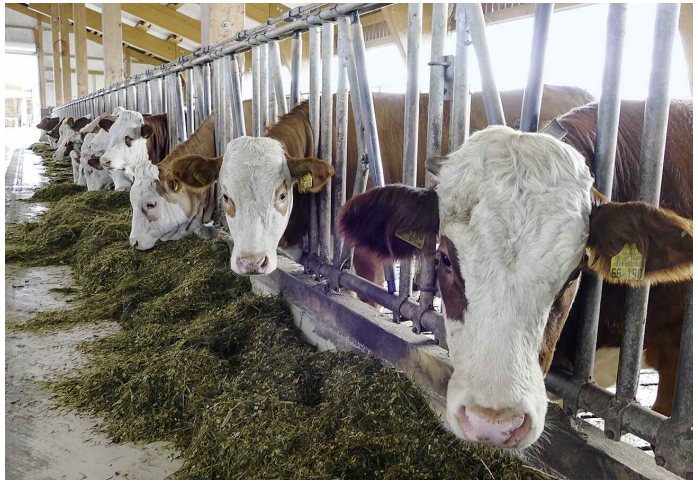
Lebenserwartung im Zoo und im natürlichen Habitat

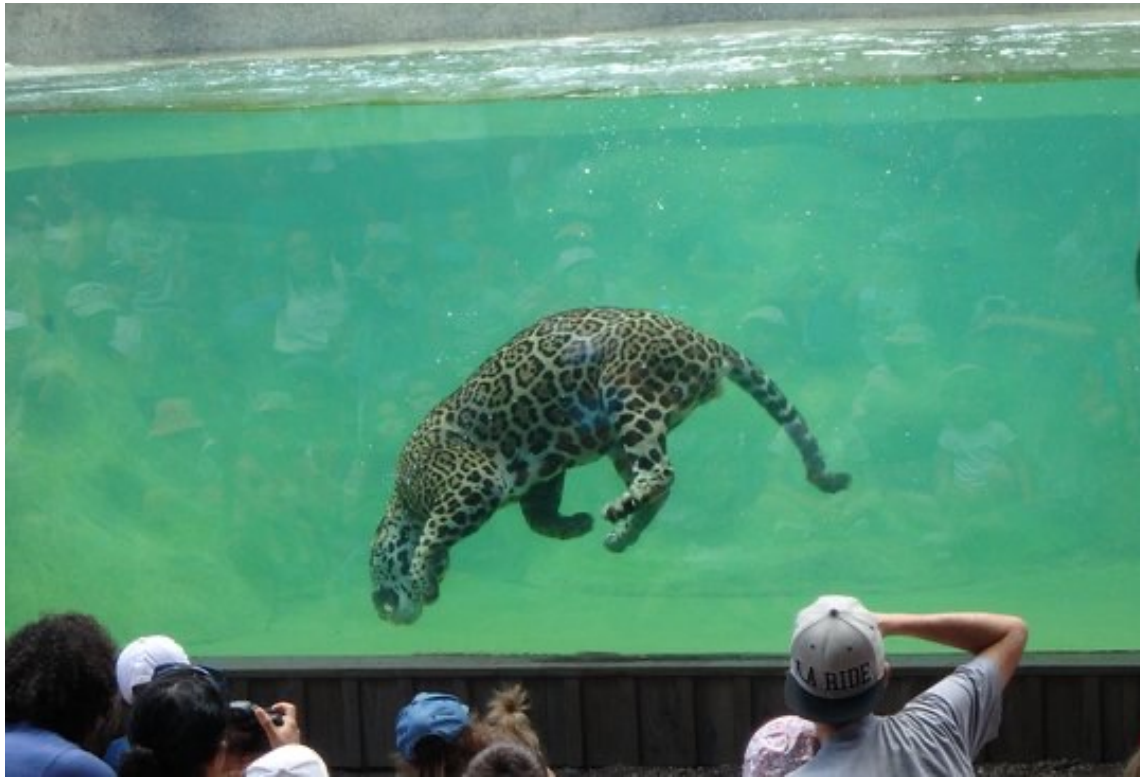
Marcus Clauss
Klinik für Zoo-, Heim- und Wildtiere, Vetsuisse-Fakultät, Universität Zürich, Schweiz
Seniorenuni 2023

University of Zurich[UZH]

Clinic
of Zoo Animals, Exotic Pets and Wildlife

Zoos sind speziell …





SPECIES 360

Global information serving conservation.

ISIS

International Species Information System

SPECIES 360

Global information serving conservation.

EAZA

Standards for the Accommodation and Care of Animals in Zoos and Aquaria

Approved by EAZA Annual
General Meeting
2 October 2020

EAZA

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2 October 2020

5.2 Stock records

1. Animal records are to be kept on a computer system using the Zoological Information Management System (ZIMS), and to be included on the global zoo animal database of Species360, by means of which information can be quickly retrieved.
2. Alternatively, records may be kept by means of an established and globally recognised and accepted record system, that is easily able to share data with ZIMS and that is and maintained in relation to all individually recognised animals and groups of animals. If a Member wishes to use an alternative record system, it shall request prior approval of the Council. The Council shall decide in its absolute discretion.
3. Where animals are disposed of or die, the records to be kept in the appropriate recording system as described in Article 95.
4. The records should provide the following information:
    a. the correct identification and scientific name;
    b. the origin (i.e. whether wild or captive born, including identification of parents, where known, and previous location/s, if any);
    c. the dates of entry into, and disposal from, the collection and to whom;
    d. the date, or estimated date, of birth;
    e. the sex of the animals (where known);
    f. any distinctive markings, including tattoo or freeze brands etc.;
    g. clinical data, including details of and dates when drugs, injections, and any other forms of treatment were given, and details of the health of the animal;
    h. the date of death and the result of any post-mortem examination;
    i. the reason, where an escape has taken place, or damage or injury has been caused to, or by, an animal to persons or property, for such escape, damage or injury and a summary of remedial measures taken to prevent recurrence of such incidents.

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EAZA Membership and Accreditation Manual

EUROPEAN ASSOCIATION OF ZOOS AND AQUARIA

EAZA

ACCREDITED MEMBER

You learn a lot about the natural world if you keep your animals in an intelligent way.

- David Attenborough, *2016*

European Association of Zoos and Aquaria
Amsterdam
Version 4
Approved by the EAZA Annual General Meeting on 22 April 2021

EAZA Membership and Accreditation Manual

EUROPEAN ASSOCIATION OF ZOOS AND AQUARIA

EAZA

ACCREDITED MEMBER

EAZA Members are required to meet obligations regarding, e.g.:

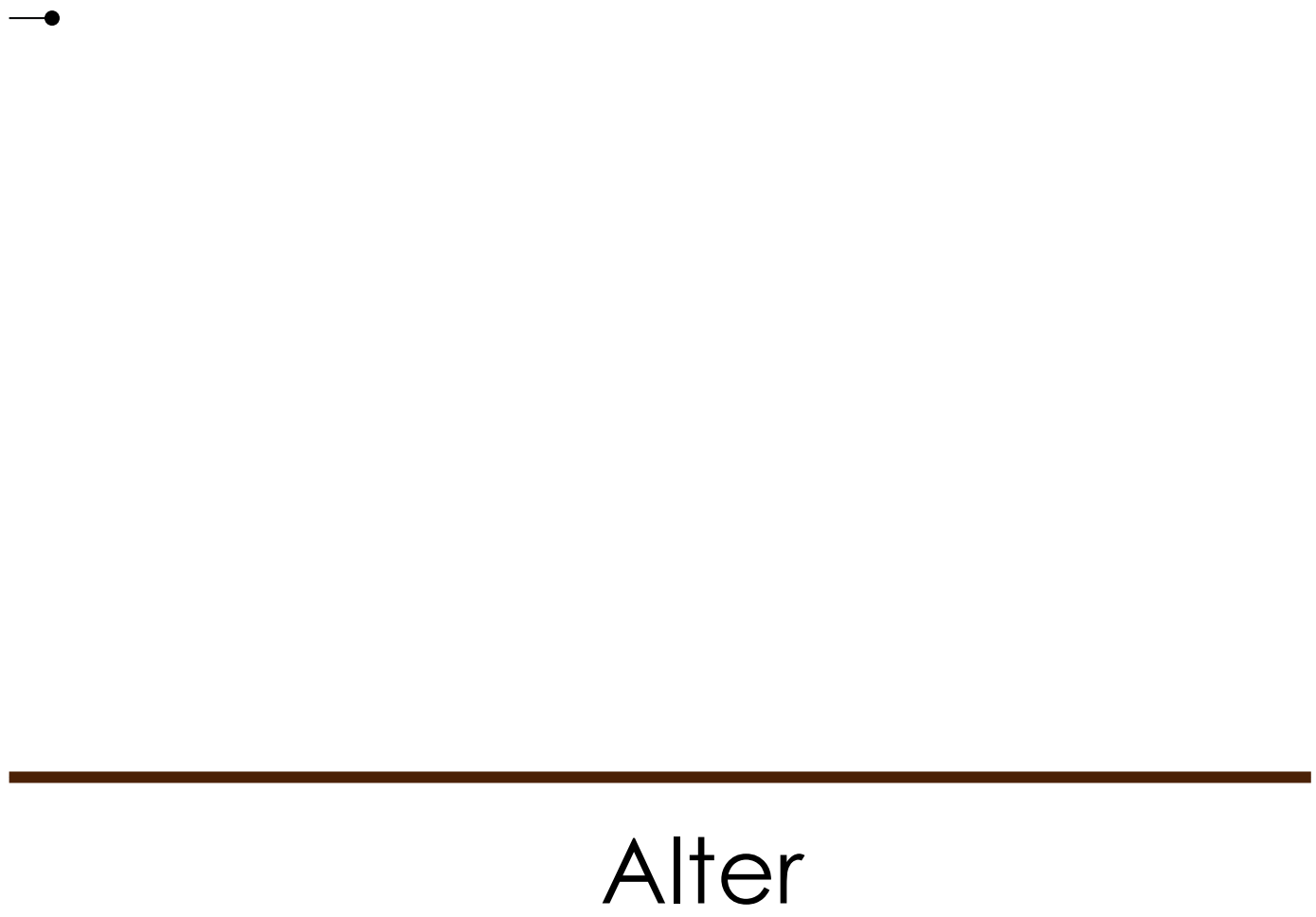
- Participation in EAZA Ex situ Programmes (EEPs) for population management
- Animal records (Species360 membership)

Überlebensdaten: Geburt und Tod

Daten in Species360: Geburt und Tod

Alter

Daten in Species360: Geburt und Tod



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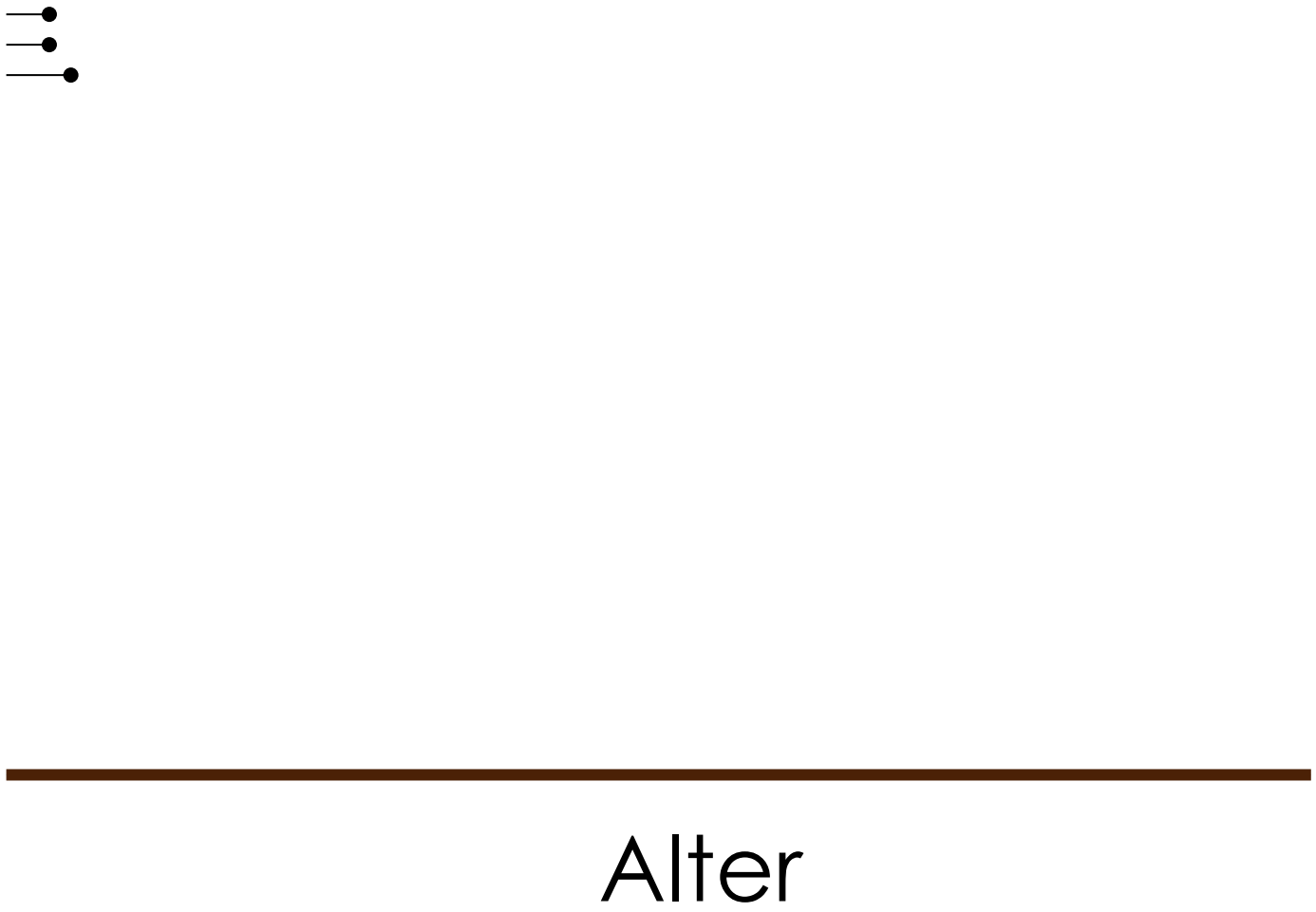

