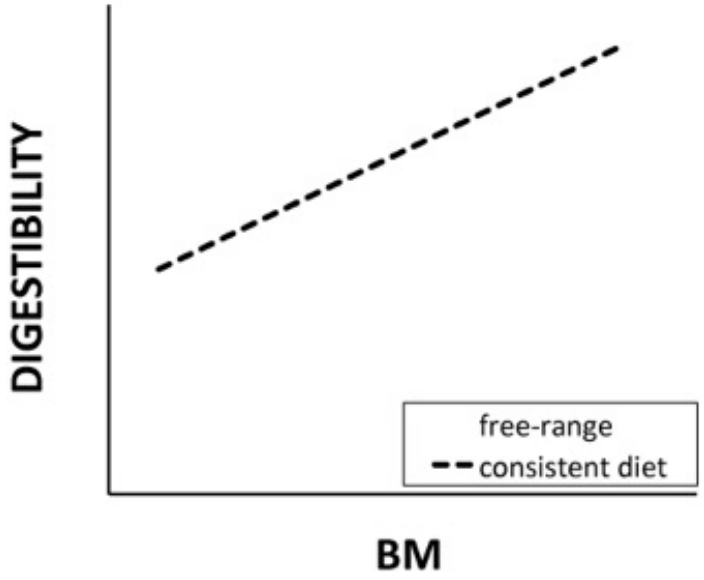
Do larger herbivores ingest lower-quality diets, and are they physiologically equipped for a 'better' digestion of such diets?

Hypothesis building



from Steuer et al. (2014)

Larger size endows higher digestive efficiency ...

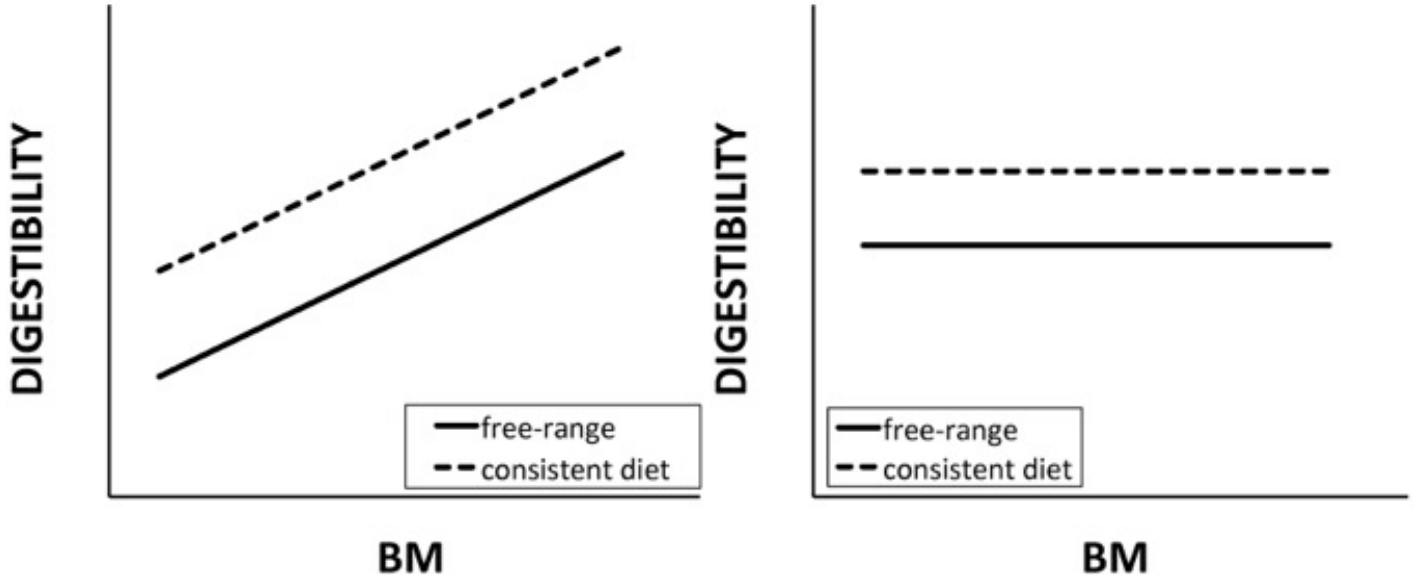


from Steuer et al. (2014)

… or body size has no effect on digestibility

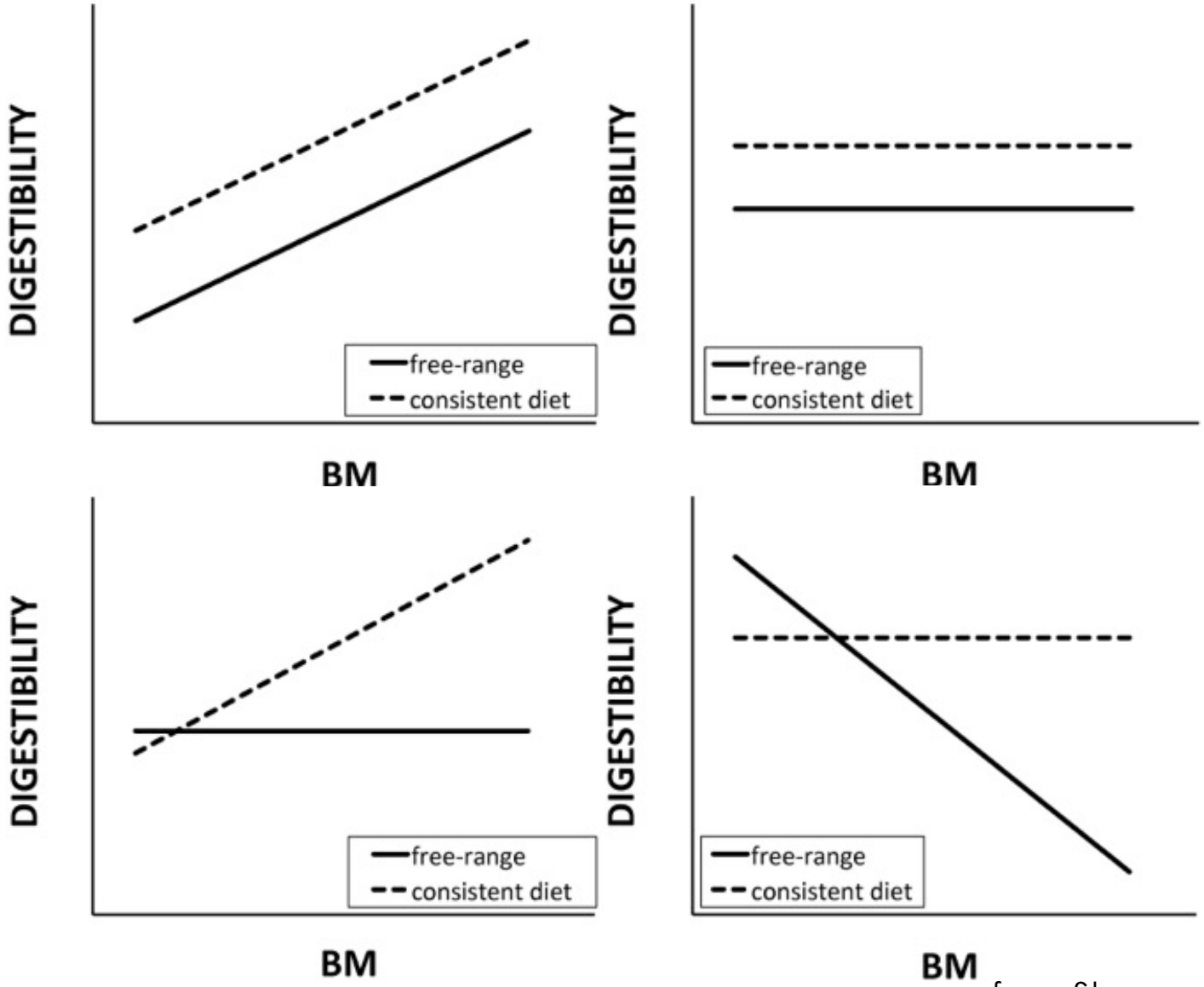
from Steuer et al. (2014)

Body size does not affect diet selection ...



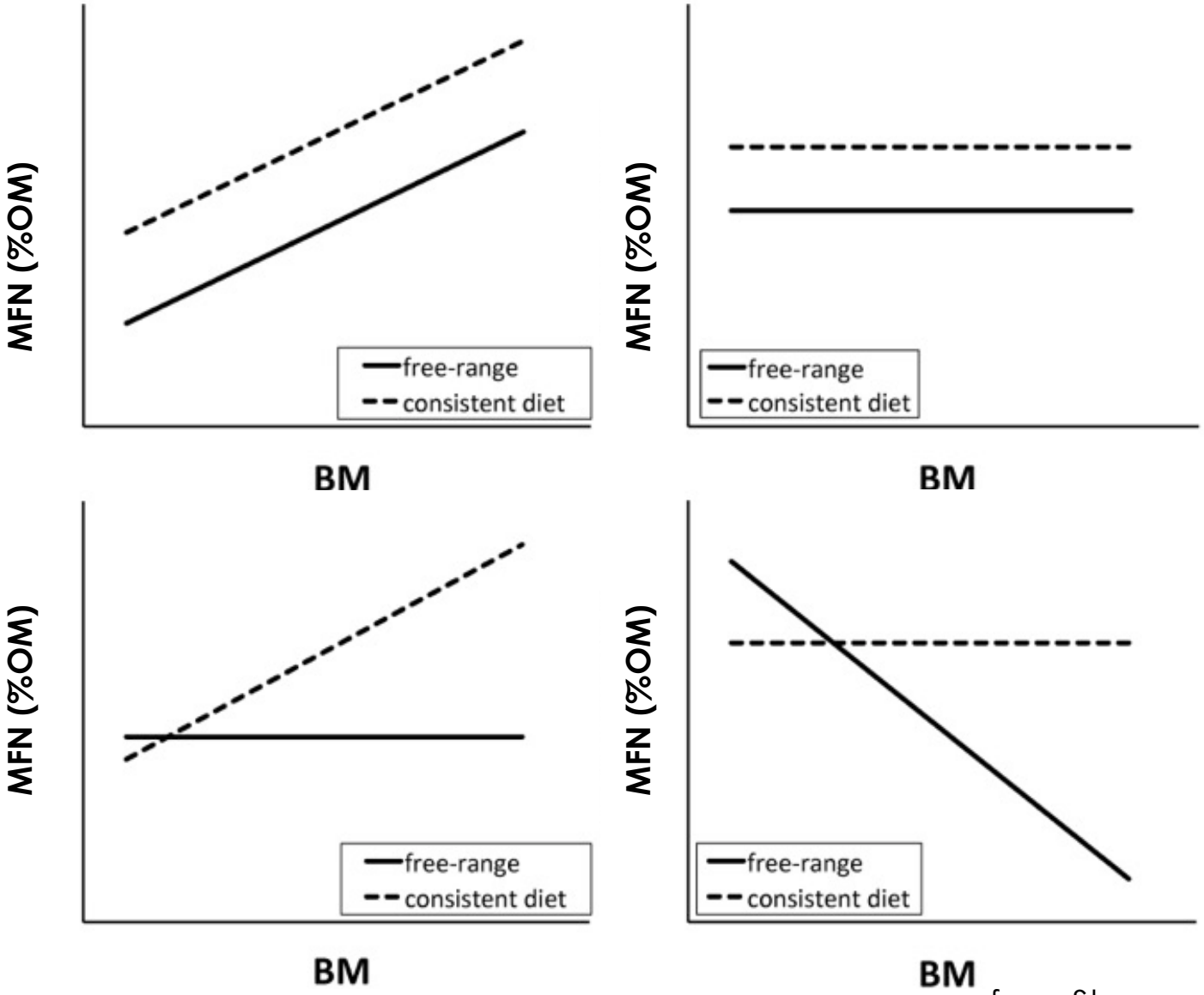
from Steuer et al. (2014)

… or larger animals eat lower quality diets



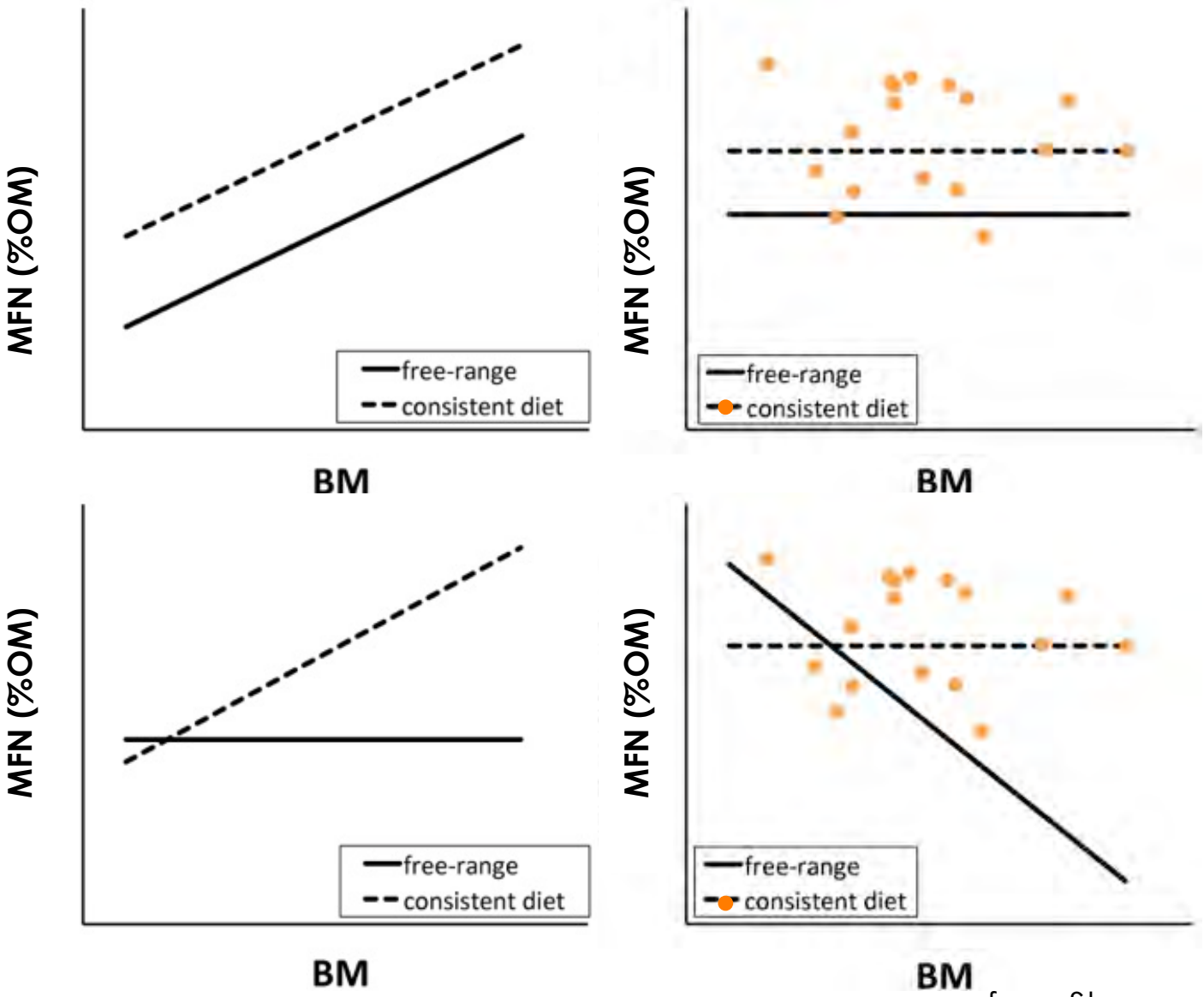
from Steuer et al. (2014)

… or larger animals eat lower quality diets



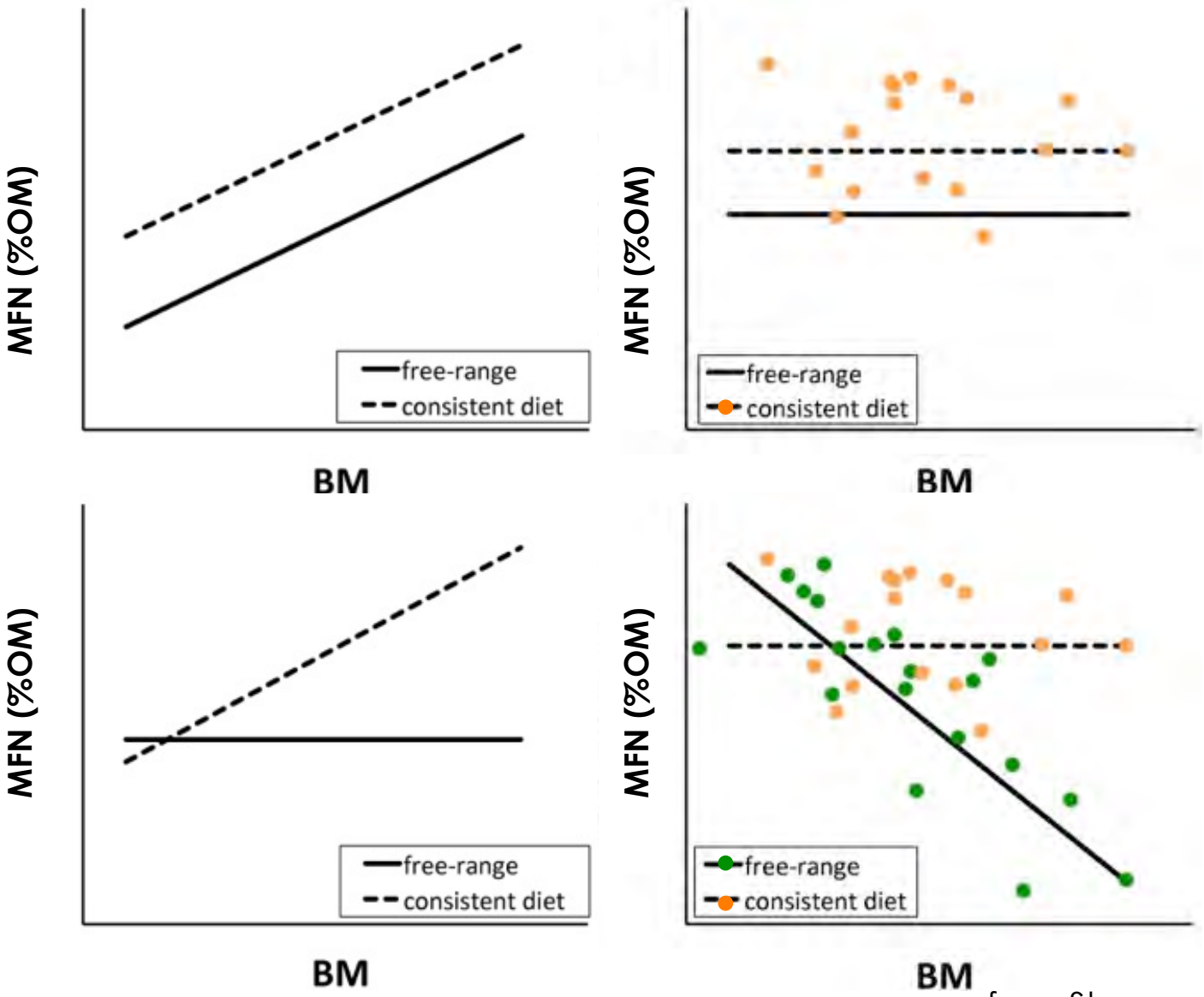
from Steuer et al. (2014)

… or larger animals eat lower quality diets



from Steuer et al. (2014)

… or larger animals eat lower quality diets



from Steuer et al. (2014)

But what does really count ?

Do others read, use, build on, deal with your publications?

Do you have a vision, or do you 'just' work on some tiny detail?

Do you do research in an elegant, cool, beautiful, simple way?

Do those who learnt from you think and speak highly of you? Do you have a reputation of integrity?

Integrity

Integrity

authorship

Authorship

Mammal Rev. 2004, Volume 34, No. 3, 241–245. *Printed in Great Britain.*

The potential interplay of posture, digestive anatomy, density of ingesta and gravity in mammalian herbivores: why sloths do not rest upside down

MARCUS CLAUSS

Authorship

Mammal Rev. 2004, Volume 34, No. 3, 241–245. *Printed in Great Britain.*

The potential interplay of posture, digestive anatomy, density of ingesta and gravity in mammalian herbivores: why sloths do not rest upside down

MARCUS CLAUSS

Mammal Rev. 2005, Volume 35, No. 2, 174–187. *Printed in Great Britain.*

The digestive performance of mammalian herbivores: why big may not be that much better

MARCUS CLAUSS* and JÜRGEN HUMMEL*†

Authorship

Mammal Rev. 2004, Volume 34, No. 3, 241–245. *Printed in Great Britain.*

The potential interplay of posture, digestive anatomy, density of ingesta and gravity in mammalian herbivores: why sloths do not rest upside down

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The digestive performance of mammalian herbivores: why big may not be that much better

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British Journal of Nutrition (2016), **116**, 763–773
doi:10.1017/S0007114516002701

Influence of ruminal methane on digesta retention and digestive physiology in non-lactating dairy cattle

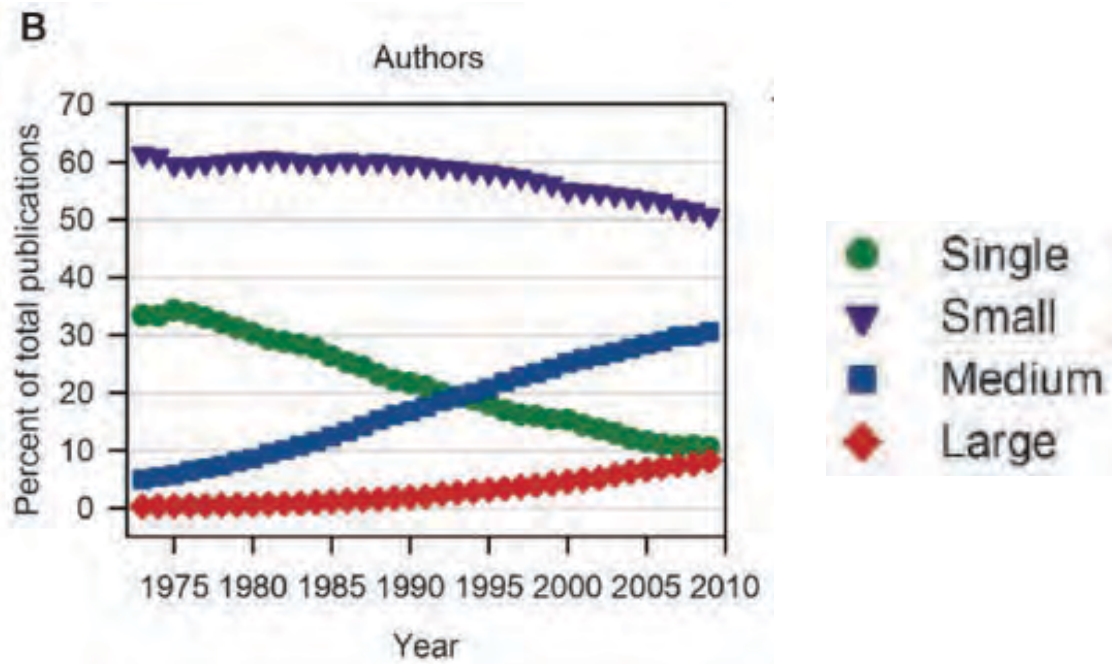
Marie T. Dittmann[1,2,3], Kirsty J. Hammond[3]†, Paul Kirton[3], David J. Humphries[3], Les A. Crompton[3], Sylvia Ortmann[4], Tom H. Misselbrook[5], Karl-Heinz Südekum[6], Angela Schwarm[2], Michael Kreuzer[2], Christopher K. Reynolds[3] and Marcus Clauss[1]*

Authorship

SCIENTIFIC PUBLISHING

Multinational teams and diseconomies of scale in collaborative research

David Hsiehchen,[1]* Magdalena Espinoza,[1] Antony Hsieh[2]



Authorship sequence

Observation of Single Top-Quark Production

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Boline,[61] T. A. Bolton,[58] E. E. Boos,[38] G. Borissov,[42] T. Bose,[76] A. Brandt,[77] R. Brock,[64] G. Brooijmans,[69] A. Bross,[49] D. Brown,[19] X. B. Bu,[7] N. J. Buchanan,[48] D. Buchholz,[52] M. Buehler,[80] V. Buescher,[22] V. Bunichev,[38] S. Burdin,[42,‡] T. H. Burnett,[81] C. P. Buszello,[43] P. Calfayan,[25] B. Calpas,[15] S. Calvet,[16] J. Cammin,[70] M. A. Carrasco-Lizarraga,[33] E. Carrera,[48] W. Carvalho,[3] B. C. K. Casey,[49] H. Castilla-Valdez,[33] S. Chakrabarti,[71] D. Chakraborty,[51] K. M. Chan,[54] A. Chandra,[47] E. Cheu,[45] D. K. Cho,[61] S. Choi,[32] B. Choudhary,[28] L. Christofek,[76] T. Christoudias,[43] S. Cihangir,[49] D. Claes,[66] J. Clutter,[57] Y. Coadou,[6,§] M. Cooke,[49] W. E. Cooper,[49] M. Corcoran,[79] F. Couderc,[18] M.-C. Cousinou,[15] S. Crépé-Renaudin,[14] V. Cuplov,[58] D. Cutts,[76] M. Ćwiok,[30] A. Das,[45] G. Davies,[43] K. De,[77] S. J. de Jong,[35] E. De La Cruz-Burelo,[33] K. DeVaughan,[66] F. Déliot,[18] M. Demarteau,[49] R. 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Authorship

Authorship sequence

Journal of Zoo and Wildlife Medicine 43(3): S108–S113, 2012

IOD IN RHINOS—NUTRITION GROUP REPORT: REPORT FROM THE NUTRITION WORKING GROUP OF THE INTERNATIONAL WORKSHOP ON IRON OVERLOAD DISORDER IN BROWSING RHINOCEROS (FEBRUARY 2011)

Marcus Clauss, Ph.D., D.V.M., Ellen Dierenfeld, Ph.D., M.S., Jesse Goff, D.V.M., Ph.D., Kirk Klasing, Ph.D., Liz Koutsos, Ph.D., M.S., Shana Lavin, Ph.D., M.S., Shannon Livingston, M.S., Brian Nielson, Ph.D., Michael Schlegel, Ph.D., P.A.S., Kathleen Sullivan, M.S., Eduardo Valdes, Ph.D., and Ann Ward, M.S.

Authorship

Authorship sequence

frontiers in Ecology and Evolution

ORIGINAL RESEARCH
published: 29 February 2016
doi: 10.3389/fevo.2016.00015

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Within-Population Isotopic Niche Variability in Savanna Mammals: Disparity between Carnivores and Herbivores

Daryl Codron[1,2], Jacqueline Codron[3], Matt Sponheimer[4] and Marcus Clauss[5]*

Authorship

Authorship sequence

Molecular Ecology (1998) 7, 519–531

Speciation and phylogeography of Hawaiian terrestrial arthropods

G. K. RODERICK and R. G. GILLESPIE

Order of authorship was determined by proximity to tenure decisions.

Authorship sequence

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Agriculture, Ecosystems and Environment 103 (2004) 509–518
Agriculture Ecosystems & Environment
www.elsevier.com/locate/agee

Forest fragmentation affects early successional patterns on shifting cultivation fields near Indian Church, Belize

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All authors contributed equally to this paper so the order of authorship was determined by rock, paper, scissors.

Authorship

Authorship sequence

AGGREGATION OF PREDATORS AND INSECT PARASITES AND ITS EFFECT ON STABILITY

By M. P. HASSELL and R. M. MAY*

Journal of Animal Ecology, Vol. 43, No. 2 (Jun., 1974), pp. 567-594

* The order of authorship was determined from a twenty-five-game croquet series held at Imperial College Field Station during summer 1973.

Authorship

Authorship sequence

Journal of Personality and Social Psychology
1990, Vol. 59, No. 1, 17–26

0022-3514/90/$00.75

The Fleeting Gleam of Praise: Cognitive Processes Underlying Behavioral Reactions to Self-Relevant Feedback

William B. Swann, Jr., J. Gregory Hixon, Alan Stein-Seroussi, and Daniel T. Gilbert
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Order of authorship was determined by a flip of what William B. Swann, Jr., claimed was a fair coin.

Authorship sequence

Equal contributions and credit given to authors in critical care medicine journals during a 10-yr period*

Crit Care Med 2012 Vol. 40, No. 3

Fei Wang, MD, PhD; Lu Tang, PhD; Lulong Bo, MD, PhD; Jinbao Li, MD, PhD; Xiaoming Deng, MD, PhD

Table 1. Number of original research articles with authors given equal credit and annual prevalence

Year	*American Journal of Respiratory and Critical Care Medicine*	*Critical Care Medicine*	*Intensive Care Medicine*	*Critical Care*
2001	0/519 (0%)	4/314 (1.3%)	0/237 (0%)	0/25 (0%)
2002	2/382 (<1%)	2/338 (<1%)	0/230 (0%)	0/28 (0%)
2003	6/365 (1.6%)	1/372 (<1%)	2/288 (<1%)	0/49 (0%)
2004	13/303 (4.3%)	4/319 (1.3%)	3/252 (1.2%)	0/65 (0%)
2005	20/364 (5.5%)	10/338 (3.0%)	3/197 (1.5%)	0/111 (0%)
2006	31/325 (9.5%)	11/360 (3.1%)	2/211 (<1%)	2/179 (1.1%)
2007	31/300 (10.3%)	19/321 (5.9%)	8/228 (3.5%)	3/133 (2.2%)
2008	43/309 (13.9%)	15/380 (3.9%)	7/222 (3.2%)	10/174 (5.7%)
2009	39/263 (14.8%)	19/375 (5.1%)	6/225 (2.7%)	19/210 (9.0%)
2010	55/277 (19.9%)	27/255 (10.6%)	11/206 (5.3%)	28/240 (11.7%)
Total	240/3407 (7.0%)	112/3372 (3.3%)	42/2296 (1.8%)	62/1214 (5.1%)
Trend[a]	$z = -14.23, p < .0001$	$z = -7.68, p < .0001$	$z = -5.24, p < .0001$	$z = -6.55, p < .0001$

Authorship sequence

Equal contributions and credit given to authors in critical care medicine journals during a 10-yr period*

Crit Care Med 2012 Vol. 40, No. 3

Fei Wang, MD, PhD; Lu Tang, PhD; Lulong Bo, MD, PhD; Jinbao Li, MD, PhD; Xiaoming Deng, MD, PhD

Table 2. Number of original research articles with authors given equal credit categorized by byline position

Byline Position of Authors Receiving Equal Credit	*American Journal of Respiratory and Critical Care Medicine* (n = 240)	*Critical Care Medicine* (n = 112)	*Intensive Care Medicine* (n = 42)	*Critical Care* (n = 62)	Total (n = 456)
First two authors	180 (75.0%)	90 (80.4%)	30 (71.4%)	44 (71.0%)	344 (75.4%)
First three or more authors	10 (4.2%)	5 (4.5%)	2 (4.8%)	3 (4.8%)	20 (4.4%)
Last two or more authors	18 (7.5%)	9 (8.0%)	3 (7.1%)	4 (6.5%)	34 (7.5%)
First and last authors	1 (<1%)	0	3 (7.1%)	3 (4.8%)	7 (1.5%)
First two and last two authors	17 (7.1%)	2 (1.8%)	2 (4.8%)	2 (3.2%)	23 (5.0%)
First two (or more) and last authors	4 (1.2%)	1 (<1%)	0	2 (3.2%)	7 (1.5%)
First and last two authors	0	1 (<1%)	0	0	1 (<1%)
First and third authors	0	1 (<1%)	0	2 (3.2%)	3 (<1%)
Middle authors only	8 (3.3%)	0	0	1 (1.6%)	9 (2.0%)
All authors	0	0	2 (4.8%)	0	2 (<1%)
Others	2 (<1%)	3 (2.7%)	0	1 (1.6%)	6 (1.3%)

Authorship sequence

Primary oligodendrocyte death does not elicit anti-CNS immunity

Giuseppe Locatelli[1,7], Simone Wörtge[2,7], Thorsten Buch[1,3,7], Barbara Ingold[4], Friederike Frommer[2], Bettina Sobottka[1], Martin Krüger[5], Khalad Karram[2], Claudia Bühlmann[1], Ingo Bechmann[5], Frank L Heppner[6], Ari Waisman[2,8] & Burkhard Becher[1,8]

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Authorship

Authorship sequence

Representation of Geometric Borders in the Entorhinal Cortex

Trygve Solstad, Charlotte N. Boccara,* Emilio Kropff,* May-Britt Moser, Edvard I. Moser†

SCIENCE VOL 322 19 DECEMBER 2008

*These authors contributed equally to this work.

Authorship

Authorship sequence

Thermal physiology of Amazonian lizards (Reptilia: Squamata)

Luisa M. Diele-Viegas[1¤a‡*], Laurie J. Vitt[2☯], Barry Sinervo[3☯], Guarino R. Colli[4☯], Fernanda P. Werneck[5☯], Donald B. Miles[6☯], William E. Magnusson[5☯], Juan C. Santos[7☯¤b], Carla M. Sette[3☯], Gabriel H. O. Caetano[3‡], Emerson Pontes[5‡], Teresa C. S. Ávila-Pires[‡1]

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‡ GHOC and EP also contributed equally to this work. LDV and TCSAP are joint senior authors on this work.
* luisa.mviegas@gmail.com

Authorship

Authorship sequence

Vocal complexity and sociality in spotted paca (*Cuniculus paca*)

Stella G. C. Lima[1☯], Renata S. Sousa-Lima[1☯], Rosana S. Tokumaru[2☯], Sérgio L. G. Nogueira-Filho[3☯], Selene S. C. Nogueira[3☯*]

1 Laboratório de Bioacústica, Departamento de Fisiologia e Comportamento / Programa de Pós-Graduação em Psicobiologia, Universidade Federal do Rio Grande do Norte, Natal, RN, Brazil, **2** Departamento de Psicologia Social e do Desenvolvimento, Universidade Federal do Espírito Santo, Vitória, ES, Brazil, **3** Laboratório de Etologia Aplicada, Departamento de Ciências Biológicas, Universidade Estadual de Santa Cruz, Ilhéus, BA, Brazil

☯ These authors contributed equally to this work.
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Authorship

Integrity

language

Why study something ?

... but no information exists on x ...

... but x has not been studied so far ...

The most likely explanation for the fact that something has not been studied yet is that it is not very interesting.

Find another reason to justify your work!

Self-praise

CHRISTMAS 2015: THE PUBLICATION GAME

Use of positive and negative words in scientific PubMed abstracts between 1974 and 2014: retrospective analysis

OPEN ACCESS

Christiaan H Vinkers *assistant professor*[1], Joeri K Tijdink *psychiatrist*[2], Willem M Otte *assistant professor*[3 4]

Box 1: Words used in PubMed search queries and Google books search engine

Positive words

Amazing, assuring, astonishing, bright, creative, encouraging, enormous, excellent, favourable, groundbreaking, hopeful, innovative, inspiring, inventive, novel, phenomenal, prominent, promising, reassuring, remarkable, robust, spectacular, supportive, unique, unprecedented

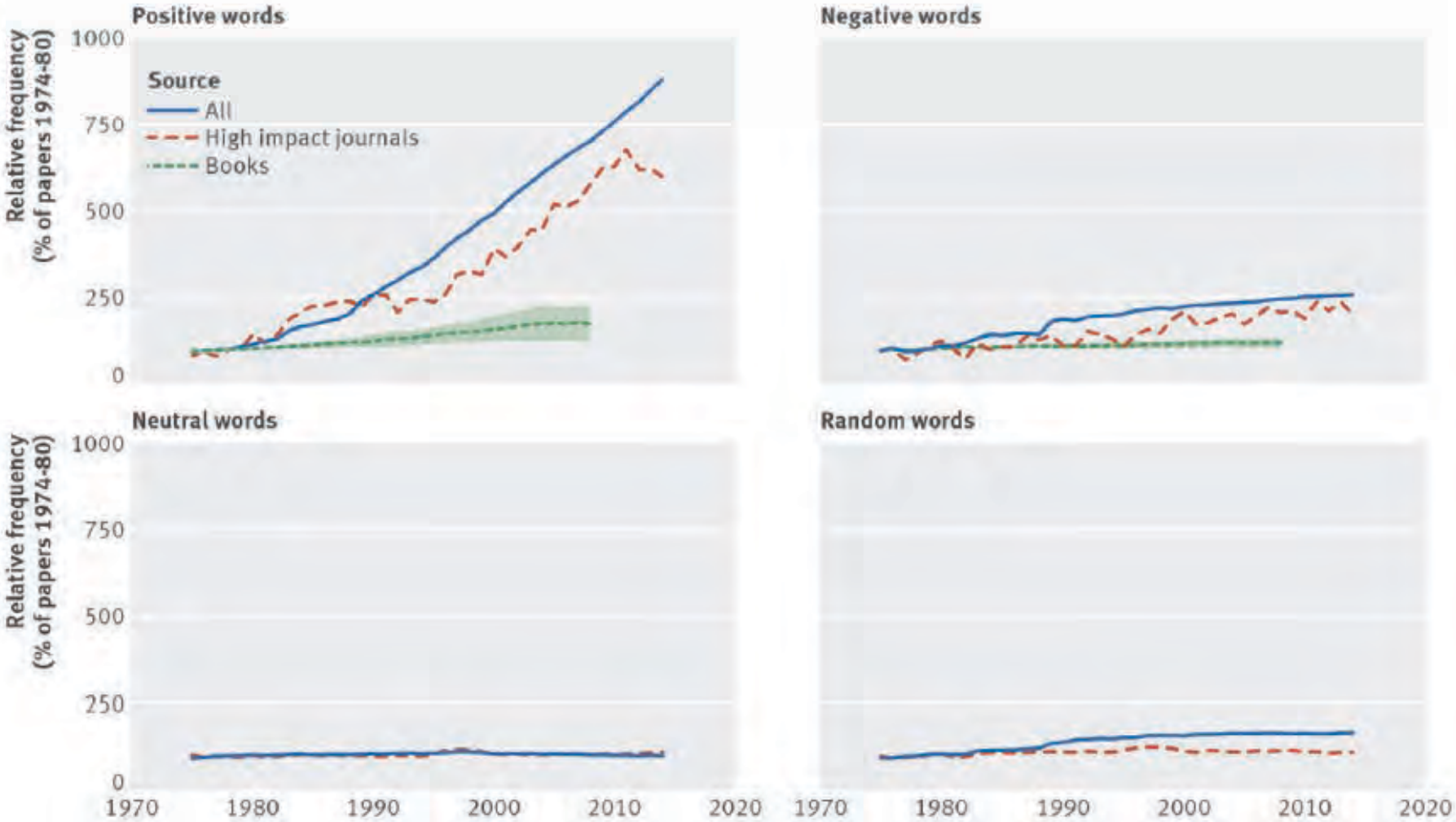
Negative words

Detrimental, disappointing, disconcerting, discouraging, disheartening, disturbing, frustrating, futile, hopeless, impossible, inadequate, ineffective, insignificant, insufficient, irrelevant, mediocre, pessimistic, substandard, unacceptable, unpromising, unsatisfactory, unsatisfying, useless, weak, worrisome

Neutral words

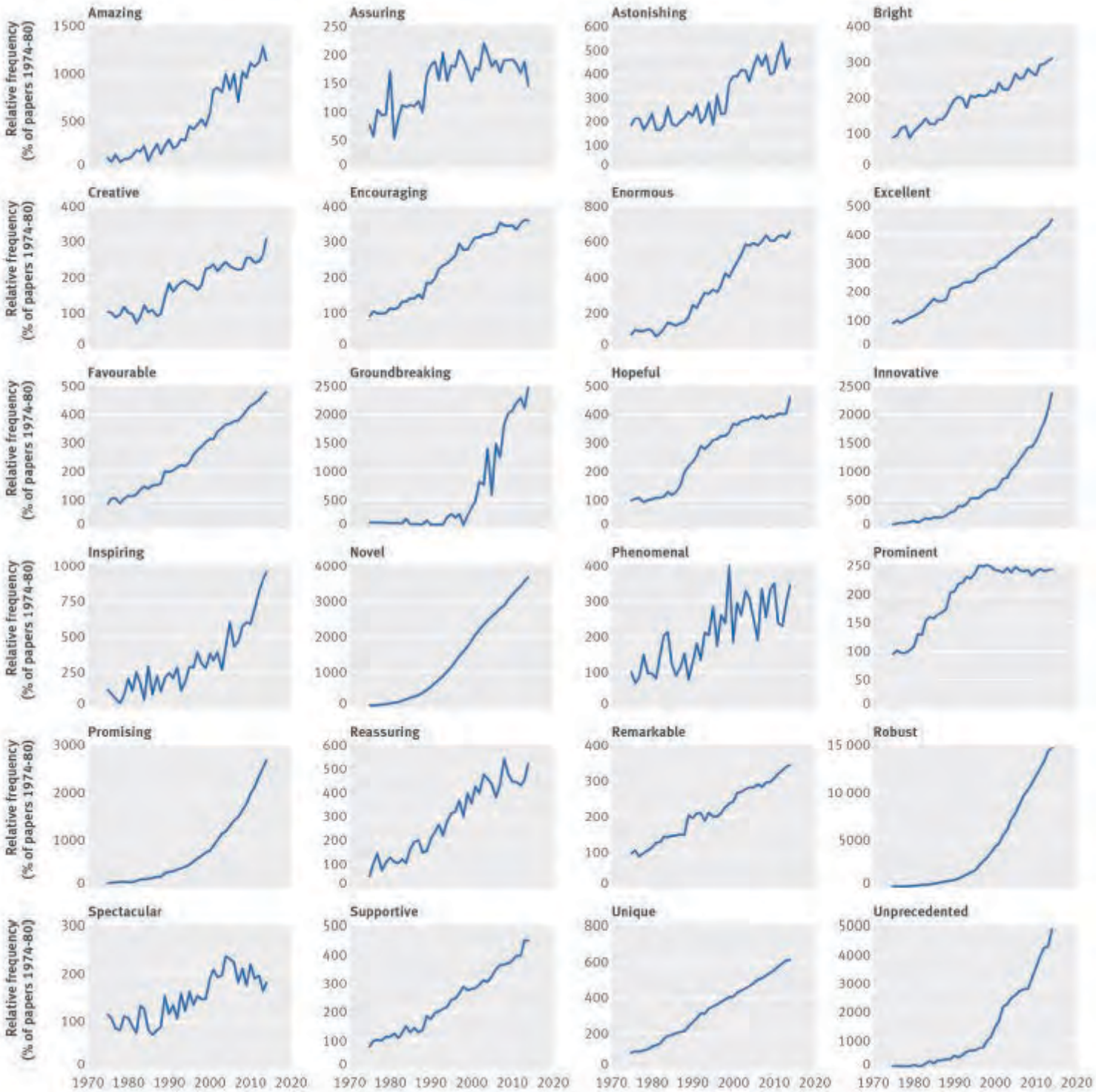
Animal, blood, bone, brain, condition, design, disease, experiment, human, intervention, kidney, liver, man, men, muscle, patient, prospective, rodent, significant, skin, skull, treatment, vessel, woman, women

Use of positive and negative words in scientific PubMed abstracts between 1974 and 2014: retrospective analysis



Self-praise

Self-praise


Amazing
Assuring
Astonishing
Bright
Creative
Encouraging
Enormous
Excellent
Favourable
Groundbreaking
Hopeful
Innovative
Inspiring
Novel
Phenomenal
Prominent
Promising
Reassuring
Remarkable
Robust
Spectacular
Supportive
Unique
Unprecedented
Relative frequency (% of papers 1974-80)
1970 1980 1990 2000 2010 2020

Integrity

respect

Bad reviewing

To:

03-Apr-2018
Dear Dr. xxxxx:

Expert reviewers have evaluated your manuscript # xxxx 2523 entitled "Effects of Cu supplementation xxxxx" which you submitted to the Journal of xxxxxx xxxxxxx. I regret to inform you that based on their comments and my assessment it will not be possible to further consider your manuscript for publication.