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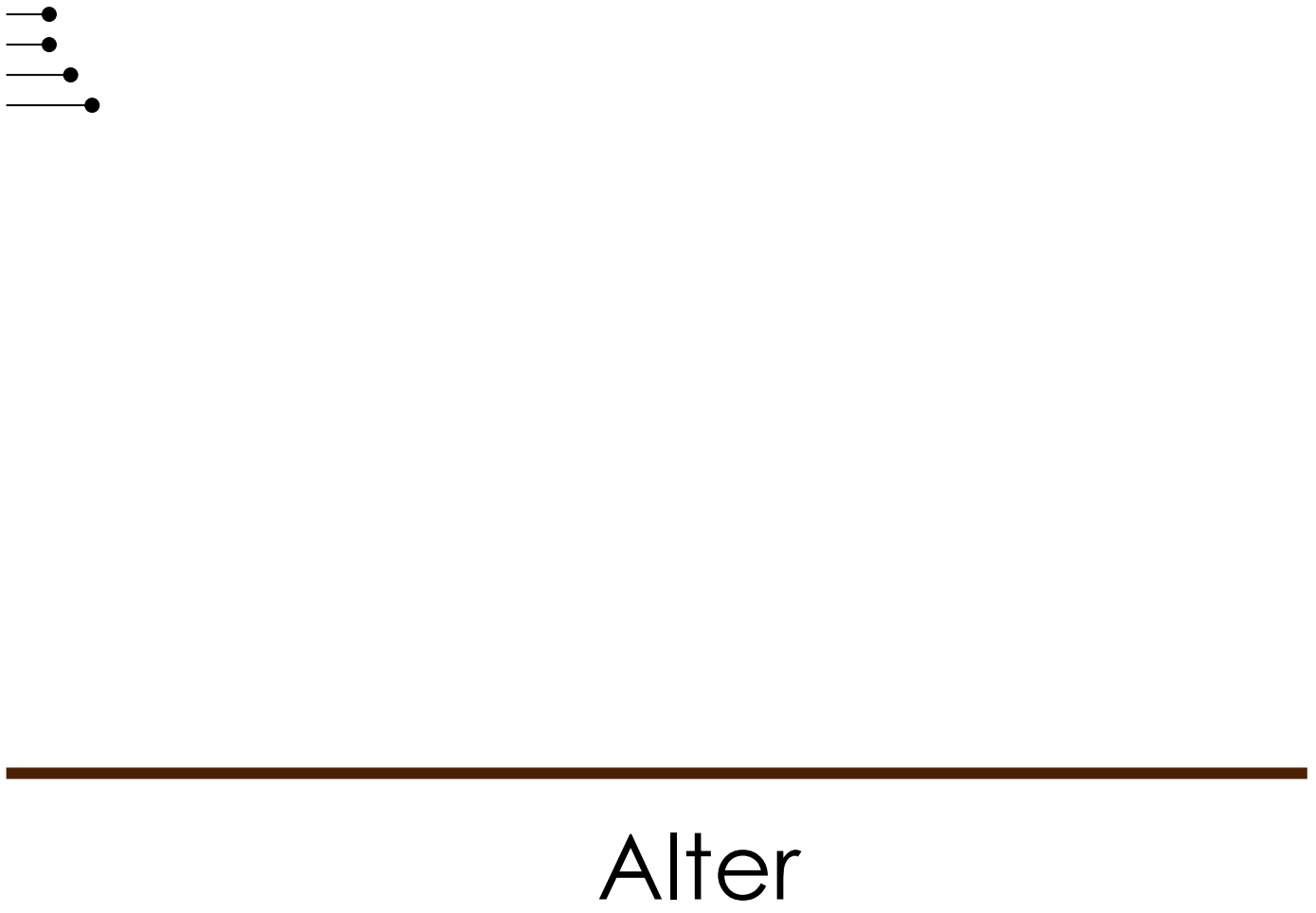

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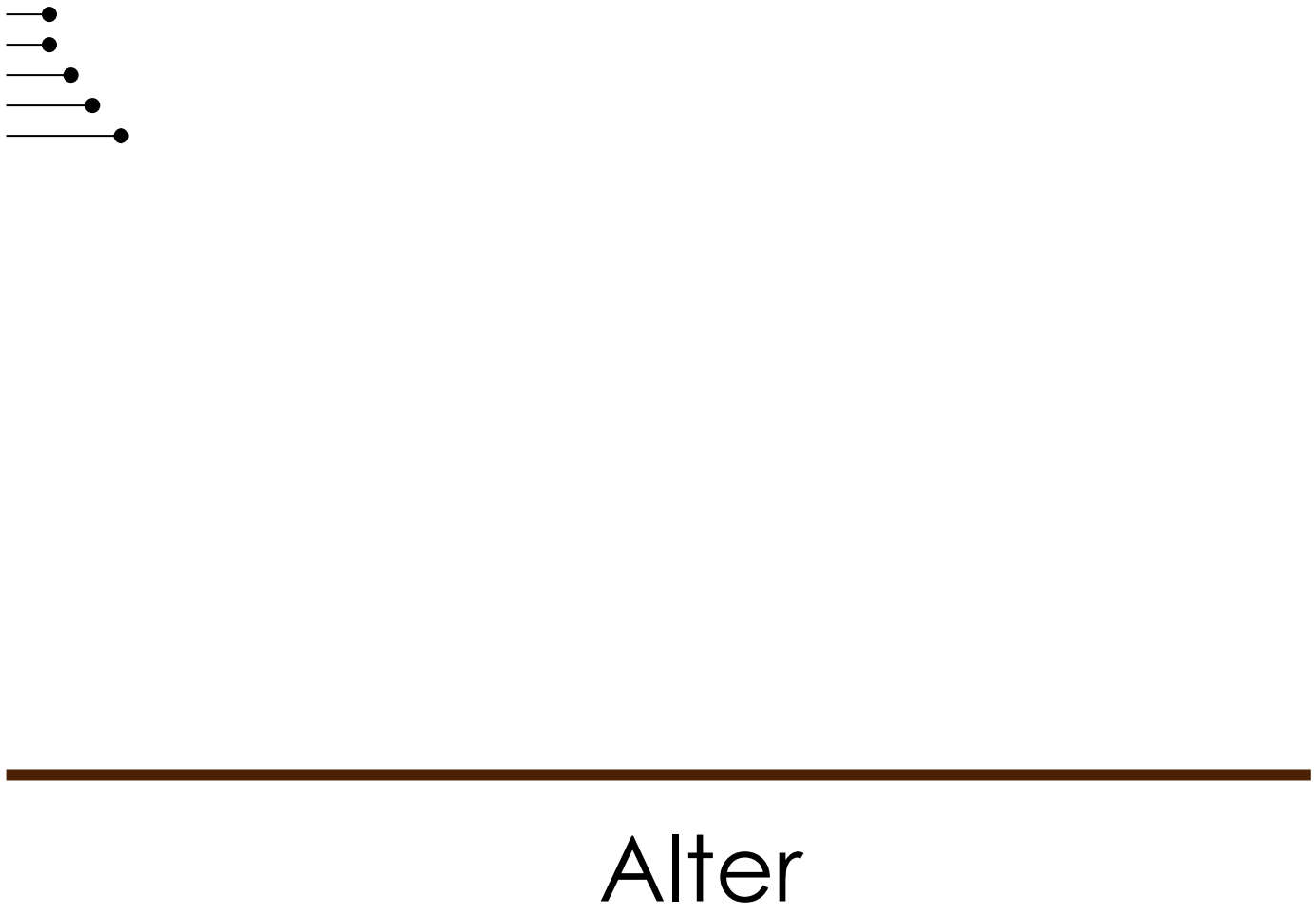

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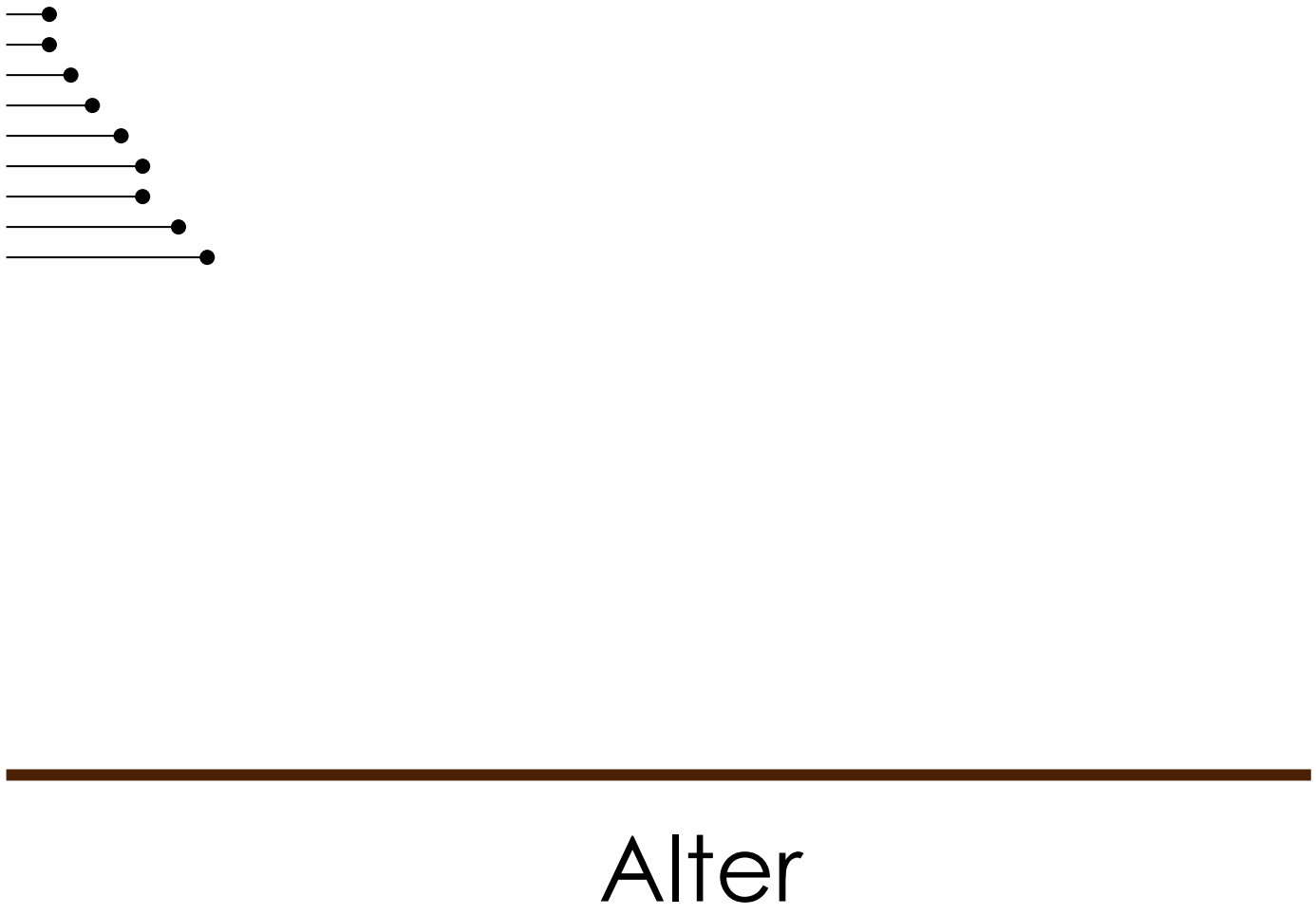

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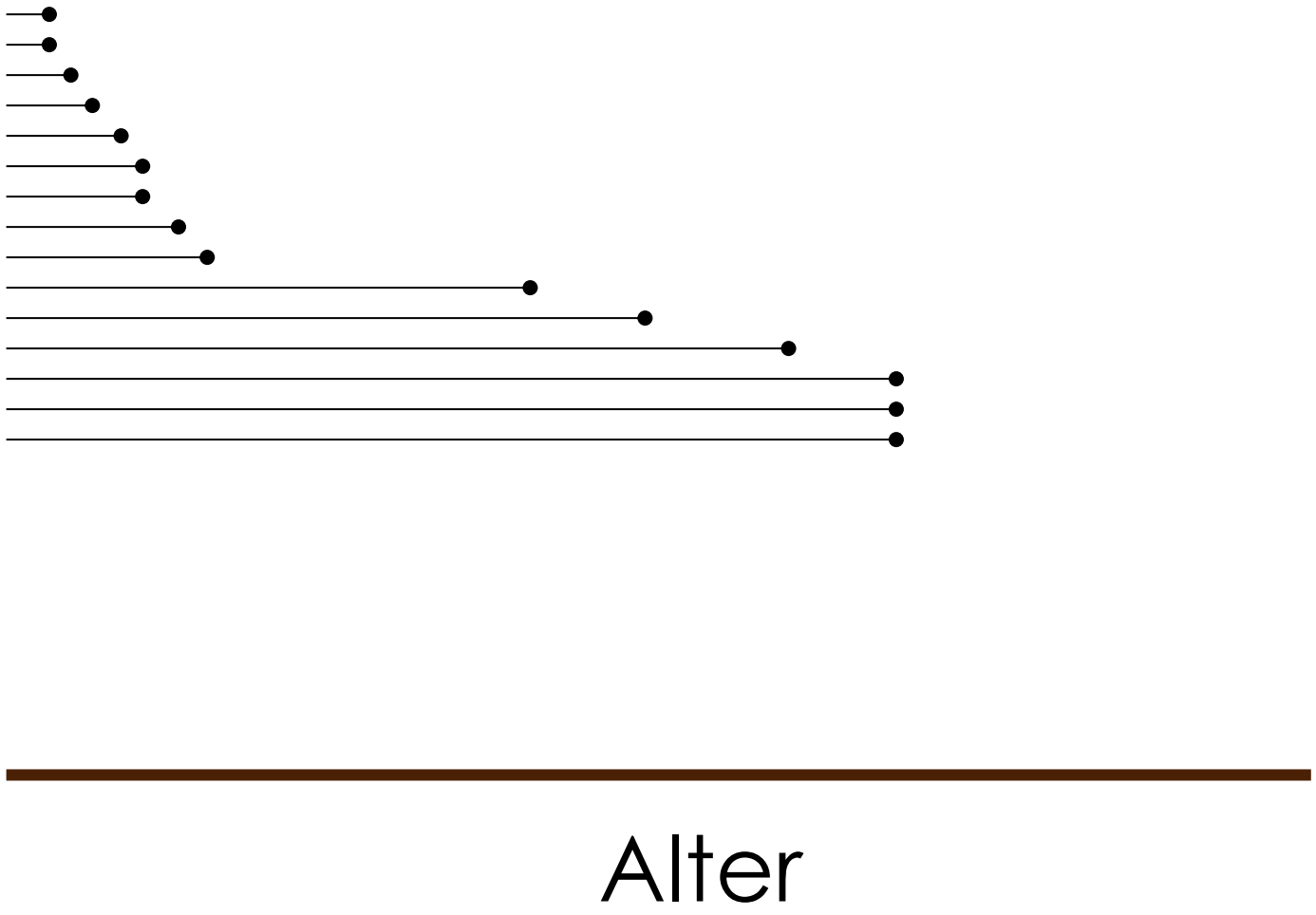