Reasons for this decision are detailed in the comments of the Associate Editor and reviewers, which are enclosed for your consideration.

Thank you for considering the Journal of xxxxxx xxxxxxx for the publication of your research. I hope the outcome of this specific submission will not discourage you from the submission of future manuscripts.

Sincerely,
Prof. xxx xxxx
Section Editor, Journal of Animal Science

Associate Editor:
Comments to the Author:
(There are no comments.)

Reviewer(s)' Comments to Author:

Reviewer: 1

Comments to the Author
This paper lacks sufficient scientific merit for publication in my opinion. The literature on Cu status and the effects of Cu supplementation xxxxxx is a science graveyard littered with reports/studies that showed little or no response to supplementation.
The first xxxxx. Secondly, for the variables of interest, I would strongly argue that with only 9 treated and 8 control subjects, the study seriously lacks statistical power to argue that 'significant results' are anything than chance/spurious effects (especially given the number of measured variables that showed no effect). Thirdly, xxxxxx.

Bad reviewing

To:

03-Apr-201
Dear Dr. xx

Expert revi
Journal of
consider y

Reasons fo

Thank you
submission

Sincerely,
Prof. xxx x
Section Ed

Associate E
Comments
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Reviewer(s

Reviewer:

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This paper
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study
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Reviewer: 2

Comments to the Author
Please see the attached word file for track-change comments. Not all of them are listed here:
l. 73-76 while this is correct, I suggest to move to discussion because you did not investigate these factors in your study design.
introduction: in my view, the other parts of the same study (Mn to hinds, Cu to stags) should be mentioned here to set the present paper into context. Otherwise, when these studies are mentioned later and the reader "detects" that they are connected, she/he will feel cheated.
l. 95 state how the setup (incl. diets) is similar to, or different from, the Mn supplementation study
l. 103 state the Cu recommendation and the level in your diet
l. 108-109 reword: a mixer does not cut; or did it reduce particle size?
l. 112 state total number of injections
l. 112 explain why dosing scheme differs from the Mn study - even if obvious to you, it is better for the reader to read the reason
l. 140 the difference in calving data seems like an effect. Can you check for significance? This should be mentioned in discussion and discussed (increased intrauterine growth?).
l. 148 this means the treatment group was weaned later than the control group? State if that affects any measurements please
l. 153 when reading for the first time, I wondered why you had not used the venipuncture for Cu serum measurement; later I realized you did, but only mention it in the discussion; I think it makes a bad impression not to mention it right away and give the result
l. 235 I do not see a benefit from having the data in a figure, I would put them in Table 3.
l. 275 if milk for females has more fat, no other differences, no difference in amount, then one would expect females to be heavier after weaning than males. This should be discussed. Alternatively, the whole analysis for calf sex differences could be deleted (you do not discuss is at all at present).
l. 280 all positive correlations? In the Mn paper, you had several negative ones. There is little discussion on this. At least, you should state how the present correlations compare with the ones you report in your Mn paper
l. 301-306 sort in a rational order (suggestions made in the attached word file)
l. 317-320 I always discourage authors to use such statements. You are the first to study the effect of (i) a fixed dose of Cu (ii) injected in (iii) late gestation and lactating (iv) red deer hinds (v) fed a blanaced diet (vi) on milk production and calf growth. These are so many conditions that it would be surprising if you were not the first. In my view, readers typically do not think highly of authors who use such claims (and would be surprised anyway to learn that an identical study had been done before). I would much rather expect a systematic short overview over red deer (and, where appropriate, domestic ruminant) supplementation studies to follow here now. This is the most major change I would recommend: to modify the discussion (actually, re-write a part) to give a good systematic overview over red deer Cu supplementation studies.
l. 337 but it (potentially) led to earlier birth in your study
l. 354-356 these data should be explained in methods and become part of the results (for the reder, it comes as a surprise that you measured this, and one wonders why it was not part of results, it would be such a natural thing to add)
l. 370 incomplete sentence
l. 400-402 this sentence sounds odd - you should state whether there are studies on the effect of Cu supplementation on mineral profile of cow milk
l. 439 if you state this, the sentence should read like suggested in the attachment; however, ensure that this conforms with journal ethical policy (not all journals would support a policy that is designed to enhance the trophy value of antlers)
l. 444 you cannot justify costs in red deer with economic losses in dairy cattle - see comment in attachment
l. 457 I added some references which I would expect in an overview on Cu supplementation in red deer
Figure 1: something is wrong with the figure (see comment in attachment)
best wishes

marcus claussManuscript_Cu_deer_Serrano_el_al…notated.pdf

Integrity

buying publications

Predatory publishing

«Wir werden alle zur Hölle fahren»: Über die Gefahr eines Atomkriegs. Seite 7

4. Februar 2018
17. Jahrgang | Nr. 5
NZZaS.ch
Fr. 6.00 | € 6.00

NZZ am Sonntag

Wie Schweizer Forscher die Hochschulen austricksen

Wer an der Hochschule Karriere machen will, muss viel publizieren. Oft kaufen sich deshalb Wissenschafter in obskure Zeitschriften ein.

Martin Amrein

Zweifelhafte Wissenschaftsjournals publizieren Studien, ohne dass sie diese seriös begutachten. Im Gegenzug verlangen sie Geld von den Forschern. Die Wissenschafter kommen so auf einfachem Weg zu mehr Publikationen – für ihre Karriere in den Hochschulen ist das entscheidend. Diese Praxis erfreut sich in den letzten Jahren zunehmender Beliebtheit. Und als eine neue

ingenieurs zu finden. An zweiter bis vierter Stelle kommen Krebsforscher mit fünf bis neun Artikeln und ein Physiker.

Die Publikationsgebühren der obskuren Zeitschriften können mehr als 3000 Dollar betragen. Manche Wissenschafter bezahlen sie aus öffentlichen Forschungszuschüssen, also Steuergeldern. Genau das will Mathias Egger, Präsident des Forschungsrats des Schweizerischen Nationalfonds, verhindern: «Uns bereitet Sorgen, dass wir ungewollt Pseudo-Journals unterstützen könnten», sagt er. Eine Arbeitsgruppe des Nationalfonds befasst sich nun mit dem Thema. «Wir wollen den Forschern helfen, die wissenschaftliche Zeitschrift

Melania Trump Einsame Rebellion

Ausländische Spione nutzen Schweiz als Drehscheibe

Der Nachrichtendienst des Bundes will künftig Treffen ausländischer Geheimdienste stören und verhindern.

Lukas Häuptli

Wegen der zentralen Lage, der guten Infrastruktur und der niedrigen Polizei- und Kontrolldichte ist die Schweiz in den letzten Jahren immer beliebter für sogenannte Drittlandtreffen ausländischer Nachrichtendienste geworden. An den Treffen erteilen ausländische Geheimdienstoffiziere Spionen anderer Länder Aufträge, bezahlen sie und nehmen von ihnen geheime politische, wirtschaftliche und militärische Informationen entgegen.

Jetzt ergreift der Nachrichtendienst des Bundes Massnahmen dagegen. «Wir sind bestrebt, solche Treffen aufzuklären», sagt eine Sprecherin. «Ziel ist es, Treffen zu verhindern oder minder

Predatory publishing

Forscher zahlen für obskure Publikationen

Um die wissenschaftliche Karriere zu fördern, publizieren viele Schweizer Forscher ihre Studien in zwielichtigen Fachzeitschriften. **Von Martin Amrein**

Predatory publishing

Recherche im Internet

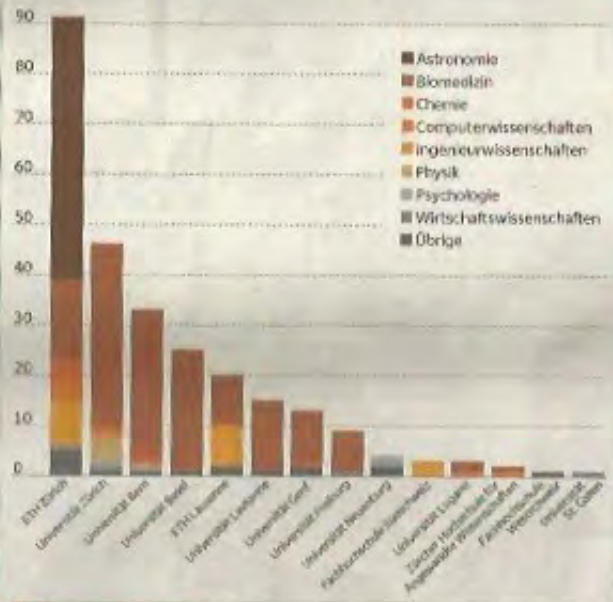
So sind wir zu den Daten gekommen

Die in diesem Artikel verwendeten Zahlen zu Schweizer Forschern, die in Pseudo-Journals publiziert haben, stammen aus einer datenjournalistischen Recherche, für die wir mit dem Forschungsinstitut Sotomo zusammengearbeitet haben. Aus dem Internet haben wir die Publikationslisten von 9565 Wissenschaftern, die über ein Profil bei der Suchmaschine Google Scholar verfügen, zusammengetragen. Bedingung war, dass die Forscher auf ihrem Profil angaben, bei einer Schweizer Universität oder Fachhochschule angestellt zu sein, oder über eine E-Mail-Adresse einer solchen Institution verfügten. Die Publikationen haben wir mit einer Liste verglichen («Beall's List»), auf der zwielichtige Zeitschriften verzeichnet sind, deren Verleger eingereichte Studien nicht richtig prüfen.

Auf diese Weise sind wir auf 222 Artikel von 146 verschiedenen Autoren gestossen. Die effektive Zahl von Artikeln in Pseudo-Journals mit Schweizer Autorenschaft dürfte noch höher sein, denn nur etwa jeder vierte Forscher besitzt ein Profil auf Google Scholar. Die Daten stammen aus dem vergangenen November. Weil das Jahr 2017 nicht vollständig erfasst ist, haben wir es in Grafik 2 ausgelassen. Der anonymisierte Datensatz ist über diesen Link verfügbar: *nzz.ch/pseudo-journals*

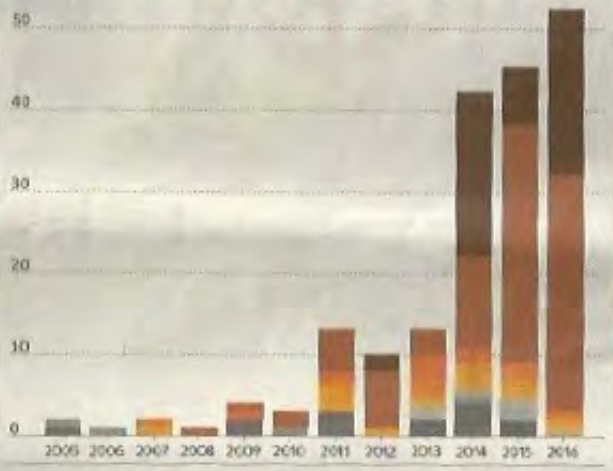
1 Universitäten vor Fachhochschulen

Anzahl Artikel in Pseudo-Journals pro Institution (2005–2017)



2 Massiver Anstieg

Anzahl Artikel von Schweizer Forschern in Pseudo-Journals pro Jahr



3 Unrühmlicher Rekord

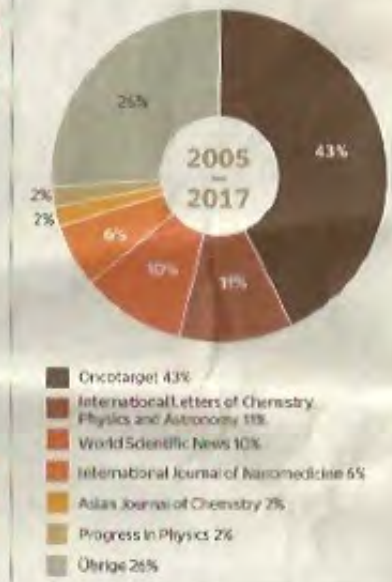
Schweizer Forscher mit den meisten Artikeln in Pseudo-Journals

4 Viele Professoren betroffen

Universitäre Position der Autoren

5 Krebsmagazin liegt vorne

Meistgenutzte Pseudo-Journals



Wilmet et al., J Primatol 2015, 4:2
http://dx.doi.org/10.4172/2167-6801.1000130

Primatology

Research Article Open Access

Field Data on the Little Known and Endangered *Lepilemur mittermeieri*

Leslie Wilmet[1,2*], Christoph Schwitzer[3], Roseline C Beudels-Jamar[2], Gontran Sonet[4], Pierre Devillers[2] and Cédric Vermeulen[1]

[1]*University of Liège - Gembloux Agro-Bio Tech, BIOSE Department, Forest Management Resources axis, Belgium, Passage des Déportés, 2. B.5030 – Gembloux, Belgium*
[2]*Conservation Biology Unit, OD Nature, Royal Belgian Institute of Natural Sciences, Brussels, Belgium, Rue Vautier, 29 1000 Bruxelles, Belgium*
[3]*Bristol Zoological Society, c/o Bristol Zoo Gardens, Clifton, Bristol, BS8 3HA (UK)*
[4]*Joint Experimental Molecular Unit (JEMU), OD Taxonomy & Phylogeny, Royal Belgian Institute of Natural Sciences, 29 Rue Vautier, B-1000 Brussels, Belgium*

Abstract

Lepilemur mittermeieri is a very little known sportive lemur of the Ampasindava peninsula of Madagascar, presently regarded as endangered. On the basis of genetic material only, obtained from three individuals collected at the same locality. No observation confidently allocated to the species has been reported since. The objectives of our research were to verify that the sportive lemurs found in forests of the Ampasindava peninsula beyond the type-locality of *Lepilemur mittermeieri* belonged to the same species as the type, to provide morphological and behavioural data for populations confidently attributed to *L. mittermeieri* and to obtain for these populations preliminary evaluations of density variations within the peninsula. Our surveys were undertaken in March and April 2014 in remnant forest patches of the western part of the Ampasindava peninsula. Linear transects by night and punctual observations by day were conducted. A total of 54 animals were seen along nine transects situated in four forest patches, two at low altitude and two at high altitude. All animals examined and photographed appeared similar, and the impression was gained that a single taxon was involved. Genetic material collected from one dead specimen proved identical to the type of *L. mittermeieri* which confirmed the identity of the populations we observed. It thus appears that *L. mittermeieri* is indeed the only sportive lemur present on the peninsula and that it occurs in several forest remnants. We endeavoured to get evaluations of the density and abundance of the species in the four forest patches we studied. We used KAIs (Kilometric Abundance Indices) to evaluate and compare relative densities, and Buckland's distance sampling method to evaluate absolute densities. The latter suggested a density of 1.9 animals/ha, a result that must, however, be taken with caution.

Keywords: *Lepilemur mittermeieri*; Ampasindava peninsula; Madagascar; Distance sampling; Endangered species

Introduction

Sportive lemurs (genus *Lepilemur*) are medium-sized, mostly folivorous, forest-dwelling, mostly nocturnal primates, confined, like the rest of the infraorder Lemuriformis, to Madagascar [1,2]. They are placed by most recent authors in the monotypic family Lepilemuridae [3,4]. As a genus, the sportive lemurs are widely distributed, in discrete populations, in low- and mid-altitude evergreen and deciduous forests of Madagascar [5-8]. The diversity of the genus has only recently been fully appreciated [4]. Until the 1970's all populations were included in two or one species. Between 1977 and the 1990's seven species were recognised. Groves [3] recognised eight species. Recent genetic and cytogenetic studies have identified 26 species, with more likely to be discovered [4]. The cryptic character of the now-recognised species, the long ignorance of their identity and the fact that many of them have only been characterised through genetic analyses mean that very few eco-ethological data can be specifically attributed to most of them. Thus, by 2013, data on behaviour and ecology were only available for six of the 26 species [4]. The genus is very homogenous; species are morphologically similar and are not sexually dimorphic. The reproductive cycle of individual species and the social behaviour of individuals are poorly known but some sportive lemurs, at least, show a seasonal reproductive cycle and individuals appear to be mostly solitary [5,8-11].

Concern for the conservation status of sportive lemurs had long been expressed, in spite of their supposed large range and occasional local abundance, because of fragmented distribution and severe threats to many isolated populations, risk factors which increase with the current intensification of deforestation and habitat degradation [12-14]. The new understanding of the diversity of the genus has considerably increased this concern as most species are now known to have very small, shrinking and fragmenting ranges and, probably for some of them, small total populations [4]. A 2012 assessment evaluates 5 species as critically endangered, 17 as endangered, 4 as vulnerable. Effective conservation actions are thus urgently needed to preserve viable populations of each species. To define and guide these actions, a minimum understanding of the limits of the area of distribution, of the habitat requirements, of the behaviour and population size of the target species are required.

Our fieldwork addresses one of the least-known, endangered, species, *Lepilemur mittermeieri*. *L. mittermeieri* was described from the Ampasindava peninsula on the basis of tissue samples from three specimens for which karyotype and mitochondrial cytochrome *b* DNA sequences were obtained [1]. At the time of description no indication of presence of the taxon outside of the type locality was known. No morphological description, and no eco-ethological data accompany the description. Mittermeier et al. [6] provided somewhat more information on *Lepilemur mittermeieri*. They suggested that the species was limited

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Received August 06, 2015; **Accepted** November 16, 2015; **Published** November 24, 2015

Citation: Wilmet L, Schwitzer C, Beudels-Jamar RC, Sonet G, Devillers P, et al. (2015) Field Data on the Little Known and, Endangered *Lepilemur Mittermeieri*. J Primatol 4: 130. doi:10.4172/2167-6801.1000130

Predatory publishing

Wilmet et al., J Primatol 2015, 4:2

Primatology

ISSN: 2167-6801

Research Article

Field Data on the Little Known and Endangered *Lepilem*

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[2]*Conservation Biology Unit, OD Nature, Royal Belgian Institute of Natural Sciences, Brussels, Belgium, Rue Vautier, 29 1000 Br*
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Received August 06, 2015; **Accepted** 24, 2015

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Primate Conservation 2017 (31): 17-25

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[3]*Bristol Zoological Society, c/o Bristol Zoo Gardens, Clifton, Bristol, UK*
[4]*Joint Experimental Molecular Unit (JEMU), OD Taxonomy & Phylogeny, Royal Belgian Institute of Natural Sciences, Brussels, Belgium*

Abstract: *Lepilemur mittermeieri* is a very little known sportive lemur of the Ampasindava peninsula of Madagascar, presently regarded as Endangered. It was described in 2006 by Rabarivola *et al*. on the basis of genetic material only, obtained from three individuals collected at the same locality. No observation confidently allocated to the species has been reported since. The objectives of our research were to verify that the sportive lemurs found in forests of the Ampasindava peninsula beyond the type locality of *Lepilemur mittermeieri* belonged to the same species as the type, to provide morphological and behavioral data for populations confidently attributed to *L. mittermeieri* and to obtain for these populations preliminary evaluations of density variations within the peninsula. Our surveys were undertaken in March and April 2014 in remnant forest patches of the western part of the Ampasindava peninsula. Linear transects by night and punctual observations by day were conducted. A total of 54 animals were seen along nine transects situated in four forest patches, two at low altitude and two at high altitude. All animals examined and photographed appeared similar, and the impression was gained that a single taxon was involved. Genetic material collected from one dead specimen proved identical to the type of *L. mittermeieri* which confirmed the identity of the populations we observed. It thus appears that *L. mittermeieri* is indeed the only sportive lemur present on the peninsula and that it occurs in several forest remnants. We endeavored to get evaluations of the density and abundance of the species in the four forest patches we studied. We used KAIs (Kilometric Abundance Indices) to evaluate and compare relative densities, and Buckland's distance sampling method to evaluate absolute densities. The latter suggested a density of 1.9 animals/ha, a result that must, however, be taken with caution.

Key Words: *Lepilemur mittermeieri,* Ampasindava peninsula, Madagascar, distance sampling, endangered species

Introduction

Sportive lemurs (genus *Lepilemur*) are medium-sized, mostly folivorous, forest-dwelling, mostly nocturnal primates, confined, like the rest of the infraorder Lemuriformes, to Madagascar (Wilmet *et al*. 2014). They are placed by most recent authors in the monotypic family Lepilemuridae (Groves 2005; Schwitzer *et al.* 2013). As a genus, the sportive lemurs are widely distributed, in discrete populations, in low and mid-altitude evergreen and deciduous forests of Madagascar (Andriaholinirina *et al*. 2006; Mittermeier *et al*. 2010; Mittermeier 2013; Drösher and Kappeler 2014). The diversity of the genus has only recently been fully appreciated (Schwitzer *et al*. 2013). Until the 1970s, all populations were included in two or one species. Between 1977 and the 1990s seven species were recognised. Groves (2005) recognised eight species. Recent genetic and cytogenetic studies have identified 26 species, with more likely to be discovered (Schwitzer *et al*. 2013). The cryptic character of the now-recognized species, the long ignorance of their identity and the fact that many of them have only been characterised through genetic analyses mean that very few eco-ethological data can be specifically attributed to most of them. Thus, by 2013, data on behaviour and ecology were only available for six of the 26 species (Schwitzer *et al*. 2013). The genus is very homogenous; species are morphologically similar and are not sexually dimorphic. The reproductive cycle of individual species and the social behaviour of individuals are poorly known but some sportive lemurs at least show a seasonal reproductive cycle and individuals appear to

* Previously published in *J. Primatol.* 2015, 4:2. http://dx.doi.org/10.4172/2167-6801.1000130.

Integrity

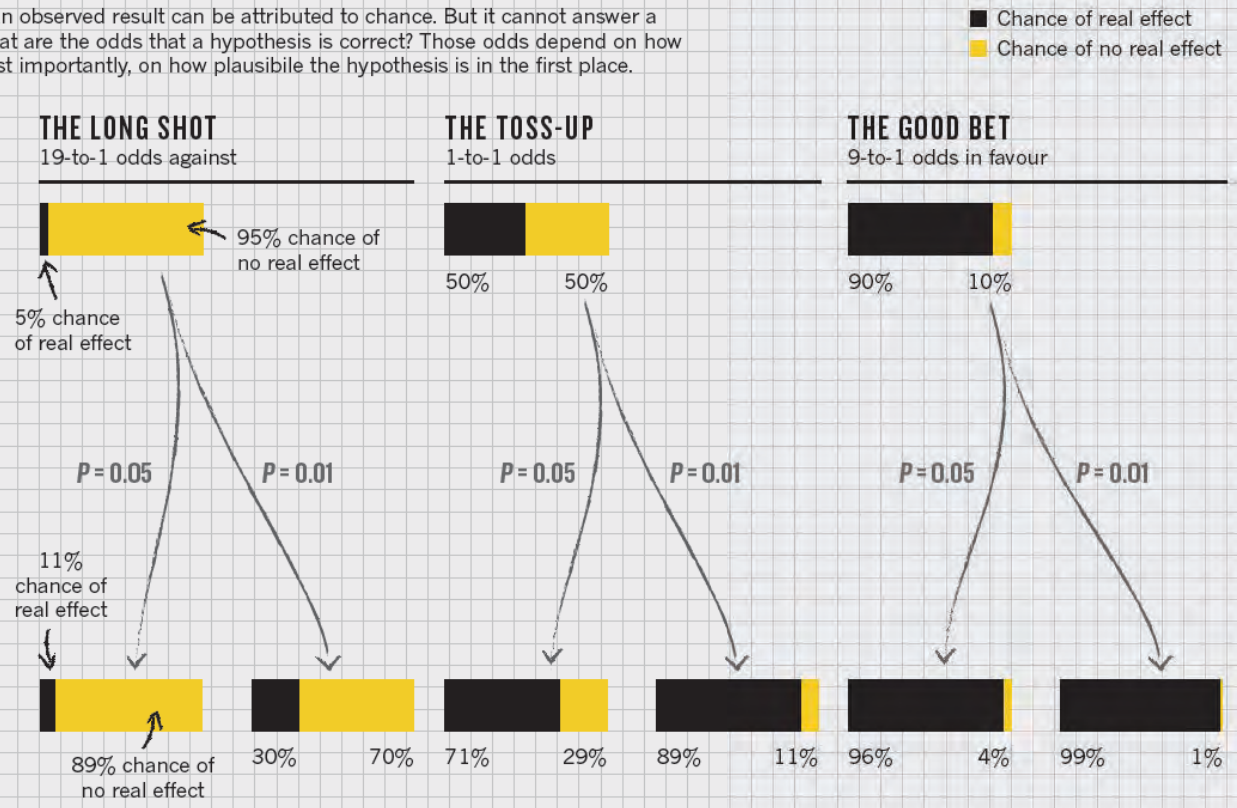
understanding your data and statistics

Understanding the P-value

R. NUZZO; SOURCE: T. SELLKE *ET AL. AM. STAT.* **55**, 62–71 (2001)

PROBABLE CAUSE

A *P* value measures whether an observed result can be attributed to chance. But it cannot answer a researcher's real question: what are the odds that a hypothesis is correct? Those odds depend on how strong the result was and, most importantly, on how plausibile the hypothesis is in the first place.



Before the experiment
The plausibility of the hypothesis — the odds of it being true — can be estimated from previous experiments, conjectured mechanisms and other expert knowledge. Three examples are shown here.

The measured *P* value
A value of 0.05 is conventionally deemed 'statistically significant'; a value of 0.01 is considered 'very significant'.

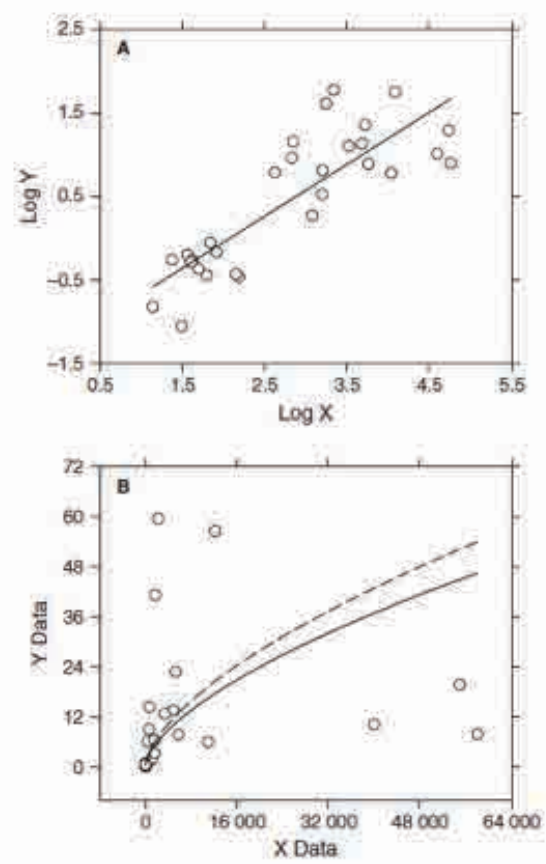
After the experiment
A small *P* value can make a hypothesis more plausible, but the difference may not be dramatic.

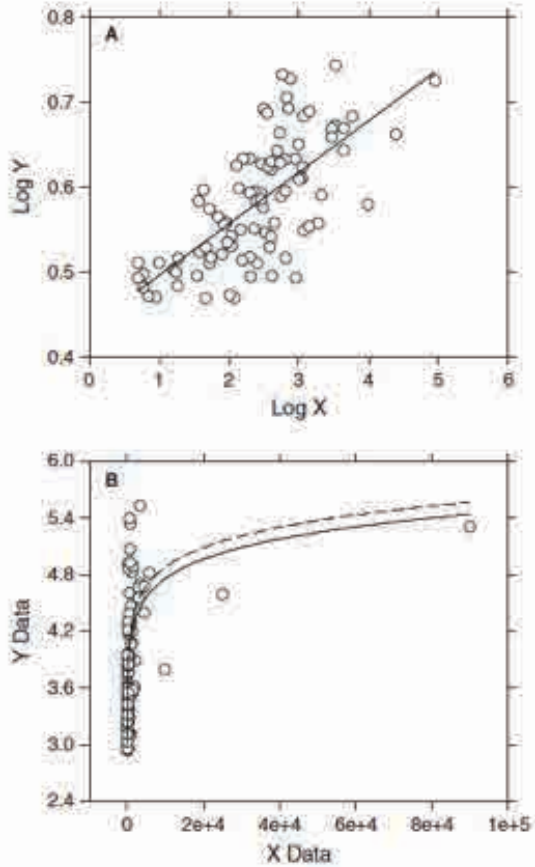
Data display

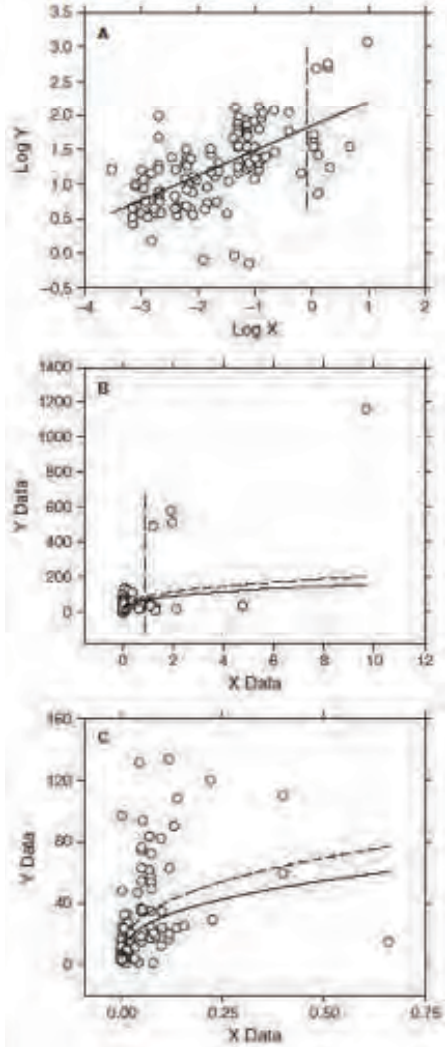
COMMENT

The essential role for graphs in allometric analysis

GARY C. PACKARD*







Know your stuff

Effects of Added Lipids on Digestibility and Nitrogen Balance in Oiled Common Murres (*Uria aalge*) and Western Grebes (*Aechmophorus occidentalis*) Fed Four Formulations of a Critical Care Diet

Rebecca S. Duerr, DVM, MPVM, PhD, and Kirk C. Klasing, PhD

Journal of Avian Medicine and Surgery 31(2):132–141, 2017

$$NR\ (\%) = N_{\text{diet}} - [(N_{\text{excreta}} \times AIA_{\text{diet}})/AIA_{\text{excreta}}]$$
$$ApND\ (\%) = (NR/N_{\text{diet}}) \times 100$$
$$AMEn\ (\text{kcal/kg diet}) = GE_{\text{diet}} - [(GE_{\text{excreta}} \times AIA_{\text{diet}})/AIA_{\text{excreta}}] - 8.22 \times N_{\text{retained}}$$
$$ED\ (\%) = AMEn/GE_{\text{diet}} \times 100$$
$$FR\ (\%) = Fat_{\text{diet}} - [(Fat_{\text{excreta}} \times AIA_{\text{diet}})/AIA_{\text{excreta}}]$$
$$FD\ (\%) = (Fat_{\text{retained}}/\ Fat_{\text{diet}}) \times 100$$

where NR is the percent of nitrogen from diet retained by the bird; N_{diet} and N_{excreta} are the percents nitrogen of the diet and droppings, respectively; AIA_{diet} is the percent AIA in the diet; AIA_{excreta} is the percent AIA in droppings; $ApND$ is the percent of nitrogen ingested by the bird that was absorbed; $AMEn$ is nitrogen-corrected apparent metabolizable energy content of the diet in kcal/kg; GE_{diet} is the gross energy of the diet in kcal/kg dry matter; GE_{excreta} is gross energy of droppings in kcal/kg dry matter; 8.22 is the energy value of uric acid in kcal/g; ED is percent energy from diet that was used by the bird; FR is the percent fat retained by the bird; Fat_{diet} is the

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Dear Kirk,

I hope this email finds you well.

We had journal club toady, discussing your Duerr&Klasing JAMS paper on re-feeding oiled birds.

After quite some discussion we came to the conclusion that there must be some typos in there, namely

NR (nitrogen retained) must be an amount, not a percentage (otherwise, the equation which is a subtraction could not be correct, and it would be the same number as ApND).

Same goes for ED and FR.

Is that correct?

Our residents were calculating in circles :-) ...

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$$ED\ (\%) = AMEn/GE_{\text{diet}} \times 100$$

Hi Marcus,

Great to hear from you. Sorry I missed the last CNS meeting but I will make it to the next one in Quebec.

This research was done by Becky Duerr as part of her PhD thesis and I will let her respond with appropriate details regarding units of measure.

ent metabolizable energy content of the diet in kcal/kg; GE_{diet} is the gross energy of the diet in kcal/kg dry matter; GE_{excreta} is gross energy of droppings in kcal/kg dry matter; 8.22 is the energy value of uric acid in kcal/g; *ED* is percent energy from diet that was used by the bird; *FR* is the percent fat retained by the bird; Fat_{diet} is the

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Hello,

Sorry for the delay, too many December deadlines between being the only vet at two busy clinics. Now happily on holiday and have more time to think J

My hopefully clear answers are below your questions in blue.

After quite some discussion we came to the conclusion that there must be some typos in there, namely
NR (nitrogen retained) must be an amount, not a percentage (otherwise, the equation which is a subtraction could not be correct, and it would be the same number as ApND).

The NR equation has all of its component parts as percents. Nitrogen Retained is the percent of nitrogen that was in the diet that was actually absorbed by the bird. If the diet had (just making up numbers here) 10% nitrogen, but had 2% nitrogen in droppings (as adjusted by the equation's % dietary marker in each), then the equation would tell me the bird retained 8%. ApND takes that percent and shows it in relation to the percent nitrogen in the diet. With my made up numbers, would be 8%/10% = 80%. So the two percents are very similar but are not the same. Both of these percents can be negative if the animal is excreting more nitrogen than

value of uric acid in kcal/g; *ED* is percent energy from diet that was used by the bird; *FR* is the percent fat retained by the bird; Fat_{diet} is the

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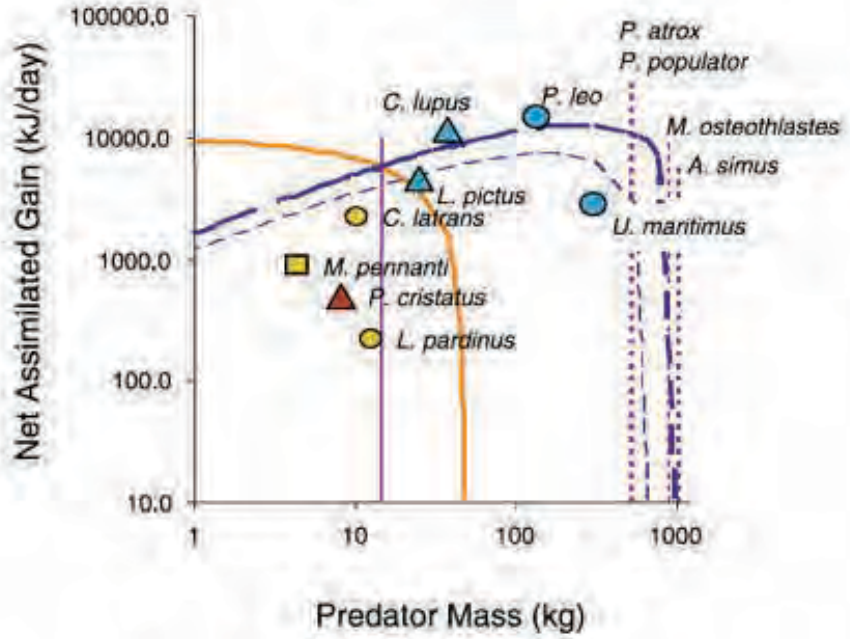
The Costs of Carnivory

Chris Carbone*, Amber Teacher, J. Marcus Rowcliffe



Measure	Parameter	Parameter Coefficients (95% Confidence Interval) for Three Models		
		Linear	Piecewise	Sigmoid
DEE	AIC	17.64	10.27	12.06
	b	0.74 (0.64–0.84)	0.58 (0.46–0.69)	0.53 (0.34–0.72)
	c	6.63 (6.36–6.9)	6.65 (6.46–6.84)	6.62 (6.41–6.85)
	d		7.63 (7.07–8.19)	7.84 (6.81– 8.87)
	t		2.88 (0.57–3.1)	2.69 (2.11–3.28)
	a			4.98 (−8.11–18.08)
DEI	AIC	52.94	32.82	31.79
	b	0.79 (0.7–0.88)	0.6 (0.5–0.69)	0.44 (0.23–0.64)
	c	7.01 (6.74–7.29)	7.06 (6.87–7.25)	6.89 (6.61–7.18)
	d		8.17 (7.73–8.61)	8.94 (7.87–10.01)
	t		2.78 (2.01–3.15)	2.61 (2.34–2.88)
	a			2.59 (0.18–5.01)

Linear: $\ln(E) = b\ln(M) + c$

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The Costs of Carnivory

Is there an intrinsic body size constraint in mammalian carnivory? – reaction to Carbone et al. (2007) 'The costs of carnivory', part 1

Posted by **pbio** on **07 May 2009 at 22:24 GMT**

Author: Marcus Clauss
Position: Senior Research Associate
Institution: Vetsuisse Faculty, University of Zurich
E-mail: mclauss@vetclinics.uzh.ch
Submitted Date: May 08, 2008
Published Date: June 10, 2008
This comment was originally posted as a "Reader Response" on the publication date indicated above. All Reader Responses are now available as comments.

In other words, the authors use two different functions to estimate the daily energy need (derived from different sets of empirical and/or theoretical data), and find these two functions in discrepancy. This evidently means that only one (or none) of these functions can be correct, and that one cannot use them both to calculate a threshold where they both intersect.

In summary, the model presented by Carbone et al. (2007) does not allow the conclusion that there are intrinsic constraints in carnivory that limit the body size of carnivores in general. It is built on two quantitatively different predictions of energetic requirements (only one of which can be true, at best).

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The Costs of Carnivory

The Costs of Carnivory: Response to Marcus Clauss

Posted by **pbio** on **07 May 2009 at 22:24 GMT**

Author: Chris Carbone
Position: Senior Research Fellow
Institution: Institute of Zoology, Zoological Society of London
E-mail: chris.carbone@ioz.ac.uk
Additional Authors: Amber Teacher, J. Marcus Rowcliffe
Submitted Date: June 18, 2008
Published Date: June 20, 2008
This comment was originally posted as a "Reader Response" on the publication date indicated above. All Reader Responses are now available as comments.

Clauss raises both qualitative and quantitative concerns regarding our model analysis (Carbone et al. 2007).