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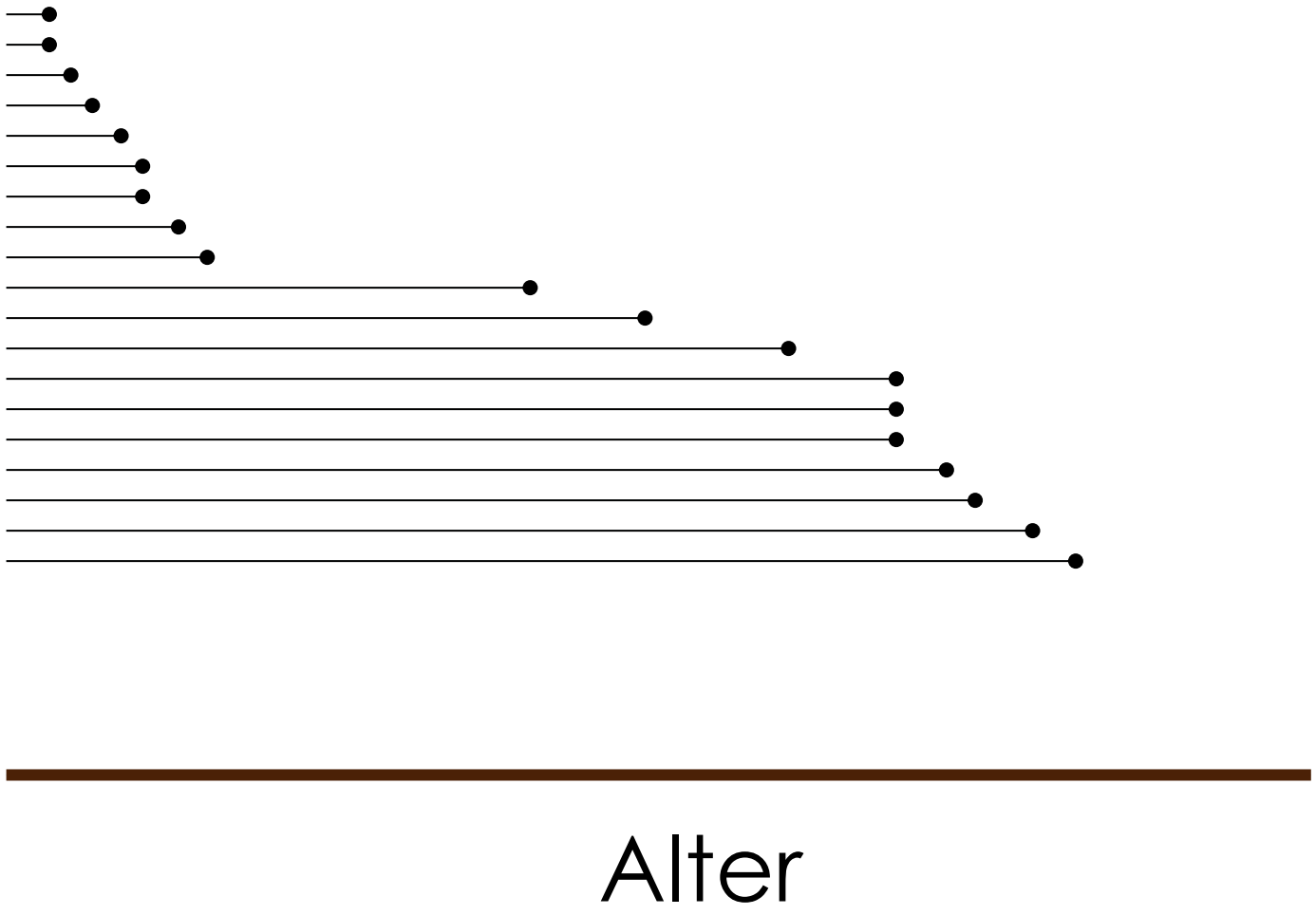

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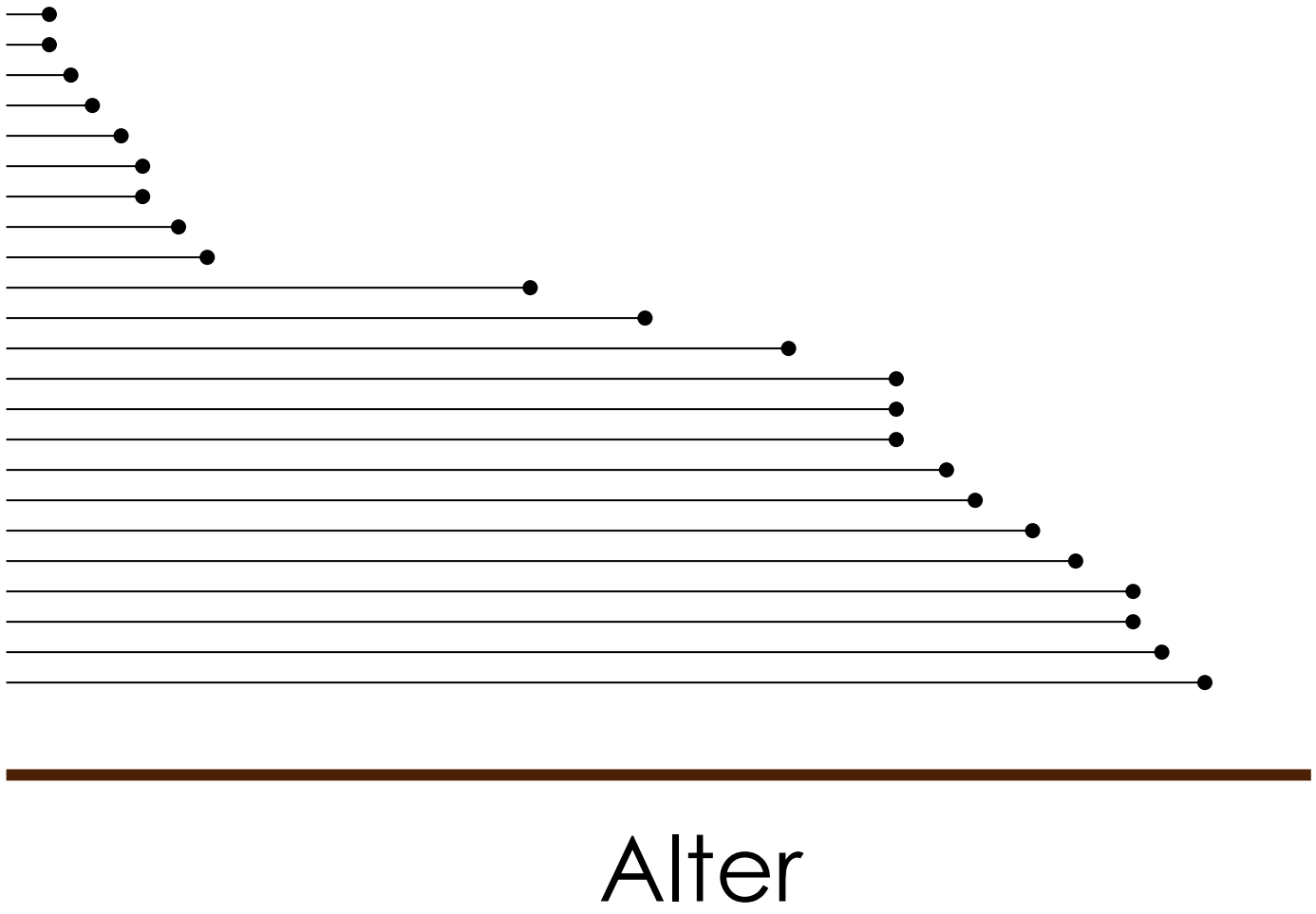

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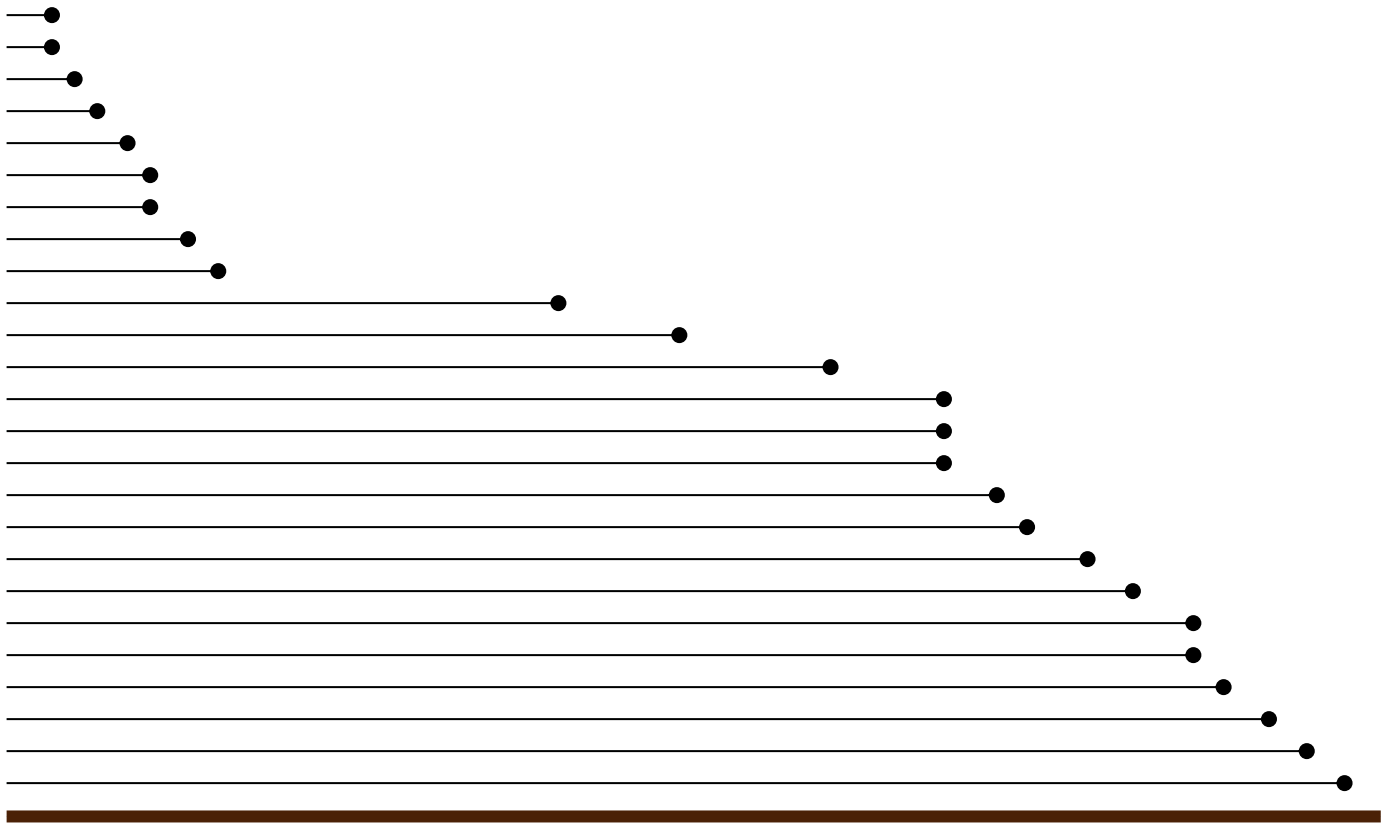