The quantitative concerns result from an unfortunate typo in our original manuscript where we give the wrong value for maximum intake (it should read 1,343 kJ/h and not 3,132 kJ/h). Our maximum mass estimate was based on the correct value. While we regret this error, it is unfortunate that he went ahead and published this part of the response after having been informed of this.

	a			4.98 (−8.11–18.08)
DEI	AIC	52.94	32.82	31.79
	b	0.79 (0.7–0.88)	0.6 (0.5–0.69)	0.44 (0.23–0.64)
	c	7.01 (6.74–7.29)	7.06 (6.87–7.25)	6.89 (6.61–7.18)
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	t		2.78 (2.01–3.15)	2.61 (2.34–2.88)
	a			2.59 (0.18–5.01)

Linear: $\ln(E) = b\ln(M) + c$

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The Costs of Carnivory

ECOLOGY LETTERS

Ecology Letters, (2014) **17**: 1553–1559 doi: 10.1111/ele.12375

LETTER

Geometric factors influencing the diet of vertebrate predators in marine and terrestrial environments

Chris Carbone,[1]* Daryl Codron,[2,3] Conrad Scofield,[1] Marcus Clauss[3] and Jon Bielby[1]

Abstract

Predator–prey relationships are vital to ecosystem function and there is a need for greater predictive understanding of these interactions. We develop a geometric foraging model predicting minimum prey size scaling in marine and terrestrial vertebrate predators taking into account habitat dimensionality and biological traits. Our model predicts positive predator–prey size relationships on land but negative relationships in the sea. To test the model, we compiled data on diets of 794 predators (mammals, snakes, sharks and rays). Consistent with predictions, both terrestrial endotherm and ectotherm predators have significantly positive predator–prey size relationships. Marine predators, however, exhibit greater variation. Some of the largest predators specialise on small invertebrates while others are large vertebrate specialists. Prey–predator mass ratios were generally higher for ectothermic than endothermic predators, although dietary patterns were similar. Model-based simulations of predator–prey relationships were consistent with observed relationships, suggesting that our approach provides insights into both trends and diversity in predator–prey interactions.

	a			4.98 (−8.11–18.08)
DEI	AIC	52.94	32.82	31.79
	b	0.79 (0.7–0.88)	0.6 (0.5–0.69)	0.44 (0.23–0.64)
	c	7.01 (6.74–7.29)	7.06 (6.87–7.25)	6.89 (6.61–7.18)
	d		8.17 (7.73–8.61)	8.94 (7.87–10.01)
	f		2.78 (2.01–3.15)	2.61 (2.34–2.88)
	d			2.59 (0.18–5.01)

Linear: $\ln(E) = b\ln(M) + c$

Publishing results that cannot be correct

DOI: 10.1111/jpn.12906

ORIGINAL ARTICLE

WILEY Journal of Animal Physiology and Animal Nutrition

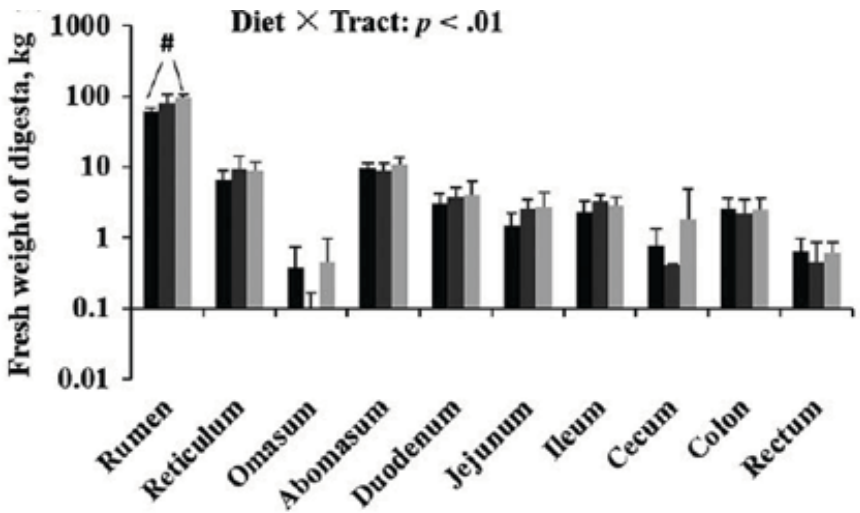
The particulate passage rate, nutrient composition and fermentation characteristics across gastrointestinal tracts in lactating dairy cows fed three different forage source diets

B. Wang | F. F. Gu | X. B. Huang | J. X. Liu

Eighteen multiparous Holstein dairy cows (cow cows per group, body weight = 634 ± 52.1 kg;

TABLE 2 Fractional passage rate of Cr-mordant corn silage-NDF (kp, %/hr) and mean retention time (hr) in the rumen and hindgut

	Treatment				
Item	AH	CS	RS	*SEM*	*p*-value
DMI, kg/day	17.1	17.7	17.8	0.49	.58
Rumen kp	6.25	5.05	5.60	0.475	.43
Mean rumen retention time[a]	17.0	21.3	18.1	2.48	.43
Hindgut kp	4.49	5.24	5.06	0.665	.71
Mean hindgut retention time	23.4	21.0	22.9	3.31	.86



Working with large datasets

RESEARCH ARTICLE

The Placental Mammal Ancestor and the Post–K-Pg Radiation of Placentals

Maureen A. O'Leary,[1,*¶] Jonathan I. Bloch,[2] John J. Flynn,[3] Timothy J. Gaudin,[4] Andres Giallombardo,[5] Norberto P. Giannini,[5,†] Suzann L. Goldberg,[6] Brian P. Kraatz,[7,*] Zhe-Xi Luo,[7,‡] Jin Meng,[8] Xijun Ni,[9,‡] Michael J. Novacek,[8] Fernando A. Perini,[5,§] Zachary S. Randall,[2] Guillermo W. Rougier,[6] Eric J. Sargis,[3] Mary T. Silcox,[10] Nancy B. Simmons,[8] Michelle Spaulding,[4,11] Paul M. Velazco,[8] Marcelo Weksler,[5,§] John R. Wible,[12] Andrea L. Cirranello[1,#]

To discover interordinal relationships of living and fossil placental mammals and the time of origin of placentals relative to the Cretaceous-Paleogene (K-Pg) boundary, we scored 4541 phenomic characters de novo for 86 fossil and living species. Combining these data with molecular sequences, we obtained a phylogenetic tree that, when calibrated with fossils, shows that crown clade Placentalia and placental orders originated after the K-Pg boundary. Many nodes discovered using molecular data are upheld, but phenomic signals overturn molecular signals to show Sundatheria (Dermoptera + Scandentia) as the sister taxon of Primates, a close link between Proboscidea (elephants) and Sirenia (sea cows), and the monophyly of echolocating Chiroptera (bats). Our tree suggests that Placentalia first split into Xenarthra and Epitheria; extinct New World species are the oldest members of Afrotheria.

It is disputed whether orders of placental mammals, the very diverse group of species that includes humans, evolved before or after the significant extinction horizon known as the Cretaceous-Paleogene (K-Pg) event 66 to 65 million years ago (Ma) (*1*, *2*). Different models have been proposed to describe ordinal-level diversification either before (short-fuse model), near (long-fuse model), or after (explosive model) this boundary (*3*). The ~5100 living placental species collectively exhibit extreme size ranges (1.5-g bumblebee bat to 190,000-kg blue whale); dramatic locomotor diversity (e.g., running, flying, and swimming); and diverse degrees of encephalization (*4*). Moreover, extinct species in the placental fossil record are even more numerous and exhibit a broader range of adaptations (*5*). Given this diversity, it is of interest to determine the phenotype of the ancestral placental mammal.

The hypothesis that the oldest members of crown Placentalia [the clade of all living placental mammals (*6*)] were present by ~100 Ma in the Mesozoic Era has been supported by molecular clock analyses (*7*–*9*), which suggest that at least 29 mammalian lineages (*7*), including the stem lineages of Primates and Rodentia, appeared in Late Cretaceous ecosystems (*8*) and survived the massive K-Pg extinction event. However, fossil evidence has not corroborated this hypothesis, despite discovery of abundant, well-preserved, small vertebrates (*10*). By contrast, phenomic phylogenies incorporating fossils have placed ordinal and interordinal speciation of Placentalia after the K-Pg extinction event (*11*).

Determining placental origins and relationships has met with the practical challenge of codifying phenomic data on a scale comparable to that for genomic data to produce a maximally informed phylogenetic tree. We built a phenomic character matrix (4541 characters; 403 constant and 492 parsimony uninformative) using MorphoBank (*12*). The matrix contains newly scored characters for 86 species representing all living placental orders plus 40 fossil species, with more than 12,000 annotated images supporting the phenomic homologies. These data were examined with molecular sequences compiled from 27 nuclear genes from GenBank (table S1).

Placental orders originated after the K-Pg boundary. A single tree emerged from our combined phenomic-molecular parsimony analysis (Fig. 1; hereafter, "combined tree"); we also performed extensive sensitivity analyses using other tree-searching methods (*13*). We applied multiple fossil ages for the oldest members of the clades sampled and ghost lineage analysis (*14*) to this tree to determine minimum divergence dates using fossils alone (*13*). Results support the monophyly of most traditional orders originally identified on the basis of phenotypes, as well as interordinal groupings discovered using molecular sequence data (Fig. 1 and Table 1). Twenty nodes (over 40%) are congruent in partitioned molecular and phenomic analyses (fig. S2).

When time-calibrated, this tree indicates that none of the six, very complete Mesozoic fossil species (e.g., *Ukhaatherium*, *Maelestes*, and *Zalambdalestes*) sampled falls within crown clade Placentalia. Instead, these Mesozoic fossils emerge as nonplacental members of Eutheria or at lower nodes. This tree suggests that interordinal and ordinal diversification occurred within the first few hundred thousand years after the K-Pg event, and the first members of modern placental orders began appearing 2 to 3 million years (My) later during the Paleocene. All recent clock-based estimates for the ages of key clades, with few exceptions, are substantially older than indicated by the fossil record (*7*, *8*, *15*). Ghost lineage estimates are minimum divergence dates and may underestimate the timing of actual splits.

We find that only the stem lineage to Placentalia crossed the K-Pg boundary and then speciated in the early Paleocene. We estimate that the minimum age of the diversification of crown Placentalia is just younger than the K-Pg boundary, or ~36 My younger than molecular clock–based mean estimates derived from supertree (*15*) and supermatrix (*7*) analyses. We do not find support for the hypothesis that 29 to 39 (*7*, *15*) mammalian lineages, including Afrotheria, Rodentia, Primates, Lipotyphla, Xenarthra,

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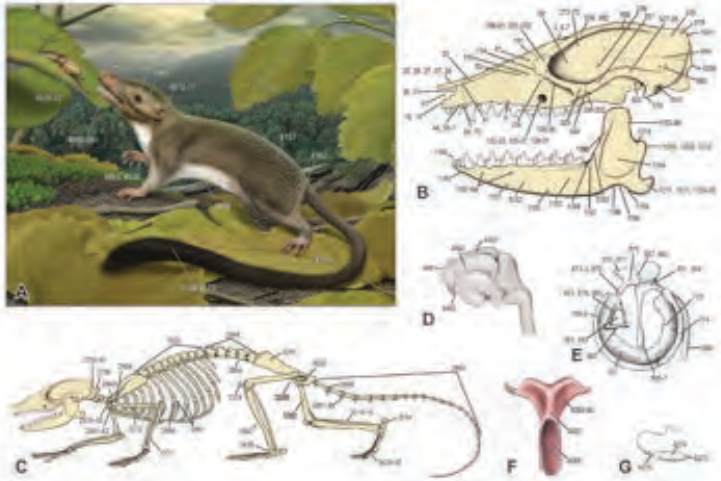

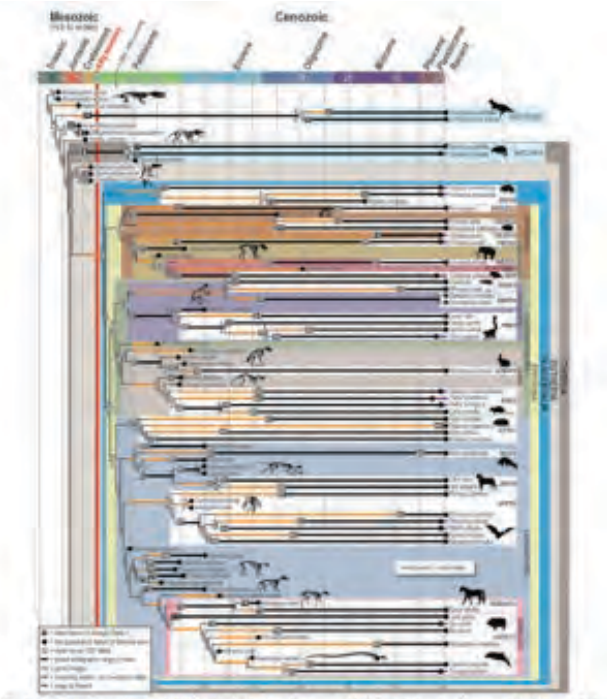

Using (soft tissue) morphology for phylogeny reconstructions

How do you treat quantitative data?

(how do you ensure your process of threshold definition is not influenced by concepts of phylogeny?)

The Placental Mammal Ancestor and the Post–K-Pg Radiation of Placentals

8 FEBRUARY 2013 VOL 339 SCIENCE www.sciencemag.org

Maureen A. O'Leary,[1,3]¶ Jonathan I. Bloch,[2] John J. Flynn,[3] Timothy J. Gaudin,[4] Andres Giallombardo,[3] Norberto P. Giannini,[5]* Suzann L. Goldberg,[3] Brian P. Kraatz,[3,6] Zhe-Xi Luo,[7]† Jin Meng,[3] Xijun Ni,[3]‡ Michael J. Novacek,[3] Fernando A. Perini,[3]‖ Zachary S. Randall,[2] Guillermo W. Rougier,[8] Eric J. Sargis,[9] Mary T. Silcox,[10] Nancy B. Simmons,[5] Michelle Spaulding,[3,11] Paúl M. Velazco,[5] Marcelo Weksler,[3]§ John R. Wible,[11] Andrea L. Cirranello[1,3]

	Taxon \ Character	4529	4530	
		*Metabolism – Methanogenesis presence	*Metabolism – Methanogensis quantity	*Behavior – D
64	Rattus norvegicus	absent*	–	
65	Orycteropus afer	present*	1-100 CH4 (methane) nmol/g/h MEAN*	faunivory
66	Equus caballus	present*	101-200	herb
67	Sus scrofa	present*	1-100 CH4 (methane) nmol/g/h MEAN*	
68	Tursiops truncatus	absent*	–	faunivory
69	Hippopotamus amphibius	present*	?	herb
70	*Lama glama	?	?	herb
71	Bos taurus	present*	201-300*	herb

Hackstein and Alen, 1996

[t.65 c.4530 s.0] Metabolism – Methanogensis quantity: (0)* 1-100 CH4 (methane) nmol/g/h MEAN; (1) 101-200; (2) 201-300; (3) 301-400; (4) 401-500;

Using (soft tissue) morphology for phylogeny reconstructions

How do you make sure you do not code for the same (complex) trait over and over again by coding its many different morphological/physiological details?

Using (soft tissue) morphology for phylogeny reconstructions

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We included characters that met the definition of logical independence (*98*).

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	Taxon \ Character	4529	4530	
		*Metabolism – Methanogenesis presence	*Metabolism – Methanogensis quantity	*Behavior – D
64	Rattus norvegicus	absent*	–	
65	Orycteropus afer	present*	1-100 CH4 (methane) nmol/g/h MEAN*	faunivor
66	Equus caballus	present*	101-200	herb
67	Sus scrofa	present*	1-100 CH4 (methane) nmol/g/h MEAN*	
68	Tursiops truncatus	absent*	–	faunivor
69	Hippopotamus amphibius	present*	?	herb
70	*Lama glama	?	?	herb
71	Bos taurus	present*	201-300*	herb

Hackstein and Alen, 1996

[t.65 c.4530 s.0] Metabolism – Methanogensis quantity: (0)* 1-100 CH4 (methane) nmol/g/h MEAN; (1) 101-200; (2) 201-300; (3) 301-400; (4) 401-500;

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	Taxon \ Cha		Taxon \ Character	4534 *Behavior – Chews the cud	4530 *Metabolism – Methanogensis quantity	*Behavior – D
64	Rattus	64	Rattus norvegicus	absent	–	
65	Orycte	65	Orycteropus afer	–*	1-100 CH4 (methane) nmol/g/h MEAN*	faunivor
66	Equus c	66	Equus caballus	absent*	101-200	herb
67	Sus scr	67	Sus scrofa	absent*	1-100 CH4 (methane) nmol/g/h MEAN*	
68	Tursiop	68	Tursiops truncatus	–*	–	faunivor
69	Hippop	69	Hippopotamus amphibius	absent	?	herb
70	*Lama	70	*Lama glama	present	?	herb
71	Bos tau	71	Bos taurus	present	201-300*	herb

Hackstein and Alen, 1996

[t.65 c.4530 s.0] Metabolism – Methanogensis quantity: (0)* 1-100 CH4 (methane) nmol/g/h MEAN; (1) 101-200; (2) 201-300; (3) 301-400; (4) 401-500;

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How do you make sure you do not code for body size over and over again?

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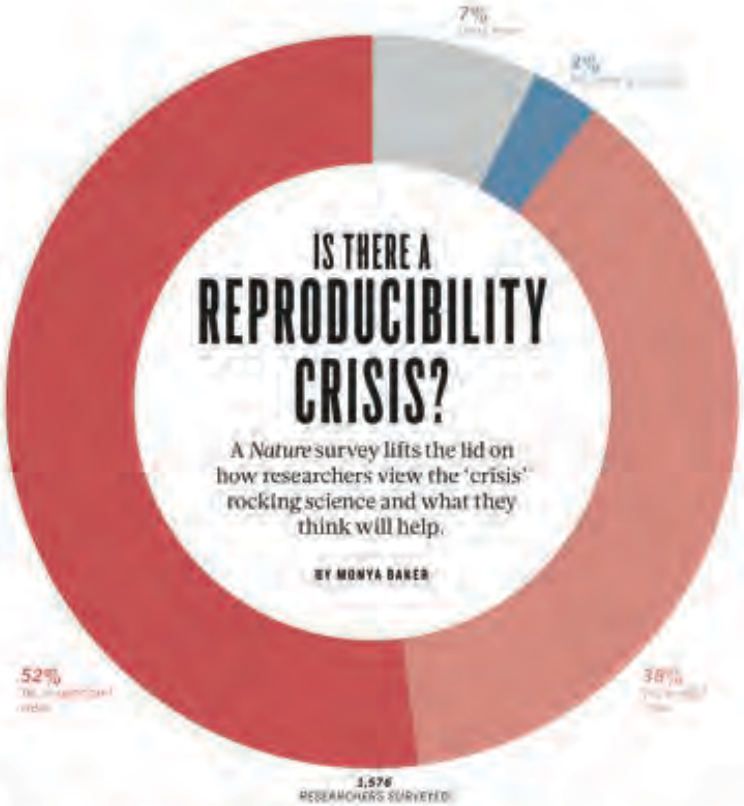
Taxon \ Character		4287 *Development – Gestation time
64	Rattus norvegicus	1 month or less
65	Orycteropus afer	7 to 8 months*
66	Equus caballus	10 to 12 months*
67	Sus scrofa	3 to 4 months*
68	Tursiops truncatus	10 to 12 months/12 to 14 months*
69	Hippopotamus amphibius	7 to 8 months*
70	*Lama glama	10 to 12 months*
71	Bos taurus	8 to 9 months*

Reproducability crisis



IS THERE A REPRODUCIBILITY CRISIS?

A *Nature* survey lifts the lid on how researchers view the 'crisis' rocking science and what they think will help.

BY MONYA BAKER

More than 70% of researchers have tried and failed to reproduce another scientist's experiments, and more than half have failed to reproduce their own experiments. Those are some of the telling figures that emerged from *Nature*'s survey of 1,576 researchers who took a brief online questionnaire on reproducibility in research.

The data reveal sometimes-contradictory attitudes towards reproducibility. Although 52% of those surveyed agree that there is a significant 'crisis' of reproducibility, less than 31% think that failure to reproduce published results means that the result is probably wrong, and most say that they still trust the published literature.

Data on how much of the scientific literature is reproducible are rare and generally bleak. The best-known analyses, from psychology[1] and cancer biology[2], found rates of around 40% and 10%, respectively. Our survey respondents were more optimistic: 73% said that they think that at least half of the papers in their field can be trusted, with physicists and chemists generally showing the most confidence.

The results capture a confusing snapshot of attitudes around these issues, says Arturo Casadevall, a microbiologist at the Johns Hopkins Bloomberg School of Public Health in Baltimore, Maryland. "At the current time there is no consensus on what reproducibility is or should be." But just recognizing that is a step forward, he says. "The next step may be identifying what is the problem and to get a consensus."

Failing to reproduce results is a rite of passage, says Marcus Munafò, a biological psychologist at the University of Bristol, UK, who has a long-standing interest in scientific reproducibility. When he was a student, he says, "I tried to replicate what looked simple from the literature, and wasn't able to. Then I had a crisis of confidence, and then I learned that my experience wasn't uncommon."

The challenge is not to eliminate problems with reproducibility in published work. Being at the cutting edge of science means that sometimes results will not be robust, says Munafò. "We want to be discovering new things but not generating too many false leads."

THE SCALE OF REPRODUCIBILITY

But sorting discoveries from false leads can be discomfiting. Although the vast majority of researchers in our survey had failed to reproduce an experiment, less than 20% of respondents said that they had ever been contacted by another researcher unable to reproduce their work (see 'A 'crisis' in numbers'). Our results are strikingly similar to another online survey of nearly 900 members of the American Society for Cell Biology (see go.nature.com/kbzs2b). That may be because such conversations are difficult. If experimenters reach out to the original researchers for help, they risk appearing incompetent or accusatory, or revealing too much about their own projects.

A minority of respondents reported ever having tried to publish

Integrity

correct citations

Correct citations

PLOS | ONE

Citation: Visscher DR, Merrill EH (2018) Functional connectivity in ruminants: A generalized state-dependent modelling approach. PLoS ONE 13(6): e0199671. https://doi.org/10.1371/journal.pone.0199671

RESEARCH ARTICLE

Functional connectivity in ruminants: A generalized state-dependent modelling approach

Darcy R. Visscher[1]*, Evelyn H. Merrill[2]

the inactivity of rumination associated with rapid gut fill resulted in reduced predation risk.

We assumed that individuals used inactivity to reduce predation risk within patches because it has been reported in field studies [96]. When inactivity, such as when ruminant lie down to ruminate, reduces predation risk,

96. Banks P, Norrdahl K, Korpimaki E. Nonlinearity in the predation risk of prey mobility. Proceedings of the Royal Society of London Series B-Biological Sciences. 2000; 267(1453):1621–1625. https://doi.org/10.1098/rspb.2000.1187

Correct citations

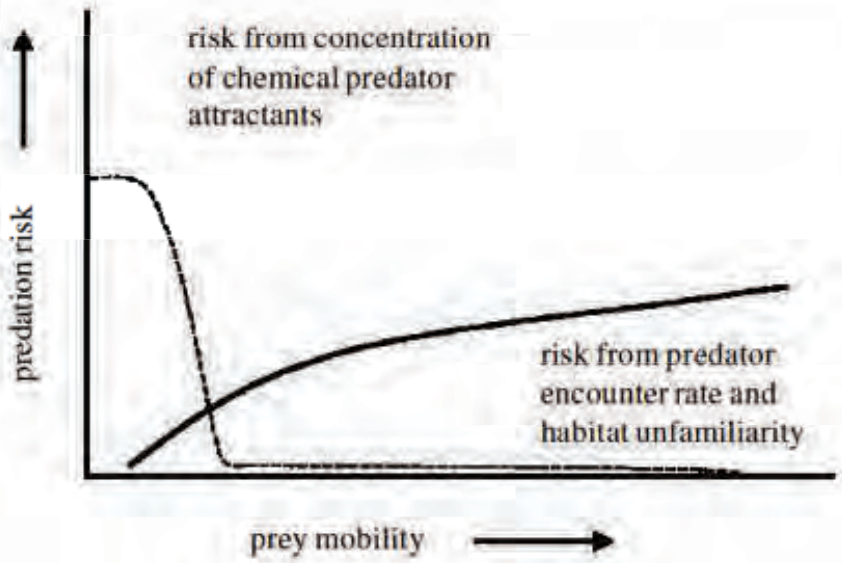
Nonlinearity in the predation risk of prey mobility

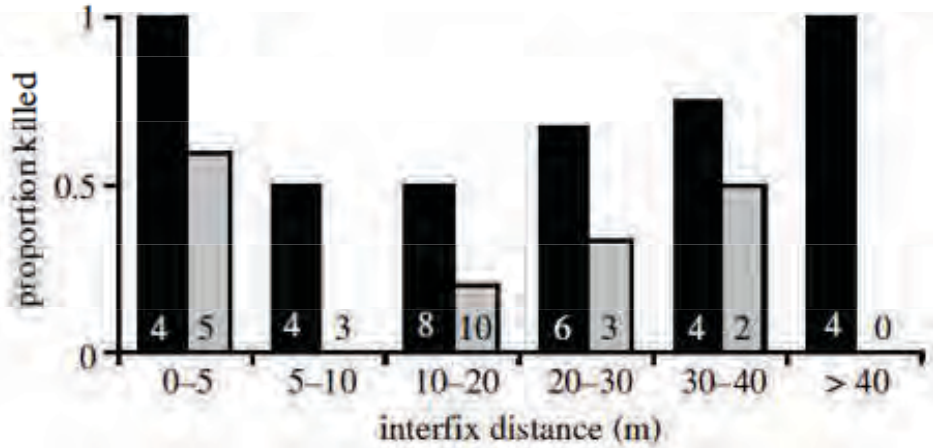
Peter B. Banks*, Kai Norrdahl and Erkki Korpimäki

Department of Biology, Section of Ecology, University of Turku, FIN-20014, Finland

Odorous waste products such as urine and faeces are unavoidable for most animals and are widely exploited by predators and their prey. Consequently, waste accumulations can be risky and prey which increase their mobility in order to disperse and dilute their waste should avoid a high predation risk until this benefit is balanced by the increasing risks of random predator encounter. This hypothesis was tested for voles (*Microtus* spp.) in Finland which are vulnerable to predation due to the scent and ultraviolet attractiveness of their urine. The mortality and mobility of radio-collared voles showed a U-shaped relationship, regardless of vole sex, species or population cycle phase. The low risks for prey making intermediate movements suggest that predation risk can exert strong selective pressures on prey such that they have little respite from the risk of being killed.

Proc. R. Soc. Lond. B (2000) **267**, 1621–1625





Correct citations

Life cycle period and activity of prey influence their susceptibility to predators

A. Molinari-Jobin, P. Molinari, A. Loison, J.-M. Gaillard and U. Breitenmoser

ECOGRAPHY 27: 323–329, 2004

We found more chamois predated when feeding, whereas roe deer were predated mainly when ruminating.

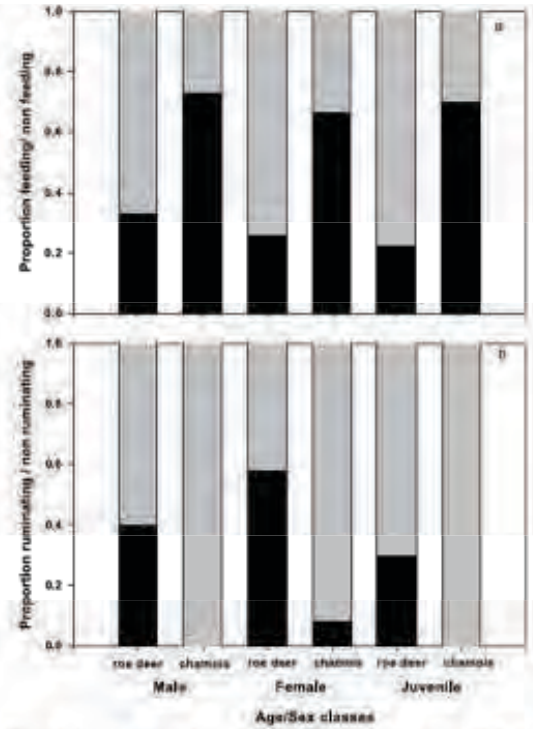


Fig. 3. Comparison between the activity that rendered the different roe deer and chamois age/sex classes vulnerable to lynx predation. (a) Feeding (n roe deer = 34, n chamois = 26). (b) Ruminating (n roe deer = 59, n chamois = 1).

Integrity

admitting you were wrong

Correcting oneself

Acta Theriologica 46 (1): 103 107, 2001. FRAGMENTA THERIOLOGICA
PL ISSN 0001 7051

Particle retention in the forestomach of a browsing ruminant, the roe deer *Capreolus capreolus*

Marcus CLAUSS*, Matthias LECHNER-DOLL, Anke BEHREND, Karin LASON, Denise LANG and Wolf J. STREICH

Clauss M., Lechner-Doll M., Behrend A., Lason K., Lang D. and Streich W. J. 2001. Particle retention in the forestomach of a browsing ruminant, the roe deer *Capreolus capreolus*. Acta Theriologica 46: 103 107.

A combination of a flotation/sedimentation experiment and sieve analysis for the reticulorumen (RR) contents of roe deer *Capreolus capreolus* Linnaeus, 1758, a browsing ruminant, showed that there was no correlation between particle size and particle density. Large particles were present in both the sedimented and the buoyant fraction, which is in accord with the reported absence of stratification of RR contents in browsing ruminants. Comparative sieve analysis of roe deer RR and caecal/rectal material demonstrated that there must be some selective particle retention in the browsing ruminant as well, as a certain fraction of large particles in RR contents does not occur in the caecal/rectal material. These results lead to the explanatory dilemma that, while selective particle retention is observed, it cannot be due to the mechanisms known to work in grazing ruminants.

Institute of Zoo Biology and Wildlife Research Berlin (IZW), Alfred-Kowalke-Str. 17, 10315 Berlin, Germany

Key words: *Capreolus capreolus*, forestomach, digestive physiology, retention mechanism

Introduction

The mechanism of selective particle retention in the reticulorumen (RR) of grazing ruminants and the resulting delay of particle passage from the RR are well understood (Lechner-Doll *et al*. 1991). The functional density of the particles a function of, amongst others, their size and their physical entrapment in the fibrous raft are responsible for their delayed outflow from the RR, a mechanism for which the stratification of rumen contents is prerogative. The RR contents of browsing ruminants, or concentrate selectors, are generally a homogenous, unstratified, frothy mass (Hofmann 1972, Nygren and Hofmann 1990, Renecker and Hudson 1990). The selective retention of particles in the RR of browsing ruminants has been shown to be far less prominent than in grazing ruminants (Hubbert 1987, Renecker and Hudson 1990, Clauss *et al*. 1998), and a causative link between the

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Zoology 112 (2009) 195–205
ZOOLOGY
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Physical characteristics of rumen contents in two small ruminants of different feeding type, the mouflon (*Ovis ammon musimon*) and the roe deer (*Capreolus capreolus*)

Marcus Clauss[a,*], Julia Fritz[b], Dorothee Bayer[a], Jürgen Hummel[c], W. Jürgen Streich[d], Karl-Heinz Südekum[c], Jean-Michel Hatt[a]

[a]*Clinic for Zoo Animals, Exotic Pets and Wildlife, Vetsuisse Faculty, University of Zurich, Winterthurerstr. 260, CH-8057 Zurich, Switzerland*
[b]*Institute of Animal Physiology, Physiological Chemistry and Animal Nutrition, University of Munich, Veterinärstr. 13, D-80539 Munich, Germany*
[c]*Institute of Animal Science, University of Bonn, Endenicher Allee 15, D-53115 Bonn, Germany*
[d]*Leibniz Institute for Zoo and Wildlife Research, Alfred-Kowalke-Str. 17, D-10315 Berlin, Germany*

Received 17 March 2008; received in revised form 4 August 2008; accepted 22 August 2008

Abstract

In domestic ruminants, the stratification of forestomach contents – the results of flotation and sedimentation processes – is an important prerequisite for the selective particle retention in this organ. A series of anatomical and physiological measurements suggests that the degree of this stratification varies between browsing and grazing wild ruminants. We investigated the forestomach contents of free-ranging mouflon and roe deer shot during regular hunting procedures. There was no difference between the species in the degree by which forestomach ingesta separated according to size due to buoyancy characteristics *in vitro*. However, forestomach fluid of roe deer was more viscous than that of mouflon, and no difference in moisture content was evident between the dorsal and the ventral rumen in roe deer, in contrast to mouflon. Hence, the forestomach milieu in roe deer appears less favourable for gas or particle separation due to buoyancy characteristics. These findings are in accord with notable differences in forestomach papillation between the two species. In roe deer, particle separation is most likely restricted to the reticulum, whereas in mouflon, the whole rumen may pre-sort particles to a higher degree. The results suggest that differences in forestomach physiology may occur across ruminant species.

Keywords: Grazer; Browser; Feeding type; Stratification; Digestive physiology

Introduction

In domestic ruminants, the stratification of the ingesta in the reticulorumen (RR) represents an important, acknowledged mechanism contributing to the selective retention of particles in the rumen and, hence, to the high digestive efficiency in this organ (Lechner-Doll et al., 1991). This stratification is characterised by a dorsal gas dome, a "fibre mat" of particulate matter floating on a fluid phase, in which, at the very bottom, very dense, small particles form a "sludge" layer (Grau, 1955; Capote and

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0944-2006/$ - see front matter
doi:10.1016/j.zool.2008.08.001

Correcting oneself

Acta Theriologica 46 (1): 103 107, 2001.
PL ISSN 0001 7051
FRAGMENTA THERIOLOGICA

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systematic investigations are lacking. In a previous study in roe deer, in which a similar technique for the separation of floating and sedimenting fractions of RR ingesta had been used (Clauss et al., 2001), no particle size difference in the floating and the sedimenting fraction had been measured. At the time, it had been concluded that the diet of the roe deer investigated in that study did not separate itself according to size along the density gradient. In retrospect, it cannot be decided whether this absence of density separation according to size in the earlier study was due to a different autumn diet consumed by the roe deer investigated at that time, or due to the fact that Clauss et al. (2001) subjected 300 ml of RR contents, rather than 100 ml as in the present study, to the flotation/sedimentation separation.

gas dome, a "fibre mat" of particulate matter floating on a fluid phase, in which, at the very bottom, very dense, small particles form a "sludge" layer (Grau, 1955; Capote and

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0944-2006/$ - see front matter
doi:10.1016/j.zool.2008.08.001

Correcting oneself

Oecologia (2002) 131:343–349
DOI 10.1007/s00442-002-0894-8

ECOPHYSIOLOGY

Marcus Clauss · Matthias Lechner-Doll
W. Juergen Streich

Faecal particle size distribution in captive wild ruminants: an approach to the browser/grazer dichotomy from the other end

Received: 10 October 2001 / Accepted: 4 February 2002 / Published online: 26 March 2002

Abstract We investigated the particle size distribution in 245 faecal samples of 81 species of captive ruminants by a wet-sieving procedure. As a comparative measure, the modulus of fineness (MOF; Poppi et al. 1980) was used. Species were classified as frugivores (n=5), browsers (BR, n=16), intermediate feeders (IM, n=35) and grazers (GR, n=25). BR generally had a higher proportion of large particles, i.e. higher MOF values, than IM or GR of comparable size. These findings are in accord with reported lower fibre digestibility and less selective particle retention in BR, and are indicative of a difference in reticulo-ruminal physiology between the main ruminant feeding types. Possible consequences of the escape of larger particles from a browser's reticulo-rumen for the feeding of captive BR are briefly discussed.

Keywords Faeces · Particle size · Ruminant diversification · Selective particle retention · Feeding type

Introduction

Whereas the size distribution in the faeces of nonruminant herbivores does not vary between foregut and hindgut fermenters, the faeces of ruminants and tylopods are characterised by especially fine particles (Uden and Van Soest 1982; Grenet et al. 1984; Fujikara et al. 1989; Lechner-Doll and von Engelhardt 1989; Okamoto 1997). Microbial fermentation as such is far less important for the reduction of ingesta particle size than the mechanical action of chewing (Spalinger and Robbins 1992). The repeated subjection of ingesta to chewing via rumination (Chai et al. 1984) and the selective retention of larger particles in the reticulo-rumen (RR) (Lechner-Doll et al. 1991) are responsible for the fine faeces of ruminants and tylopods.

Differences in the faecal particle size distribution within the ruminant guild have been observed sporadically [Renecker and Hudson (1990), moose *Alces alces*, wapiti *Cervus elaphus* and cattle; Van Wieren (1996a), sheep and goats]. Specifically, two browsing ruminants, the moose (Hofmann 1990; Nygren and Hofmann 1990; Hofmann and Nygren 1992; Nygren et al. 2001) and the giraffe (*Giraffa camelopardalis*, Clauss 1998) have been reported to excrete faeces with particles of dimensions that are not found in cattle. These observations are of direct relevance to the discussion about the physiological correlates of the diversification of ruminants.

In his presentation of ruminant feeding types, Hofmann (1989) documented anatomical observations that he interpreted as indications that browsers (BR) cannot retain particles in their RR as efficiently as grazers (GR), and consecutively postulated a faster passage rate and a lesser ability to digest fibrous material for browsing ruminants. In the ensuing scientific discussion, the relevance of Hofmann's anatomical observations for actual physiological processes was repeatedly questioned (Gordon and Illius 1994; Robbins et al. 1995; Illius and Gordon 1999). However, evidence has been collated recently that shows that BR do digest fibre less efficiently (Iason and Van Wieren 1998) and retain particles less efficiently in their forestomach (Clauss and Lechner-Doll 2001). Comparative studies of digestibility and particle retention, however, require an elaborate experimental setup and have therefore only been performed to a limited extent with a few ruminant species. The faecal particle size distribution, as an indicator of the effectiveness of particle size reduction in the digestive tract and therefore of fibre digestion, has not yet been comparatively studied in ruminants. As such a survey does not necessitate a costly trial design, we

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Zoo Biology 27:70–77 (2008)

Technical Report

Differences in Fecal Particle Size Between Free-ranging and Captive Individuals of Two Browser Species

Jürgen Hummel,[1]* Julia Fritz,[2] Ellen Kienzle,[2] E. Patricia Medici,[3] Stefanie Lang,[2] Waltraut Zimmermann,[4] W. Jürgen Streich,[5] and Marcus Clauss[6]

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Data from captive animals indicated that browsing (BR) ruminants have larger fecal particles—indicative of lesser chewing efficiency—than grazers (GR). To answer whether this reflects fundamental differences between the animal groups, or different reactions of basically similar organisms to diets fed in captivity, we compared mean fecal particle size (MPS) in a GR and a BR ruminant (aurox *Bos primigenius taurus*, giraffe *Giraffa camelopardalis*) and a GR and a BR hindgut fermenter (Przewalski's horse *Equus ferus przewalskii*, lowland tapir *Tapirus terrestris*), both from captivity and from the wild. As would be expected owing to a proportion of finely ground, pelleted feeds in captive diets, MPS was smaller in captive than free-ranging GR. In contrast, MPS was drastically higher in captive than in free-ranging BR of either digestion type. Thus, the difference in MPS between GR and BR was much more pronounced among captive than free-ranging animals. The results indicate that BR teeth have adapted to their natural diet so that in the wild, they achieve a particle size reduction similar to that of GR. However, although GR teeth seem equally adapted to food ingested in captivity, the BR teeth seem less well suited to efficiently chew captive diets. In the case of ruminants, less efficient particle size reduction

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Received 15 May 2007; Revised 18 July 2007; Accepted 30 October 2007

DOI 10.1002/zoo.20161
Published online 26 November 2007 in Wiley InterScience (www.interscience.wiley.com).

Correcting oneself

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(Hofmann, 1988). It was previously thought that the lack of stratification resulted in less efficient particle separation, leading to larger faecal particles in browsing than in grazing ruminants kept in zoos (Clauss *et al.*, 2002). More recent results have shown that such differences do not occur if species are measured on their natural diets (Hummel *et al.*, 2008b; Lechner *et al.*, 2010). Correspondingly, no difference in particle dis-

size reduction similar to that of GR. However, although GR teeth seem equally adapted to food ingested in captivity, the BR teeth seem less well suited to efficiently chew captive diets. In the case of ruminants, less efficient particle size reduction

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DOI 10.1002/zoo.20161
Published online 26 November 2007 in Wiley InterScience (www.interscience.wiley.com).

Correcting oneself

Mammalian Biology 79 (2014) 44–51

Contents lists available at ScienceDirect

Mammalian Biology

journal homepage: www.elsevier.com/locate/mambio

RETRACTED

Original Investigation

Impact of anthropogenic disturbance on the density and activity pattern of deer evaluated with respect to spatial scale-dependenc

Naoki Agetsuma[a,*], Ryosuke Koda[b], Riyou Tsujino[c], Yoshimi Agetsuma-Yanagihar

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ARTICLE INFO

Article history:
Received 20 December 2012
Accepted 24 May 2013
by Luca Corlatti
Available online 21 June 2013

Keywords:
Cervus nippon yakushimae
Activity
Density
Land use
Spatial scale

ABSTRACT

Anthropogenic disturbance modifies various ecological [illegible] of wildlife. The magnitude of the effects will change depending on spatial scale. Th[illegible] for wildlife c[illegible]ation, the effective spatial scale at which the disturbance has the greatest e[illegible]s on wild populations [illegible]ust be determined. This study examined the influence of anthropogenic di[illegible]bance on two ecological traits (population density and daily activity pattern) of deer. We quantified [illegible] effects of la[illegible]use (broad-leaved forest, mixed coniferous/broad-leaved forest, natural grassland, s[illegible]ine vegeta[illegible], forestry area, and agricultural land), hunting risk, and densities of feral domestic dog[illegible] wild [illegible]keys. The effects of land use were analyzed at various spatial scales a[illegible]odel selecti[illegible]ure (generalized mixed model) was used to examine significant variables [illegible]ological traits at each spatial scale. Combinations of selected variables differed with ecologic[illegible]aits a[illegible] scales. The spatial scale of the best model was defined as the most effective spatial s[illegible]ch ecological trait. Deer density was affected positively by areas of natural gras[illegible]nd mon[illegible]ensity, and negatively by areas of forestry, mixed forest and agricultural land a[illegible]effectiv[illegible]tial scale. For the daily activity pattern, larger areas of agricultural land, sma[illegible]natura[illegible]assland a[illegible] and higher hunting risk reduced diurnal and induced nocturnal activity. Th[illegible]st eff[illegible]tial scale explaining population density was smaller than that of daily activity [illegible] that agricultural land, forestry areas and hunting risk affected deer ecology as anth[illegible]enic disturbance. However, each disturbance factor modified different ecological traits or modified [illegible]ological traits at different spatial scales. Detecting the appropriate spatial scales at which anthropogen[illegible]turbance should be managed is essential for wildlife conservation.

Introduction

Anthropogenic disturb[illegible] influe[illegible]s wildlife populations worldwide (B[illegible], 20[illegible]ers their ecology in various ways. T[illegible] popul[illegible]n densi[illegible]g., Hockin et al., 1992; Blom et al., 20[illegible]lva-B[illegible] and Sieving, 2012), activity pattern (e.g., Kilpat[illegible], Presley et al., 2009), habitat use (e.g., Coulon e[illegible]2008; Fletcher and Hutto, 2008; Hockin et al., 1992; Markovchic[illegible]holls et al., 2008) and other ecological traits (Hockin et al., 1992) [illegible]l change depending on the type and magnitude of disturbance. Identical disturbance may affect different ecological traits of wildlife (Gill et al., 2001; Kilgo et al., 1998). The influences of anthropogenic disturbance on wildlife ecology are complex, and can have both negative and positive effects on species (e.g., Fletcher and Hutto, 2008; Markovchick-Nicholls et al., 2008).

Habitat transformation is a major disturbing factor for wild populations, altering numbers of individuals through modifications of resource availability and shelter sites. Such a disturbance may favor some wildlife species. For example, the density of raccoons (*Procyon lotor*) has increased in urban and suburban areas (Riley et al., 1998) following considerable habitat modifications. Furthermore, the abundances of some fruit bats (Phyllostomidae) are greater in farmland or secondary forests than in primary forests (Willig et al., 2007). However, habitat transformation often induces negative impacts on wild populations. The density of the Japanese monkey (*Macaca fuscata*) decreases in areas with coniferous plantations (Hill et al., 1994) and ungulates tend to avoid exposed areas without shelter sites (Mysterud and Ostbye, 1999).

Hunting and control measures also alter population density, activity pattern and habitat use of wildlife. White-tailed deer (*Odocoileus virginiana*) show significant shifts of core-area use and daily activity pattern between the prehunt and hunt period

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1616-5047/$ – see front matter © 2013 Deutsche Gesellschaft für Säugetierkunde. Published by Elsevier GmbH. All rights reserved.
http://dx.doi.org/10.1016/j.mambio.2013.05.002

Correcting oneself

Mammalian Biology 79 (2014) 44–51

Contents lists available at ScienceDirect

Mammalian Biology 79 (2014) 414

Contents lists available at ScienceDirect

Mammalian Biology

journal homepage: www.elsevier.com/locate/mambio

Retraction Notice

Retraction notice to "Impact of anthropogenic disturbance on the density and activity pattern of deer evaluated with respect to spatial scale-dependency" [Mamm. Biol. 79 (1) (2014) 44–51]

Naoki Agetsuma[a], Ryosuke Koda[b], Riyou Tsujino[c], Yoshimi Agetsuma-Yanagihara[d]

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This article has been retracted: please see Elsevier Policy on Article Withdrawal (http://www.elsevier.com/locate/withdrawalpolicy).

This article was retracted at the request of the authors Naoki Agetsuma, Ryosuke Koda, Riyou Tsujino and Yoshimi Agetsuma-Yanagihara.

The authors are sorry to report that they found a bug in statistical software "R" used in their article published in Mammalian Biology. They would like to withdraw the paper.

The authors found a bug of the "dredge" function in "MuMIn" package of statistical software "R" (R Development Core Team, 2012) they used. The "dredge" function generates all possible mathematical models such as generalized linear model (GLM) and generalized linear mixed model (GLMM) using all combination of variables, and supports model selection procedures by AIC. The "R" prepares several GLMM functions such as "glmmML", "lmer" and "glmmadmb", and manual of the "MuMIn" package shows the "dredge" function can be applicable for all these GLMM functions (Barton K. 2013). Then, they used "glmmadmb" and "dredge" for their analyses.

However, when the authors made further analyses of the same data set using "glmmadmb" and "dredge" functions recently, they found a discrepancy of statistic results of "dredge" with other functions ("summary" and "model.sel"). The "dredge" seems not to take account of "mixed effect" of the models and it seems to generate results of GLM (i.e. "glm.nb" function). This bug of software has not been ever reported as far as the authors know and may occur only between "glmmadmb" and "dredge". The "dredge" might work properly in "glmmML" and "lmer".

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activity pattern and habitat use of wildlife. White-tailed deer (*Odocoileus virginiana*) show significant shifts of core-area use and daily activity pattern between the prehunt and hunt period

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http://dx.doi.org/10.1016/j.mambio.2013.05.002

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http://dx.doi.org/10.1016/j.mambio.2013.05.002

Integrity

the 'scooping' myth

Can you really be 'scooped'?

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EDITORIAL

The importance of being second

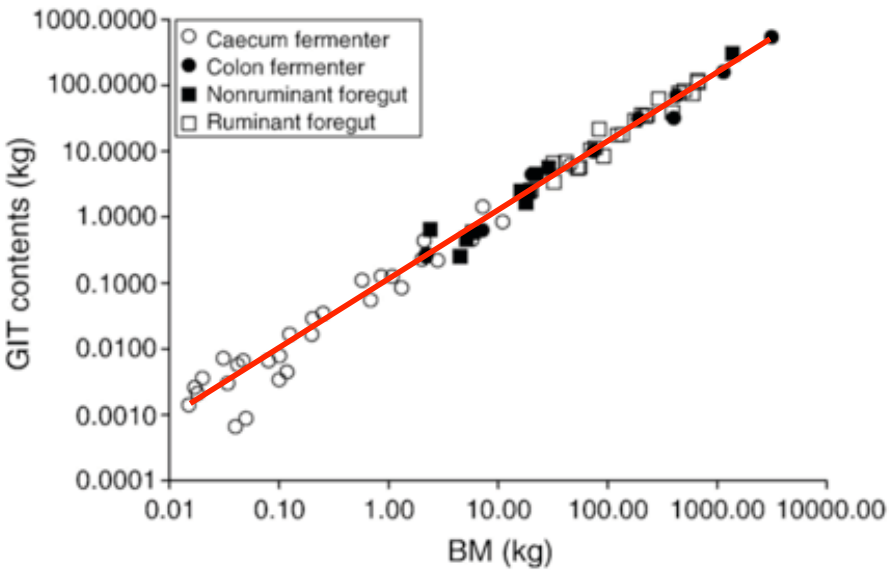
The *PLOS Biology* Staff Editors*

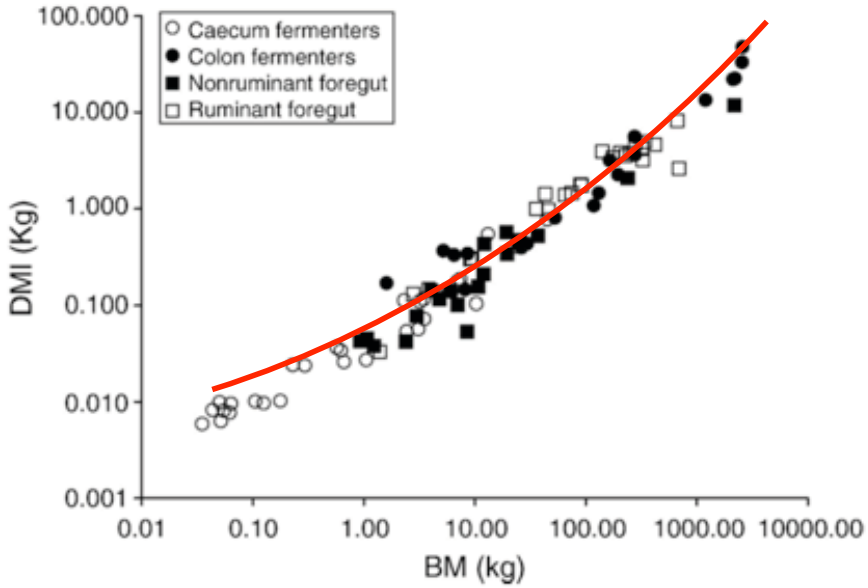
Public Library of Science, San Francisco, California, United States of America

Citation: The *PLOS Biology* Staff Editors (2018) The importance of being second. PLoS Biol 16(1): e2005203. https://doi.org/10.1371/journal.pbio.2005203

Being scooped

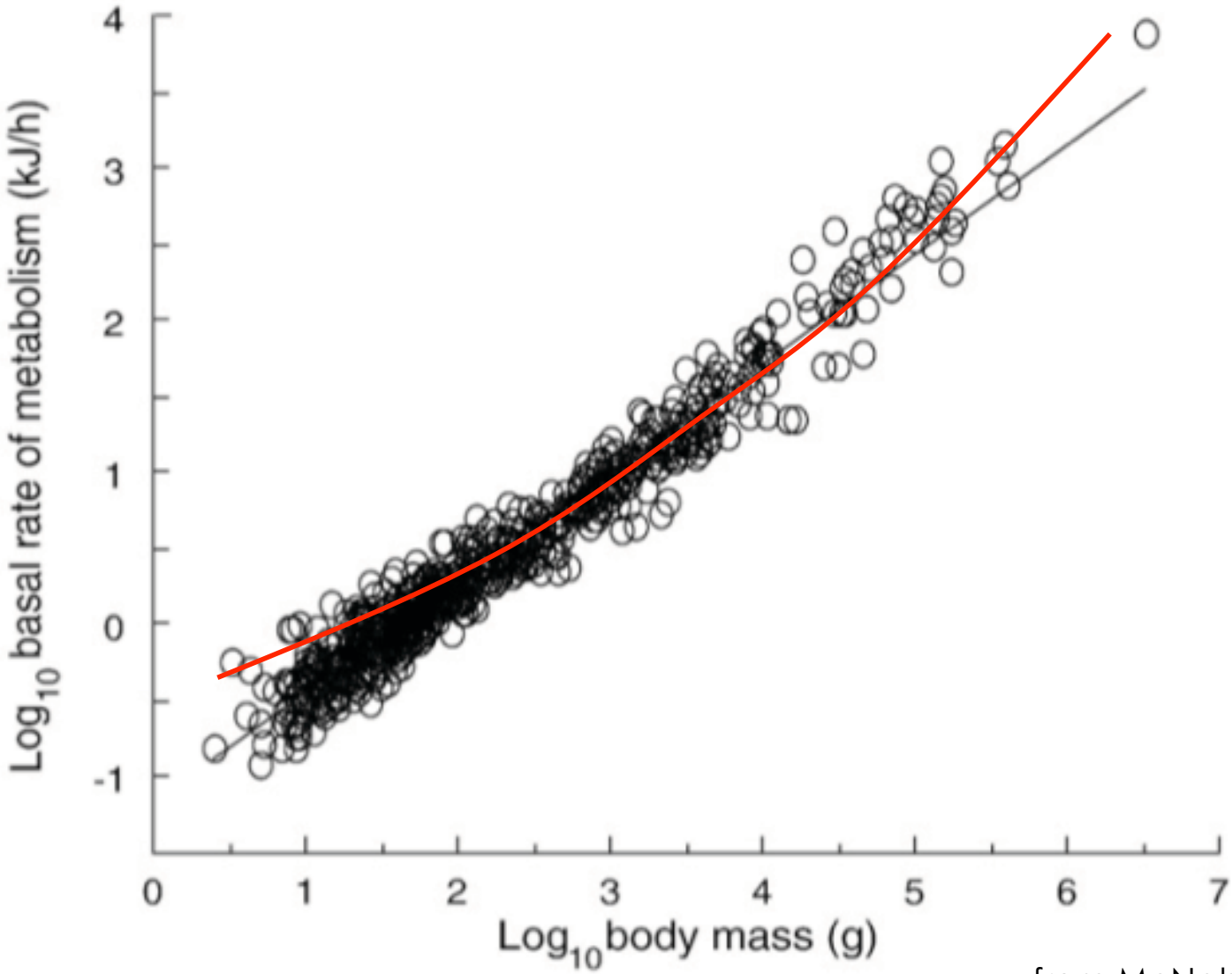
Straight line ... *or curvature?*





from Clauss et al. (2007)

Straight line ... *or curvature?*



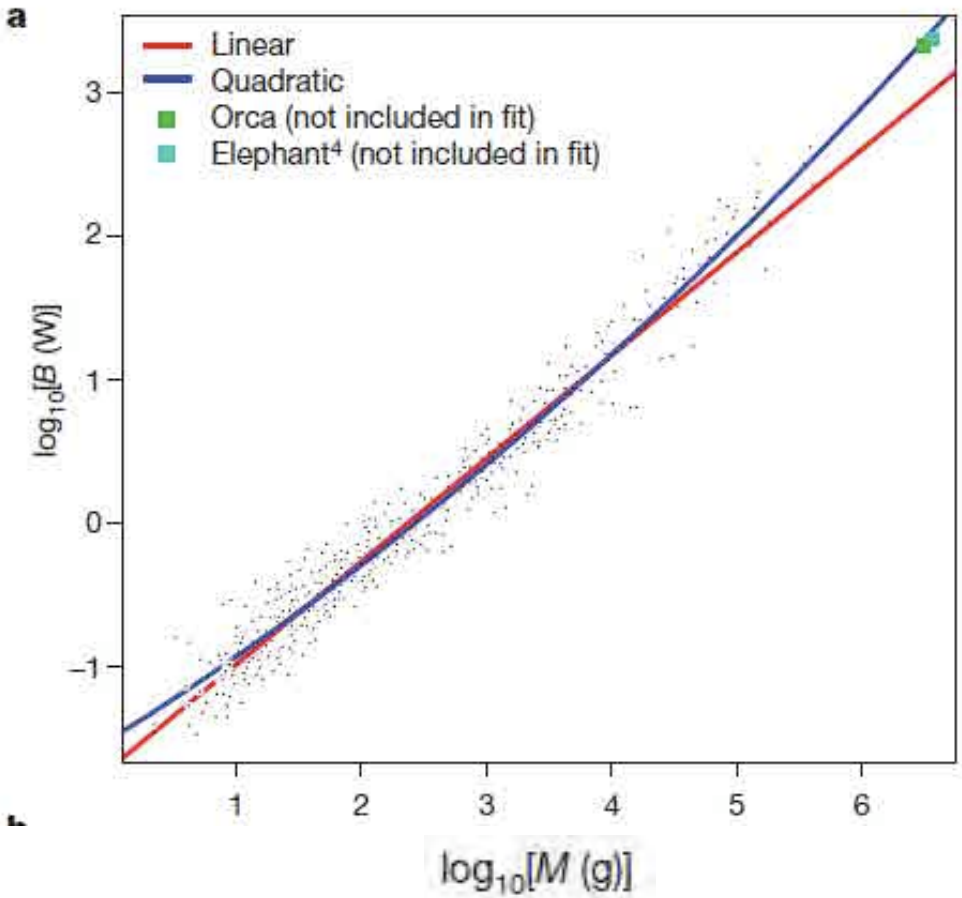
from McNab (2008)

Vol 464|1 April 2010|doi:10.1038/nature08920 nature

LETTERS

Curvature in metabolic scaling

Tom Kolokotrones[1], Van Savage[2], Eric J. Deeds[1] & Walter Fontana[1]



Vol 464|1 April 2010|doi:10.1038/nature08920 nature

LETTERS

Curvature in metabolic scaling

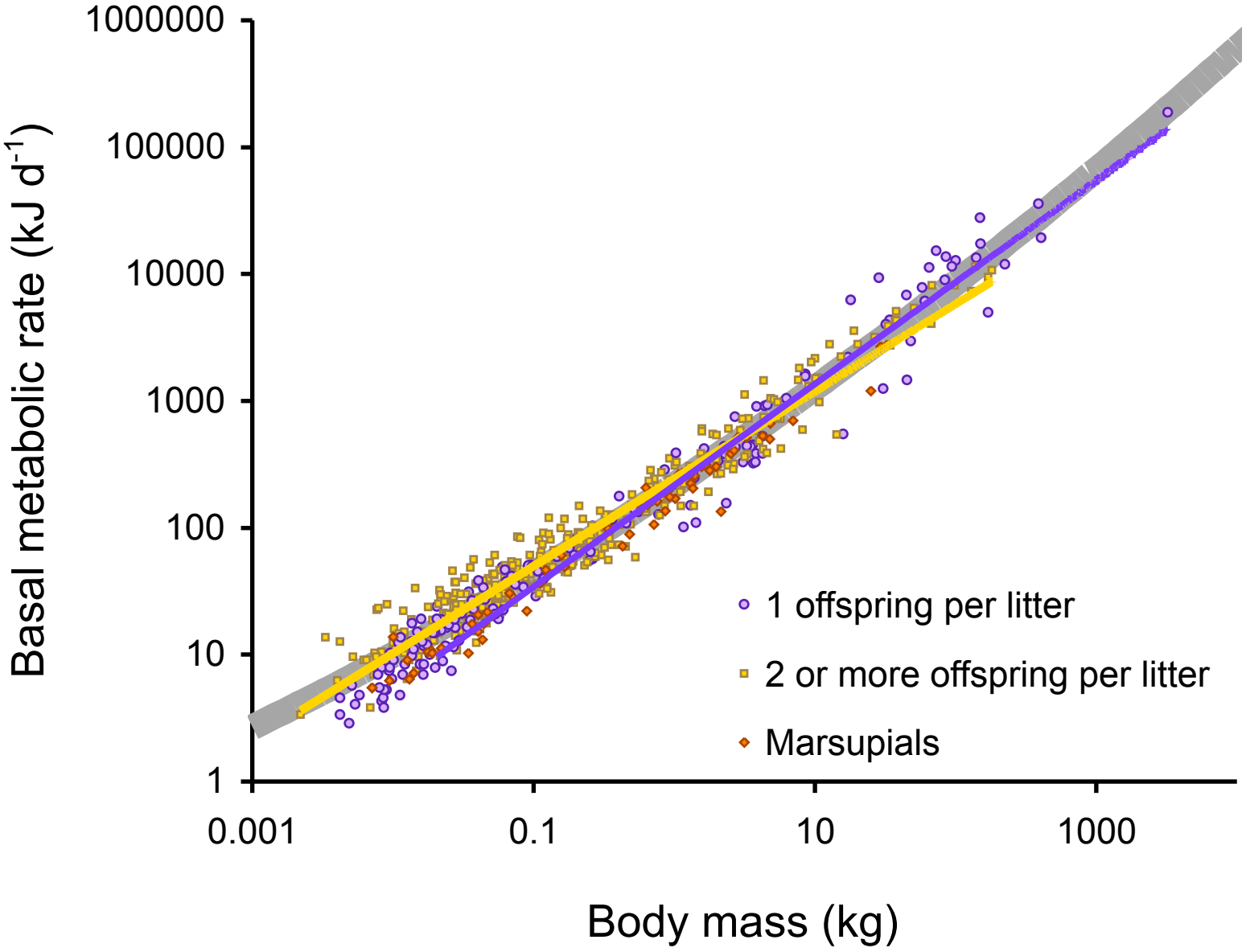
Tom Kolokotrones[1], Van Savage[2], Eric J. Deeds[1] & Walter Fontana[1]

On the other hand, the quadratic model with temperature (equation (4)), which provides the best fit to the data, predicts that the slope of the scaling function increases without bound (though this apparent behaviour may be due to the paucity of data for large animals). If this is correct, the metabolic scaling relationship may directly determine maximum animal size. This limit might occur at the mass at which the slope equals 1. Beyond this point, bigger is no longer better, meaning that an x% increase in body mass requires a greater than x% increase in metabolic rate. Our fit suggests that this point occurs around 10^8 g (100 t): intriguingly, this is about the size of the blue whale, which is believed to be the largest animal that has ever lived.

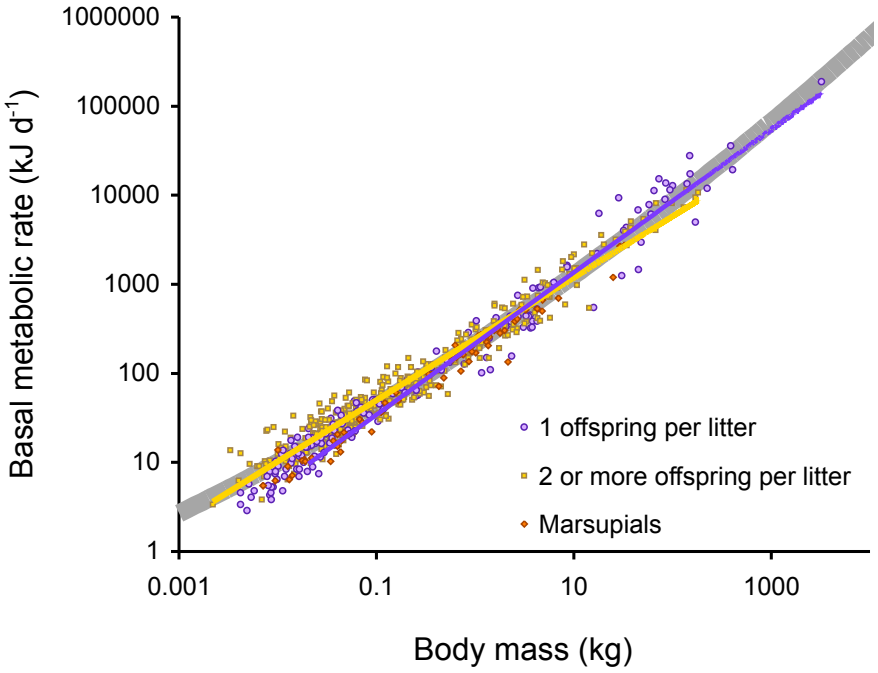
Own analyses

- If curvature is an effect of distribution networks, it should be evident in other clades than just mammals

Mode of reproduction?

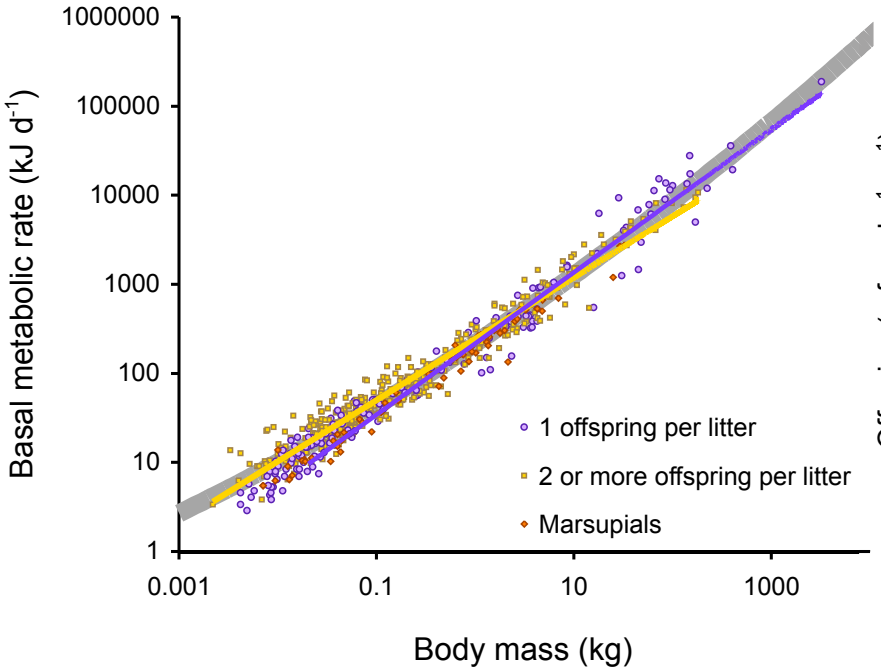


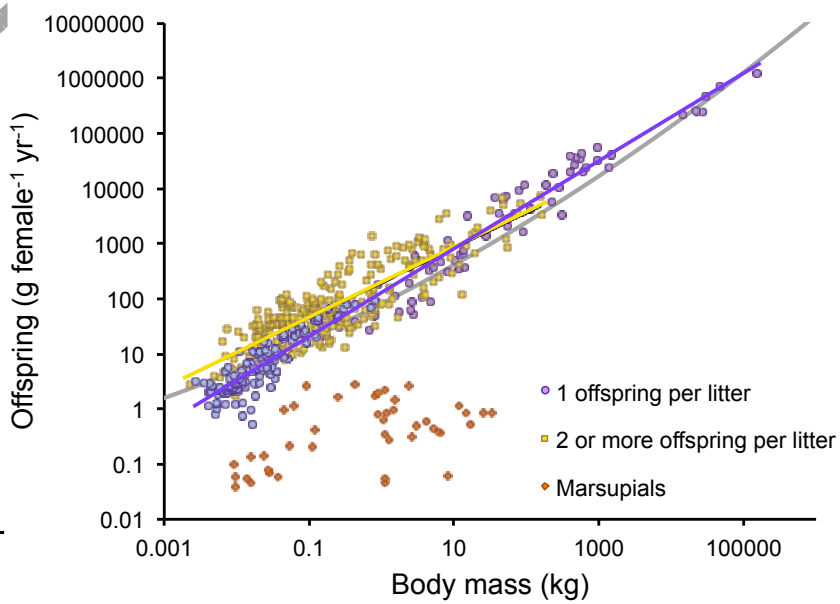
Mode of reproduction?



from Müller et al. (2012)

Mode of reproduction?





from Müller et al. (2012)

Why the curvature?

Oikos 121: 102–115, 2012
doi: 10.1111/j.1600-0706.2011.19505.x

Subject Editor: Dustin Marshall. Accepted 4 April 2011

Dichotomy of eutherian reproduction and metabolism

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Bevaviour when being scooped

Comparative Biochemistry and Physiology, Part A 187 (2015) 119–129

Contents lists available at ScienceDirect

Comparative Biochemistry and Physiology, Part A

journal homepage: www.elsevier.com/locate/cbpa

The digestive morphophysiology of wild, free-living, giraffes

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ARTICLE INFO

Article history:
Received 7 March 2015
Received in revised form 19 May 2015
Accepted 19 May 2015
Available online 2 June 2015

Keywords:
Giraffe
Digestion
Anatomy
Physiology
Ecology

ABSTRACT

We have measured rumen-complex (rumen, reticulum, omasum, abomasum) and intestine (small and large combined) mass in 32 wild giraffes of both sexes with body masses ranging from 289 to 1441 kg, and parotid gland mass, tongue length and mass, masseter and mandible mass in 9 other giraffes ranging in body mass from 181 to 1396 kg. We have estimated metabolic and energy production rates, feed intake and home range size. Interspecific analysis of mature ruminants show that components of the digestive system increase linearly (Mb^1) or positively allometric ($Mb^{>1}$) with body mass while variables associated with feed intake scale with metabolic rate ($Mb^{.75}$). Conversely, in giraffes ontogenetic increases in rumen-complex mass were negatively allometric ($Mb^{<1}$), and increases in intestine mass, parotid gland mass, masseter mass, and mandible mass were isometric (Mb^1). The relative masseter muscle mass (0.14% of Mb) and the relative parotid mass (0.03% of Mb) are smaller than in other ruminants. Increases in tongue length scale with head length$^{0.72}$ and $Mb^{.32}$ and tongue mass with $Mb^{.68}$. Absolute mass of the gastrointestinal tract increased throughout growth but its relative mass declined from 20% to 15% of Mb. Rumen-complex fermentation provides ca 43% of daily energy needs, large intestine fermentation 24% and 33% by digestion of soluble carbohydrates, proteins, and lipids. Dry matter intake (kg) was 2.4% of body mass in juveniles and 1.6% in adults. Energy requirements increased from 35 Mj/day to 190 Mj/day. Browse production rate sustains a core home range of 2.2–11.8 km^2.

1. Introduction

While much is known about the diets of wild giraffes (e.g. Hall-Martin and Basson, 1975; Pellew, 1984A) and their feeding ecology (Leuthold and Leuthold, 1972; Pellew, 1983A,B; du Toit, 1990A,B,C; Young and Isbell, 1991; Woolnough and du Toit, 2001; Cameron and du Toit, 2007), how and where the browse they eat is processed to provide the energy and nutrients they need is relatively unknown. The anatomy of their mouths and adnexal structures has been described in detail by Owen (1838), Joly and Lavocat (1846), and Perez et al. (2012), as has the relevance of the shape of their maxilla (Solounias and Moelleken, 1993). Systematic analysis of the structure and development of their brachydont, selenodont teeth and their dental formula has been described by Singer and Boné (1960) and Hall-Martin (1976), but no analysis of their role in the acquisition of browse has been done. Anecdotally Hamilton (1978) suggested that the bilobed lower canine functioned to strip browse, and as the ridge-basin structure of molars in southern African browsers is highly conserved we assume that their function follows the typical pattern as described by Archer and Sanson (2002): the selenodont ridges act to shear browse and the basins crush it. There have been sporadic measurements of salivary gland mass (Robbins et al., 1995; Hofmann et al., 2008) but no systematic analysis of their ontogeny. Masseter muscle mass has been reported in a single captive giraffe by Clauss et al. (2008) and by us in wild giraffes in the context of the anatomy of their head and skull and not digestion (Mitchell et al., 2013B). Similarly, we have reported mandible mass, and tongue length and mass (Mitchell et al., 2013B).

There has also not been a systematic analysis of the ontogeny of their gastrointestinal tract. Studies on ruminants in general have concluded that the size of the gastrointestinal tract should increase linearly with increases in body mass (Demment, 1982; Demment and van Soest, 1985; Ginnett and Demment, 1997). Ginnett and Demment (1997) qualitatively confirmed this conclusion in giraffes by studying the eating habits of males and females. Males eat more in a shorter time than females and as males are larger than females they must also have a larger rumen. Clauss et al. (2003A) suggested that the most important function of the rumen is to delay the passage of ingesta and prolong digestion time. Delayed passage implies a slowly emptying rumen which inhibits intake, so its absolute and relative mass should increase linearly with body mass to compensate for both intake limitation and for the greater absolute energy needs that large size demands. In a seminal but controversial study Hofmann (1989) classified giraffe as concentrate selectors or obligatory browsers and, therefore, the structure of their gastrointestinal tract should be different to that of grazers. Browsers have relatively small rumens (Giesecke and van Gylswyk, 1975),

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http://dx.doi.org/10.1016/j.cbpa.2015.05.015
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ANATOMIA HISTOLOGIA EMBRYOLOGIA
JOURNAL OF VETERINARY MEDICINE

Anatomia, Histologia, Embryologia

ORIGINAL ARTICLE

Quantitative Macroscopic Anatomy of the Giraffe (*Giraffa camelopardalis*) Digestive Tract

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With 7 figures and 7 tables

Received May 2015; accepted for publication July 2015

doi: 10.1111/ahe.12201

Summary

Quantitative data on digestive anatomy of the world's largest ruminant, the giraffe, are scarce. Data were collected from a total of 25 wild-caught and 13 zoo-housed giraffes. Anatomical measures were quantified by dimension, area or weight and analysed by allometric regression. The majority of measures scaled positively and isometrically to body mass. Giraffes had lower tissue weight of all stomach compartments and longer large intestinal length than cattle. When compared to other ruminants, the giraffe digestive tract showed many of the convergent morphological adaptations attributed to browsing ruminants, for example lower reticular crests, thinner ruminal pillars and smaller surface area of the omasal laminae. Salivary gland weight of the giraffe, however, resembled that of grazing ruminants. This matches a previous finding of similarly small salivary glands in the other extant giraffid, the okapi (*Okapia johnstoni*), suggesting that not all convergent characteristics need be expressed in all species and that morphological variation between species is a combination of phylogenetic and adaptational signals.

Introduction

Our current knowledge of the digestive anatomy and physiology of ruminants is generally based on a few but thoroughly studied livestock species, while only selective descriptions and scant quantitative data are available for non-domestic species. Domestic ruminants are grazers or intermediate feeders according to the classification introduced by Hofmann and Stewart (1972) and have 'cattle-type' digestive tracts according to a more recently proposed classification of ruminants as either 'cattle-type' or 'moose-type' based on digestive tract anatomy and physiology (Clauss et al., 2010b; Dittmann et al., 2015). Briefly, 'cattle-type' ruminants have stratified rumen contents, a fast reticuloruminal fluid throughput, a relatively large omasum, deep reticular crests and thick rumen pillars. In contrast, 'moose-type' ruminants have homogenous rumen contents, a slower fluid throughput, a relatively small omasum, low reticular crests and thin rumen pillars (Clauss et al., 2010b). Whereas 'moose-types' are usually strict browsers, 'cattle-types' may include varying amounts of grass in their diet to the effect that they are considered either strict grazers or mixed feeders (Codron and Clauss, 2010). The difference between these two types is currently thought to be related to a difference in the amount and viscosity of saliva they produce: whereas the 'moose-type' is thought to produce lesser amounts of a more proteinaceous (and hence viscous) saliva due to the inclusion of tannin-binding proteins, the 'cattle-type' produces larger amounts of a more watery saliva (Hofmann et al., 2008). The success of the 'cattle-type' is thought to lie in the more intensive harvest of microbes growing in the rumen by the increased 'wash-out' effect of the high fluid throughput (Dittmann et al., 2015). Of the browsing or 'moose-type' ruminants, only the moose (*Alces alces*) and roe deer (*Capreolus capreolus*) have been studied in detail (e.g. Hofmann et al., 1976; Hofmann and Nygren, 1992), while comprehensive information on the world's largest ruminant, the giraffe, is scarce. A few reports provide quantitative data

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Comparative Biochemistry and Physiology, Part A 187 (2015) 119–129

Contents lists available at ScienceDirect

Comparative Biochemistry and Physiology, Part A

journal homepage: www.elsevier.com/locate/cbpa

The digestive morphophysiology of wild, free-living, giraffes

G. Mitchell [a,b,*], D.G. Roberts [b], S.J. van Sittert [b]

ANATOMIA HISTOLOGIA EMBRYOLOGIA
JOURNAL OF VETERINARY MEDICINE

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Quantitative Macroscopic Anatomy of the Giraffe (*Giraffa camelopardalis*) Digestive Tract

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CBP MS24644 Part A ¶

The digestive morphophysiology of giraffe ¶

Mitchell & van Sittert ¶

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Reviewed by Marcus Clauss, Zurich (does not wish to remain anonymous) ¶

¶

Preamble: We presented our giraffe digestive anatomy work at the 2012 Comparative Nutrition Society meeting and are in the last stages of finalising our manuscript. This means I do have a conflict of interest in reviewing this. I estimate we will need about 1 month until submission, as of 8.3.2015. I do this review immediately and also email it directly to the authors to avoid the impression I try to delay this paper here (in case reporting of refereee 2 is delayed and hence delays the transmission of both refereee comments). ¶

¶

General: This manuscripts provides an evaluation of data on the digestive tract of giraffe, some of which was

the relevance of the shape of their maxilla (Solounias and Moelleken, 1993). Systematic analysis of the structure and development of their brachydont, selenodont teeth and their dental formula has been described by Singer and Boné (1960) and Hall-Martin (1976), but no analysis of their role in the acquisition of browse has been done. Anecdotally Hamilton (1978) suggested that the bilobed lower canine functioned to strip browse, and as the ridge–basin structure of molars in southern African browsers is highly conserved we assume that their function follows the typical pattern as described by Archer and Sanson (2002): the selenodont ridges act to shear browse and the basins crush it. There

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http://dx.doi.org/10.1016/j.cbpa.2015.05.015
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intermediate feeders according to the classification introduced by Hofmann and Stewart (1972) and have 'cattle-type' digestive tracts according to a more recently proposed classification of ruminants as either 'cattle-type' or 'moose-type' based on digestive tract anatomy and physiology (Clauss et al., 2010b; Dittmann et al., 2015). Briefly, 'cattle-type' ruminants have stratified rumen contents, a fast reticuloruminal fluid throughput, a relatively large omasum, deep reticular crests and thick rumen pillars. In contrast, 'moose-type' ruminants have homogenous rumen contents, a slower fluid throughput, a relatively small omasum, low reticular crests and thin rumen pillars (Clauss et al., 2010b). Whereas 'moose-

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Journal of Zoology ZSL

Journal of Zoology. Print ISSN 0952-8369

Functional anatomy of bovid upper molar occlusal surfaces with respect to diet

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Keywords
ruminant; ungulate; ecomorphology; browser; grazer; diet.

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Editor: Andrew Kitchener

Received 30 June 2009; revised 14 October 2009; accepted 19 October 2009

doi:10.1111/j.1469-7998.2009.00668.x

Abstract

This paper presents an analysis of molar occlusal morphology and its relation to diet in modern bovids. The work develops previous research by analysing samples from 86 species from all major subfamilies and from across their geographical distribution. Molar surfaces are characterized by the length, thickness and shape of enamel formations. Discriminant function analysis (DFA) is used to characterize the dental anatomy of each group and permits interpretations as to the selective pressures governing occlusal form. Grazers and most browsers are very different and distinguishable, the former possessing long and thickened enamel with a bimodal distribution of central ridge enamel alignment. Frugivorous duikers possess thickened enamel and large surface areas, traits interpreted as adaptations for hard-object feeding. Mixed feeders consuming mostly dicot material cluster with browsers, while mixed-grazers approach but do not attain a grazer-like morphology. Many browser-like characteristics are present in mixed feeders that consume significant proportions of grass. Plant toughness is seen as a primary driver of occlusal form in bovids. A greater variation in occlusal form between and within feeding groups is observed compared with that noted previously. Finally, the use of DFA renders the application of occlusal morphology as a means of inferring dietary ecology in extinct forms a distinct possibility.

Introduction

It is predicted that surface or occlusal morphology of mammalian teeth will be well suited to the mechanical demands of the diet. Recent studies by Evans and colleagues (Evans & Sanson, 2003; Evans, 2005; Evans *et al.*, 2007) have demonstrated as much for a diverse array of mammalian taxa. Large mammalian herbivores, however, have been notably absent from such investigations. Only the studies of Rensberger, Forsten & Fortelius (1984), Archer & Sanson (2002) and Kaiser (2002) have considered the occlusal surface of large herbivores in any detail. However, these studies are taxonomically restricted, the study of 26 species of southern African bovids by Archer & Sanson (2002) being the most extensive. This paper aims to partly fill this gap in research by combining and modifying previous methodologies to characterize and explain the variation seen in upper molar occlusal morphology in relation to dietary behaviour in a taxonomically wide sample from the ruminant family Bovidae.

A representative example of a bovid molar is shown in Fig. 1. Archer & Sanson (2002) were the first to demonstrate that bovid molars vary enormously with diet, despite the anticipated buffering effects of rumination suggested by Fortelius (1985). Using enamel ridge thicknesses and lengths, and dentine basin widths, they demonstrated that grazer molars show a wide variety of form, but are unified in the possession of large amounts of thick enamel, particularly the buccal protocone ridge. Browsers on the other hand had a dominant shearing blade in the buccal part of the tooth and a large lingual crushing basin. Mixed feeders clustered towards either tooth type depending on whether grass or browse was the dominant dietary component.

Rensberger *et al.* (1984) and latterly Kaiser (2002) investigated the distribution and alignment of enamel ridges in various extant and extinct members of the Equidae. They showed that in more recent forms where grass was a dominant dietary component, enamel ridges were aligned parallel and perpendicular to the chewing direction.

The results of these investigations suggest that such methods are ripe for their application to a much larger comparative sample. This study will use the combination of variables from these studies to characterize the occlusal morphology of extant bovids from all major tribes and most geographical regions, and explain the variation in occlusal form with respect to dietary behaviour. Of the variables used by Archer & Sanson (2002), the categorical and somewhat subjectively coded variables that consider the nature of accessory cavities and entostyles are replaced by continuous variables. Enamel alignment variables are similar to that described in Kaiser (2002), though are more restricted in their application and do not attempt to differentiate between functioning and functionless enamel. In addition, the use of multivariate statistics will allow

Journal of Zoology ZSL

Journal of Zoology. Print ISSN 0952-8369

Enamel ridge alignment in upper molars of ruminants in relation to their natural diet

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Keywords
teeth; molar; chewing; grazer; browser; abrasion; occlusion; adaptation.

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Editor: Andrew Kitchener

Received 30 June 2009; revised 20 October 2009; accepted 3 November 2009

doi:10.1111/j.1469-7998.2009.00674.x

Abstract

Although it is generally thought that dental design reflects mechanical adaptations to particular diets, concrete concepts of such adaptations beyond the evolution of hypsodonty are largely missing. We investigated the alignment of enamel ridges in the occlusal molar surface of 37 ruminant species and tested for correlations with the percentage of grass in the natural diet. Independent of phylogenetic lineage, species that were either larger and/or included more grass in their natural diet showed a higher proportion of enamel ridges aligned at low angles to the direction of the chewing stroke. Possible explanations for this design are a potential alignment of grass blades in parallel to the molar tooth row, a potential increased proportion of a propalinal (anterior–posterior) chewing movement in grazers as opposed to a strictly transversal chewing stroke in browsers and the general distribution of forces along the occlusal surface during the chewing stroke. The latter will be less heterogenous (with less force peaks) with an increasing proportion of low-angle enamel ridges. While the validity of these explanations will have to be tested in further studies, the enamel ridge alignment represents a clear signal that deviates from an arbitrary distribution and hence most likely represents a functional adaptation.

Introduction

Herbivores cannot digest plant fibre by themselves; this task is performed by symbiotic microbes (Stevens & Hume, 1998). Microbial digestion (= fermentation) of plant fibre takes time; however, this time can be greatly reduced if the plant material is divided into small particles (with relatively larger surfaces) before being subjected to microbial fermentation (e.g. Bjorndal, Bolten & Moore, 1990). Speedy fermentation allows reasonably short ingesta retention times and hence high levels of food intake (Clauss *et al.*, 2007*b*). Therefore, food comminution is one of the most significant innovations in mammals, which have to fuel high levels of metabolism by high levels of food intake.