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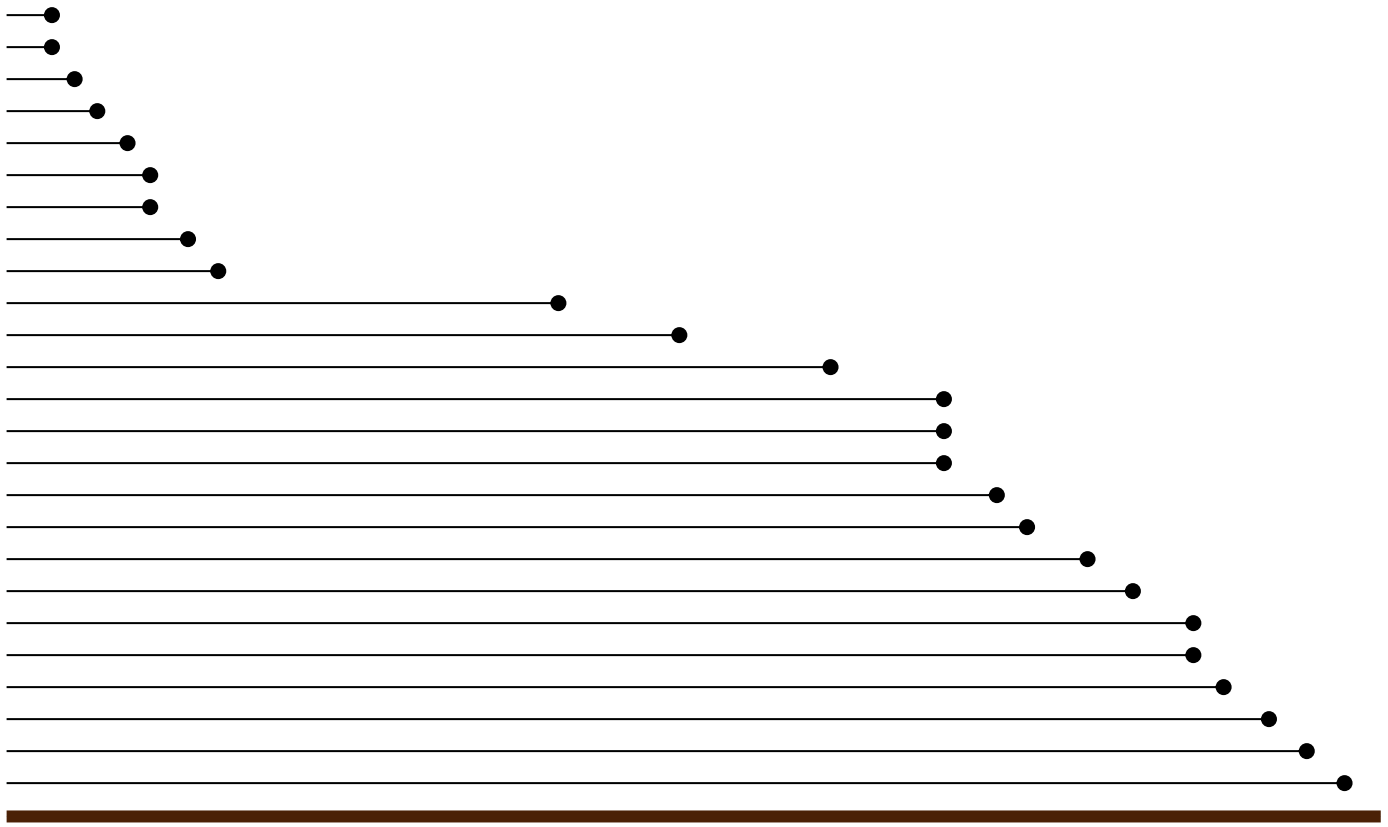

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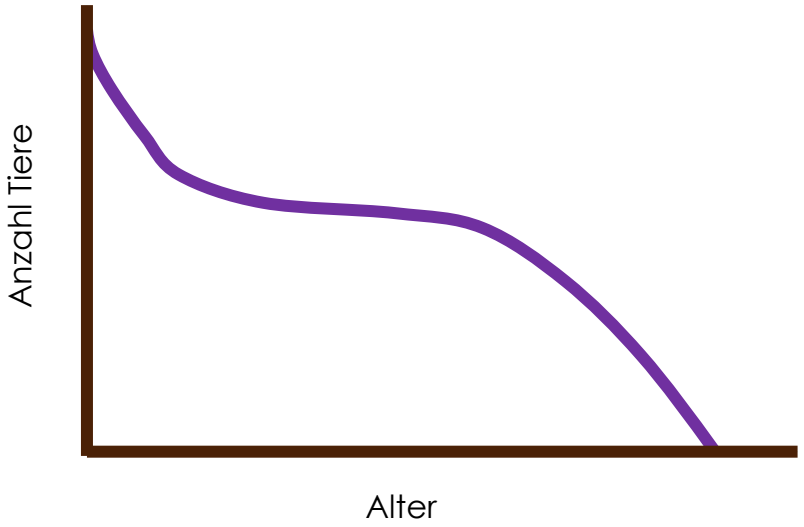

Mortalität

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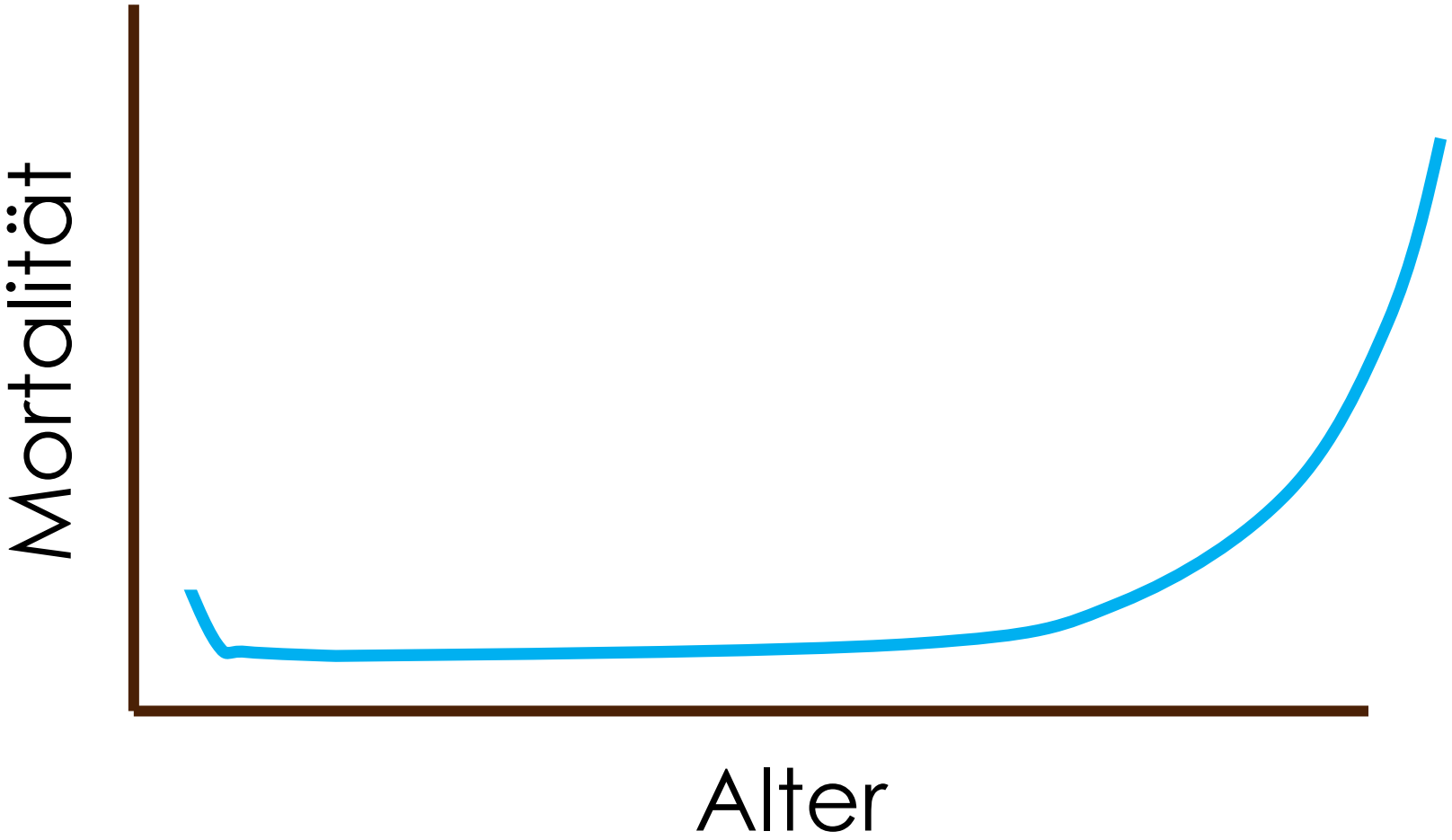

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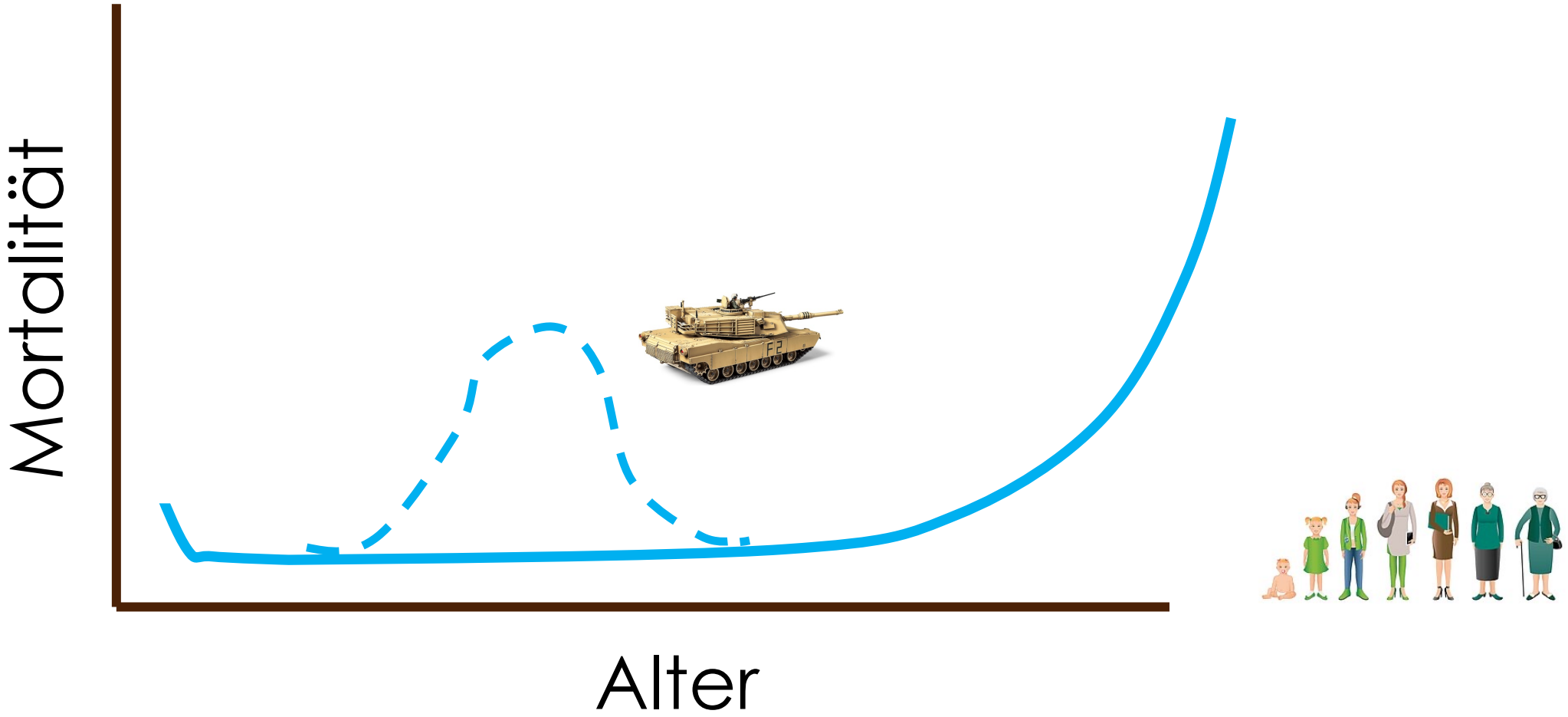

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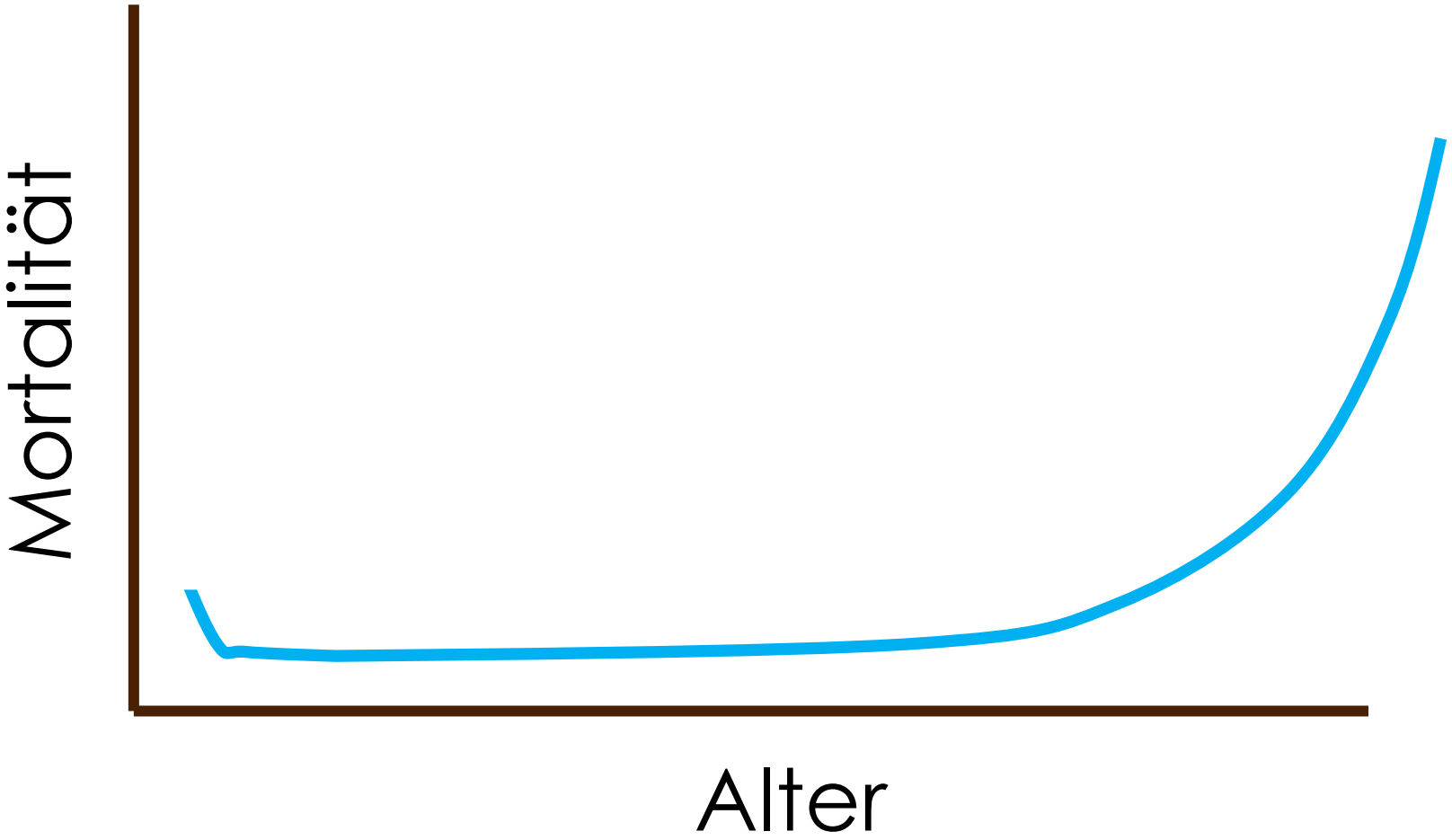