Among mammals, ruminants are exceptional in terms of their chewing efficiency; they achieve significantly finer faecal particles than other terrestrial mammals (Fritz *et al.*, 2009), resulting from a combination of efficient teeth plus selective ruminal retention of insufficiently comminuted/digested food particles and subsequent re-chewing (rumination). Among the ruminants, there are significant differences in the degree of digesta particle size reduction between captive individuals of different feeding types – grazers, intermediate feeders and browsers (Clauss, Lechner-Doll & Streich, 2002), and the difference in faecal particle size between free-ranging and captive individuals may be greater in browsing than in grazing species (Hummel *et al.*, 2008). These functional data suggest that dental morphology and chewing performance vary among ruminants with the feeding type. Differences in the degree of hypsodonty (Janis, 1995; Williams & Kay, 2001; Cerling, Harris & Passey, 2003; Sponheimer *et al.*, 2003; Codron *et al.*, 2007), molar wear rates (Solounias, Fortelius & Freeman, 1994) and overall wear pattern ('mesowear'; Fortelius & Solounias, 2000; Franz-Odendaal & Kaiser, 2003) are well documented between ruminant feeding types; these are associated with diet abrasiveness and functional tooth longevity, but not directly with the function of particle size reduction. Additionally, differences between ruminant feeding types have been observed in the structure of the molar occlusal surface (Solounias & Dawson-Saunders, 1988; Archer & Sanson, 2002) and in the mass of the masseter muscle (Clauss *et al.*, 2008*a*) as well as its insertion area (Solounias & Dawson-Saunders, 1988; Solounias, Moelleken & Plavcan, 1995). These morphological observations complement the functional observations on faecal particle size and suggest that there are fundamental differences in the way in which browse and grass are processed by the ruminant masticatory apparatus.

Unfortunately, to date, these assumptions are mostly based on anatomical observations in the herbivore

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Journal of Zoology ZSL

JZO-06-09-OM-231

Heywood – functional anatomy of bovid upper molar occlusal surfaces

Dear Lucinda Haines,

This paper describes how an array of molar occlusal surface measurements varies systematically between feeding types for bovid ruminants. The number of species investigated is impressive, the original data is given, and the patterns observed and outliers are aptly discussed. I think this paper is highly suitable for publication in J Zool and only minor revisions are required.

I send you the review of this manuscript really soon (usually you have to send a reminder, I know), even though I am leaving for holidays tomorrow and have tons of other stuff to finish till then – but you will have realized that we just submitted a very similar paper to this one to J Zool (first author: Thomas Kaiser), and I want to strictly avoid/prevent the impression that I would try to delay the Heywood paper because we just submitted something very similar.

On the similarity: the two papers overlap in some degree in terms of the results that are found – which is brilliant, because they corroborate each other's findings.

They differ extremely in the way the statistics are performed (this is not a technical but a conceptual difference, and both concepts are valid in their own purpose), in the attempt to interpret function, and of course in the species analysed. Therefore, this overlap is not a

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RESEARCH ARTICLE

The Evolution of Stomach Acidity and Its Relevance to the Human Microbiome

DeAnna E. Beasley[1]*, Amanda M. Koltz[2], Joanna E. Lambert[3], Noah Fierer[4,5], Rob R. Dunn[1]

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Abstract

Gastric acidity is likely a key factor shaping the diversity and composition of microbial communities found in the vertebrate gut. We conducted a systematic review to test the hypothesis that a key role of the vertebrate stomach is to maintain the gut microbial community by filtering out novel microbial taxa before they pass into the intestines. We propose that species feeding either on carrion or on organisms that are close phylogenetic relatives should require the most restrictive filter (measured as high stomach acidity) as protection from foreign microbes. Conversely, species feeding on a lower trophic level or on food that is distantly related to them (e.g. herbivores) should require the least restrictive filter, as the risk of pathogen exposure is lower. Comparisons of stomach acidity across trophic groups in mammal and bird taxa show that scavengers and carnivores have significantly higher stomach acidities compared to herbivores or carnivores feeding on phylogenetically distant prey such as insects or fish. In addition, we find when stomach acidity varies within species either naturally (with age) or in treatments such as bariatric surgery, the effects on gut bacterial pathogens and communities are in line with our hypothesis that the stomach acts as an ecological filter. Together these results highlight the importance of including measurements of gastric pH when investigating gut microbial dynamics within and across species.

OPEN ACCESS

Citation: Beasley DE, Koltz AM, Lambert JE, Fierer N, Dunn RR (2015) The Evolution of Stomach Acidity and Its Relevance to the Human Microbiome. PLoS ONE 10(7): e0134116. doi:10.1371/journal.pone.0134116

Editor: Xiangzhen Li, Chengdu Institute of Biology, CHINA

Received: March 8, 2015

Accepted: July 6, 2015

Published: July 29, 2015

Data Availability Statement: All relevant data are within the paper.

Funding: The authors have no support or funding to report.

Competing Interests: The authors have declared that no competing interests exist.

Introduction

Often, vertebrate stomach evolution is discussed in the context of the stomach's role in chemically breaking down food and, specifically, denaturing proteins via pepsinogen and HCl [1]. The stomach clearly serves these purposes. However in light of our growing understanding of microbial symbionts' role in human health, it is interesting to reassess the stomach's additional role as an important barrier against pathogen entry into the gastrointestinal tract [2–3]. Here we consider the ecology of bird and mammal stomachs and, in the same light, medical

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RESEARCH ARTICLE

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Citation: Beasley DE
N, Dunn RR (2015) T
and Its Relevance to
ONE 10(7): e013411
pone.0134116

Editor: Xiangzhen Li
CHINA

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Published: July 29, 2

Data Availability Sta
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Funding: The author
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Competing Interests
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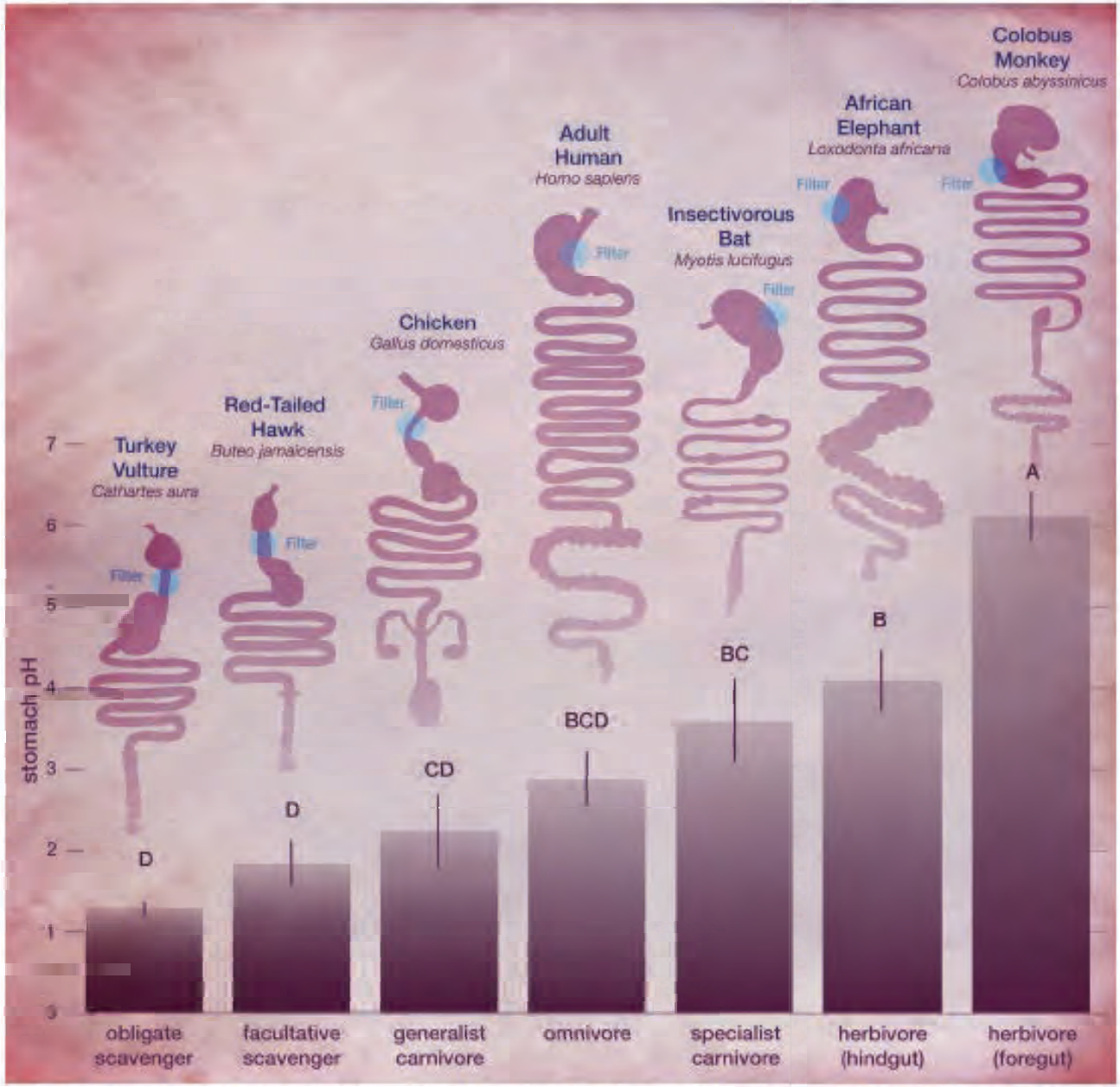

Fig 1. Comparison of stomach pH (mean ± S.E.) across trophic groups with gastrointestinal tracts of representative birds and mammals. Different letters above error bars represent statistically significant differences ($P < 0.05$) using ANOVA and Tukey-Kramer post-hoc test. Obligate scavengers (1.3 ± 0.08), facultative scavengers (1.8 ± 0.27), generalist carnivore (2.2 ± 0.44), omnivore (2.9 ± 0.33), specialist carnivore (3.6 ± 0.51), hindgut herbivore (4.1 ± 0.38) and foregut herbivore (6.1 ± 0.31).

Using statistics

LETTER

doi:10.1038/nature10349

Strontium isotope evidence for landscape use by early hominins

Sandi R. Copeland[1,2], Matt Sponheimer[2], Darryl J. de Ruiter[3], Julia A. Lee-Thorp[4,5], Daryl Codron[5], Petrus J. le Roux[5], Vaughan Grimes[3,7] & Michael P. Richards[1,8]

Ranging and residence patterns among early hominins have been indirectly inferred from morphology[1,2], stone-tool sourcing[3], referential models[4,5] and phylogenetic models[6–8]. However, the highly uncertain nature of such reconstructions limits our understanding of early hominin ecology, biology, social structure and evolution. We investigated landscape use in *Australopithecus africanus* and *Paranthropus robustus* from the Sterkfontein and Swartkrans cave sites in South Africa using strontium isotope analysis, a method that can help to identify the geological substrate on which an animal lived during tooth mineralization. Here we show that a higher proportion of small hominins than large hominins had non-local strontium isotope compositions. Given the relatively high levels of sexual dimorphism in early hominins, the smaller teeth are likely to represent female individuals, thus indicating that females were more likely than males to disperse from their natal groups. This is similar to the dispersal pattern found in chimpanzees[9], bonobos[10] and many human groups[11], but dissimilar from that of most gorillas and other primates[12]. The small proportion of demonstrably non-local large hominin individuals could indicate that male australopiths had relatively small home ranges, or that they preferred dolomitic landscapes.

Established palaeontological and archaeological techniques provide little tangible evidence of how early hominins used and moved across landscapes. For example, home-range size has been estimated on the basis of a rough correlation with body mass[1] and models of early hominin dispersal have relied on behaviours that are common among hominoids and are presumed to be present in a common ancestor[4–8].

We used a geochemical proxy, strontium isotope analysis of tooth enamel, to investigate landscape use in early hominins. We sampled a series of hominin tooth-crowns with a relatively new method for measuring strontium isotopes in teeth: laser ablation multi-collector inductively coupled plasma mass spectrometry (MC-ICP-MS). This method is almost non-destructive because it leaves only small traces (200 × 750 μm) on the enamel surface[13,14] (Supplementary Fig. 1).

The $^{87}Sr/^{86}Sr$ ratios of animals directly reflect the $^{87}Sr/^{86}Sr$ ratios of their foods, which in turn are primarily a reflection of local geology and to a lesser extent, of hydrology and atmospheric inputs[15–17]. The $^{87}Sr/^{86}Sr$ ratio of bedrock varies as a result of its original Rb/Sr ratio and age[18]. Because strontium is ingested and incorporated in trace quantities into mammalian teeth during the period of enamel mineralization, $^{87}Sr/^{86}Sr$ ratios can be used to study movement across landscapes in geologically heterogeneous areas. The fossil-hominin-bearing caves of the Sterkfontein Valley are situated in the diverse geological substrates of the Transvaal supergroup in South Africa, and represent one such area[19]. This presents a unique opportunity to investigate land-use patterns of South African early hominins from the Plio-Pleistocene.

We measured the $^{87}Sr/^{86}Sr$ ratios in the permanent dentition of 19 australopiths from the Sterkfontein Valley (Supplementary Table 1 and Methods). Because tooth-crown formation was complete by approximately age 8 in these hominins[20], the isotopic composition of enamel should reflect behaviour before dispersal from the natal group. The specimens included 11 *P. robustus* individuals from Swartkrans (Member 1, ~1.8 million years ago) and eight *A. africanus* individuals from Sterkfontein (Member 4, ~2.2 million years ago) (Supplementary Tables 1 and 2). For comparative purposes, we measured the $^{87}Sr/^{86}Sr$ ratios in the fossil enamel of 38 mammalian teeth that are roughly contemporaneous with these hominins (Supplementary Table 1). We use taxa with small home ranges (*Procavia* and *Raphicerus*), called here 'small-range mammals', as a proxy for local $^{87}Sr/^{86}Sr$ ratios[21]. To establish the biologically available $^{87}Sr/^{86}Sr$ ratios across the region, we analysed more than 170 modern plants and animals within 50 km of the fossil sites, sampling 11 different geological substrates (Fig. 1 and Supplementary Table 3).

The biologically available $^{87}Sr/^{86}Sr$ ratio of the geological substrate that includes the fossil-bearing caves, the Malmani dolomite, ranged from 0.721 to 0.734. Its mean differs from that of nine nearby geological substrates (nested analysis of variance on ranks, unequal N HSD, $P < 0.001$) and overlaps appreciably with that of only two substrates (Fig. 2 and Supplementary Table 3). Therefore, individuals with $^{87}Sr/^{86}Sr$ ratios outside the dolomite range can be identified with confidence as non-local to the dolomite, that is, the tooth was mineralized while the individual spent at least some time subsisting elsewhere. More specific spatial attribution, beyond non-local (non-dolomite), is not possible at this stage. The minimum distance from the Sterkfontein and Swartkrans caves to a non-local geology is 2–3 km to the southeast, 5–6 km to the northwest and >30 km in roughly northeast and southwest directions (Fig. 1).

The $^{87}Sr/^{86}Sr$ data for fossils indicated that a higher proportion of Hominidae (32%, $n = 19$) were non-local than the proportions of Cercopithecidae (14%, $n = 7$), Procaviidae (9%, $n = 11$) and Bovidae (16%, $n = 19$) (Supplementary Table 1 and Supplementary Discussion). Among 57 fossil teeth analysed, five out of seven of the teeth with the most radiogenic (high $^{87}Sr/^{86}Sr$) values were hominins, and the $^{87}Sr/^{86}Sr$ ratios of the Hominidae were significantly different from those of the small-range mammals (Kruskal–Wallis, Conover–Iman, $P = 0.002$), whereas those of the other primate family, Cercopithecidae, were not.

Within the Hominidae, there was no statistically significant difference between the proportions of non-locals in *P. robustus* (36%) and *A. africanus* (25%). However, there were significant differences between subsets of hominins defined by tooth size (Supplementary Fig. 2, Supplementary Table 2 and Methods). The four most radiogenic specimens were small hominins (tooth size below the mean for that tooth and species) and at least 50% of the small hominins were non-local. In contrast, significantly fewer of the large hominins (11%; tooth size above the mean for that tooth and species) were

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Using statistics

LETTER

doi:10.1038/nature10149

Strontium isotope evidence for landscape use by early hominins

Sandi R. Copeland[1,2], Matt Sponheimer[2], Darryl J. de Ruiter[3], Julia A. Lee-Thorp[4,5], Daryl Codron[5], Petrus J. le Roux[5], Vaughan Grimes[3,7] & Michael P. Richards[1,8]

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Journal of Human Evolution 63 (2012) 764–769

Contents lists available at SciVerse ScienceDirect

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Journal homepage: www.elsevier.com/locate/jhevol

News and views

A re-analysis of sex differences in landscape use in early hominins: A comment on Copeland and colleagues

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ARTICLE INFO

Article history:
Received 28 March 2012
Accepted 24 June 2012
Available online 24 August 2012

Keywords:
Australopithecus
Hominin behavior
Hominin dispersal
Dental isotopes

Recently, Copeland et al. (2011) presented a novel analysis of strontium isotopes in the teeth of samples of *Australopithecus africanus* and *Paranthropus robustus* from Sterkfontein and Swartkrans caves in South Africa. The method and data allow one "to study movement across landscapes in geologically heterogeneous areas" (Copeland et al., 2011: 76) of samples of extinct organisms using teeth. Taking advantage of the taphonomic preservation of early hominins from restricted cave sites in South Africa, and the fact that the local landscape is strongly heterogeneous, Copeland and colleagues evaluate a sample of hominin teeth, along with those of other primates, Procavidae and Bovidae, and present convincing evidence that the hominin specimens showed variation in residence patterns, with some being 'local' (having been born and remained in the area near the caves), and some being 'non-local' (having grown up in an area at least several kilometers distant from the caves, and then immigrated to the area near the caves).

Importantly, Copeland and colleagues analyze hominin tooth size and find that there is a statistically significant tendency for smaller specimens to be non-local, and a trend for larger specimens to be local. Arguing that larger specimens are more likely male and smaller ones female on the basis of dental sexual dimorphism, the authors state that "strontium isotope data indicate differences in landscape use between males and females", and that "the Sr isotopes probably indicate that females preferentially moved away from residential groups" (Copeland et al., 2011: 77). While acknowledging that the strontium isotope evidence is insufficient to specifically test the hypothesis that *Paranthropus* was characterized by a *Gorilla*-like social system in which both males and females transfer (Lockwood et al., 2007), they go on to conclude that the dispersal patterns found within the "South African australopiths generally" are "more consistent with *Pan*-like dispersal patterns" (Copeland et al., 2011: 77). This finding is potentially very important, as it would constitute direct evidence that early hominins shared a dispersal pattern similar to that of both *Pan* and modern *Homo*. Consequently, the analysis has received attention among those interested in the topic (*e.g.*, Schoeninger, 2011; van der Merwe, 2011).

Unfortunately, re-analysis of the data on which the claim of sexual differences in residential patterns is based suggests that this inference is not clearly supported by the data presented in the analysis.

It is important to note that the strontium isotope data and the interpretation of whether specimens were 'local' or 'non-local' are not at issue in this assessment. Rather, the authors provide an analysis of the association between tooth size and residential patterns, making a series of assumptions that have a strong impact on the conclusion that there were sex differences in landscape use.

Copeland and colleagues analyze isotopic data for four teeth: maxillary and mandibular canines, and maxillary and mandibular M3s. For a modern reference sample, they use *Gorilla* and *Pan* data from Mahler (1973) in which they demonstrate that while there is overlap in male and female M3 tooth size, specimens that are plus or minus one standard deviation above or below the mean are likely to be males and females, respectively. Copeland and colleagues justify the use of *Gorilla* and *Pan* as reference species because of the magnitude of inferred size dimorphism in both *Australopithecus* and *Paranthropus*, often stated as being between that of extant *Gorilla* and *Pan* (McHenry and Coffing, 2000). Importantly, though the canine teeth constitute 11 of the 19 specimens, no mention is made of the low magnitude of canine dimorphism in the hominins, and whether this will impact sex identification on the basis of canine tooth size. This issue will be addressed further below.

Copeland and colleagues measured basal area (mesiodistal × buccolingual dimensions) of each tooth for which isotopes were measured and compared them with all measurable homologous teeth from Sterkfontein, Makapansgat, Kromdraai, Swartkrans, and Drimolen to assess whether the tooth is large or small by comparison with other hominin teeth of the same species (either *A. africanus* or *P. robustus*). Copeland and colleagues assess specimens as falling above or below the

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http://dx.doi.org/10.1016/j.jhevol.2012.06.007

Using statistics

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Contents lists available at SciVerse ScienceDirect

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The authors do not provide a clear reason for reporting a one-sided test. This would be justified if there were an a priori reason to believe that one sex should show a bias in transfer pattern. On the one hand, it might be argued that because female exogamy is common in extant hominoids (including humans), then the early hominins might be expected to show the same pattern, thereby justifying the one-sided test. On the other hand, the strong dimorphism of early hominins has been argued as consistent with a *Gorilla*-like social system (Kappelman, 1996; Lockwood et al., 2007), in which case male exogamy might also be expected (as noted by Copeland and colleagues), justifying a two-tailed test, which yields a non-significant result ($P = 0.099$, Table 1). However, no a priori justification is discussed. Rather, the test is provided

Omitting data

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Research

Cite this article: Lemaître JF, Vanpé C, Plard F, Gaillard JM. 2014 The allometry between secondary sexual traits and body size is nonlinear among cervids. *Biol. Lett.* **10**: 20130869.
http://dx.doi.org/10.1098/rsbl.2013.0869

Evolutionary biology

The allometry between secondary sexual traits and body size is nonlinear among cervids

J. F. Lemaître, C. Vanpé, F. Plard and J. M. Gaillard

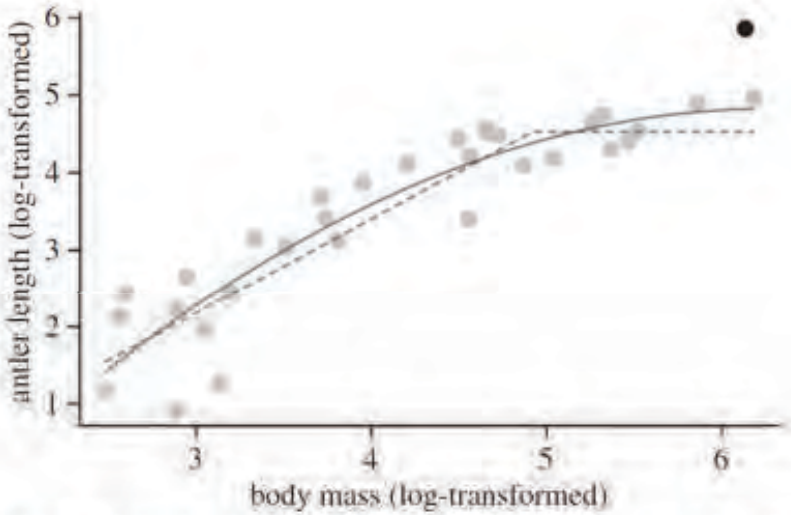


Figure 1. Relationship between antler length and body mass (on a log–log scale) across 31 extant cervids. The quadratic (solid line) and threshold (with one slope, dashed line) models best described the relationship. The black circle represents the extinct Irish elk (*Megaloceros giganteus*).

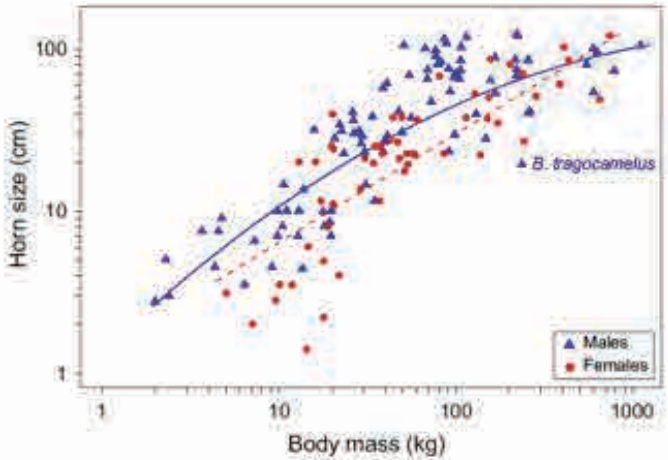
Omitting data

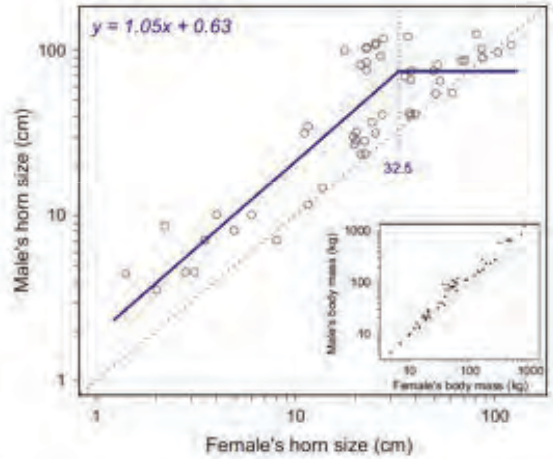
JOURNAL OF Evolutionary Biology

doi: 10.1111/jeb.13142

Evolutionary allometry reveals a shift in selection pressure on male horn size

M. TIDIÈRE*, J.-F. LEMAÎTRE*, C. PÉLABON†, O. GIMENEZ‡ & J.-M. GAILLARD*





This pattern, much more pronounced in males than in females, suggests either that horn size is limited by some constraints in the largest bovids or is no longer the direct target of sexual selection in very large species.

Acknowledgments

M.Tidière. is funded by the French Ministry of Education and Research. C. Pélabon was supported by the Research Council of Norway through its Centres of Excellence funding scheme, project number 223257. We warmly thank M. Clauss for insightful comments.

Omitting data

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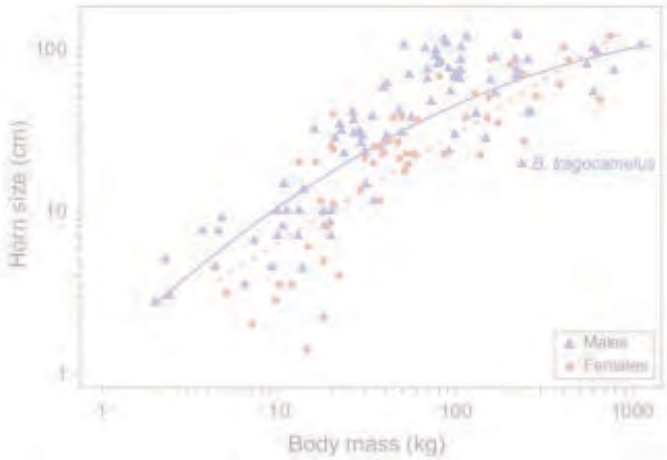
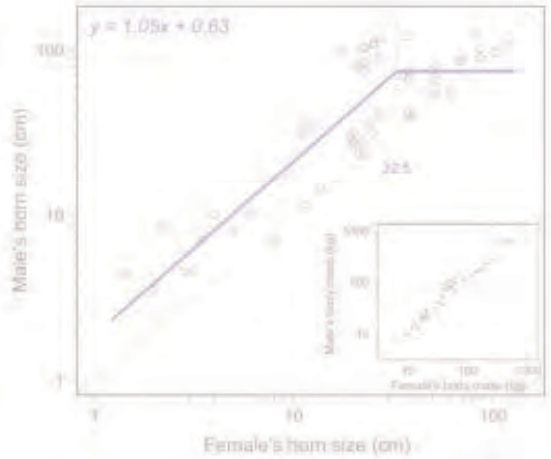
M. TIDIÈRE*, J.-F. LEMAÎTRE*, C. PÉLABON†, O. GIMENEZ‡ & J.-M. GAILLARD*





This pattern, much more pronounced in males than in females, suggests either that horn size is limited by some constraints in the largest bovids or is no longer the direct target of sexual selection in very large species.

Acknowledgments

M.Tidière. is funded by the French Ministry of Education and Research. C. Pélabon was supported by the Research Council of Norway through its Centres of Excellence funding scheme, project number 223257. We warmly thank M. Clauss for insightful comments.

Omitting data

JOURNAL OF Evolutionary Biology

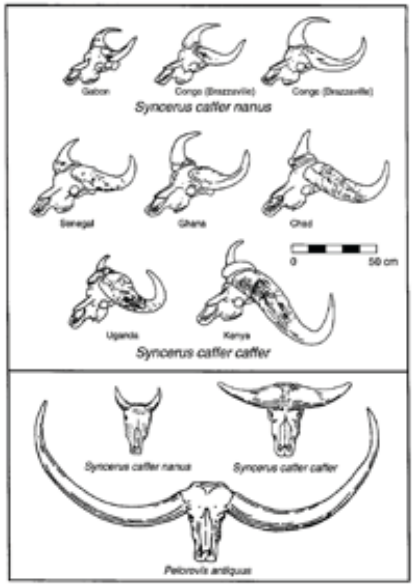
doi: 10.1111/jeb.13142

Evolutionary allometry reveals a shift in selection pressure on male horn size

Journal of Archaeological Science (1994) 21, 725–733

The Long-Horned African Buffalo (*Pelorovis antiquus*) is an Extinct Species

Richard G. Klein



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Quaternary Research 68 (2007) 220–226

QUATERNARY RESEARCH

Short Paper

The Olduvai buffalo *Pelorovis* and the origin of *Bos*

Bienvenido Martínez-Navarro [a,*], Juan Antonio Pérez-Claros [b], Maria Rita Palombo [c], Lorenzo Rook [d], Paul Palmqvist [b]

tion and Research. C. Pélabon was supported by the Research Council of Norway through its Centres of Excellence funding scheme, project number 223257. We warmly thank M. Clauss for insightful comments.

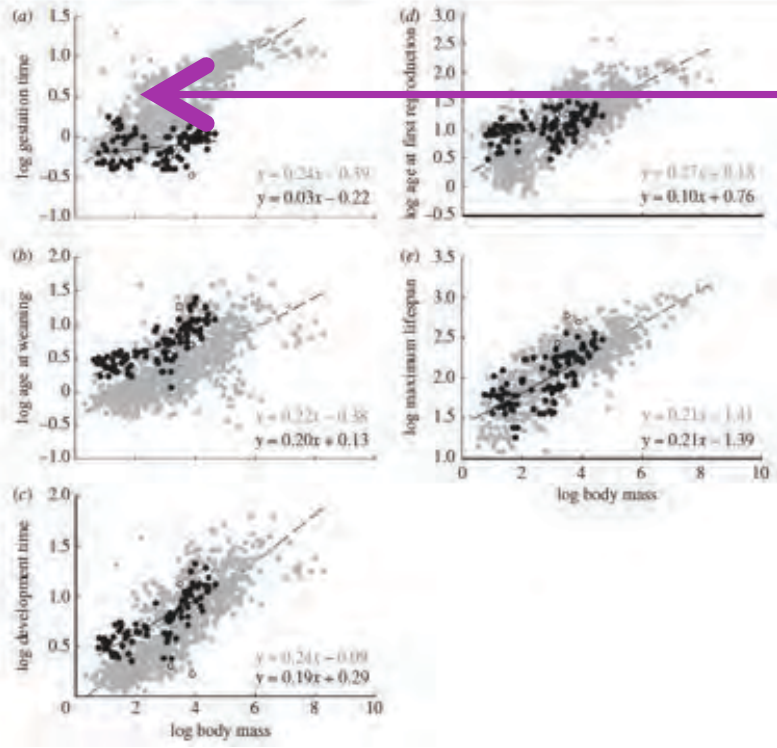
Deliberately omitting data

PROCEEDINGS of THE ROYAL SOCIETY B

Proc. R. Soc. B (2011) 278, 560–568
doi:10.1098/rspb.2010.1056
Published online 25 August 2010

Universal scaling of production rates across mammalian lineages

Marcus J. Hamilton[1,2,3,4], Ana D. Davidson[1,4], Richard M. Sibly[5] and James H. Brown[1,4]



Chapter 5

LIFE HISTORY

Richard M. Sibly

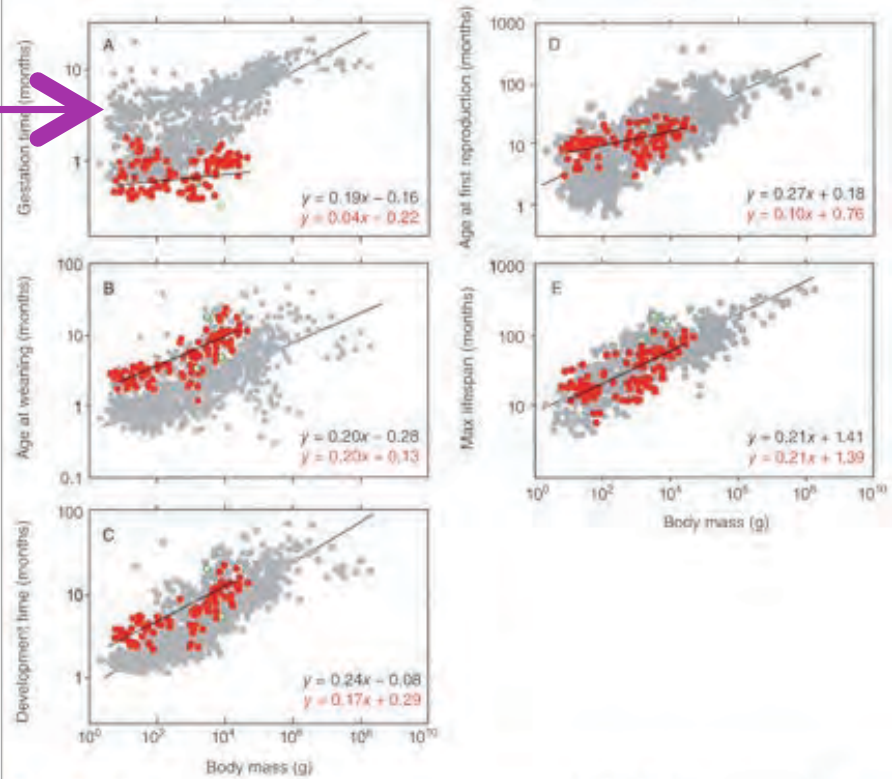


Figure 5.4 The timings of major life-history events in marsupials, shown in red, placentals, shown in gray, and three monotremes (open circles). Times are measured in months. (A) Gestation time; (B) age at weaning; (C) development time; (D) age at first reproduction; (E) maximum lifespan. (From Hamilton et al. 2011.)

Deliberately omitting data

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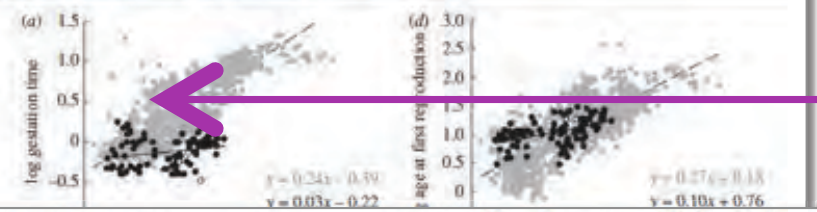
562 M. J. Hamilton *et al.* *Scaling mammalian production*



Chapter 5

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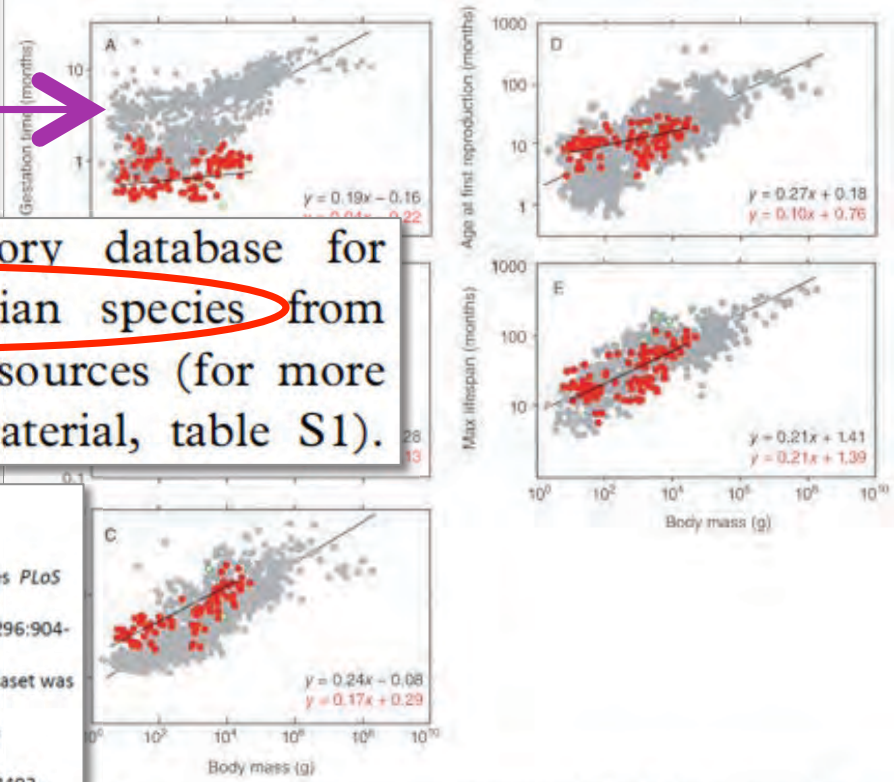

4 The timings of major life-history events in marsupials, shown in red, placentals, shown in grey, and three
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monotremes, we compiled a life-history database for more than 4000 non-volant mammalian species from both primary and secondary published sources (for more details, see electronic supplementary material, table S1).

Supplementary material

Supplementary Table 1. Data were compiled from the following sources:

a. Cardillo M, et al. 2004 Human population density and extinction risk in the world's carnivores *PLoS Biology* Vol. 2, No. 7, e197 doi:10.1371/journal.pbio.0020197
b. Ceballos G Ehrlich PR (2002) Mammal Populations Losses and the Extinction Crisis. *Science* 296:904-907.
c. Damuth MJ (1981) Population density and body size in mammals. *Nature* 290: 699-700. (Dataset was not made publicly available and was kindly provided by the author.)
d. Dickman C, Woodford Ganf R (2007) *A Fragile Balance: The Extraordinary Story of Australian Marsupials* (The Univ of Chicago Press, Chicago).
e. Ernest, SKM (2003) Life history characteristics of placental nonvolant mammals. *Ecology* 84:3402-3402.
f. Jones KE, Purvis A, Gittleman JL (2003) Biological Correlates of Extinction Risk in Bats. *Am Nat* 161:601-614.

Integrity

honouring those who had an idea first or whose data you use

Omitting sources or sloppy research

Are fast-moving elephants really running?

Despite their unseemly bulk, elephants can hit high speeds — but use an unusual style.

It is generally thought that elephants do not run[1-5], but there is confusion about how fast they can move across open terrain and what gait they use at top speed. Here we use video analysis to show that Asian elephants (*Elephas maximus* L.) can move at surprisingly high speeds of up to 6.8 m s^{-1} (25 km h^{-1}) and that, although their gait might seem to be a walk even at this speed, some features of their locomotion conform to definitions of running.

Elephants moving rapidly have been estimated[2,4] to reach speeds of about 4 m s^{-1} (15 km h^{-1}), although anecdotal evidence[1] claims that they can reach 11 m s^{-1} (40 km h^{-1}). To investigate the gait used by elephants at top speeds, we used video analysis to study 42 healthy, active Asian elephants throughout Thailand (for details, see supplementary information). The skin was marked with non-toxic tempera paint dots over the limb-joint centres of the elephants (right fore- and hindlimbs; Fig. 1), estimated by palpation and manipulation of the joints; these dots were used for later video digitizing. Mahouts guided the elephants along a 30-metre course, parallel to the field of view of the video camera (60 Hz). Elephants had at least 10 m to accelerate or decelerate before and after this 30-m course. A total of 188 trials were carried out; trials with sudden accelerations or decelerations in the 10-m videotaped stretch of the course were omitted.

Our digitization of the hip-joint markers (using Peak Motus, Peak Performance, Colorado) measured the average velocity along the central 10 m of the track. We used the length of the thigh segment (between the centres of hip- and knee-joint markers) to scale the digitized video coordinates to real dimensions. Photocell timers at either end of the track gave an average velocity across the entire 30 m, which was used as a preliminary gauge of which elephants were the fastest, as well as for comparison with the 10-m velocity to monitor speed changes. Speeds over the 10-m and 30-m courses were generally similar, indicating that the elephants did not suddenly speed up or slow down.

Of the elephants, 32 reached top speeds of over 4.0 m s^{-1}, 20 exceeded 5.0 m s^{-1}, and three attained speeds greater than 6.0 m s^{-1}. The fastest gait used by elephants has been variously described as a walk, amble, trot, pace, rack or a running walk[1-5], but — given that these speeds are relatively fast — how well does this gait of the fastest elephants fit the definitions of running?

Several kinematic factors distinguish quadrupedal walking from running. First, trotting and galloping are running gaits with footfall patterns that are distinct from walking[5]. Second, an aerial phase (a period during which no foot touches the ground) often marks the transition from walking to running[5]. Third, a run has been defined as any gait with a duty factor (the fraction of a complete sequence of footfalls for which a given foot is in contact with the ground) of less than 0.50 (ref. 5). Our elephants maintained the same walking footfall pattern (Fig. 2a) and always kept at least one foot in contact with the ground, although they used duty factors as low as 0.37.

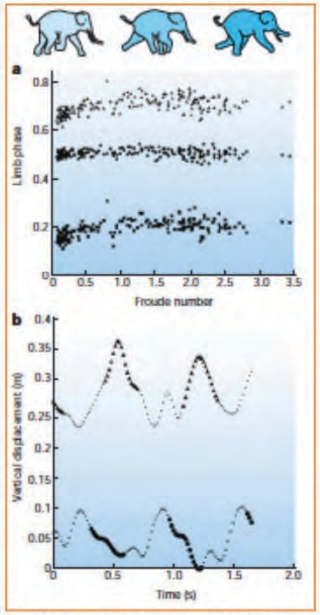


Figure 2 Biomechanics of rapid movement by Asian elephants (*Elephas maximus* L.). **a**, Relative limb phase (fraction of stride time for which each foot comes into contact with the ground after the left hind foot) plotted against dimensionless speed (Froude number). At all speeds, the left hind foot, then the left front (squares), then the right hind (circles), then the right front foot (triangles) contact the ground in the same sequence. Images of elephants moving at 6.6 m s^{-1} (Froude number, 3.1; see movie in supplementary information) illustrate these footfall patterns, which are typical of quadrupedal walking[5]. **b**, Vertical displacements of the hip (circles) and shoulder (triangles) joints plotted against time for one individual moving at 6.8 m s^{-1} (Froude number, 2.8). Large symbols indicate stance phase; small symbols indicate swing phase. This downward hip movement was typical of all fast-moving elephants; many showed a downward-then-upward pattern during stance. Roughly 2.5 strides are shown, beginning just before and ending just after the 10-m section of the observation course.

Figure 1 An Asian elephant marked with dots for ga

Walking and running can also guished by the forces involved. Th number (Fr) is a dimensionle calculated as velocity²/(acceleration ty × hip height). At speeds beyon the force needed to keep the body circular arc during stance exceeds of gravity. Theoretically, this r walking animal to leave the ground Most animals usually switch from a run at Fr ≈ 0.50, presumably bec energetic or mechanical trigg quadrupeds switch from a trot to a Fr ≈ 2.5 (ref. 6). The elephants exceeded Fr 1.0, reaching Fr values 3.4 — speeds that are inconsiste quadrupedal walking gait. Other such as running birds[8], also have r gaits at high Froude numbers.

It is the exchange of gravitation tial and kinetic energy that fund distinguishes walking and runnin centre of mass is highest at mid- walking, but lowest at mid-stanc ning[12]. Our analysis shows that at lo as expected for walking, elephants and hip joints rise and then fall (vertical motion of the centre of ma the stance phase. At the highest s vertical movements of the shoulde walking, but hip motion indicates (Fig. 2b). During the stance phase o limb, shoulder motion resembles moving upwards and then downwa the front foot is on the ground, wi hip's motion during the stance ph hindlimb is characteristic of runnin downwards and then upwards.

Usually, the various criteria fo and running are consistent, maki tively easy to distinguish walking f ning, but this is not true in th elephants. Our observations sugge greater speeds, elephants do m merely walk. Ground-reaction-fo are needed to demonstrate co whether the elephants' gait involves spring-

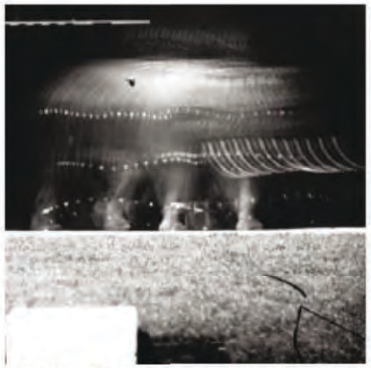
Early work on elephant gait not to be forgotten

Sir — I was fascinated by the beautiful video analysis of elephants' gaits performed by J. R. Hutchinson *et al.* (*Nature* **422**, 493–494; 2003) but surprised to find no mention of Etienne-Jules Marey, who pioneered an analysis of elephant motion, photographically, in 1887 (E. J. Marey & C. Pagès, *C. R. Acad. Sci.* **105**, 149–156; 1887).

It is true that Eadweard Muybridge had photographed elephants in motion a couple of years earlier, but he did not mark up the salient joints as Marey did, and so could not measure vertical movement at the hip or shoulder. Moreover, his use of a battery of 24 separate cameras could not provide a "chronophotograph", as Marey called it, of successive configurations superimposed on a single plate. (Marey secured this by using an ordinary camera with a slotted-disc shutter rotating behind the open lens.) Such photographs, and the diagrams that could be extracted from them, were necessary if one was to analyse the biomechanics involved.

Marey's elephants (see illustration) were marked in the same way as those of Hutchinson and colleagues. His motion analyses, which were far more probing and extensive than Muybridge's, are described very fully in Marta Braun's *Picturing Time: The work of Etienne-Jules Marey, 1830–1904* (University of Chicago Press, Chicago, 1992).

Oliver Sacks
New York University School of Medicine, Psychiatry and Neurology, 2 Horatio Street 3C, New York, New York 10014, USA



First steps: chronophotographs by Etienne-Jules Marey showed how elephants walked.

Making a song and dance about emotion

Sir — The idea that dancing rids the body of nervous emotion was an old one even in 1953, as pointed out in '50 years ago' (*Nature* **422**, 673; 2003).

Alfred Wallace, arguing against Darwin's notion of sexual selection in his book *Darwinism* (MacMillan, London & New York; 1889), suggested that "the act of singing [by male birds] is evidently a pleasurable one and probably serves as an outlet for superabundant nervous energy and excitement, just as dancing, singing and field sports do for men".

A man of impeccable manners, Wallace — although not conceding a role for dance in the life of birds — concluded that "singing… may well have originated merely as… an invitation from the male to the female".

I await with nervous anticipation my invitation to *Nature*'s next party.

Rupert C. Marshall
School of Biological Sciences, Royal Holloway, University of London, Egham, Surrey TW20 0EX, UK

Claiming uniqueness

Received: 17 October 2016 | Revised: 11 July 2017 | Accepted: 15 July 2017
DOI: 10.1111/vru.12566

ORIGINAL INVESTIGATION

WILEY

Ultrasonographic measurement of caudal vena cava to aorta ratios for determination of volume depletion in normal beagle dogs

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Abstract

A noninvasive method for quantifying hydration status would be helpful for clinical management and for research applications in dogs. This prospective, experimental, pilot study aimed to assess the feasibility of ultrasonographic measurement of the caudal vena cava to aorta ratio as a method for quantifying volume depletion in dogs. In 12 normal beagle dogs, furosemide was administered intravenously at a dose of 1 mg/kg, every 2 h, for 8 h, to induce consecutive volume depletion. Every 30 min after administration, ultrasonographic images of the caudal vena cava and aorta, and physical and biological parameters related to dehydration were acquired. On transverse and longitudinal planes of caudal vena cava and aorta images, the height and area of the caudal vena cava and aorta were measured to calculate the caudal vena cava/aorta ratios. All images were acquired by approaching from the right intercostal space with the dogs in left lateral recumbency. A negative correlation was present between the percentage of weight loss in dogs and all four investigated caudal vena cava/aorta ratios (transverse plane width of the caudal vena cava [TW]/aorta; transverse plane height of caudal vena cava [TH]/aorta; longitudinal plane area of the caudal vena cava [TA]/aorta; and longitudinal plane maximal height of the caudal vena cava [L]/aorta). Significant differences ($P < 0.001$) were seen between dogs with and without clinical signs of dehydration for all caudal vena cava/aorta ratios. Findings indicated that ultrasonographic caudal vena cava/aorta ratios are feasible methods for quantifying volume depletion and for use as an adjunct to standard subjective methods for estimating hydration status in dogs.

KEY WORDS
canine, caudal vena cava, dehydration, ultrasonic diagnosis, ultrasound

1 | INTRODUCTION

Dehydration is a state commonly encountered in animal patients with decreased fluid intake, resulting from anorexia or increased fluid loss via urinary and gastrointestinal routes.[1] Current standard methods for determining the dehydration status of an animal involve evaluation of the physical examination data, history, and results of a few simple laboratory tests, however this approach has been questioned due to inaccuracies.[1,2] Therefore, numerous studies for developing evaluation methods with reliability and accuracy have been introduced in veterinary as well as human medicine.[3-8]

The ratios of the diameters of the inferior vena cava and aorta based on ultrasonography have been previously reported as useful and noninvasive parameters for evaluating dehydration and have been shown to correlate with hydration status in human patients.[9-11] Several radiographic studies for evaluation of hydration status have reported that the caudal vena cava size is decreased in dogs with hypovolemic status.[12,13] And in one recent study, a correlation between systolic pressure variation and the caudal vena cava to aorta ratios in anesthetized hypovolemic dogs was evaluated.[14] [Correction added on 2 February 2018, after first online publication: the preceding sentences have been revised for clarity. The in-text citation of Meneghini et al, 2016 [14] has been added and have renumbered the subsequent references.]

Therefore, this study was performed to assess the feasibility of ultrasonographic methods for quantifying the degree of dehydration, to test correlations between caudal vena cava/aorta ratios and the

Claiming uniqueness

Received: 17 October 2016 | Revised: 11 July 2017 | Accepted: 15 July 2017
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ORIGINAL INVESTIGATION

WILEY

Ultrasonographic measurement of caudal vena cava to aorta ratios for determination of volume depletion in normal beagle dogs

LETTER TO THE EDITOR

WILEY

Using ideas and methodologies from other authors without proper referencing is a form of plagiarism!

in normal beagle dogs. They noted the originality of using this proposed method in dogs several times and stated, "Although the ultrasonographic measurements of the IVC diameter have already been reported for estimation of intravascular volume in human medicine, no such ultrasonographic methods have been reported for measurement of caudal vena cava size in veterinary medicine," without properly referencing previously published studies that have employed this ultrasonographic method using the caudal vena cava for volemic assessment in dogs.[2,3] The method proposed by Kwak et al. is neither original nor is their report the first published article to report on the use of this method on dogs. In fact, without proper refer-

Taking others' data

Short Communication

Will current conservation responses save the Critically Endangered Sumatran rhinoceros *Dicerorhinus sumatrensis*?

Rasmus Gren Havmøller, Junaidi Payne, Widodo Ramono, Susie Ellis K. Yoganand, Barney Long, Eric Dinerstein, A. Christy Williams Rudi H. Putra, Jamal Gawi, Bibhab Kumar Talukdar and Neil Burgess

Abstract The Critically Endangered Sumatran rhinoceros *Dicerorhinus sumatrensis* formerly ranged across South-east Asia. Hunting and habitat loss have made it one of the rarest large mammals and the species faces extinction despite decades of conservation efforts. The number of individuals remaining is unknown as a consequence of inadequate methods and lack of funds for the intensive field work required to estimate the population size of this rare and solitary species. However, all information indicates that numbers are low and declining. A few individuals persist in Borneo, and three tiny populations remain on the Indonesian island of Sumatra and show evidence of breeding. Rhino Protection Units are deployed at all known breeding sites but poaching and a presumed low breeding rate remain major threats. Protected areas have been created for the rhinoceros and other in situ conservation efforts have increased but the species has continued to go locally extinct across its range. Conventional captive breeding has also proven difficult; from a total of 45 Sumatran rhinoceros taken from the wild since 1984 there were no captive births until 2001. Since then only two pairs have been actively bred in captivity, resulting in four births, three by the same pair at the Cincinnati Zoo and one at the Sumatran Rhino Sanctuary in Sumatra, with the sex ratio skewed towards males. To avoid extinction it will be necessary to implement intensive management zones, manage the metapopulation as a single unit, and develop advanced reproductive techniques as a matter of urgency. Intensive census efforts are ongoing in Bukit Barisan Selatan but elsewhere similar efforts remain at the planning stage.

Keywords Conservation planning, Critically Endangered, extinction, advanced reproductive technology, intensive management zones, metapopulation management, Sumatran rhino, South-east Asia

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Received 4 January 2015. Revision requested 26 February 2015. Accepted 20 March 2015. First published online 3 August 2015.

The Sumatran rhinoceros *Dicerorhinus sumatrensis* is categorized as Critically Endangered on the IUCN Red List (van Strien et al., 2008). It has been extirpated from > 99% of its former range, is threatened by poaching for its horn and has proven difficult to breed in captivity (Dinerstein, 2011). Poaching of rhinoceroses has soared in recent years (Emslie, 2013) and was the primary cause of extinction of the western black rhinoceros *Diceros bicornis longipes* and wild northern white rhinoceros *Ceratotherium simum cottoni* in Africa (Emslie, 2011a, b), and the Javan rhinoceros *Rhinoceros sondaicus annamiticus* in mainland South-east Asia (Brook et al., 2012). It has also been a causal factor in the decline of the Sumatran rhinoceros, which has also been affected by habitat loss and isolation (Ahmad et al., 2013). Here we outline the population status of the Sumatran rhinoceros, summarize the threats to its survival and highlight the main components and progress of the emergency plan developed during the April 2013 Sumatran Rhino Crisis Summit in Singapore and later agreed upon in the Bandar Lampung Declaration in October 2013.

Reliable population estimates for Sumatran rhinoceros have always been difficult to obtain. After years of suspected decline, the population was assessed in 2009 to comprise 200–216 individuals (Zafir et al., 2011). We provide an updated estimate (Fig. 1) but it should be noted that robust

Oryx, 2016, 50(2), 355–359 © 2015 Fauna & Flora International doi:10.1017/S0030605315000472

Taking others' data

Short Communication

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et al., 2012; WWF–Malaysia, 2012). Tabin Wildlife Reserve in Sabah, Malaysia, was believed to contain as many as 20 rhinoceroses in the 1980s but records of fresh footprints declined thereafter. Since 2007 there have been no definite signs of the presence of wild rhinoceroses in the Reserve other than those of a female that was captured in 2011. This was despite an effort by Borneo Rhino Alliance of 11,600 trap-days at 52 trap stations covering > 300 km^2 in a 2.5 × 2.5 km^2 grid during July 2012–July 2013, overlapping the entire area where footprints had been recorded during 1995–2005.

Taking others' data

Will current conservation responses save the Critically Endangered Sumatran rhinoceros *Dicerorhinus sumatrensis*? —CORRIGENDUM

Rasmus Gren Havmøller, Junaidi Payne, Widodo Ramono, Susie Ellis
K. Yoganand, Barney Long, Eric Dinerstein, A. Christy Williams
Rudi H. Putra, Jamal Gawi, Bibhab Kumar Talukdar and Neil Burgess

Doi: 10.1017/S0030605315000472. Published online by Cambridge University Press, 3 August 2015

The following text was mistakenly omitted from the acknowledgements of this article (Havmøller et al., 2015):

For Sabah, Rasmus Gren Havmøller and J. Payne gratefully acknowledge the support of the Federal Ministry of Education and Research, Germany, the Leipzig Zoo and SOS Rhino for supplying financial support for the camera trap study conducted by P. Kretzschmar & T. Bohm from the Leibniz Institute for Zoo and Wildlife Research in the Tabin Wildlife Reserve during 2012–2013, in cooperation with the Borneo Rhino Alliance. The results of the Tabin data presented here are preliminary and approximate. A full analysis of the data obtained from that study will be published by P. Kretzschmar et al.

Reference

Havmøller, R.G., Payne, J., Ramono, W., Ellis, S., Yoganand, K., Long, B. et al. Will current conservation responses save the Critically Endangered Sumatran rhinoceros *Dicerorhinus sumatrensis*? Published 3 August 2015, doi:10.1017/S0030605315000472.

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Will current conservation res
Critically Endangered Sumatr
Dicerorhinus sumatrensis? —

Rasmus Gren Havmøller, Junaidi P
K. Yoganand, Barney Long, Eric
Rudi H. Putra, Jamal Gawi, Bibhab

Doi: 10.1017/S0030605315000472. Published online by Cambridge

The following text was mistakenly omitted from the acknowledgements of this article (Havmøller et al., 2015):

For Sabah, Rasmus Gren Havmøller and J. Payne gratefully acknowledge the support of the Federal Ministry of Education and Research, Germany, the Leipzig Zoo and SOS Rhino for supplying financial support for the camera trap study conducted by P. Kretzschmar & T. Bohm from the Leibniz Institute for Zoo and Wildlife Research in the Tabin Wildlife Reserve during 2012–2013, in cooperation with the Borneo Rhino Alliance. The results of the Tabin

also proven difficult; from a total of 45 Sumatran rhinoceros taken from the wild since 1984 there were no captive births

Red List (van Strien et al., 2008). It
from > 99% of its former range, is th
for its horn and has proven difficult
(Dinerstein, 2011). Poaching of rhino
recent years (Emslie, 2011) and was
extinction of the western black rhino
simum cottoni in Africa (Emslie, 2011a
rhinoceros *Rhinoceros sondaicus annam*
South-east Asia (Brook et al., 2012). It
factors in the decline of the Sumatran
also been affected by habitat loss a
Sumatran rhinoceros, summarize the
and highlight the main components
emergency plan developed during
Sumatran Rhino Crisis Summit in
agreed upon in the Bandar Lam
October 2013.

Reliable population estimates for
have always been difficult to obtain. A
decline, the population was assessed
200–216 individuals (Zafir et al., 201
dated estimate (Fig. 1) but it should

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Jamal Gawi Leuser International Foundation, Banda Aceh, Aceh, Indonesia
Bibhab Kumar Talukdar IUCN Species Survival Commission Asian Rhino Specialist Group, Guwahati, Assam, India
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Received 20 February 2014. Revised 16 February 2015.
Accepted 20 March 2015. First published online 3 August 2015.

Oryx, 2016, 50(2), 355–359 © 2015 Fauna & Flora International doi:10.1017/S0030605315000472

et al., 2010; WWF-Malaysia, 2012). Tabin Wil
in Sabah, Malaysia, was believed to contain as
rhinoceroses in the 1980s but records of fresh f
clined thereafter since 2007 the last
signs of the presence of wild rhinoceroses in
other than those of a female that was captu
This was despite an effort by Borneo Rhino
11,6[illegible] trap-days at 52 trap stations covering >
a 2.5×2.5 km grid during July 2012–July 2013
the entire area where footprints had been rec
1995–2005.

Global Ecology and Conservation 6 (2016) 257–275

Contents lists available at ScienceDirect

Global Ecology and Conservation

journal homepage: www.elsevier.com/locate/gecco

Review paper

The catastrophic decline of the Sumatran rhino (*Dicerorhinus sumatrensis harrissoni*) in Sabah: Historic exploitation, reduced female reproductive performance and population viability

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HIGHLIGHTS

- The reason for the recent decline of the Sumatran rhino is poorly understood.
- The remaining small isolated rhino populations are deemed to go extinct.
- Historic exploitation led to low numbers of Sumatran rhinos on Borneo.
- PVA analyses identify the fertility of females as key factor for population growth.
- A resource selection study identifies habitat characteristics preferred by the rhinos in Sabah.

ARTICLE INFO

Article history:
Received 27 November 2015
Received in revised form 23 February 2016
Accepted 23 February 2016

Keywords:
Megaherbivore
Sumatran rhino
Conservation
Extinction
Resource selection function
Population viability analyses

ABSTRACT

The reasons for catastrophic declines of Sumatran rhinos are far from clear and data necessary to improve decisions for conservation management are often lacking. We reviewed literature and assembled a comprehensive data set on surveys of the Sumatran rhino subspecies (*Dicerorhinus sumatrensis harrissoni*) in the Malaysian state of Sabah on Borneo to chart the historical development of the population in Sabah and its exploitation until the present day. We fitted resource selection functions to identify habitat features preferred by a remnant population of rhinos living in the Tabin Wildlife Reserve in Sabah, and ran a series of population viability analyses (PVAs) to extract the key demographic parameters most likely to affect population dynamics. We show that as preferred habitat, the individuals in the reserve were most likely encountered in elevated areas away from roads, in close distance to mud-volcanoes, with a low presence of human trespassers and a wallow on site, and within a neighbourhood of dense forest and grassland patches

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http://dx.doi.org/10.1016/j.gecco.2016.02.006

Taking others' data

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Received 27 November 2014. Revised 20 February 2015. Accepted 26 March 2015. First published online 3 August 2015.

Global Ecology and Conservation 6 (2016) 257–275

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Between June 2012 and November 2013, we conducted a camera trap survey in areas with known rhino presence in previous years (Figure A1). The survey was carried out in the central and northern part of the TWR and ranged over an area of 301 km^2. A total of 57 camera trap stations were placed along a square grid of 6 km^2. The grid size was chosen according to the minimum home range size of Sumatran rhinos of 10 km^2 (Strien, 1986). Cameras were spaced at an average of 2.4 km at locations preferred by rhinos, such as game trails, mud wallows or hill crest. This set up enabled us to sample all rhinos possibly ranging in the survey area. Two remotely triggered infrared cameras (Reconyx PC 800 Hyperfire Professional IR, Reconyx. Inc, Wisconsin, USA) were placed at each camera trap station. The cameras set to operate for 24 h each day. Stations were checked every two to three months and the number of days each camera trap station was functional over the total survey period was recorded.

A total of 781.9 km of surveys and a total of 10,316 trapping days (counting only functional camera traps) provided no evidence of Borneo rhino presence in TWR anymore.

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http://dx.doi.org/10.1016/j.gecco.2016.02.006

Taking others' data

Hypoxia of the growing liver accelerates regeneration

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Background. After portal vein ligation of 1 side of the liver, the other side regenerates at a slow rate. This slow growth may be accelerated to rapid growth by adding a transection between the 2 sides, i.e., performing portal vein ligation and parenchymal transection. We found that in patients undergoing portal vein ligation and parenchymal transection, portal vein hyperflow in the regenerating liver causes a significant reduction of arterial flow due to the hepatic arterial buffer response. We postulated that the reduction of arterial flow induces hypoxia in the regenerating liver and used a rat model to assess hypoxia and its impact on kinetic growth.

Methods. A rat model of rapid (portal vein ligation and parenchymal transection) and slow regeneration (portal vein ligation) was established. Portal vein flow and pressure data were collected. Liver regeneration was assessed in rats using computed tomography, proliferation with Ki-67, and hypoxia with pimonidazole and HIF-1α staining.

Results. The rat model confirmed acceleration of regeneration in portal vein ligation and parenchymal transection as well as the portal vein hyperflow seen in patients. Additionally, tissue hypoxia was observed after portal vein ligation and parenchymal transection, while little hypoxia staining was detected after portal vein ligation. To determine if hypoxia is a consequence or an inciting stimulus of rapid liver regeneration, we used a prolyl-hydroxylase blocker to activate hypoxia signaling pathways in the slow model. This clearly accelerated slow to rapid liver regeneration. Inversely, abrogation of hypoxia led to a blunting of rapid growth to slow growth. The topical application of prolyl-hydroxylase inhibitors on livers in rats induced spontaneous areas of regeneration.

Conclusion. This study shows that pharmacologically induced hypoxic signaling accelerates liver regeneration similar to portal vein ligation and parenchymal transection. Hypoxia is likely an accelerator of liver regeneration. Also, prolyl-hydroxylase inhibitors may be used to enhance liver regeneration pharmaceutically. (Surgery 2017;161:666-79.)

From the Institute of Physiology,[a] Center for Integrative Human Physiology, University of Zürich, Zürich, Switzerland; Division of Transplant Surgery, Department of Surgery,[b] Rush University Medical Center, Chicago, IL; Department of Surgery, Cantonal Hospital Winterthur,[c] Zürich, Switzerland; Division of Hepatology, Department of Gastroenterology,[d] and Division of Transplantation, Department of Surgery,[f] Duke University, Durham, NC; Institute of Anesthesiology,[e] University Hospital Zürich, Zürich, Switzerland; Department of Anesthesiology,[h] University of Illinois Chicago, Chicago, IL.

THE LIVER REGENERATES EXTENSIVELY AFTER INJURY TO HEPATOCYTES, partial removal of liver tissue (partial hepatectomy), and upon flow abrogation of 1 of the 2 portal vein branches.[1] Portal vein occlusion may be achieved either through interventional embolization or surgical ligation, while the hepatic artery supplies oxygen and nutrition to the ligated lobe. This maneuver, first described by liver surgeons almost 80 years ago,[2] results in growth of the nonligated part of the liver. Liver regeneration after portal vein manipulation found its clinical application in liver operations performed to increase the size of the disease-free liver prior to extensive resections.[3] With this application, removal of previously unresectable liver tumors with extended hepatectomies became possible.

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Accepted for publication May 17, 2016.

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0039-6060/$ - see front matter

http://dx.doi.org/10.1016/j.surg.2016.05.018

Taking others' data

Hypoxia of the growing liver accelerates regeneration

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0039-6060/$ - see front matter

http://dx.doi.org/10.1016/j.surg.2016.05.018

We acknowledge the contribution of Tobias Piegeler, MD to the collection of data for the animal experiment and to the drafting of the first version of this paper.

Taking others' data

Hypoxia of the growing liver accelerates regeneration

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Birgit Roth Z'graggen, PhD,[a] Roland H. Wenger, PhD,[a] Donat R. Spahn, MD,[a]

Notice of concern regarding: Hypoxia of the growing liver accelerates regeneration

Rolf Graf, PhD, Henrik Petrowsky, MD, Philipp Dutkowski, MD, *and* **P. A. Clavien, MD, PhD,** *Zurich, Switzerland*

From the Department of Surgery and Transplantation, University Hospital of Zurich, Zurich, Switzerland

We discovered with astonishment the paper by Schadde et al,[1] which reports data on patients from the Department of Surgery and Transplantation at the University Hospital of Zurich, Zurich, Switzerland. While these data were gathered under the institutional review board of the Associating Liver Partition and Portal Vein Ligation for Stated Hepatectomy (ALPPS) registry, neither the principal investigator and sponsor, nor any faculty member of the Department of Surgery or scientific committee of the ALPPS registry, were informed of the use of these data. Although we do not support such practice, we would keep the courtesy to let these human data be made publically available.

10.1016/j.surg.2016.05.018
Accepted for publication December 15, 2016.
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Surgery 2017;161:666-79.
0039-6060/$ - see front matter
http://dx.doi.org/10.1016/j.surg.2016.12.024

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1. Schadde E, Tsatsaris C, Swiderska-Syn M, Breitenstein S, Urner M, Schimmer R, et al. Hypoxia of the growing liver accelerates regeneration. Surgery 2016, http://dx.doi.org/10.1016/j.surg.2016.05.018. [Epub ahead of print].

Integrity

teamplay

Teamplay

Journal of Zoo and Wildlife Medicine 46(4): 755–766, 2015

ETORPHINE–KETAMINE–MEDETOMIDINE TOTAL INTRAVENOUS ANESTHESIA IN WILD IMPALA (*AEPYCEROS MELAMPUS*) OF 120-MINUTE DURATION

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Abstract: There is a growing necessity to perform long-term anesthesia in wildlife, especially antelope. The costs and logistics of transporting wildlife to veterinary practices make surgical intervention a high-stakes operation. Thus there is a need for a field-ready total intravenous anesthesia (TIVA) infusion to maintain anesthesia in antelope. This study explored the feasibility of an etorphine–ketamine–medetomidine TIVA for field anesthesia. Ten wild-caught, adult impala (*Aepyceros melampus*) were enrolled in the study. Impala were immobilized with a standardized combination of etorphine (2 mg) and medetomidine (2.2 mg), which equated to a median (interquartile range [IQR]) etorphine and medetomidine dose of 50.1 (46.2–50.3) and 55.1 (50.8–55.4) µg/kg, respectively. Recumbency was attained in a median (IQR) time of 13.9 (12.0–16.5) min. Respiratory gas tensions, spirometry, and arterial blood gas were analyzed over a 120-min infusion. Once instrumented, the TIVA was infused as follows: etorphine at a variable rate initiated at 40 µg/kg per hour (adjusted according to intermittent deep-pain testing); ketamine and medetomidine at a fixed rate of 1.5 mg/kg per hour and 5 µg/kg per hour, respectively. The etorphine had an erratic titration to clinical effect in four impala. Arterial blood pressure and respiratory and heart rates were all within normal physiological ranges. However, arterial blood gas analysis revealed severe hypoxemia, hypercapnia, and acidosis. Oxygenation and ventilation indices were calculated and highlighted possible co-etiologies to the suspected etorphine-induced respiratory depression as the cause of the blood gas derangements. Impala recovered in the boma post atipamezole (13 mg) and naltrexone (42 mg) antagonism of medetomidine and etorphine, respectively. The etorphine–ketamine–medetomidine TIVA protocol for impala may be sufficient for field procedures of up to 120-min duration. However, hypoxemia and hypercapnia are of paramount concern and thus oxygen supplementation should be considered mandatory. Other TIVA combinations may be superior and warrant further investigation.

Key words: *Aepyceros melampus*, etorphine, impala, ketamine, medetomidine, TIVA.

INTRODUCTION

Etorphine immobilization in impala (*Aepyceros melampus*) has been studied since the 1960s.[1,7] Despite decades of use in impala, etorphine immobilization has only been described and no reports are available mentioning its use for the long-term maintenance of surgical anesthesia. The lack of its incorporation into anesthetic maintenance protocols is perhaps because of pronounced dose-related respiratory depression.[4,23,24] In order to decrease the dose of etorphine and thus its undesirable characteristics, it can be used in a combination with other drugs with known analgesic and anesthetic sparing effects, such as a low dose of ketamine (a cyclohexamine dissociative anesthetic) or medetomidine (an alpha$_2$-adrenoceptor agonist) to achieve surgical anesthesia.[14]

In South Africa, because of the importance of antelope for conservation and the value of these animals in zoo and private wildlife collections, veterinary intervention is often required.[1,22] These animals, in particular impala, are prone to injury and are often presented to veterinarians for surgical intervention. Long-duration transport to veterinary facilities, field equipment, manpower limitations, and high cost make surgery on wildlife a challenge. A reliable field anesthetic protocol that does not require the logistical challenges of inhalation agents may make surgical interventions more accessible to antelope situated in remote

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Teamplay

Veterinary Anaesthesia and Analgesia 2017, 44, 138–143 http://dx.doi.org/10.1111/vaa.12402

SHORT COMMUNICATION

Propofol–medetomidine–ketamine total intravenous anaesthesia in thiafentanil–medetomidine-immobilized impala *(Aepyceros melampus)*

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Abstract

Objective To characterise a propofol–medetomidine-ketamine total intravenous anaesthetic in impala (*Aepyceros melampus*).

Study design Prospective clinical study.

Animals Ten adult female impala.

Materials and methods Impala were immobilised at 1253 m above sea level with 2.0 mg thiafentanil and 2.2 mg medetomidine via projectile darts. Propofol was given to effect (0.5 mg kg^{-1} boluses) to allow endotracheal intubation, following which oxygen was supplemented at 2 L minute^{-1}. Anaesthesia was maintained with a constant-rate infusion of medetomidine and ketamine at 5 μg kg^{-1} hour^{-1} and 1.5 mg kg^{-1} hour^{-1}, respectively, and propofol to effect (initially 0.2 mg kg^{-1} minute^{-1}) for 120 minutes. The propofol infusion was titrated according to reaction to nociceptive stimuli every 15 minutes. Cardiopulmonary parameters were monitored continuously and arterial blood gas samples were analysed intermittently. After 120 minutes maintenance, the thiafentanil and medetomidine were antagonised using naltrexone (10:1 thiafentanil) and atipamezole (5:1 medetomidine), respectively.

Results All impala were successfully immobilised. The median dose [interquartile range (IQR)] of propofol required for intubation was 2.7 (1.9–3.3) mg kg^{-1}. The propofol–medetomidine–ketamine combination abolished voluntary movement and ensured anaesthesia for the 120 minute period. Propofol titration showed a generally downward trend. Median (IQR) heart rate [57 (53–61) beats minute^{-1}], respiratory rate [10 (9–12) breaths minute^{-1}] and mean arterial blood pressure [101 (98–106) mmHg] were well maintained. Arterial blood gas analysis indicated hypoxaemia, hypercapnia and acidaemia. Butorphanol (0.12 mg kg^{-1}) was an essential rescue drug to counteract thiafentanil-induced respiratory depression. All impala regurgitated frequently during the maintenance period. Recovery was calm and rapid in all animals. Median (IQR) time to standing from antagonist administration was 4.4 (3.2–5.6) minutes.

Conclusions and clinical relevance A propofol–medetomidine–ketamine combination could provide adequate anaesthesia for invasive procedures in impala. The propofol infusion should begin at 0.2 mg kg^{-1} minute^{-1} and be titrated to clinical effect. Oxygen supplementation and airway protection with a cuffed endotracheal tube are essential.

Keywords *Aepyceros melampus*, impala, ketamine, medetomidine, propofol, total intravenous anaesthetic.

Introduction

Historically, wild ruminants are chemically immobilised for capture followed by prompt drug antagonism

Teamplay

Journal of Zoo and Wildlife Medicine 48(1): 62–71, 2017

CONTINUOUS INTRAVENOUS INFUSION ANESTHESIA WITH MEDETOMIDINE, KETAMINE, AND MIDAZOLAM AFTER INDUCTION WITH A COMBINATION OF ETORPHINE, MEDETOMIDINE, AND MIDAZOLAM OR WITH MEDETOMIDINE, KETAMINE, AND BUTORPHANOL IN IMPALA (*AEPYCEROS MELAMPUS*)

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Abstract: In order to develop a long-term anesthesia for flighty antelope species in field situations, two different protocols for induction and maintenance with an intravenous infusion were evaluated in wild-caught impala (*Aepyceros melampus*). Ten adult female impala were induced with two induction protocols: one consisted of 0.2 mg/kg medetomidine, 4 mg/kg ketamine, and 0.15 mg/kg butorphanol (MKB) and one consisted of 0.375 mg/kg etorphine, 0.2 mg/kg medetomidine, and 0.2 mg/kg midazolam (EMM). In both treatments, anesthesia was maintained with a continuous intravenous infusion (CII) at an initial dose rate of 1.2 µg/kg per hr medetomidine, 2.4 mg/kg per hr ketaminen and 36 µg/kg per hr midazolam. Partial reversal was achieved with naltrexone (2 : 1 mg butorphanol; 20 : 1 mg etorphine) and atipamezole (5 : 1 mg medetomidine). Evaluation of anesthesia included respiratory rate, heart rate, rectal temperature, arterial blood pressure, oxygen saturation, end tidal carbon dioxide tension, and tidal volume at 5-min intervals, palpebral reflex and response to painful stimuli at 15-min intervals, and arterial blood gases at 30-min intervals. Plasma cortisol concentration was determined after induction and before reversal. Duration and quality of induction and recovery were evaluated. EMM caused a faster induction of 9.5 ± 2.9 min compared to 11.0 ± 6.4 min in MKB. Recovery was also quicker in EMM (EMM: 6.3 ± 5.4 min; MKB: 9.8 ± 6.0 min). However, EMM also produced more cardiopulmonary side effects, including hypoxemia and hypercapnia, and calculated oxygenation indices ($PaCO_2$-$PETCO_2$) were worse than in MKB. One animal died after induction with EMM. The CII provided surgical anesthesia in 7 of 10 animals in MKB and in 9 of 9 animals in EMM for 120 min. In conclusion, the MKB induction protocol had advantages for prolonged anesthesia in impala with significantly less cardiopulmonary depression compared to EMM. The comparably decreased anesthetic depth could easily be adjusted by an increase of the CII.

Key words: *Aepyceros melampus*, CII, impala, ketamine, medetomidine, midazolam.

INTRODUCTION

Short-term anesthesia is commonly performed in antelope species in the field. Quick inductions are crucial to prevent exhaustion, hyperthermia,[23] and trauma in nervous species, and several combinations of potent opioids and α2-adrenoceptor agonists (α2-agonists) or tranquilizers have been established.[21] Potent opioids have the advantage of a quick induction but often cause poor respiration and muscle rigidity,[21,24,25] rendering them unsuitable for prolonged procedures. Impala (*Aepyceros melampus*) appear particularly susceptible to etorphine-induced respiratory depression,[24,25] which has been successfully addressed with administration of the mixed agonist-antagonist opioid butorphanol in other species.[14,27] Immobilization of impala with a combination of ketamine and relatively high doses of medetomidine was described to achieve reliable respiration and muscle relaxation; however, levels

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manuscript preparation without informing the other collaborators

Veterinary Anaesthesia and Analgesia 2017, 44, 991–1006 http://dx.doi.org/10.1016/j.vaa.2017.04.005

REVIEW ARTICLE

Chemical capture of impala (*Aepyceros melampus*): A review of factors contributing to morbidity and mortality

Gareth E Zeiler & Leith CR Meyer

Journal of Zoo and Wildlife Medicine 48(1): 1058–1071, 2017
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CAPTIVE MANAGEMENT OF WILD IMPALA (*AEPYCEROS MELAMPUS*) DURING INTENSIVE IMMOBILIZATION AND GENERAL ANESTHESIA STUDY TRIALS

Gareth E. Zeiler, M.Med.Vet. (Anaesthesiology), Dipl. E.C.V.A.A., Dipl. A.C.V.A.A., and Leith C.R. Meyer, B.V.Sc., Ph.D.

Journal of the South African Veterinary Association
ISSN: (Online) 2224-9435, (Print) 1019-9128

AOSIS

Page 1 of 8 Original Research

Comparison of thiafentanil-medetomidine to etorphine-medetomidine immobilisation of impalas (*Aepyceros melampus*)

Authors:
Gareth E. Zeiler
Leith C.R. Meyer

Impalas (*Aepyceros melampus*) are increasingly valuable in the South African wildlife industry, and there is a greater need to chemically immobilise them, ideally with minimal risk. This study aimed to compare the times to recumbency and physiological effects of thiafentanil-

Zeiler and Meyer BMC Veterinary Research (2017) 13:246
DOI 10.1186/s12917-017-1163-8

BMC Veterinary Research

RESEARCH ARTICLE Open Access

Blood acid-base status in impala (*Aepyceros melampus*) immobilised and maintained under total intravenous anaesthesia using two different drug protocols

Gareth E. Zeiler* and Leith C. R. Meyer

Trusting coauthors that are not trustworthy

CellPress

Cell Metabolism
Short Article

Grizzly Bears Exhibit Augmented Insulin Sensitivity while Obese Prior to a Reversible Insulin Resistance during Hibernation

O. Lynne Nelson,[1,10] Heiko T. Jansen,[2,10] Elizabeth Galbreath,[3] Kurt Morgenstern,[4] Jamie La[illegible] Gehring, Kimberly Scott Rigano,[5] Jae Lee,[6] Jianhua Gong,[6] Adam J. Shaywitz,[7,9] Chantal A. W[illegible],[8] Cha[illegible] T. Ro[illegible]ns,[5] and Kevin C. Corbit[6,*]
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http://dx.doi.org/10.1016/j.cmet.2014.07.008

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SUMMARY

The confluence of obesity and di[illegible]s a w[illegible]d-wide epidemic necessitates th[illegible]isco[illegible]ry of [illegible]w therapies. Success in this end[illegible]or [illegible]ans-latable preclinical studies, [illegible]ich [illegible]onally employ rodent models. As an a[illegible]rnative a[illegible]ach, we explored hibernation w[illegible]esity is a [illegible]ural adaptation to survive months o[illegible]sting. Here we report that grizzly bea[illegible] exhibit sea[illegible]al tripartite insulin responsivene[illegible] such that obes[illegible] animals augment insulin sens[illegible]ity b[illegible]only weeks later enter hibernation-specific [illegible] resist[illegible]e (IR) and subsequently reiniti[illegible]spon[illegible]one[illegible] upon awakening. Preparatio[illegible]or h[illegible]ernatio[illegible] characterized by adiposity [illegible]pled t[illegible]ncreased insulin sensitivity via modified PT[illegible]g specifically in adipose tissue, sugge[illegible]g a state of "healthy" obesity analogous to huma[illegible] with *PTEN* haploinsufficiency. Collectively, we show that bears reversibly cope with homeostatic perturbations considered detrimental to humans and describe a mechanism whereby IR functions not as a late-stage metabolic adaptation to obesity, but rather a gatekeeper of the fed-fasting transition.

INTRODUCTION

The World Health Organization has proclaimed that obesity may replace more traditional public maladies, such as undernutrition, as the most significant cause of poor human health (Fauci, 2008). However, only three antiobesity drugs are currently marketed (Yanovski and Yanovski, 2014), despite numerous preclinical [illegible]esses, questioning the predictive power of traditional research models (Vickers et al., 2011). An alternative approach uses natural extreme biology where evolutionary experimentation has solved complex physiological problems (Rowe et al., 2013; Seifert et al., 2012; Smith et al., 2011; Tian et al., 2013; Tøien et al., 2011). For example, hibernating animals annually become obese to survive prolonged periods of sparse food availability.

Hibernation is an astonishing feat of evolution. Following a period of unparalleled hyperphagia and weight gain, bears do not eat for up to 7 months and subsist solely on stored fat while in a hypometabolic state near normal body temperature (Tøien et al., 2011). Preparation for hibernation centers on considerable fat accumulation, which necessitates a lipogenic state. In contrast, prolonged fasting during the winter months is overcome by utilization of stored lipids via lipolysis (Nelson, 1973). How these annual physiological adaptations—hyperphagia, obesity, and lipolysis—are controlled is unknown. We decided to study the metabolic consequences of these extreme states in the grizzly bear (*Ursus arctos horribilis*).

RESULTS AND DISCUSSION

Grizzly bears were housed and studied in October (prehibernation), January (hibernation), and May (posthibernation) as described (Nelson and Robbins, 2010). We utilized bears of variable ages and sex to determine if the physiological responses observed were broadly relevant or specific to a subset of bears. In addition, for serum insulin measurements, we used four female bears that were born in captivity and trained to undergo sample collection without the potentially confounding effects of anesthesia. Preparation for hibernation was characterized by striking increases in body weight and fat (Table 1). We sought to determine if these alterations were accompanied by metabolic adaptations typically found in obese humans. Seasonal changes

Trusting coauthors that are not trustworthy

CellPress

Cell Metabolism
Short Article

Grizzly Bears Exhibit Augmented Insulin Sensitivity while Obese Prior to a Reversible Insulin Resistance during Hibernation

CellPress

Cell Metabolism
Retraction

Retraction Notice to: Grizzly Bears Exhibit Augmented Insulin Sensitivity while Obese Prior to a Reversible Insulin Resistance during Hibernation

O. Lynne Nelson, Heiko T. Jansen, Elizabeth Galbreath, Kurt Morgenstern, Jamie Lauren Gehring, Kimberly Scott Rigano, Jae Lee, Jianhua Gong, Adam J. Shaywitz, Chantal A. Vella, Charles T. Robbins, and Kevin C. Corbit*
*Correspondence: kcorbit@amgen.com
http://dx.doi.org/10.1016/j.cmet.2015.08.011

(Cell Metabolism *20*, 376–382; August 5, 2014)

Amgen requested the retraction as an outcome of an internal review where it was determined that one of the Amgen authors had manipulated specific experimental data presented in Figures 1 and 3. Because of data manipulation, this author is no longer employed by Amgen. The authors at Washington State University and University of Idaho are confident that the physiological data generated for this manuscript are accurate and representative of the true metabolic responses of these grizzly bears and are currently repeating the mechanistic portions of the study. Amgen deeply regrets this circumstance and extends their sincere apologies to the scientific community.

transition.