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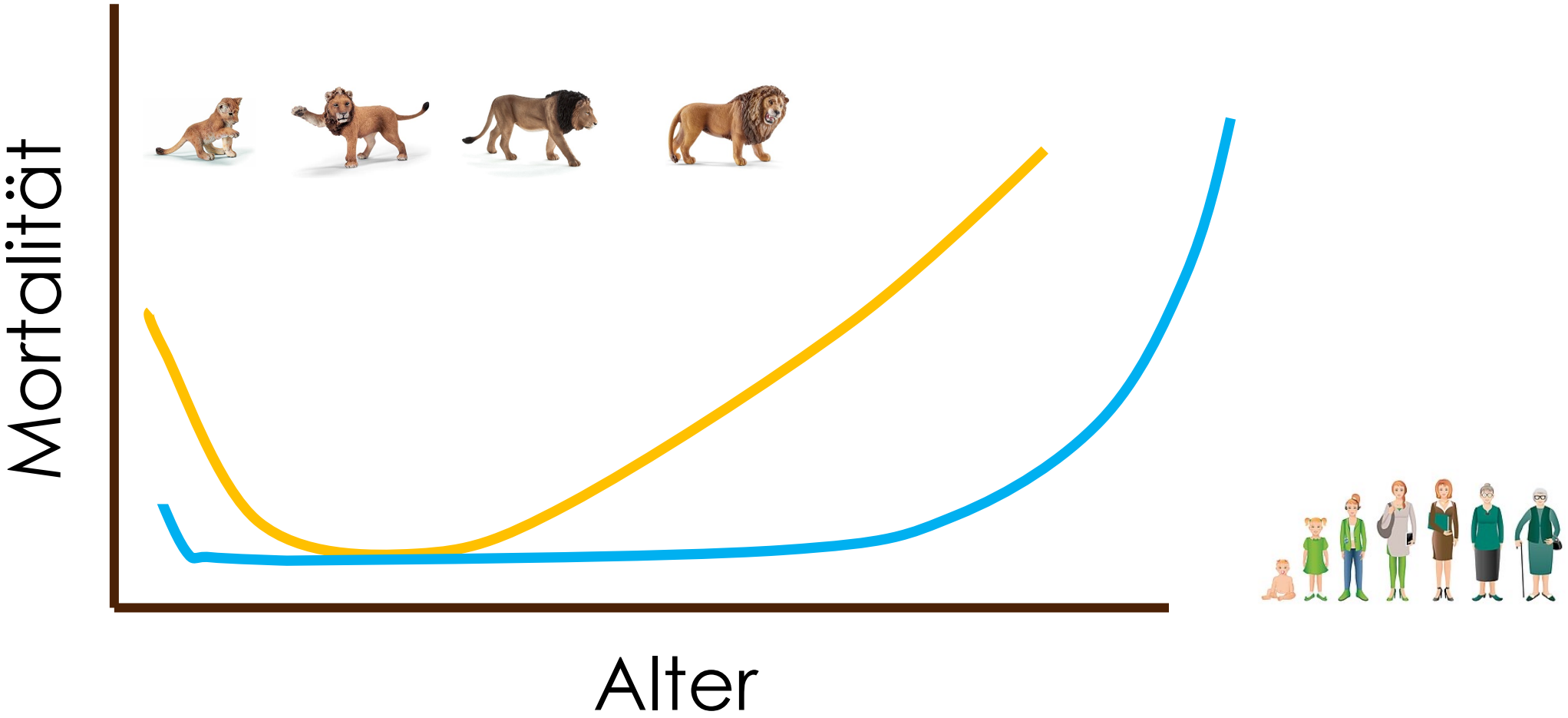

Vergleich mit natürlichen Habitaten

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SCIENTIFIC REPORTS

OPEN

Comparative analyses of longevity and senescence reveal variable survival benefits of living in zoos across mammals

Received: 10 June 2016
Accepted: 30 September 2016
Published: 07 November 2016

Morgane Tidière[1], Jean-Michel Gaillard[1], Vérane Berger[1], Dennis W. H. Müller[2], Laurie Bingaman Lackey[3], Olivier Gimenez[4], Marcus Clauss[5] & Jean-François Lemaître[1]

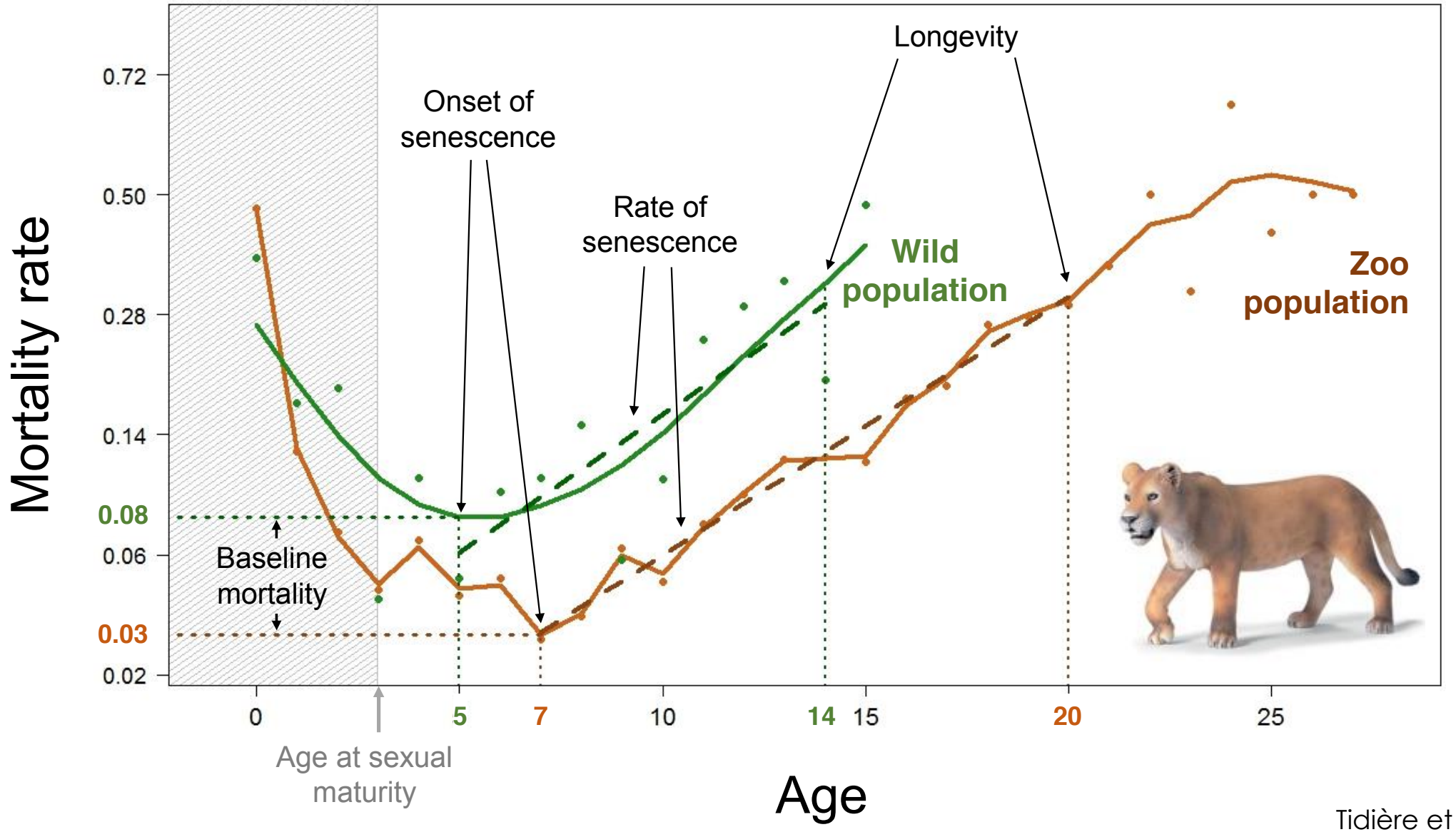
While it is commonly believed that animals live longer in zoos than in the wild, this assumption has rarely been tested. We compared four survival metrics (longevity, baseline mortality, onset of senescence and rate of senescence) between both sexes of free-ranging and zoo populations of more than 50 mammal species. We found that mammals from zoo populations generally lived longer than their wild counterparts (84% of species). The effect was most notable in species with a faster pace of life (i.e. a short life span, high reproductive rate and high mortality in the wild) because zoos evidently offer protection against a number of relevant conditions like predation, intraspecific competition and diseases. Species with a slower pace of life (i.e. a long life span, low reproduction rate and low mortality in the wild) benefit less from captivity in terms of longevity; in such species, there is probably less potential for a reduction in mortality. These findings provide a first general explanation about the different magnitude of zoo environment benefits among mammalian species, and thereby highlight the effort that is needed to improve captive conditions for slow-living species that are particularly susceptible to extinction in the wild.

Zoological gardens represent artificial environments in which animals are maintained, bred and displayed. By doing so, zoos achieve a diversity of goals beyond their visitors' recreation: basic zoological and conservation education reaches 700 million visitors per year all over the world[1]. Continuing research and expertise building by many thousands of zoo staff worldwide continuously improves knowledge of animal, population and ecosystem management. Zoos also aim to maintain viable *ex situ* insurance populations of endangered species that can be used for re-introduction to the wild[2,3]. Zoo staff manages and generates funding for *in situ* conservation projects[1,4]. Finally, zoos facilitate opportunities for researchers to increase expertise in a large variety of areas, from basic zoology to applied husbandry and molecular biology.

When assessing the justification of holding nondomestic species in zoos, the welfare of the individual animals housed in captivity is a critical ethical issue that has to be weighed against these aims[5]. There is no single proxy to measure the welfare of animals. Indicators typically employed include measures of survival (such as longevity, annual survival, or ageing rate), reproduction (such as fertility or litter size), physiology (such as stress hormones or the occurrence of specific diseases) and behavior (such as stereotypies)[5,6]. It is typically believed that zoo animals live longer than their free-ranging conspecifics due to the consistent provision of food, water, and shelter from harsh climates, the absence of predation and management to minimize violent intraspecific encounters and accidents, as well as veterinary prophylactic and therapeutic intervention. However, zoo animals may be subject to behavioral deficits[6]. While an increasing number of comparative studies have demonstrated species-specific differences in the response to zoo-conditions[7–9], and a few species-specific comparisons of survival metrics between free-ranging and captive specimens have been published[10,11], large-scale inter-specific comparisons of captive and