INTRODUCTION

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Integrity

beyond the grey zone

Claiming uniqueness

June 30, 2016

Journal of Zoo and Wildlife Medicine
American Association of Zoo Veterinarians
581 705 White Oak Rd
Yulee, FL
32097 USA

Dear Editors:

Please find enclosed a manuscript entitled: "Influence of pork and pork by-products on macronutrient and energy digestibility and palatability in African wildcats (*Felis silvestris lybica*) and microbial population evaluation in raw meat diets" that we would like to submit for exclusive consideration of publication as an article in Journal of Zoo and Wildlife Medicine.

The authors appreciate the consideration of this unique manuscript. The objectives of the research included evaluation of nutrient digestibility and fecal scores of four commercially available raw meat carnivore diets in a small felid model species, African wildcat (*Felis silvestris lybica*). The diet treatments evaluated included a 100% raw pork based diet (Carnivore Essentials). Pork has not traditionally been utilized as a viable raw meat option for zoo carnivores; however, advances in swine management have eliminated many concerns and pork is a timely and novel meat option for the zoo industry. The pork diet was compared to three commonly fed carnivore diets (Nebraska Brand Premium Feline, Nebraska Brand Special Beef Feline and Triple A Brand). In addition, common microbial screens were conducted on all tested diets and standard methods of caloric density (metabolizable energy) were compared. We believe these data are exceptionally valuable for veterinarians and nutritionists because they provide information regarding the value of additional options when managing diets of carnivores. In addition, to the authors' knowledge, this is the first study to compare metabolizable energy calculated using both the NRC equations and standard Modified Atwater values applied to carnivore diets. The data demonstrate the differences and possible underestimation of ME for zoological carnivore diets. Veterinarians managing carnivores would benefit from these data because they will provide insight into obesity and body condition concerns of managed felids and other carnivores consuming raw meat diets.

Claiming uniqueness

June 30, 2016

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benefit from these data because they will prov
concerns of managed felids and other carnivo

Influence of pork and pork by-products on macronutrient and energy digestibility and palatability in large exotic felids

C. J. Iske,* C. L. Morris,*†[1] and K. L. Kappen†

*Department of Animal Sciences, Iowa State University, Ames 50011;
and †Omaha's Henry Doorly Zoo & Aquarium, Omaha, NE 68107

ABSTRACT: Two experiments were conducted to evaluate digestibility and palatability of a new commercial pork-based raw diet for zoo-managed felids. Currently 2 protein sources (beef or horse) comprise the majority of commercial raw meat diet formulations for exotic carnivores in zoological institutions. Pork-based diets have traditionally not been widely utilized and thus nutrient digestibility of pork has not been adequately evaluated in exotic carnivores. The objectives of this study were 1) to determine if a pork-based diet had similar apparent total tract macronutrient digestibility and fecal scores as standard zoo carnivore diets formulated with either horse or beef, in large exotic felids and 2) evaluate palatability of pork for use in zoos. Ten exotic felids were used including cheetahs (*Acinonyx*

d for treatment adaptation followed by 4 d of sample collection. Dry matter and crude protein apparent digestibility values were greater ($P < 0.05$) in felids fed Pork (88.0 and 95.7%) compared with felids fed Horse (83.6 and 92.7%) and B2 (85.6 and 93.1%). Apparent organic matter digestibility was greater ($P < 0.05$) in felids fed Pork (90.8%) than felids fed Horse (88.5%). Apparent fat digestibility values were high across all treatments but were greater ($P < 0.05$) in felids fed Pork (98.5%) compared with felids fed B1 (95.5%) or B2 (96.5%). Gross energy digestibility values were greater in felids fed Pork (92.4%) compared with B1 (90.2%). Average fecal scores were 2.30, 2.94, 3.42, and 3.54 for Horse, Pork, B1 and B2, respectively; and were different ($P < 0.05$) between treatments with exception of B1 and B2

Calculations for ME using modified Atwater factors and the NRC equation predicted 4.6, 4.5, 4.7, and 4.9

pork-based diet (Pork). Fecal scores also were evaluated (1 = hard to 5 = watery/liquid). This randomized crossover design study consisted of 4 periods, each 10

and palatability compared with standard zoo carnivore formulations. In conclusion, pork-based diets could be included among dietary options for large zoo felids.

Key words: exotic felids, fecal scores, nutrient digestibility, palatability, pork, raw diet

J. Anim. Sci. 2016.94:3738–3745
doi:10.2527/jas2016-0414

INTRODUCTION

In zoological institutions, carnivores are typically fed raw meat diets manufactured with beef or horsemeat as primary protein sources. Although research studies addressing health benefits of raw meat diets in felids are lacking, several studies have documented greater digestibility of macronutrients in felid species

fed various raw meat diets including beef, horse, and poultry compared with kibble diets (Wynne, 1989; Crissey et al., 1997; Vester et al., 2008; Vester et al., 2010a, 2010b; Kerr, 2012; Kerr et al., 2013). However, pork has not been evaluated for use in zoo carnivore diets and may provide a protein option for nutritional management of zoo carnivores. It is important to evaluate fecal scores, digestibility, and palatability of new dietary options to determine feasibility of incorporating them into animal management plans. Additionally, felids as a whole can develop aversions to foods comprising the majority of their diets for extended periods

[1]Corresponding author: clmorris@iastate.edu
Received February 25, 2016.
Accepted June 2, 2016.

Being caught at faking

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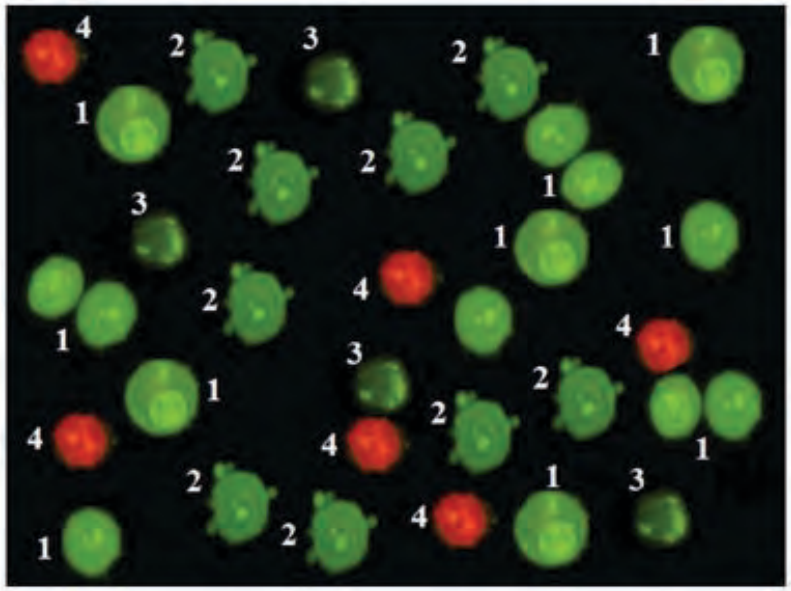
SCIENTIFIC REPORTS

OPEN

Novel piperazine core compound induces death in human liver cancer cells: possible pharmacological properties

Received: 01 October 2015
Accepted: 23 March 2016
Published: 13 April 2016

Nima Samie[1], Sekaran Muniandy[2], M. S. Kanthimathi[2,3], Batoul Sadat Haerian[1] & Raja Elina Raja Azudin[4]



Being inconsistent

Oecologia (1994) 98:167–175

ORIGINAL PAPER

Iain J. Gordon · Andrew W. Illius

The functional significance of the browser-grazer dichotomy in African ruminants

Received: 24 February 1994 / Accepted: 12 April 1994

Abstract The allometric relationships for the fermentation rate of dry matter, the total energy concentration of volatile fatty acids (VFAs), the energy supplied from VFA production and the mass of the digesta contents within the rumen or caecum and proximal colon (hindgut) were used to test whether the digestive strategies of grazing and browsing African ruminants differ. The wet and dry mass of the contents of the rumen and hindgut were allometrically related to body mass (BM). These relationships did not differ between browsing and grazing ruminants. The fermentation rates in the rumen were strongly allometric and the intercepts of the relationships did not differ between browsers and grazers. The fermentation rates in the hindgut were not allometrically related to BM and did not differ between ruminants with different feeding habits. Likewise, the total energy concentration of the VFAs in the rumen and hindgut showed no allometric scaling and did not differ between browsing and grazing ruminants. The energy supplied by VFA production in both the rumen and hindgut of African ruminants scaled at around 0.8 with BM. Only in the case of the energy supplied by VFAs in the rumen were there significantly different intercepts for browsing and grazing ruminants. The energy supplied by VFA production in the rumen was inadequate to meet the energy requirements for maintenance of browsers and small grazers. The retention time of digesta in the alimentary tract was positively related to BM although there was no difference in the allometric relationships for grazers and browsers. The results of these analyses suggest that, after controlling for the effects of body mass, there is little difference in digestive strategy between African ruminants with different morphological adaptations of the gut.

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Key words Feeding habits · Rumen · Digestive strategy Allometry · Retention time

Introduction

African ruminants have diversified to fill a wide variety of ecological niches and vary considerably in body mass and the type of diet consumed (Sinclair 1983). Body mass (Bell 1971; Jarman 1974), feeding facilitation (Bell 1971), competitive exclusion (Murray and Brown 1992; Illius and Gordon 1993) and predation (Sinclair 1985) have been hypothesized as the primary ecological pressures shaping the community structure of African ruminants. Hofmann and Stewart (1972) and Hofmann (1973, 1989) suggested that the major dichotomy separating species of ruminants is in their adaptations for consuming a bulk/roughage diet of primarily grasses (grazers) or a concentrate diet of browse or forbs (browsers).

The differences in the proportions of structural carbohydrates in grasses and browse are seen as leading to differences in the structure and function of the digestive tract of grazing and browsing ruminants. Forages consist of cell contents which are wholly digestible (van Soest 1982), digestible cell wall and an indigestible residue (predominately lignin). For any given phenological stage, browse has higher levels of cell solubles and lignin but lower levels of holocellulose (cellulose and hemicellulose) than grasses (McDowell et al. 1983; Demment and van Soest 1985). Consequently, browse has higher levels of the rapidly fermenting soluble component than grasses. However, because of the higher lignin content in the cell wall of browse, the absolute digestibility of browse tends to be lower (White and Trudell 1980). Therefore, browsers are expected to have a digestive system adapted for the rapid excretion of the highly lignified, less digestible cell wall fraction, whereas grazers have adaptations to slow down the passage of plant material in the rumen, thereby increasing the extent of digestion of the less lignified cell wall component. Hofmann (1973) demonstrated anatomical adaptations of the ali-

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Oecologia (1994) 98:167–175

ORIGINAL PAP

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The functional
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Oecologia (2001) 129:498–508
DOI 10.1007/s004420100768

F. Javier Pérez-Barbería · Iain J. Gordon
Andrew W. Illius

Phylogenetic analysis of stomach adaptation in digestive strategies in African ruminants

Received: 19 March 2001 / Accepted: 25 June 2001 / Published online: 31 July 2001

Abstract The stomach morphology of 28 species of artiodactyls that differ in feeding style (browser, mixed feeder, grazer) was analysed using a multivariate approach and phylogenetic correction in order to test whether stomach morphology was correlated with feeding style when body mass was controlled for. A total of 25 morphological traits of the stomach were used in the analysis. After the effects of body mass and phylogeny on stomach morphology were taken into account, there was no significant grouping of species according to feeding style. When information about the feeding style of each species was included in the analysis, the set of morphological traits separated the mixed feeders from the other two feeding styles, but grazers and browsers had similar morphological features. Most of the variance in stomach morphology was explained by body mass and a lesser proportion by phylogeny. The main morphological features that have previously been proposed as being adaptations in grazing species, namely, lengthening of the retention time of ingesta to achieve an increase in their fibre digestion capability by means of a larger relative stomach capacity, a greater subdivision of chambers and smaller openings, are not supported by the findings of this study. Thus, there is no consistent evidence to support a significant adaptive effect of stomach morphology to different diets in the Artiodactyla.

Keywords Allometry · Body mass · Comparative method · Feeding styles · Gut morphology

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Introduction

The feeding habits of some ungulates in a natural habitat were, to our knowledge, first defined by Van Zyl (1965), but it was Hofmann who classified African ruminants into three feeding styles according to morphological adaptations of the digestive system (Hofmann 1973, 1989), as related to differences in diet composition (Hofmann 1968, 1984, 1988; Hofmann and Stewart 1972; Hofmann et al. 1995). Hofmann's categorisation of feeding styles has been extensively used in grazing ecology (Owen-Smith 1982; Gordon and Illius 1988, 1994, 1996; McNaughton 1991; Van Wieren 1996). Differences in stomach morphology between species that differ in diet triggered subsequent studies on other parts of the digestive system, for example, morphological adaptations of the organs involved in the selection (lips, muzzle: Janis and Ehrhardt 1988; Pérez-Barbería and Gordon 2001a) and the processing of food (teeth, jaws, jaw muscles: Fortelius 1985; Axmacher and Hofmann 1988; Janis 1988; Pérez-Barbería and Gordon 1999a, 2001a) and also in behavioural variables (activity time: Mysterud 1998; Pérez-Barbería and Gordon 1999b; home range: Mysterud et al. 2001; habitat use: Pérez-Barbería et al. 2001b). Based on Hofmann's (1973) classification, it has been assumed that grazing species achieve a greater extent of digestion of fibre in comparison with browsing species by means of food retention in the rumen, large stomach capacity, higher degree of stomach compartmentalisation and smaller openings between the rumen and omasum. However, a statistical relationship between the differences in stomach morphology, described by Hofmann (1973), and diet composition has not yet been demonstrated.

A recurrent problem which arises when studying the differences in the morphology or function of the digestive system, in relation to Hofmann's classification, is the possible confounding effect of body mass (Gordon and Illius 1994; Robbins et al. 1995; Iason and Van Wieren 1998). After controlling for body mass, Gordon and Illius (1994) found that there were no differences in wet

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Oecologia (1994) 98:167–175 © Springer-Verlag 1994

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Oecologia (2001) 129:498–508
DOI 10.1007/s004420

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Received: 19 March
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THE ROYAL SOCIETY

Received 5 December 2003
Accepted 9 February 2004
Published online 6 April 2004

The evolution of phylogenetic differences in the efficiency of digestion in ruminants

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This study investigates, for the first time (to our knowledge) for any animal group, the evolution of phylogenetic differences in fibre digestibility across a wide range of feeds that differ in potential fibre

We expect that:

(iii) species adapted to consuming different diets will differ in the efficiency with which they digest fibre when body mass has been taken into account;

We would have to conclude that, at present, there do not appear to be any known differences in morphology that can explain differences in digestive efficiency. Are other

the proportion of grass and to decrease with the proportion of browse in the natural diet that characterizes

research has hitherto failed to demonstrate any relationship between differences in morphology and digestive efficiency between species, other than at a gross level (Robbins 1993). We offer a novel analysis that controls for confounding effects and highlights the flexibility of digestive adaptation in ruminants.

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Proc. R. Soc. Lond. B (2004) 271, 1081–1090
DOI 10.1098/rspb.2004.2714

Omitting sources or sloppy research

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1. INTRODUCTION

Despite considerable efforts in the analysis of the comparative anatomy of the digestive tract of ungulates, research has hitherto failed to demonstrate any relationship between differences in morphology and digestive efficiency between species, other than at a gross level (Robbins 1993). We offer a novel analysis that controls for confounding effects and highlights the flexibility of digestive adaptation in ruminants.

Previous research in this area demonstrates a number of weaknesses. The first weakness is the question of continuous versus discrete variables. Hofmann (1968, 1973) and Hofmann & Stewart (1972) described the stomach morphology of a number of species of African ruminants and using this information classified species into three groups (i.e. concentrate selectors, intermediate, and bulk and roughage eaters). Concentrate selectors (i.e. browsers) were the species whose diet mainly contained browse; bulk and roughage eaters (i.e. grazers) were species in which grass was the main component of the diet, and the third group, intermediate (i.e. mixed feeders), consumed a mixture of browse and grass, depending upon the habitat or season. Hofmann & Stewart (1972) and Hofmann (1973) pointed out that their stomach classification coincided with the main dietary habits of the ruminant species. However, Hofmann's later papers (1985, 1988) established a composite criterion of species classification '...based on typical structures of the digestive tract ... and/or on feeding behaviour/forage selection' (Hofmann 1985, p. 398). This may be the cause of confusion in the literature as to the criteria used to classify species, almost entirely based on dietary habits but frequently linked with the stomach classification of Hofmann (1973) (see Iason & van Wieren 1999; Pérez-Barbería & Gordon 1999*a*, 2000, 2001; Brashares *et al.* 2000; Gagnon & Chew 2000; Pérez-Barbería *et al.* 2001*a*). As a result, the relationships that many studies find between the variables studied—dietary classification and stomach morphology—are confounded by circular argumentation (Pérez-Barbería *et al.* 2001*a*).

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The new approach, proposed in this study, is simple and straightforward, to use a covariate or group of covariates containing information on the diet of each species as a continuous variable rather than a categorical variable. In this paper, the three main dietary components (i.e. grass, browse, fruit) were defined by two covariates, percentage of grass and percentage of browse, since the percentages of the three components total 100%. Datasets containing

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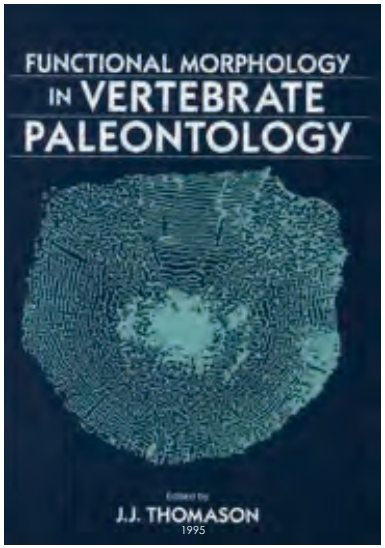

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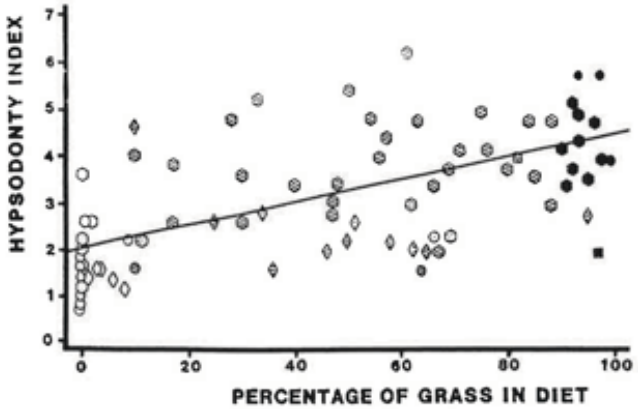
Correlations between craniodental morphology and feeding behavior in ungulates: reciprocal illumination between living and fossil taxa

CHRISTINE M. JANIS

Ungulate morphology and diet



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Plagiarism

OIKOS 102: 253–262, 2003

Ruminant diversification as an adaptation to the physicomechanical characteristics of forage. A reevaluation of an old debate and a new hypothesis

Marcus Clauss, Matthias Lechner-Doll and W. Jürgen Streich

Clauss, M., Lechner-Doll, M. and Streich, W. J. 2003. Ruminant diversification as an adaptation to the physicomechanical characteristics of forage. A reevaluation of an old debate and a new hypothesis. – Oikos 102: 253–262.

The validity of Hofmann's classification of ruminants into browsers/"concentrate selectors", intermediate feeders and grazers/"grass and roughage eaters" and of his consecutive physiological postulates has repeatedly been questioned. In contrast to former concepts, which all focused on the chemical characteristics of the respective forages, we propose a new hypothesis on the main driving force of ruminant diversification, namely the physicomechanical characteristics of the respective forages. In contrast to browse, grass tends to stratify and form a "fibrous raft" in the reticulorumen. The significantly more capacious forestomachs of grazers, and the significantly thicker rumen pillars (indicating the strength of reticulorumen muscle equipment) of their forestomachs, are interpreted as particular adaptations to this forage characteristic. With these parameters, we present, for the first time, two single morphological measurements that allow the statistical reconstruction of Hofmann's classification. A small forestomach capacity and the lack of strong reticulorumen muscles in browsers would explain the observed exclusiveness with which browsers avoid grass forage under natural conditions, which we confirmed using two datasets on the composition of the natural diet. Both rumen pillar thickness and relative forestomach capacity were significantly correlated to the grass content of the natural diet, respectively. Our functional interpretation was also supported by a stepwise regression analysis with the proportion of grass in the natural diet as dependent variable and the rumen pillar thickness, the relative forestomach capacity, and the body weight as independent variables, which revealed significant equations.

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Ruminants have been classified according to their feeding habits for a long time (Talbot and Talbot 1962, Lamprey 1963, Van Zyl 1965, Jarman 1974, Hansen et al. 1985, Bodmer 1990, Gagnon and Chew 2000) and differences in ecology and behaviour have been noted. However, it was the pioneering work of Hofmann (1969, 1973, 1988, 1989) that brought the concept of different feeding types to the high level of attention it is still receiving today. Hofmann observed morphological differences between the feeding types – the "concentrate selectors"[1]/browsers (BR), intermediate feeders (IM) and grazers (GR) – and hypothesized consequent physiological differences.

There are several limitations to Hofmann's presentations. Hofmann (1973) did not record the body weights for most individuals he investigated but gave mostly

[1] The use of the term 'concentrate selectors' has been criticised by Hoppe (1984), Robbins et al. (1995), Owen-Smith (1997) and Clauss et al. (2002b); we prefer the term "browser", even when referring to Hofmann's morphological classification.

Accepted 19 February 2003

ISSN 0030-1299

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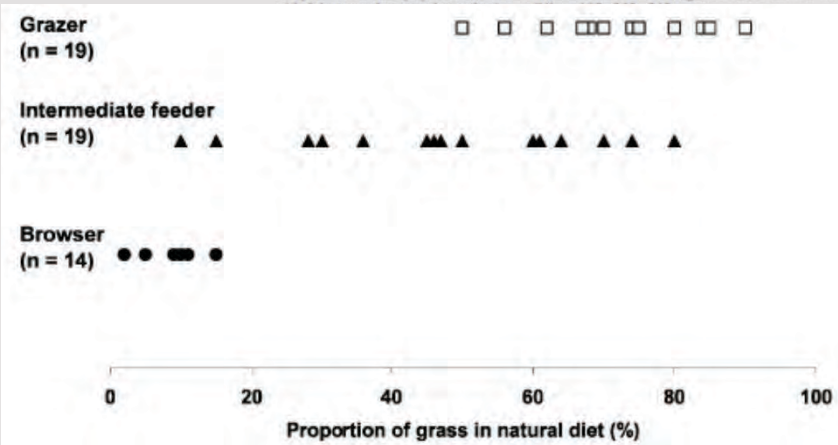

Fig. 3. Distribution of the percentage of grass in the natural diet of ruminants of different feeding types (according to Hofmann). Data from Van Wieren (1996a).

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Previous research in this area demonstrates a number of weaknesses. The first weakness is the question of continuous versus discrete variables. Hofmann (1968, 1973) and Hofmann & Stewart (1972) described the stomach morphology of a number of species of African ruminants and using this information classified species into three groups (i.e. concentrate selectors, intermediate, and bulk and roughage eaters). Concentrate selectors (i.e. browsers) were the species whose diet mainly contained browse; bulk and roughage eaters (i.e. grazers) were species in which grass was the main component of the diet, and the third group, intermediate (i.e. mixed feeders), consumed a mixture of browse and grass, depending upon the habitat or season. Hofmann & Stewart (1972) and Hofmann (1973) pointed out that their stomach classification coincided with the main dietary habits of the ruminant species. However, Hofmann's later papers (1985, 1988) established a composite criterion of species classification '…based on typical structures of the digestive tract … and/or on feeding behaviour/forage selection' (Hofmann 1985, p. 398). This may be the cause of confusion in the literature as to the criteria used to classify species, almost entirely based on dietary habits but frequently linked with the stomach classification of Hofmann (1973) (see Iason & van Wieren 1999; Pérez-Barbería & Gordon 1999*a*, 2000, 2001; Brashares *et al.* 2000; Gagnon & Chew 2000; Pérez-Barbería *et al.* 2001*a*). As a result, the relationships that many studies find between the variables studied—dietary classification and stomach morphology—are confounded by circular argumentation (Pérez-Barbería *et al.* 2001*a*).

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DOI 10.1098/rspb.2004.2714

Plagiarism

OIKOS 102: 253–262, 2003

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Accepted 19 February 2003

ISSN 0030-1299

THE ROYAL SOCIETY

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Published online 6 April 2004

The evolution of phylogenetic differences in the efficiency of digestion in ruminants

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This study investigates, for the first time (to our knowledge) for any animal group, the evolution of phylogenetic differences in fibre digestibility across a wide range of feeds that differ in potential fibre digestibility (fibre to lignin ratio) in ruminants. Data, collated from the literature, were analysed using a linear mixed model that allows for different sources of random variability, covariates and fixed effects, as well as controlling for phylogenetic relatedness. This approach overcomes the problem of defining boundaries to separate different ruminant feeding styles (browsers, mixed feeders and grazers) by using two covariates that describe the browser–grazer continuum (proportion of grass and proportion of browse in the natural diet of a species). The results indicate that closely related species are more likely to have similar values of fibre digestibility than species that are more distant in the phylogenetic tree. Body mass did not have any significant effect on fibre digestibility. Fibre digestibility is estimated to increase with the proportion of grass and to decrease with the proportion of browse in the natural diet that characterizes the species. We applied an evolutionary model to infer rates of evolution and ancestral states of fibre digestibility; the model indicates that the rate of evolution of fibre digestibility accelerated across time. We suggest that this could be caused by a combination of increasing competition among ruminant species and adaptation to diets rich in fibre, both related to climatically driven environmental changes in the past few million years.

Keywords: browser; grazer; phylogeny; evolution; digestibility; diet

1. INTRODUCTION

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Previous research in this area demonstrates a number of weaknesses. The first weakness is the question of continuous versus discrete variables. Hofmann (1968, 1973) and Hofmann & Stewart (1972) described the stomach morphology of a number of species of African ruminants and using this information classified species into three groups (i.e. concentrate selectors, intermediate, and bulk and roughage eaters). Concentrate selectors (i.e. browsers) were the species whose diet mainly contained browse; bulk and roughage eaters (i.e. grazers) were species in which grass was the main component of the diet, and the third group, intermediate (i.e. mixed feeders), consumed a mixture of browse and grass, depending upon the habitat or season. Hofmann & Stewart (1972) and Hofmann (1973) pointed out that their stomach classification coincided with the main dietary habits of the ruminant species. However, Hofmann's later papers (1985, 1988) established a composite criterion of species classification '…based on typical structures of the digestive tract … and/or on feeding behaviour/forage selection' (Hofmann 1985, p. 398). This may be the cause of confusion in the literature as to the criteria used to classify species, almost entirely based on dietary habits but frequently linked with the stomach classification of Hofmann (1973) (see Iason & van Wieren 1999; Pérez-Barbería & Gordon 1999*a*, 2000, 2001; Brashares *et al.* 2000; Gagnon & Chew 2000; Pérez-Barbería *et al.* 2001*a*). As a result, the relationships that many studies find between the variables studied—dietary classification and stomach morphology—are confounded by circular argumentation (Pérez-Barbería *et al.* 2001*a*).

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Plagiarism

OIKOS 102: 253–262, 2003

GRAZERS & BROWSERS - COMPARATIVE DIETS
1991-07-31

	SPECIES	LOCALITY	WET SEASON: GRASS	WOODY	FORB	FRUIT
104	Ovis dalli	Yukon	57	20	23	0
105	Ovis canadensis	Colorado	30	0	70	0
106	Ovis canadensis	B.Columbia	45.5	20	29	5
107	Antilope americana	Colorado	21.5	0	78.5	0
108	Antilope americana	SE.Oregon	6	14.5	79.5	0
109	Cervus elaphus	Poland	17.5	45.5	36.5	0.5
110	Cervus elaphus	Scotland	83	11.5	1.5	4
111	Cervus elaphus	Greece	2	80	18	0
112	Cervus canadensis	Colorado	64	20.5	15.5	0
113	Cervus canadensis	Oregon	36	30.5	33.5	0
114	Cervus canadensis	S.Dakota	77.5	11	11.5	0
115	Cervus canadensis	N.Mexico				
116	Cervus canadensis	SE.Idaho	9	48	43	0
117	Odocoileus hemionus	Arizona	5.5	90	2.5	2
118	Odocoileus hemionus	N.Mexico	0.5	62	36.5	1
119	Odocoileus hemionus	Colorado				
120	Odocoileus hemionus	PtReyes,Cal.	16.5	19	64	0
121	Odocoileus virginianus	Michigan				
122	Odocoileus virginianus	Texas	9.5	38.8	53.7	0
123	Odocoileus virginianus	Surinam	14	20	39	27
124	Odocoileus virginianus	Louisiana	5	87.5	7	0.5
125	Odocoileus virginianus	Arizona	10	81	8	1
126	Rangifer tarandus	Norway	64	12.5	20	3.5
127	Rangifer tarandus	Banks Isl	58	28	13	1
128	Alces alces	I.Royale	0	75	25	0
129	Alces alces	Manitoba				
130	Capreolus capreolus	England	8	56	33	4
131						
132	Mazama americana	Surinam	1	20	9	70
133	Ozotocercus bezoarticus	Argentine	80	0	8	12
134	Dama dama	PtReyes,Cal.	57.5	10	32.5	0
135	Axis axis	PtReyes,Cal.	62	14	24	0
136	Axis axis	S.India	22	13	65	0
137	Cervus unicolor	S.India	15	40	44	0
138	Boselaphus tragocamelus	Texas	61	4	24	11

Dietsan norman | Aktuelle | TEMPWIN2 | TEMPWIN | TEMPSUM2 | TEMPSUM | AFRW

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[3]Institute of Cell, Animal and Population Biology, University of Edinburgh, West Mains Road, Edinburgh EH9 3JT, UK (a.illius@ed.ac.uk)

This study investigates, for the first time (to our knowledge) for any animal group, the evolution of phylogenetic differences in fibre digestibility across a wide range of feeds that differ in potential fibre digestibility (fibre to lignin ratio) in ruminants. Data, collated from the literature, were analysed using a linear mixed model that allows for different sources of random variability, covariates and fixed effects, as well as controlling for phylogenetic relatedness. This approach overcomes the problem of defining boundaries to separate different ruminant feeding styles (browsers, mixed feeders and grazers) by using two covariates that describe the browser–grazer continuum (proportion of grass and proportion of browse in

ruminant species. However, Hofmann's later papers (1985, 1988) established a composite criterion of species classification '…based on typical structures of the digestive tract … and/or on feeding behaviour/forage selection' (Hofmann 1985, p. 398). This may be the cause of confusion in the literature as to the criteria used to classify species, almost entirely based on dietary habits but frequently linked with the stomach classification of Hofmann (1973) (see Iason & van Wieren 1999; Pérez-Barbería & Gordon 1999*a*, 2000, 2001; Brashares *et al.* 2000; Gagnon & Chew 2000; Pérez-Barbería *et al.* 2001*a*). As a result, the relationships that many studies find between the variables studied—dietary classification and stomach morphology—are confounded by circular argumentation (Pérez-Barbería *et al.* 2001*a*).

browse; bulk and roughage eaters (i.e. grazers) were species in which grass was the main component of the diet, and the third group, intermediate (i.e. mixed feeders), consumed a mixture of browse and grass, depending upon the habitat or season. Hofmann & Stewart (1972) and Hofmann (1973) pointed out that their stomach classification coincided with the main dietary habits of the

1994, 1996; Janis & Ehrhardt 1988; Spencer 1995; van Wieren 1996, Iason & van Wieren 1999; Pérez-Barbería & Gordon 1999*a*,*b*, 2000, 2001; Brashares *et al.* 2000; Gagnon & Chew 2000; Pérez-Barbería *et al.* 2001*a*). However, stomach morphology and dietary habits are continuous variables and they should be treated as such.

A second weakness of previous work has been an under-

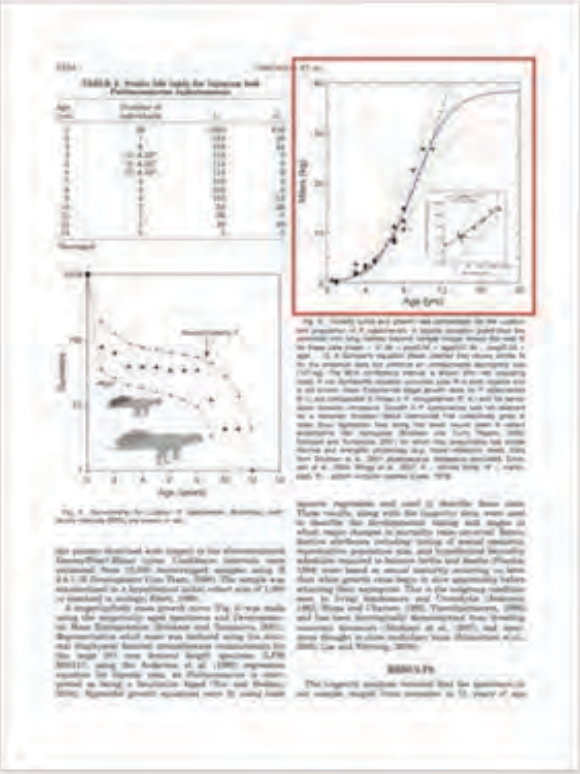
Pérez-Barbería, F. J., Gordon, I. J. & Illius, A. 2001*a* Phylogenetic analysis of stomach adaptation in digestive strategies in African ruminants. *Oecologia* 129, 498–508.

Proc. R. Soc. Lond. B (2004) 271, 1081–1090
DOI 10.1098/rspb.2004.2714

Sloppy use of data

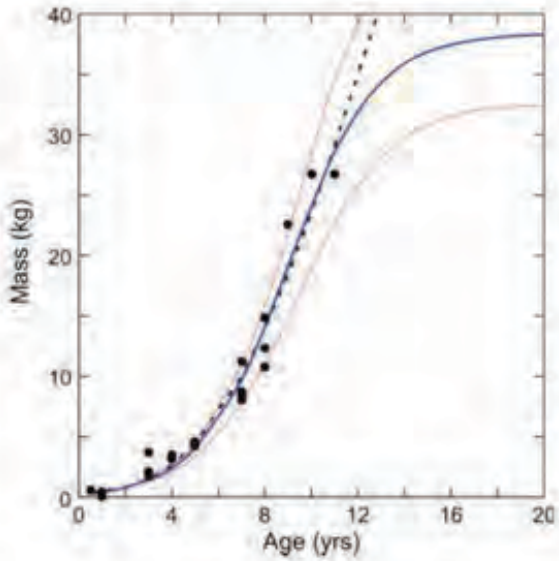
Dinosaurs and Statistics

A new paper by Nathan P. Myhrvold, the former chief technology officer of Microsoft, highlights possible statistical problems in a series of papers on dinosaur growth rates. Two examples are shown below. Related Article »



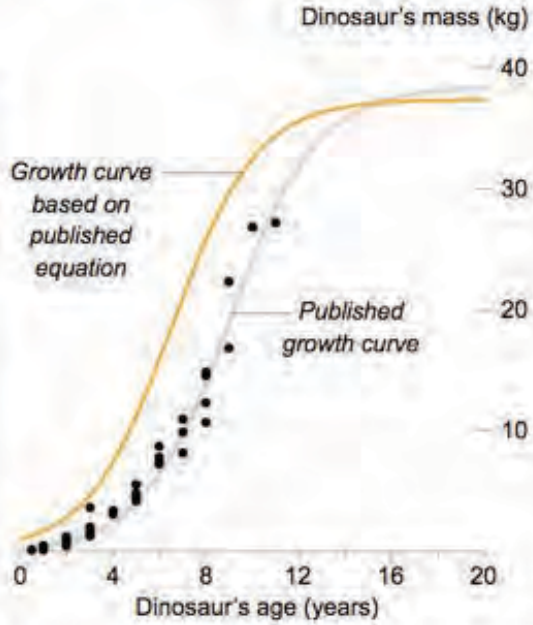
AN EXAMPLE FROM 2009

One questioned paper, published in the Anatomical Record, includes a chart showing the growth rate (—) of Psittacosaurus lujiatunensis, a beaked dinosaur. The data points are shown below in black.



RECREATING THE CHART

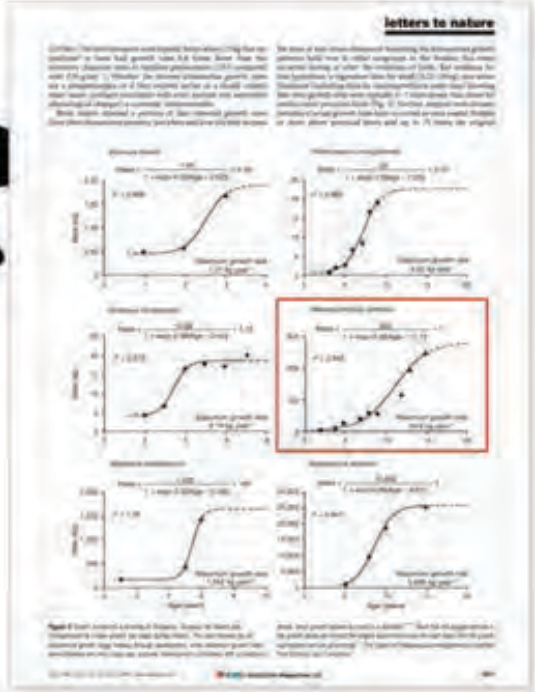
But when Dr. Myhrvold tried to recreate the curve using the equation given in the paper, the resulting growth curve (—) was very different.



Sloppy use of data

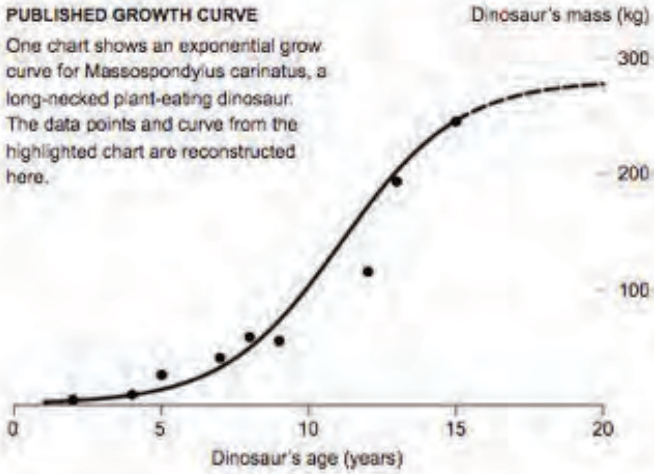
AN EXAMPLE FROM 2001

Another questioned paper, published in the journal Nature, includes an illustration of several dinosaur species and a set of charts showing their growth rates.



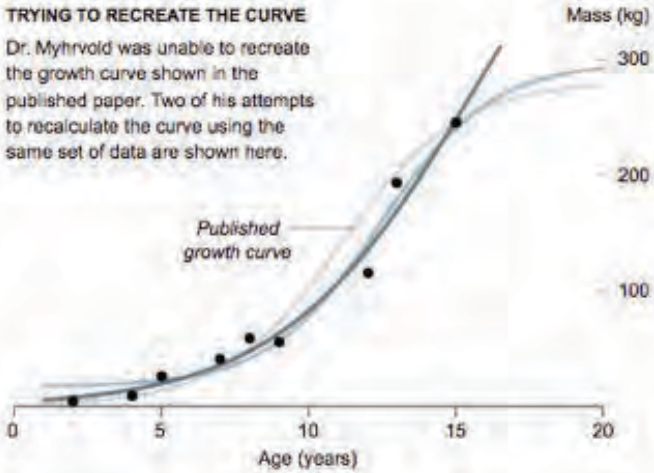
PUBLISHED GROWTH CURVE

One chart shows an exponential grow curve for Massospondylus carinatus, a long-necked plant-eating dinosaur. The data points and curve from the highlighted chart are reconstructed here.



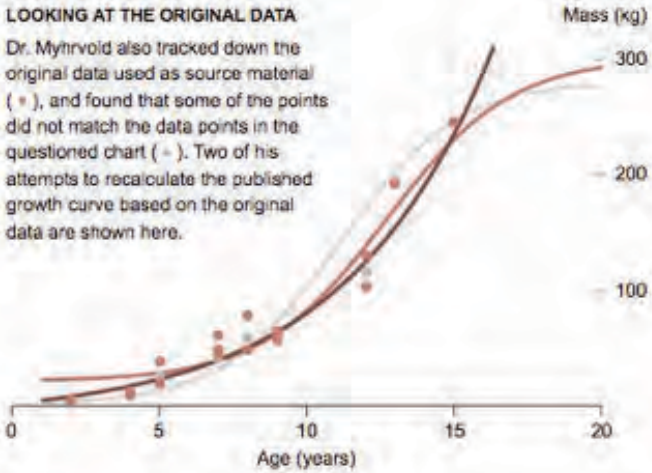
TRYING TO RECREATE THE CURVE

Dr. Myhrvold was unable to recreate the growth curve shown in the published paper. Two of his attempts to recalculate the curve using the same set of data are shown here.