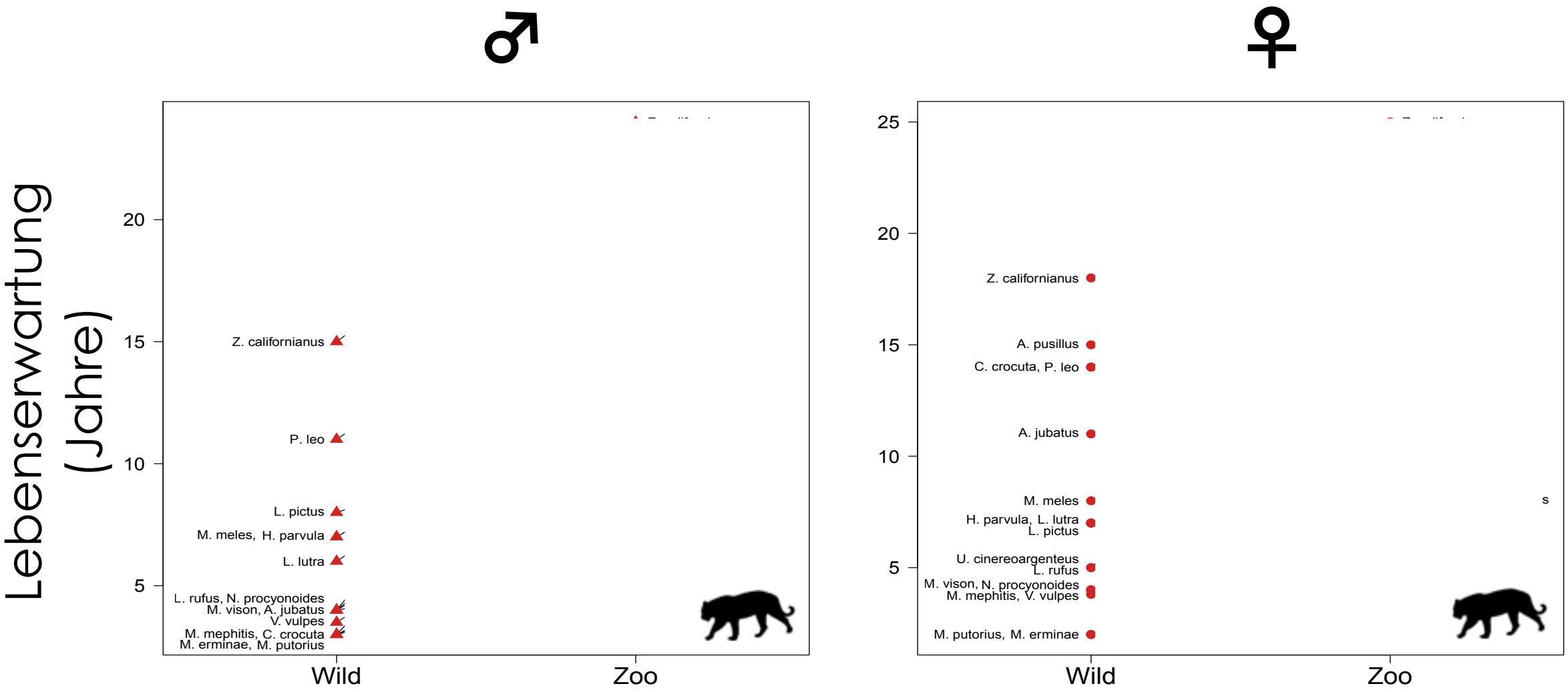
[1]Université de Lyon, F-69000, Lyon; Université Lyon 1; CNRS, UMR5558, Laboratoire de Biométrie et Biologie Evolutive, F-69622, Villeurbanne, France. [2]Zoologischer Garten Halle GmbH, Fasanenstr. 5a, 06114 Halle (Saale), Germany. [3]World Association of Zoos and Aquariums (WAZA), Gland, Switzerland. [4]UMR 5175, Centre d'Ecologie Fonctionnelle et Evolutive, campus CNRS, 1919 route de Mende, 34293, Montpellier Cedex 5, France. [5]Clinic for Zoo Animals, Exotic Pets and Wildlife, Vetsuisse Faculty, University of Zurich, Winterthurerstr. 260, 8057 Zurich, Switzerland. Correspondence and requests for materials should be addressed to M.T. (email: mtidiere@gmail.com)

Sterberaten



Tidière et al. (2016)

Raubtiere werden im Zoo … ?



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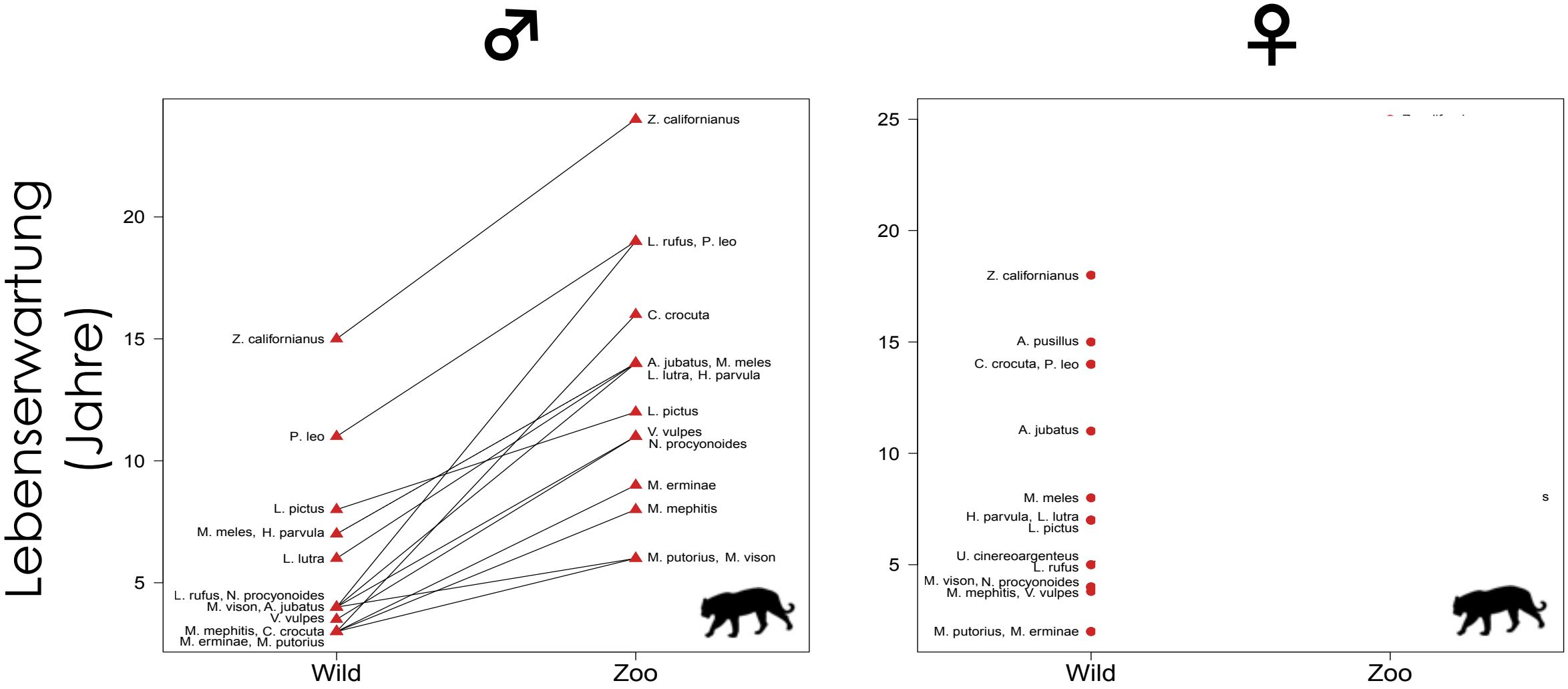

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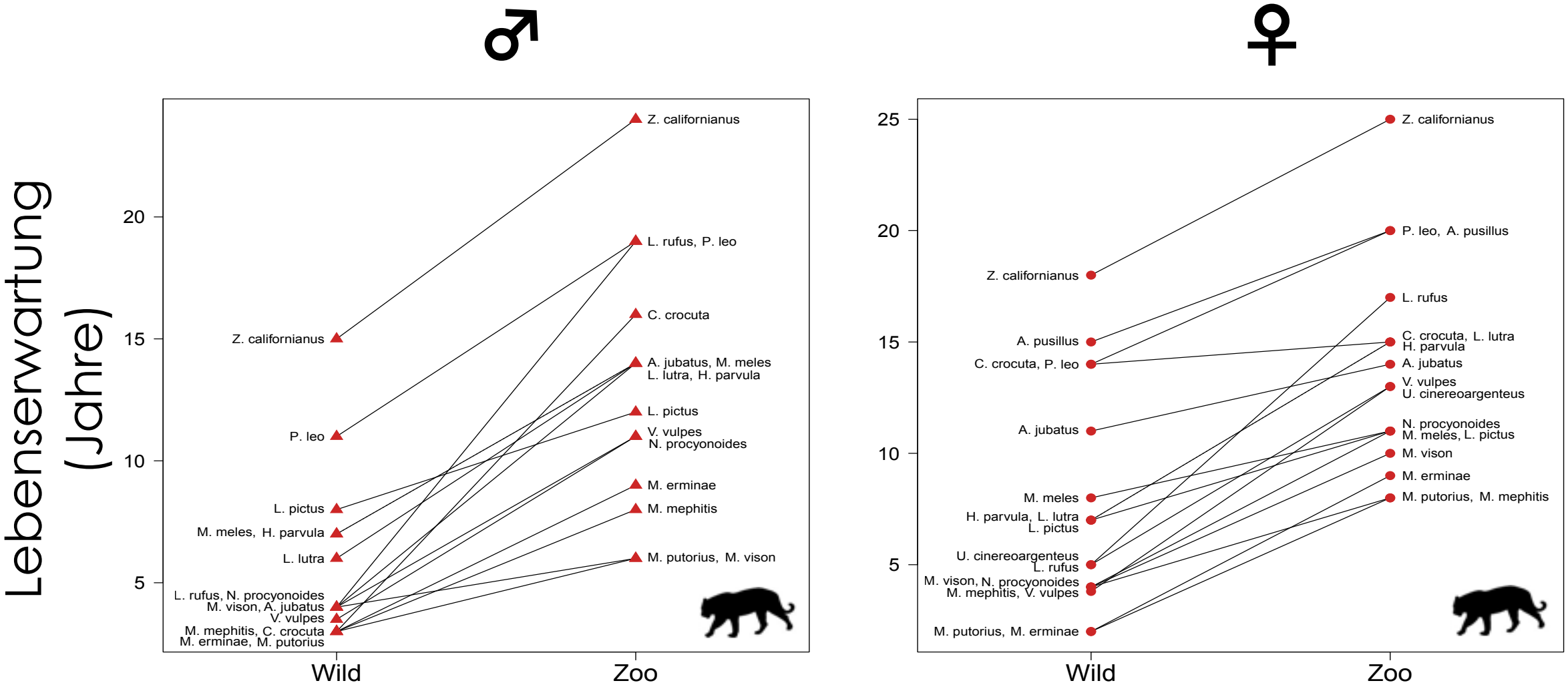

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Warum werden Raubtiere im Zoo älter ?

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Entwickeln sich Zoos weiter oder bleiben sie stehen ?

European Association of Zoo- and Wildlife Veterinarians (EAZWV)
7th scientific meeting, April 30—May 3 2008. Leipzig, Gemany

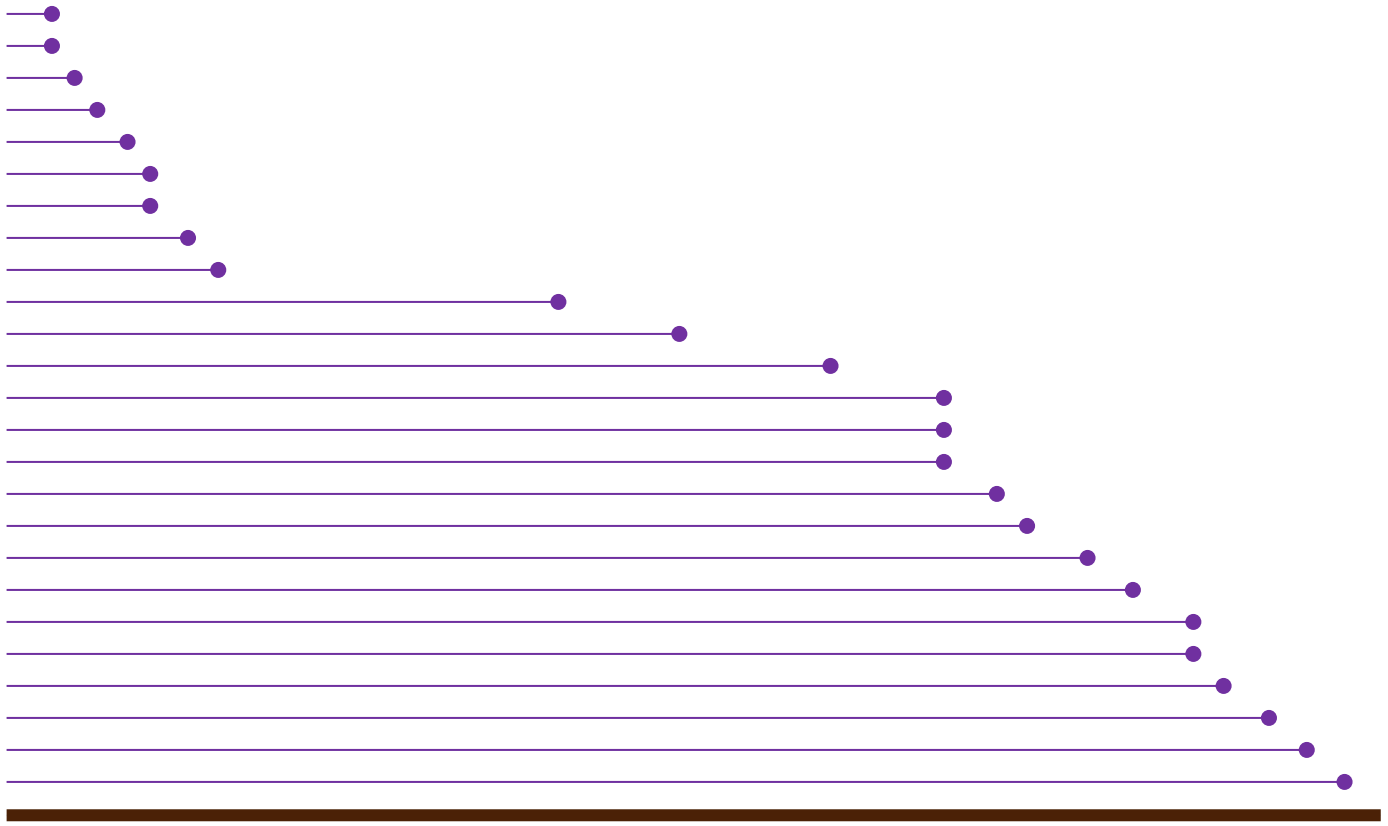
EVALUATION OF OKAPI (*Okapia johnstoni*) NECROPSY REPORTS AND STUDBOOK DATA AS PART OF THE EAZWV SUMMER SCHOOL

STUDENTS 1ST EAZWV SUMMER SCHOOL[1]

1. for a list of contributors, see acknowledgements

	Newborn mortality (died within first year after birth)		
	Global	Epulu	Europe
Total births	505	71	248
Birth date	---------- in % of all births ----------		
before 1960	25.0	13.5	77.8
1960-69	36.8	0.0	40.5
1970-79	39.7	0.0	40.0
1980-89	25.3	0.0	39.6
1990-99	25.8	0.0	38.0
2000-2007	24.0	0.0	25.0
total	28.9	7.0	38.3

Daten in Species360: Geburt und Tod



Alter

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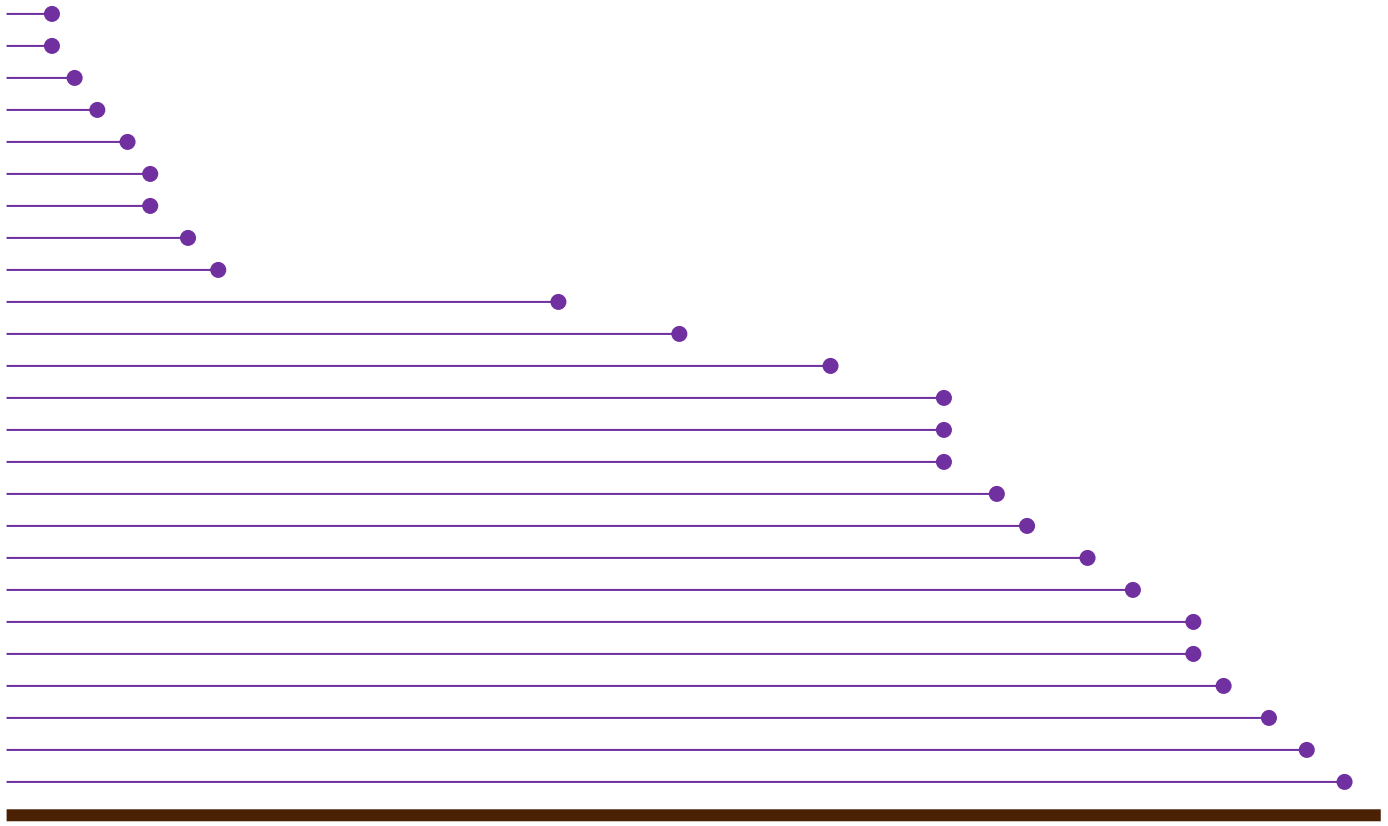

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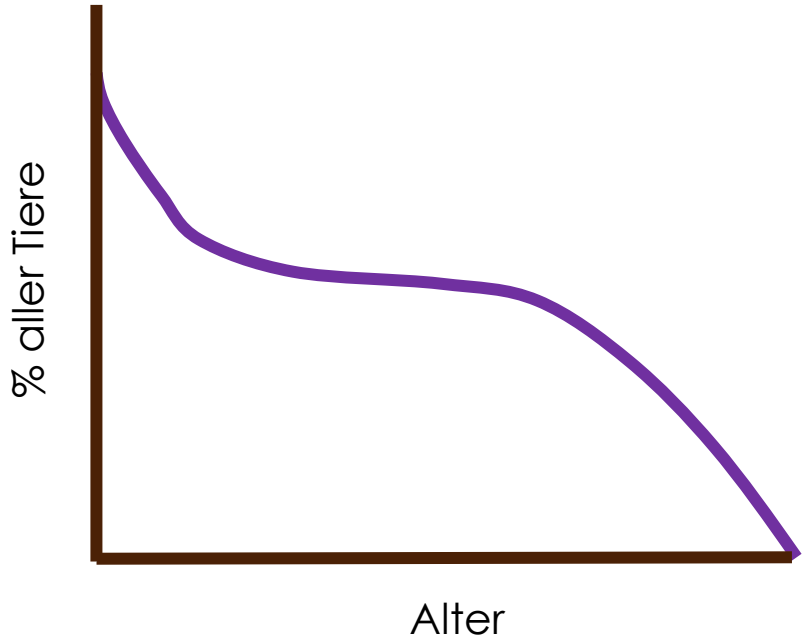

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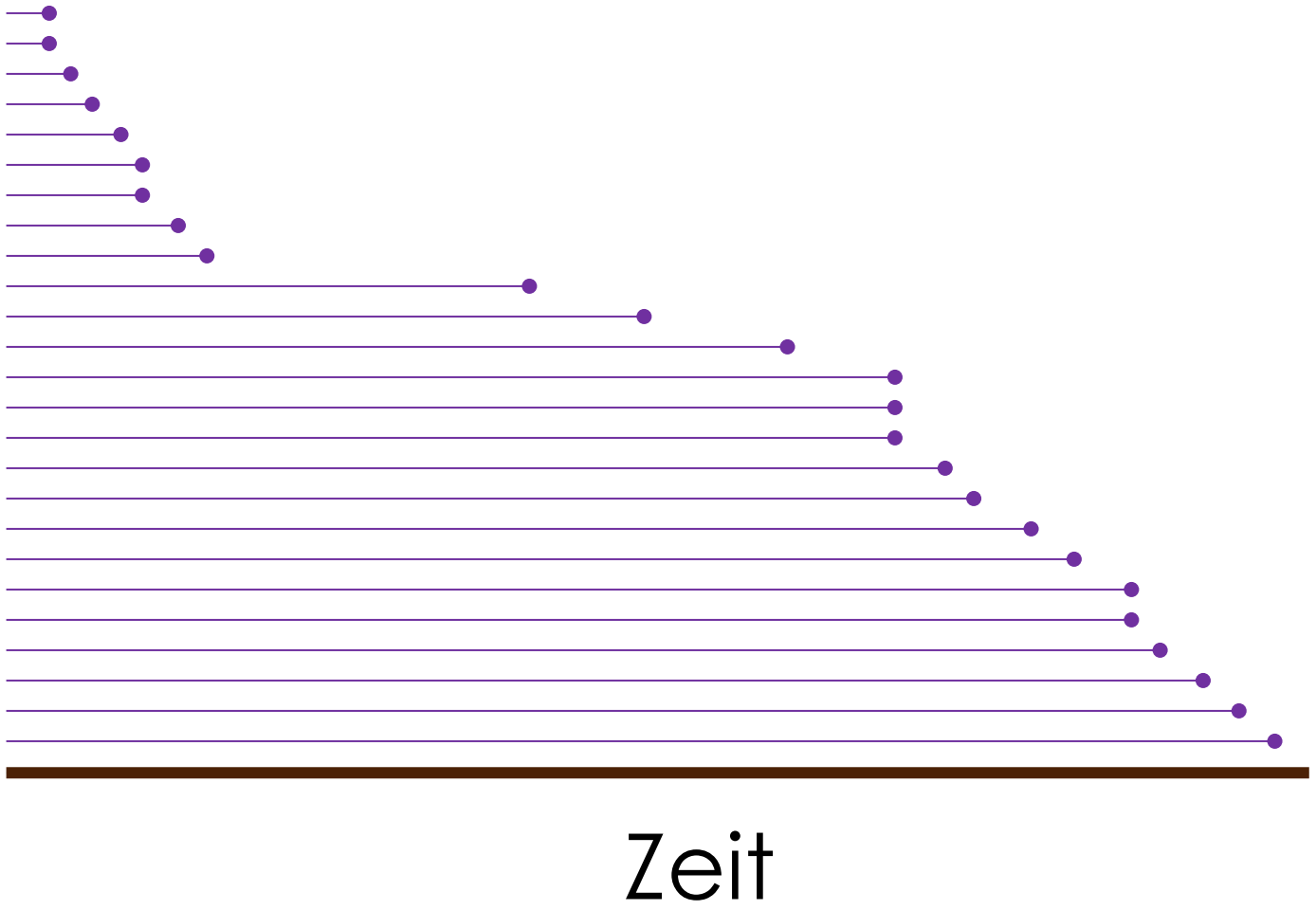

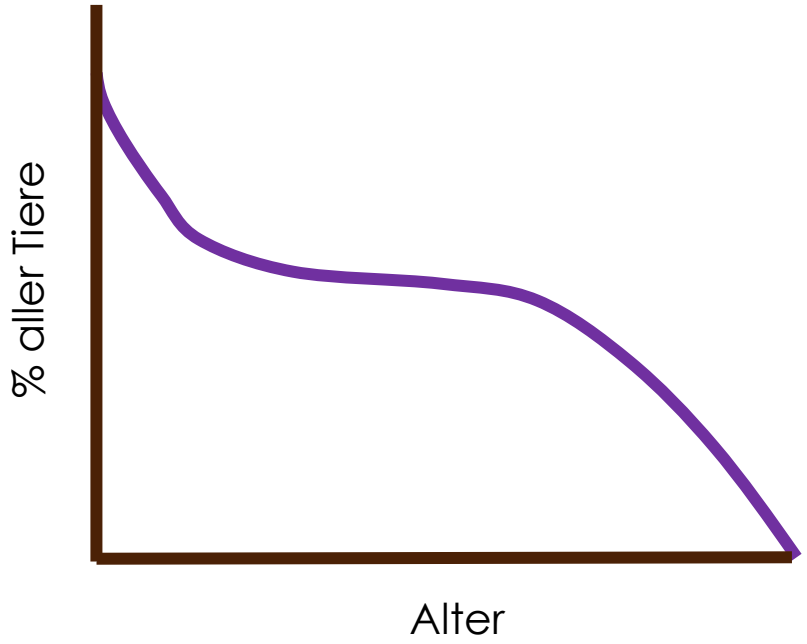

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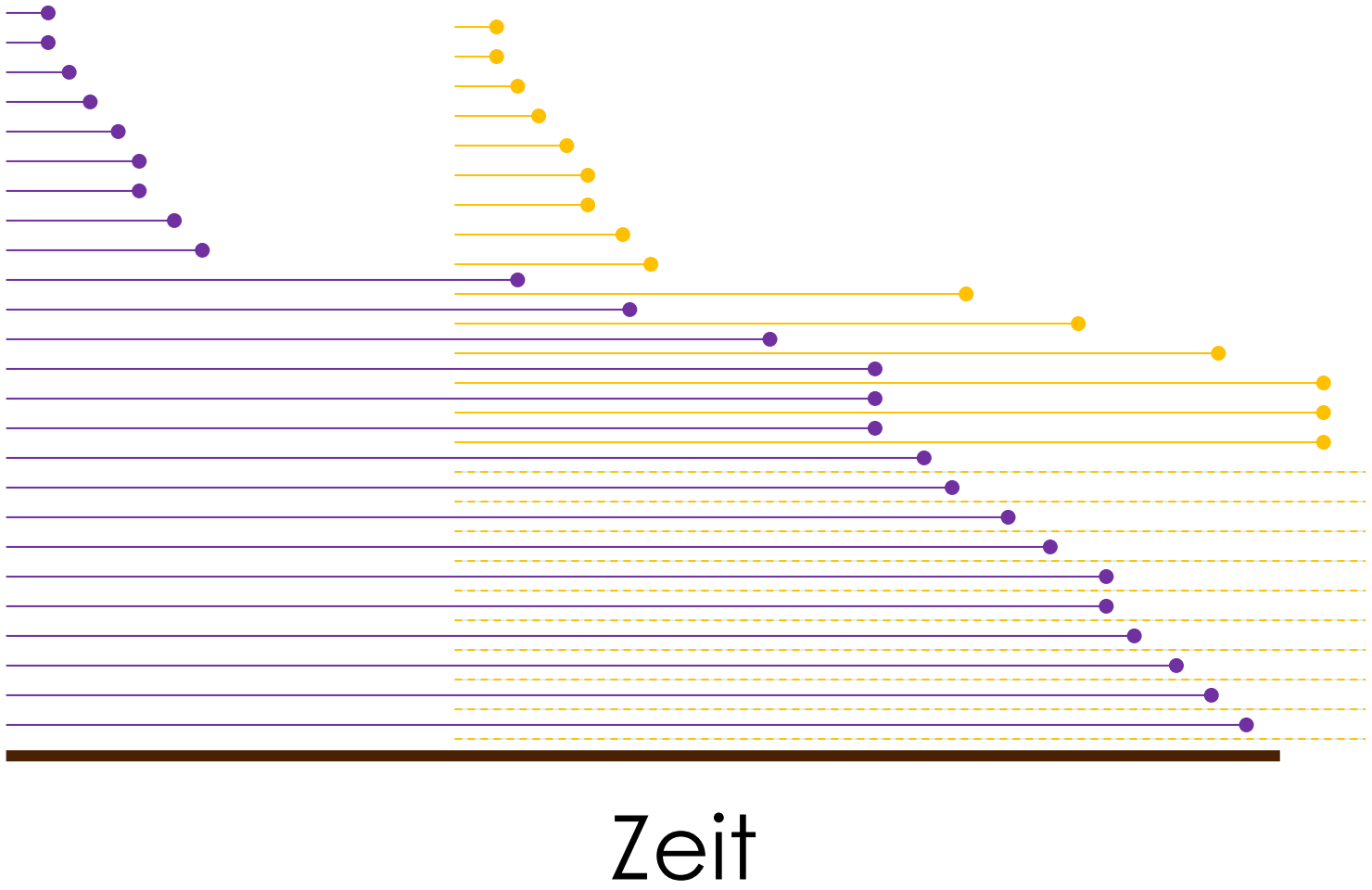