LOOKING AT THE ORIGINAL DATA

Dr. Myhrvold also tracked down the original data used as source material (•), and found that some of the points did not match the data points in the questioned chart (◦). Two of his attempts to recalculate the published growth curve based on the original data are shown here.



Sloppy use of data

Dr. Myhrvold 's article, published by the journal PLoS One, says Dr. Erickson's papers contain major mistakes, including graphs that do not match the data and curves that do not match the reported equations. And Dr. Myhrvold's revised estimates put the maximum growth rate of Apatosaurus at about a tenth of what Dr. Erickson and his colleagues had reported.

Dr. Erickson declined to be interviewed, but issued an email statement noting that the papers had been the work of teams of scientists and had been peer-reviewed.

Dr. Myhrvold's "reinterpretation of our data, although reaching moderately different conclusions on a species by species basis, strongly supports the cardinal conclusions that we reached regarding how dinosaurs grew," the statement said. "The bottom line is that the empirical findings of our research group stand, and we stand behind them."

Sloppy use of data

Some of Dr. Erickson's co-authors agree that the papers have errors that should be corrected. "I'll be interested to see how Greg responds scientifically to Nathan's claims," said Kristina A. Curry Rogers, a professor of geology at Macalester College in St. Paul, who was a co-author of the 2001 paper in Nature. "If he has data to the contrary, then he can present that. If he does not, then he can explain that."

Dr. Curry Rogers said Dr. Myhrvold had provided ample information and explanation backing up his assertions. "All his methods are laid bare," she said. "Anyone who wants to challenge him can do it."

Other co-authors of Dr. Erickson's include Mark A. Norell, chairman of paleontology at the American Museum of Natural History; Philip J. Currie, a professor of dinosaur paleobiology at the University of Alberta; and Peter J. Makovicky, associate curator of paleontology at the Field Museum in Chicago.

Sloppy use of data

About two and half years ago, Dr. Myhrvold came across a 2009 paper by Dr. Erickson as he was trying to answer the question, "Why were dinosaurs big?" He said data in two of the graphs, one plotting the length of the thigh bone versus age, the other mass versus age, conflicted with each other. "I instantly knew that this couldn't be correct," Dr. Myhrvold said.

Dr. Myhrvold said he contacted Dr. Erickson, asking for the original data. While Dr. Erickson answered some questions, he said the data was on a computer he had gotten rid of and later that he did not have time to answer more questions, Dr. Myhrvold said.

Dr. Myhrvold was able to obtain some of the data from other researchers and thought he could do a better statistical analysis. Last year, he submitted a paper with his calculations — a fairly esoteric scientific disagreement about how best to extract reasonable generalizations from a limited number of fossils.

Dr. Erickson was one of the reviewers and argued strongly against publication. While praising Dr. Myhrvold's accomplishments and saying the calculations appeared to be numerically correct, Dr. Erickson said the paper would not advance scientific understanding.

"In fact it will hurt our field by producing inherently flawed growth curves, misrepresenting the work of others, and stands to drive a wedge between labs that are currently cordial with one another," he wrote.

Just discussion ?

DINOSAUR PHYSIOLOGY

Evidence for mesothermy in dinosaurs

John M. Grady,[1*] Brian J. Enquist,[2,3] Eva Dettweiler-Robinson,[1] Natalie A. Wright,[1] Felisa A. Smith[1]

SCIENCE 13 JUNE 2014 • VOL 344 ISSUE 6189

TECHNICAL COMMENT

DINOSAUR PHYSIOLOGY

Comment on "Evidence for mesothermy in dinosaurs"

M. D. D'Emic

Grady *et al.* (Reports, 13 June 2014, p. 1268) suggested that nonavian dinosaur metabolism was neither endothermic nor ectothermic but an intermediate physiology termed "mesothermic." However, rates were improperly scaled and phylogenetic, physiological, and temporal categories of animals were conflated during analyses. Accounting for these issues suggests that nonavian dinosaurs were on average as endothermic as extant placental mammals.

TECHNICAL COMMENT

DINOSAUR PHYSIOLOGY

Comment on "Evidence for mesothermy in dinosaurs"

Nathan P. Myhrvold

Grady *et al.* (Reports, 13 June 2014, p. 1268) studied dinosaur metabolism by comparison of maximum somatic growth rate allometry with groups of known metabolism. They concluded that dinosaurs exhibited mesothermy, a metabolic rate intermediate between endothermy and ectothermy. Multiple statistical and methodological issues call into question the evidence for dinosaur mesothermy.

TECHNICAL RESPONSE

DINOSAUR PHYSIOLOGY

Response to Comments on "Evidence for mesothermy in dinosaurs"

John M. Grady,[1*] Brian J. Enquist,[2,3] Eva Dettweiler-Robinson,[1] Natalie A. Wright,[1] Felisa A. Smith[1]

D'Emic and Myhrvold raise a number of statistical and methodological issues with our recent analysis of dinosaur growth and energetics. However, their critiques and suggested improvements lack biological and statistical justification.

Just discussion ?

DINOSAUR PHYSIOLOGY

Evidence for mesothermy in dinosaurs

John M. Grady,[1*] Brian J. Enquist,[2,3] Eva Dettweiler-Robinson,[1] Natalie A. Wright,[1] Felisa A. Smith[1]

SCIENCE 13 JUNE 2014 • VOL 344 ISSUE 6189

Allometries of Maximum Growth Rate versus Body Mass at Maximum Growth Indicate That Non-Avian Dinosaurs Had Growth Rates Typical of Fast Growing Ectothermic Sauropsids

Jan Werner*, Eva Maria Griebeler

PLOS ONE
February 2014 | Volume 9 | Issue 2 | e88834

Dinosaur Metabolism and the Allometry of Maximum Growth Rate

Nathan P. Myhrvold*

PLoS ONE 11(11): e0163205.

Formal comment on: Myhrvold (2016) Dinosaur metabolism and the allometry of maximum growth rate. *PLoS ONE*; 11(11): e0163205

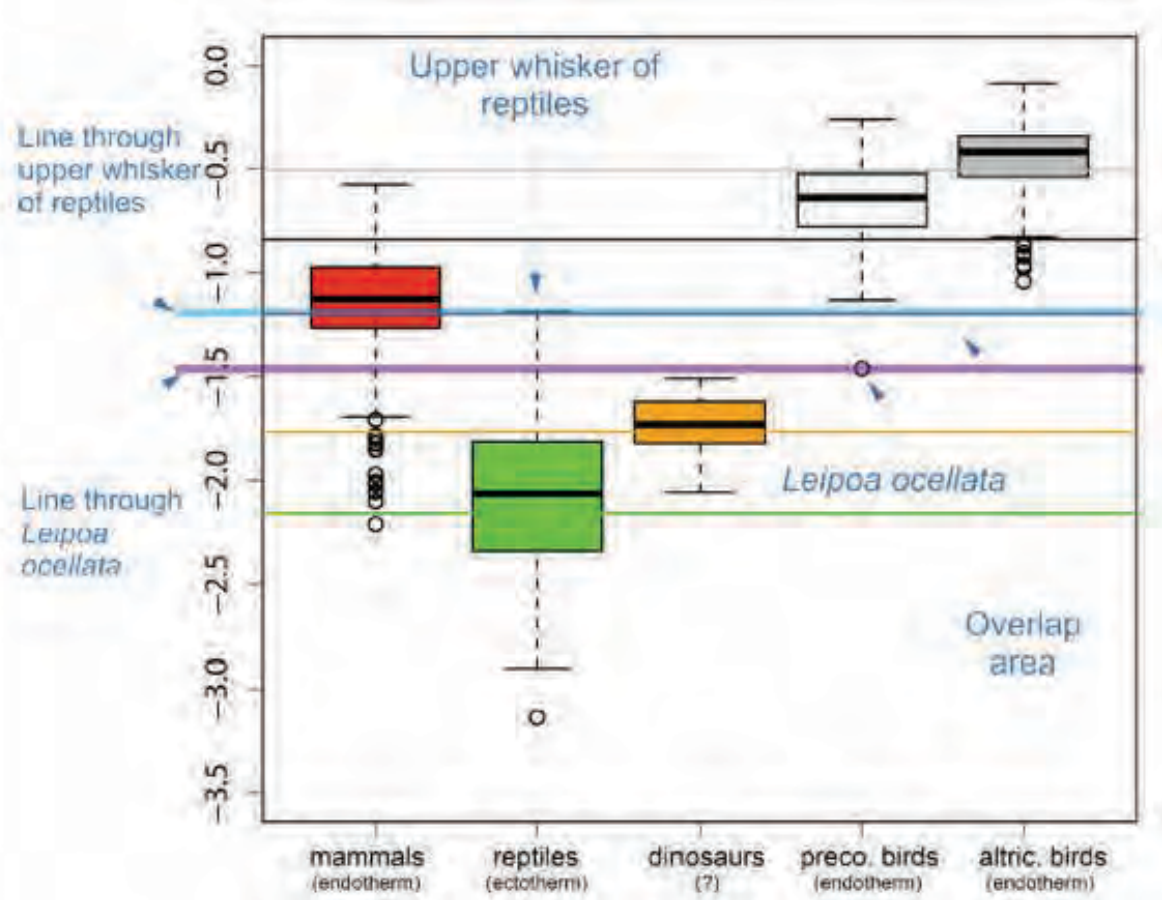
Eva Maria Griebeler*, Jan Werner

Response to formal comment on Myhrvold (2016) submitted by Griebeler and Werner (2017)

Nathan P. Myhrvold*

Response to formal comment on Myhrvold (2016) submitted by Griebeler and Werner (2017)

Nathan P. Myhrvold*



Just discussion ?

Response to formal comment on Myhrvold (2016) submitted by Griebeler and Werner (2017)

Nathan P. Myhrvold *

Table 2. Quotations relevant to hypothesis H1 in [2] and [3]. Passages from Werner and Griebeler [3] that express a view equivalent to hypothesis H1 are shown *above*, along with passages from Myhrvold [2] defining H1, and reaching a conclusion about Werner and Griebeler [3] with respect to H1.

	Quotes from Werner & Griebeler [3]
Page 7	What can we infer from growth rates of dinosaurs about their metabolism or thermoregulation strategy? Our results suggest that dinosaurian growth rates were between those predicted by the reptile and mammal regression model and that some dinosaurian growth rates were within the range of mammalian growth rates. Thus, one may argue that at least some dinosaurs were endotherms and/or had metabolic rates similar to those of mammals.
	Additionally, nonavian dinosaurian PGLS regression coefficients (intercept and slope) did not differ statistically from coefficients of the reptile regression model. All these arguments provide evidence that the studied dinosaurs had a lower metabolic rate than recent endotherms.
	Quotes from Myhrvold [2]
Page 2	H1. The metabolism of all members of a taxonomic group is determined by the regression parameters a and b for the group (from the allometric relationship $G_{max} = a\ M^b$), by comparison with a, b for groups with known metabolism.
Page 6	Werner and Griebeler [12] recognized at least some of the problems with hypothesis H1.

Just discussion ?

Response to formal comment on Myhrvold (2016) submitted by Griebeler and Werner (2017)

Nathan P. Myhrvold*

As Werner and Griebeler have observed in the last paragraph of their paper [3]:

> Thus, under the assumption that growth rate, metabolic rate and thermoregulation are directly linked, it is not possible to infer whether the studied dinosaurs had an ectothermic or endothermic metabolic rate because of the large variability seen in ectothermic and endothermic growth rates.

Unfortunately the very next sentence, which ends the paragraph above is this [3]

> However, compared to growth rates seen in other sauropsids, all studied dinosaurs had rather an ectothermic metabolic rate than an endothermic rate.

This is the ultimate conclusion of the paper–the message that dinosaurs are ectotherms appears in both the title of the paper and its abstract. In that concluding sentence, and others preceding it in the paper which also reach that conclusion, they appear, in my view at least, to reverse themselves.

Just discussion ?

Untruthful reviewing

Mammalian Biology 79 (2014) 9–16

Contents lists available at ScienceDirect

Mammalian Biology

journal homepage: www.elsevier.com/locate/mambio

Original Investigation

Low scaling of a life history variable: Analysing eutherian gestation periods with and without phylogeny-informed statistics

Marcus Clauss[a,*], Marie T. Dittmann[b], Dennis W.H. Müller[a,c], Philipp Zerbe[a,d], Daryl Codron[a,e]

(Raia et al. 2003; Palombo 2007; Meiri and Raia 2010). Studies that link insular dwarfism to a shift towards a faster life history often rely on the reconstruction of life history traits using allometry. For example, Roth (1990, 1992), Raia et al. (2003) or Palombo (2007) explicitly use quarter-power scaling to reconstruct the life

Untruthful reviewing

Referee: 2

This is an interesting and well-executed body of analytical experiments which basically revolve around one single and relevant question: Is the celebrated quarter power scaling law sensible to phylogenetic correction?

Unfortunately, I'm not as positive for the rest of the manuscript, and for the interpretation of the results in particular. I have attached a densely commented edited version of the original submission. Here, I just briefly remark the main points of concern.

NOTE THAT WE ARE TALKING ABOUT POST-NATAL DEVELOPMENT HERE- Furthermore, I've based that idea on a survivorship curve, not on a power law regression.
This last claim is simply wrong. Raia et al. 2003 did use power laws to reconstruct life history (see documentation below).

Raia et al. 2003 is titled "The fast life of a dwarf giant", and in the abstract it says: Through the analysis of E. falconeri survivorship, of some reconstructed life-history traits, and of its ecology, and taking into account the Island rule (Foster, 1964), we concluded that E. falconeri moved somewhat toward the 'fast' extreme of the slow-fast continuum in life-history traits in regards to its mainland ancestor. ***In the methods, the authors state (p. 298):*** In addition to survivorship analysis, we made extensive use of allometric formulae to predict many life-history variables. ***On p. 300 the authors claim:*** According to the former estimation and to the allometric relationship between physiological time and body mass which is $t=M^{0.25}$, we calculated that E. falconeri was sexually mature when 3–4 years old and that it had a pregnancy duration of some 189 days, life span of around 26 years and fasting endurance of some 71 days (allometric formulae taken from Calder, 1996, pregnancy period and fasting endurance taken from Roth, 1992). ***So in contrast to the claim of the reviewer above, the 0.25 allometry was used for character reconstruction, and it was not only used to talk about post-natal development, but also for the reconstruction of the gestation period.***

Integrity

bullshit

When editors and reviewers don't pay attention

PLOS | ONE

RESEARCH ARTICLE

Biomechanical Characteristics of Hand Coordination in Grasping Activities of Daily Living

Ming-Jin Liu[1], Cai-Hua Xiong[1]*, Le Xiong[2], Xiao-Lin Huang[3]

1 Institute of Rehabilitation and Medical Robotics, State Key Lab of Digital Manufacturing Equipment and Technology, Huazhong University of Science and Technology, Wuhan, Hubei 430074, China, **2** Foisie School of Business, Worcester Polytechnic Institute, Worcester, MA 01609–2280, United States of America, **3** Tongji Hospital, Tongji Medical College of Huazhong University of Science and Technology, Wuhan, Hubei 430030, China

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Citation: Liu M-J, Xiong C-H, Xiong L, Huang X-L (2016) Biomechanical Characteristics of Hand Coordination in Grasping Activities of Daily Living. PLoS ONE 11(1): e0146193. doi:10.1371/journal.pone.0146193

Editor: Renzhi Han, Ohio State University Medical Center, UNITED STATES

Received: October 28, 2015

Accepted: December 14, 2015

Abstract

Hand coordination can allow humans to have dexterous control with many degrees of freedom to perform various tasks in daily living. An important contributing factor to this important ability is the complex biomechanical architecture of the human hand. However, drawing a clear functional link between biomechanical architecture and hand coordination is challenging. It is not understood which biomechanical characteristics are responsible for hand coordination and what specific effect each biomechanical characteristic has. To explore this link, we first inspected the characteristics of hand coordination during daily tasks through a statistical analysis of the kinematic data, which were collected from thirty right-handed subjects during a multitude of grasping tasks. Then, the functional link between biomechanical architecture and hand coordination was drawn by establishing the clear corresponding causality between the tendinous connective characteristics of the human hand and the coordinated characteristics during daily grasping activities. The explicit functional link indicates that the

characteristics during daily grasping activities. The explicit functional link indicates that the biomechanical characteristic of tendinous connective architecture between muscles and articulations is the proper design by the Creator to perform a multitude of daily tasks in a comfortable way. The clear link between the structure and the function of the human hand

National Basic Research Program of China (973 Program, Grant No. 2011CB013301), and National Natural Science Foundation of China (Grant No.

Introduction

The human hand is an amazing instrument that can perform a multitude of functions, such as

structure to perform numerous tasks. Hand coordination should indicate the mystery of the Creator's invention.

When editors and reviewers don't pay attention

PLOS | ONE

RETRACTION

Retraction: Biomechanical Characteristics of Hand Coordination in Grasping Activities of Daily Living

The *PLOS ONE* Staff

Following publication, readers raised concerns about language in the article that makes references to a 'Creator', and about the overall rationale and findings of the study.

Upon receiving these concerns, the *PLOS ONE* editors have carried out an evaluation of the manuscript and the pre-publication process, and they sought further advice on the work from experts in the editorial board. This evaluation confirmed concerns with the scientific rationale, presentation and language, which were not adequately addressed during peer review.

Consequently, the *PLOS ONE* editors consider that the work cannot be relied upon and retract this publication.

The editors apologize to readers for the inappropriate language in the article and the errors during the evaluation process.

Reference

1. Liu M-J, Xiong C-H, Xiong L, Huang X-L (2016) Biomechanical Characteristics of Hand Coordination in Grasping Activities of Daily Living. PLoS ONE 11(1): e0146193. doi: 10.1371/journal.pone.0146193 PMID: 26730579

When editors and reviewers don't pay attention

Response about the decision by PLoS ONE

Posted by Mingjin on **29 Mar 2016 at 08:35 GMT**

We apologize for using some inappropriate words in our paper. English is not our native language, and our understanding of the word "Creator" was not as that of a native English speaker expected. Actually, we would like to refer the word to another meaning like Nature (造化 in Chinese). We are not creationists and our paper does not relate to the creationism as well. On the contrary, if you read our paper completely, you would find that we had referred to the knowledge of evolution in the Discussion of our paper, such as "this unique ability can apparently facilitate the capacity for more effective tool making and tool use during the evolutionary process" and "dexterous performance of numerous functions following the evolutionary remodeling of the ancestral hand for millions of years". We apologize for any troubles may have caused by this misunderstanding.

We think our paper can be corrected by removing the inappropriate words. It is not our intention to mention the creationism. We feel regret about the decision by the journal. The language of our paper did have some errors and we apologize for the language errors. However, we disagree with the concerns about the scientific rationale given by the journal. David Knutson, Public Relations Manager of PLoS, explained to Chronicle of Higher Education (http://chronicle.com/arti...) about the concerns on the scientific rationale in March 7, 2016. He said PLoS referred to a comment (http://journals.plos.org/...) and considered that "the authors did not explain how their work contributed to the base of scientific knowledge about the structure of the hand". In view of that question, we think our work does not aim to further explore the anatomic structure of human hand, but would like to explore the link between function and structure. In this paper, we hope to inspire other people in the design of robotic hands.

We emailed our response about the question to the editors of PLoS ONE on March 9, 2016. Then the journal replied us after several days with more questions raised by the two members of PLoS ONE editorial board on March 14, 2016. After read these questions carefully, we think all the questions are either irrelevant or groundless. For instance, the experts considered that our paper lacked a thorough discussion about the works of evolution. But our work does not relate to hand evolution. The

When editors and reviewers don't pay attention

PLOS | ONE

RESEARCH ARTICLE

A huge mountain made out of a molehill

Posted by dwwitzell on **24 Mar 2016 at 02:34 GMT**

The furor over the single mention of the word Creator in this paper is shocking! A huge mountain made out of a molehill. At best, the reactions show prejudicial bias. At worst, it can be considered intolerant and bigoted. I am thoroughly disgusted at the anti-scientific witch hunt that has taken place here! Retraction of the paper was bad enough, because it was not done for scientific reasons! If it was, you would have focused on the methodology, the data, and the conclusions, citing specific methodological flaws, or specific flaws in the data or conclusions, rather than ignore the science and zero in on the use of one word that by no means reflected the focus of the paper.

But firing the reviewing editor was not only total overkill, it looks vindictive, petty, and spiteful! He appears to have focused on the paper itself during his review, not allowing the one-time use of one word to distract him from the meat of the paper, and he did not deserve to be fired over his approval of this study. All you critics should have behaved in a more rational, open-minded, and tolerant way, and let the science presented speak for itself, rather than get your knickers in a knot because the paper contained one word you obviously couldn't stomach. You certainly did your scientific reputations no favours by over-reacting to it. And by insisting on the censorship of papers that use terms that offend your personal biases, you have transformed the term "peer review" from a term connoting quality control in scientific publications to a political term more suggestive of "peer pressure," which guarantees suppression of both innovative science and of scientists that deviate even slightly from the status quo. You have also undermined science itself, because true science is supposed to be dictated by the data. It is supposed to be free of personal bias and censorship. Innovative, groundbreaking discoveries don't come from those committed to the status quo and who practice and insist on consensus science. They come from those able and willing to think outside the box and to follow wherever the science leads. But who will be willing to practice science this way as long as the old school dinosaurs have the power to threaten their careers?

When editors and reviewers don't pay attention

Lindsay & Boyle, *Cogent Social Sciences* (2017), 3: 1330439
https://doi.org/10.1080/23311886.2017.1330439

cogent social sciences

SOCIOLOGY | RESEARCH ARTICLE

The conceptual penis as a social construct

Jamie Lindsay[1]* and Peter Boyle[1]

Abstract: Anatomical penises may exist, but as pre-operative transgendered women also have anatomical penises, the penis *vis-à-vis* maleness is an incoherent construct. We argue that the conceptual penis is better understood not as an anatomical organ but as a social construct isomorphic to performative toxic masculinity. Through detailed poststructuralist discursive criticism and the example of climate change, this paper will challenge the prevailing and damaging social trope that penises are best understood as the male sexual organ and reassign it a more fitting role as a type of masculine performance.

Subjects: Gender Studies - Soc Sci; Postmodernism of Cultural Theory; Feminism

Received: 17 April 2017
Accepted: 11 May 2017

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Reviewing editor:
Jamie Halsall, University of Huddersfield, UK

But what does really count ?

Do others read, use, build on, deal with your publications?

Do you have a vision, or do you 'just' work on some tiny detail?

Do those who learnt from you think and speak highly of you? Do you have a reputation of integrity?

Are you happy?

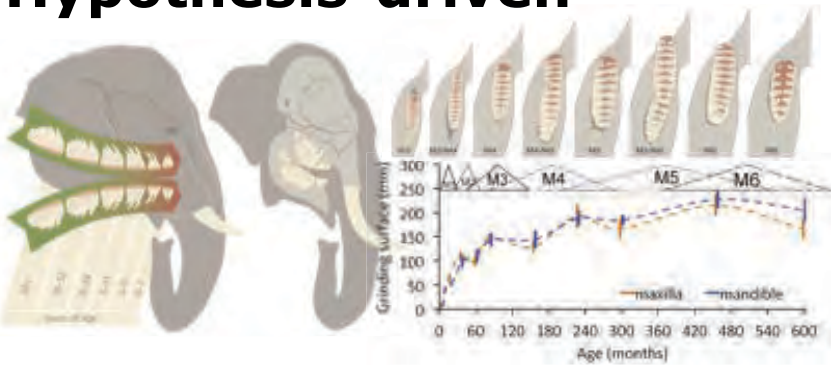
Would the child you were be proud of the adult you are?

Integrity

getting used to lying

The myth of 'hypothesis-driven research'

Hypothesis-driven

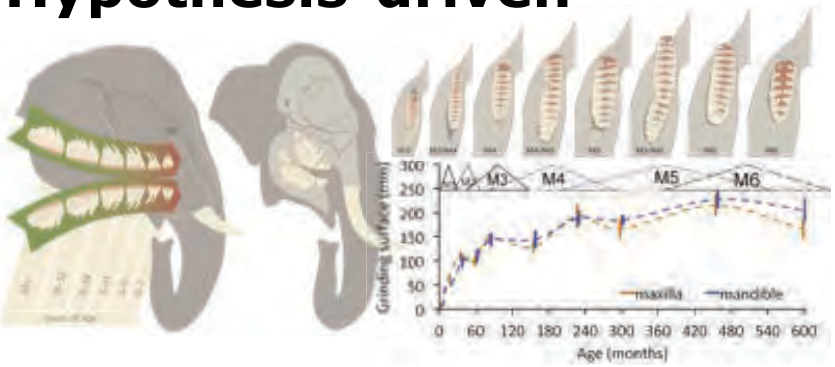


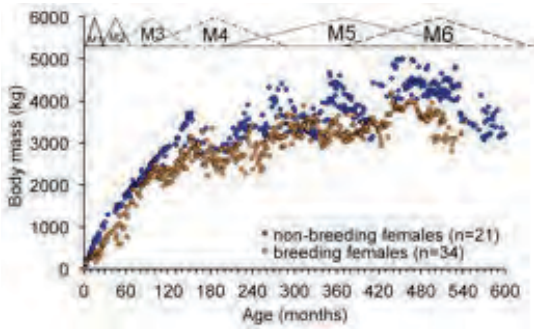
"to test our hypothesis, we collected body mass data from zoo elephants"

Schiffmann et al. (in preparation)

The myth of 'hypothesis-driven research'

Hypothesis-driven



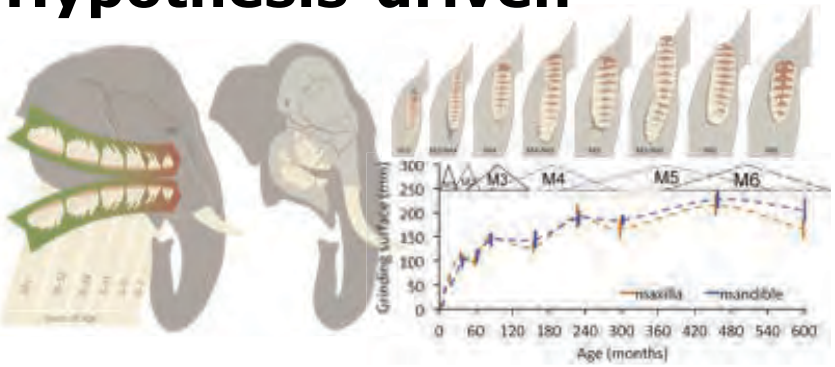


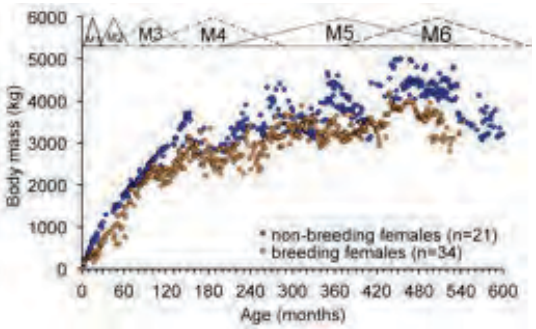
"our hypothesis was confirmed"

Schiffmann et al. (in preparation)

The myth of 'hypothesis-driven research': getting used to lying

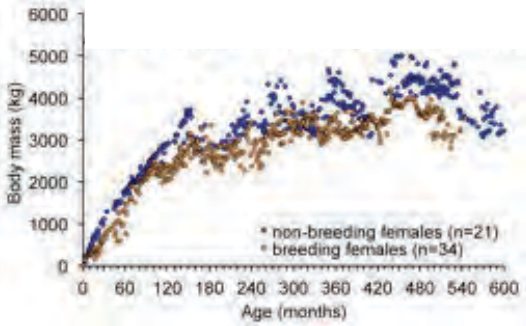
Hypothesis-driven





"our hypothesis was confirmed"

Serendipity-driven



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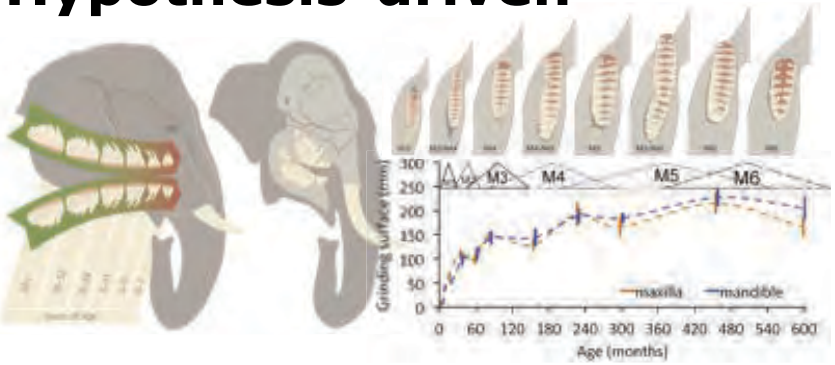
"I know a good thing when I see it"

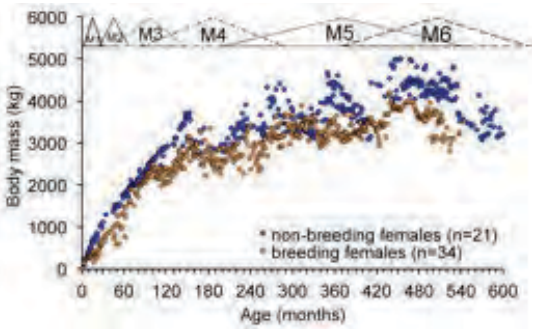
Patty Larkin, '*Angels running*'

Schiffmann et al. (in preparation)

The myth of 'hypothesis-driven research': getting used to lying

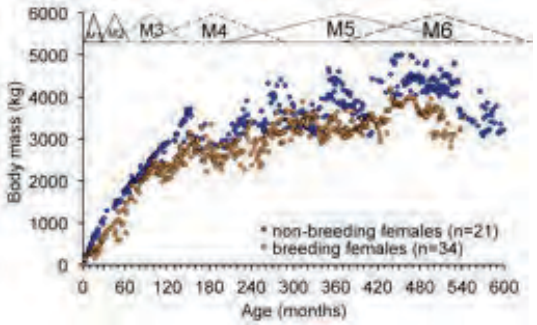
Hypothesis-driven





"our hypothesis was confirmed"

Serendipity-driven



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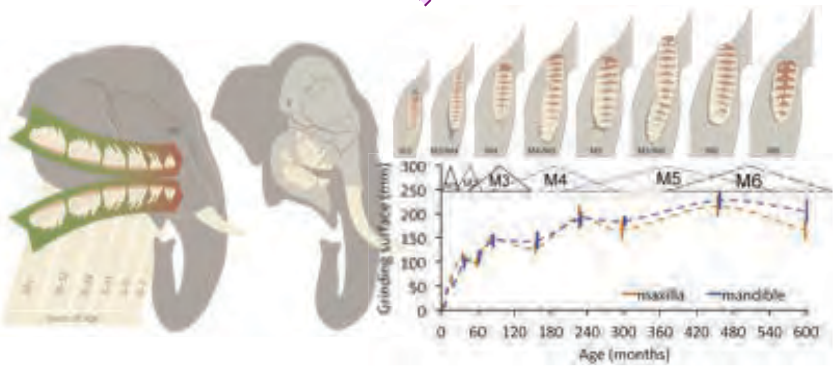


"we stumbled across a pattern and we think we can explain it"

Schiffmann et al. (in preparation)

The greatest story ever planned?

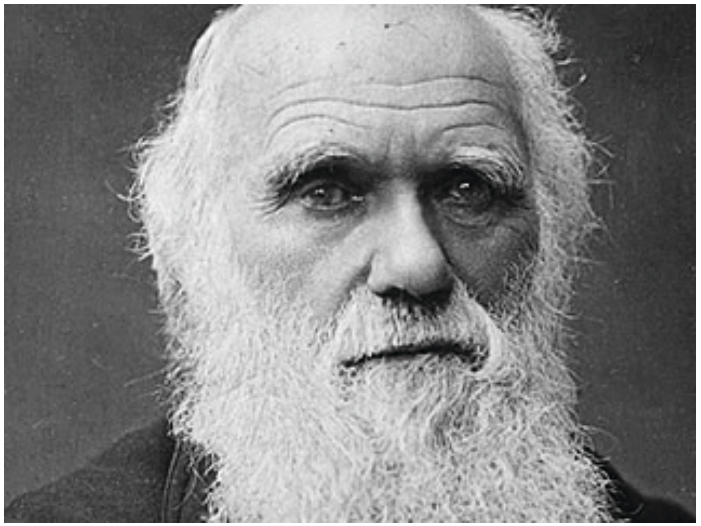
Darwin's diary:

1. Hypothesis

Species originate by selection acting on the variability of phenotypes so that only certain ones can reproduce/so that certain ones can reproduce more efficiently.

2. Research plan

Travel around the world and find model systems to test hypothesis.

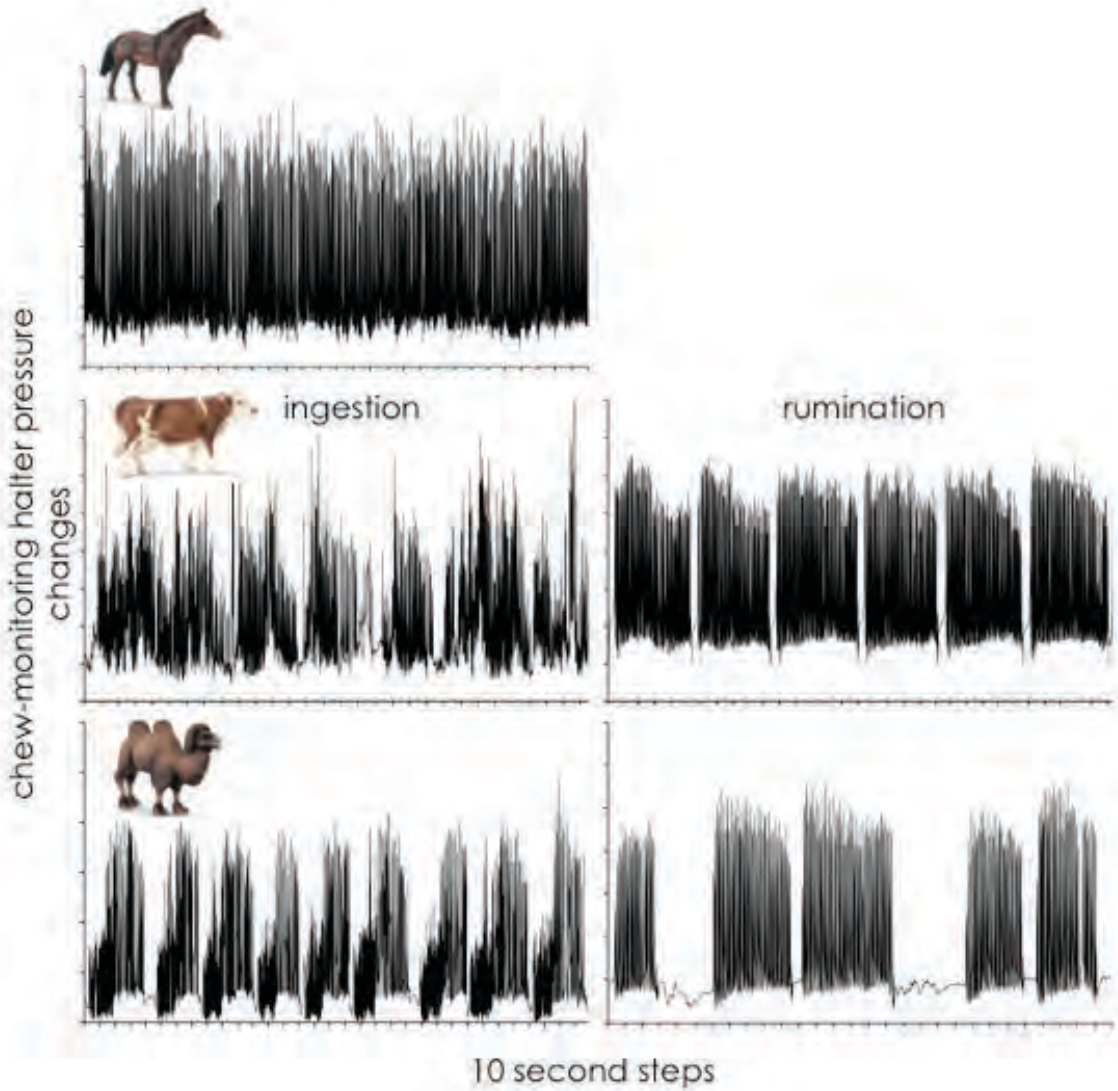


RESEARCH ARTICLE

WILEY JEZ-A ECOLOGICAL and INTEGRATIVE PHYSIOLOGY

Ingestive mastication in horses resembles rumination but not ingestive mastication in cattle and camels

Marie T. Dittmann[1,2,3] | Michael Kreuzer[2] | Ullrich Runge[4] | Marcus Clauss[3]



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Marie T. Dittmann[1,2,3] | Michael Kreuzer[2] | Ullrich Runge[4] | Marcus Clauss[3]

In the course of the preparation for an experiment with cattle (Dittmann et al., 2016), the first author (MTD) tested a chew-monitoring head collar operating with a noseband sensor (RumiWatch; Itin + Hoch GmbH, Liestal, Switzerland) on a horse for practicing halter application and data evaluation functions. The system had been developed primarily for cattle (Ruuska, Kajava, Mughal, Zehner, & Mononen, 2016; Zehner, Umstätter, Niederhauser, & Schick, 2017) but in the meantime was also validated for application in horses (Werner, Umstatter, Zehner, Niederhauser, & Schick, 2016). The system comprises a proprietary algorithm developed to classify chewing events of cattle as "ingestive" or "rumination" mastication, a differentiation not required in nonruminating species such as horses. When applying the algorithm on the test horse data, nevertheless, it unexpectedly interpreted the mastication of that horse as "rumination." This

The myth of 'hypothesis-driven research': getting used to lying

What kind of behaviour are we promoting when we (fanatically) promote 'hypothesis-driven research'?

What kind of scientists are we selecting for?

For 'decision-makers' and grant agencies, 'hypothesis-driven' means control, planning, the suppression of the unexpected.

Funding only 'hypothesis-driven research' means you do not fund, by definition, the generation of new ideas ***– only (if you are lucky) their testing***.

The myth of 'hypothesis-driven research': getting used to lying

But the more interesting aspect is:

If you teach (= set incentives to the effect that) people (to) lie about hypothesis generation, how do you teach that lying should not expand to data manipulation?

find your place

How do I start ?

Ambition/effort <=> “love” for a topic ?
Read! Read! Read!

(also: literature check for a certain clinical case)

Find your own questions

=> Read (lit. research) - look for an answer!

If there is no answer or if it does not satisfy:

=> you have your topic!

‘I did not chose the music, it chose me’

C. Eastwood, Honkytonk Man

How do I start ?

Write.

Write before you are ready.

But please only write if you want to say something, not because you want to have a career.

CAREERS

EDUCATION US needs to improve science literacy to prepare workforce p.130

TURNING POINT Biochemist's high-risk research direction pays off p.131

NATUREJOBS For the latest career listings and advice www.naturejobs.com

As a graduate student, you might find yourself well on the way with your education and 'ABD' (all but dissertation). Day after day, you tell yourself that you really, really intend to start writing your paper. After all, you've collected all the data, analysed them many times and entered them into tables.

But then you start thinking that maybe you need just a few more data. Perhaps, too, you should try a different analysis technique. And what if the tables you used aren't the right ones, or need to be formatted differently?

Many of the thousands of researchers we have worked with are constantly being tripped up by finicky, niggling details that keep them from writing up their research. Every day, they mean to start, but every day, something gets in their way or seems more important — and this can go on for years. Some very common obstacles get in the way of high-quality, high-quantity scholarly writing, but powerful, evidence-based techniques can help researchers to overcome repetitive and unhelpful habits and get moving (see 'How to get out of a dissertation-writing rut').

WRITING MYTHS

The biggest impediments to scholarly writing are long-held myths that seem to get passed down through the academic ranks like precious but unhelpful ancient wisdom. The first is the Readiness Myth — "I should write when I feel ready, and I don't feel ready yet". The secret to high output is that you have to write before you feel ready, because you might never reach that point. Researchers read endlessly and conduct countless experiments in the belief that it will eventually make them feel ready to write — we call these habits readitis and experimentitis. But ironically, all that reading and experimenting often makes them less likely to write, and more confused. So the first way to speed up your writing is to stop waiting, stop reading and experimenting, and start writing. You won't feel ready, but you have to do it anyway.

This brings us to the second myth, the Clarity Myth — "I should get it all clear in my head first, and then write it down". This isn't how writing works in practice. You have probably had the experience in which you were sure about how a paper would go until you started to write it. Then you discovered that there were inconsistencies, or it didn't flow well or the links didn't make sense. This tells you that it wasn't all that coherent in your head, after all. In fact, writing clarifies your thinking. Writing is not recording — you don't just take ▸

COLUMN

Turbocharge your writing today

Before you can tackle the overwhelming task of huge writing projects, you must first put aside some widely held myths, say **Maria Gardiner** and **Hugh Kearns**.

‘publish *and* perish !’

Brian McNab (2002)

Always remember: most people who are really happy in this world are so without having published a thing.

Science is not about control.

Is is about cultivating a perpetual condition of wonder in the face of something that forever grows one step richer and subtler than our latest theory about it.

It is about reverence, not mastery.

Richard Powers (1991) The gold bug variations. William Morrow & Co, New York