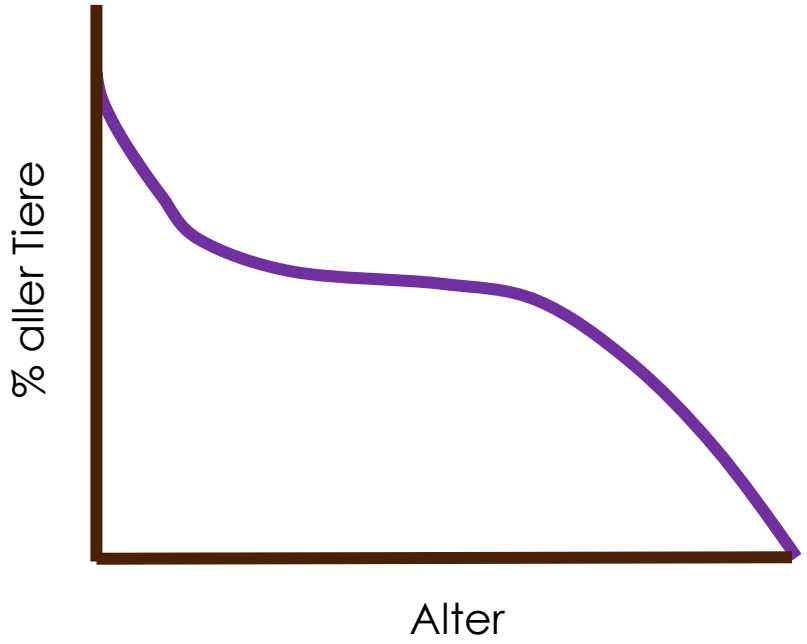

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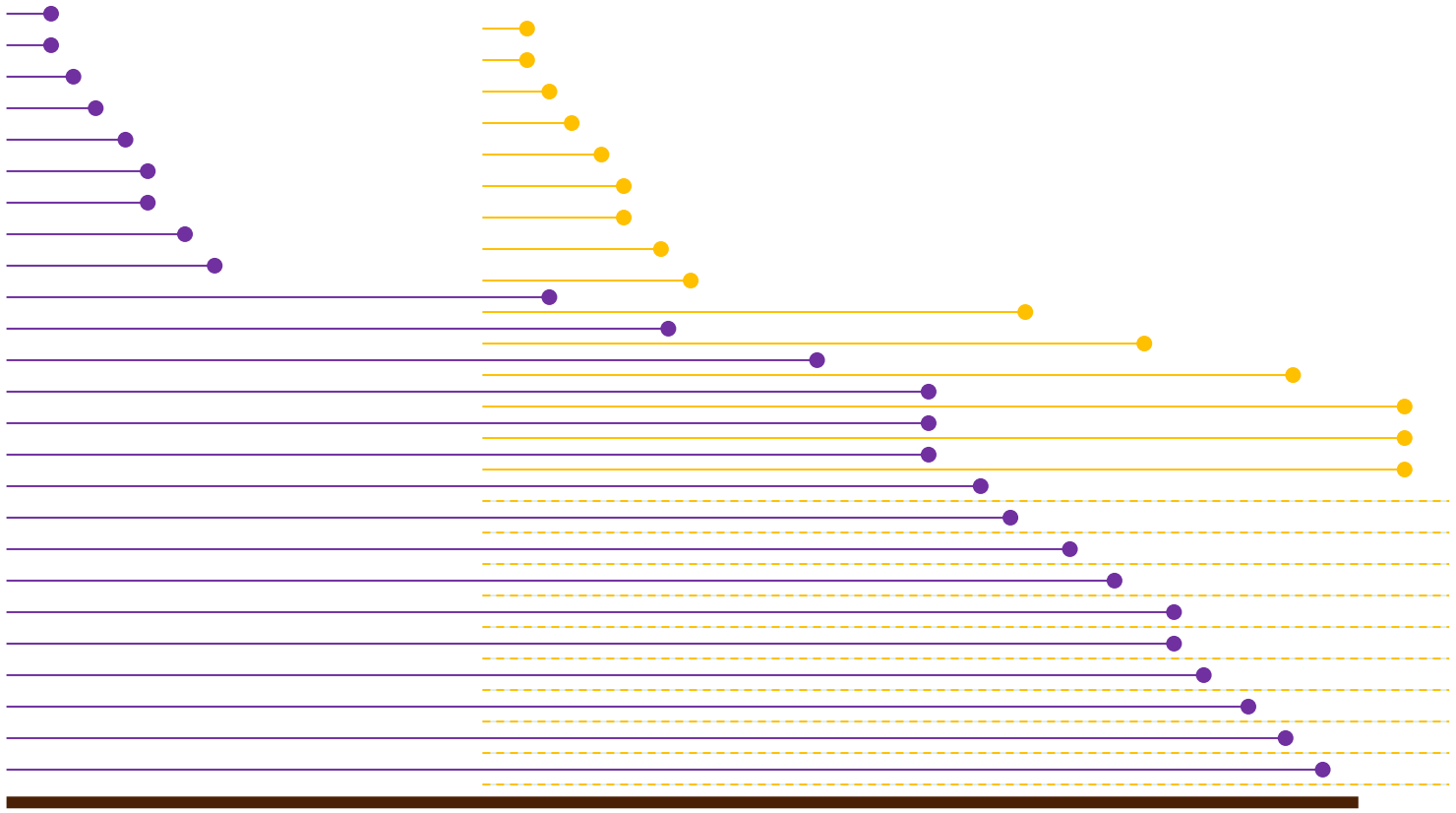

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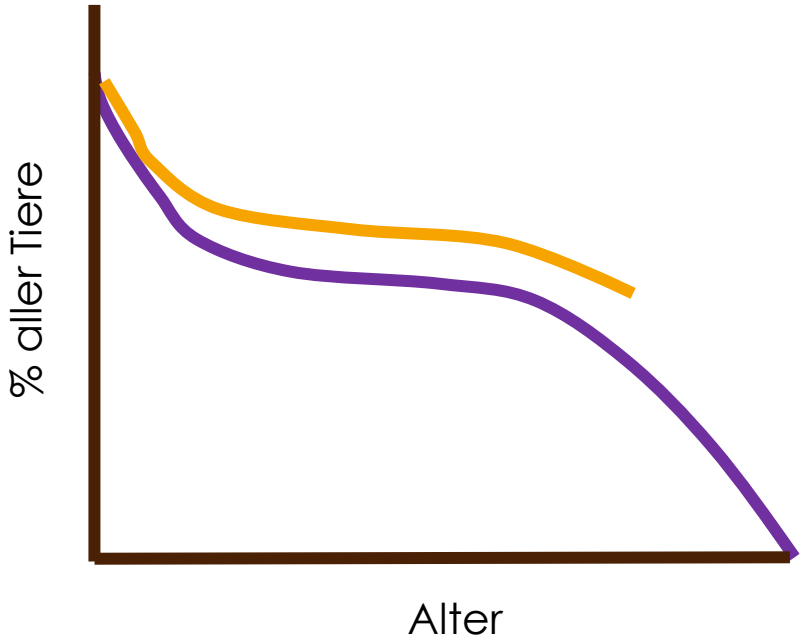

Captive and Wild Orangutan (*Pongo* sp.) Survivorship: A Comparison and the Influence of Management

S.A. WICH[1]*, R.W. SHUMAKER[1], L. PERKINS[2], AND H. DE VRIES[3]
[1]*Great Ape Trust of Iowa, Des Moines, Iowa*
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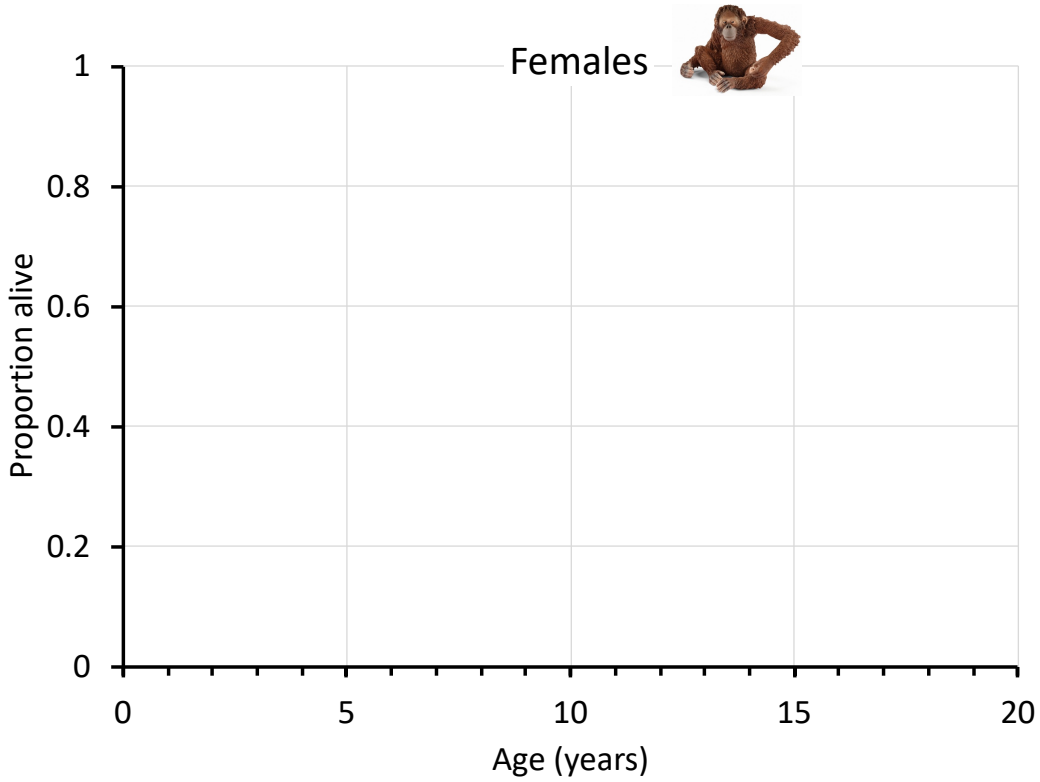

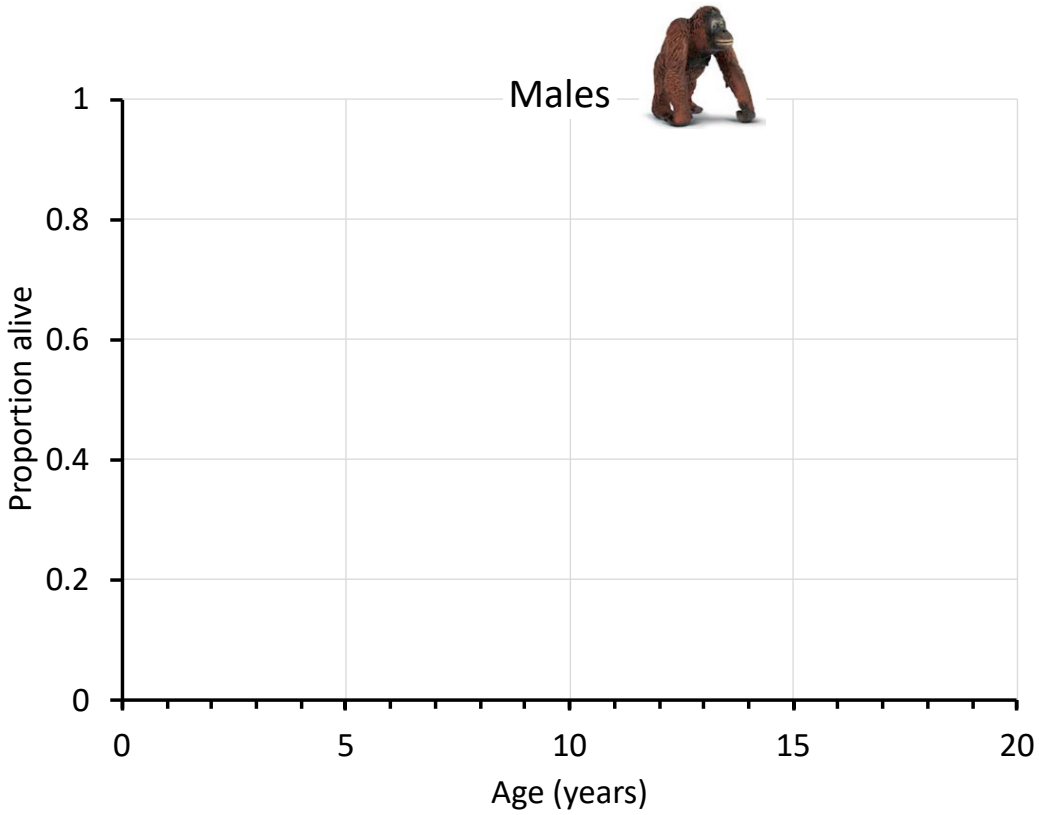

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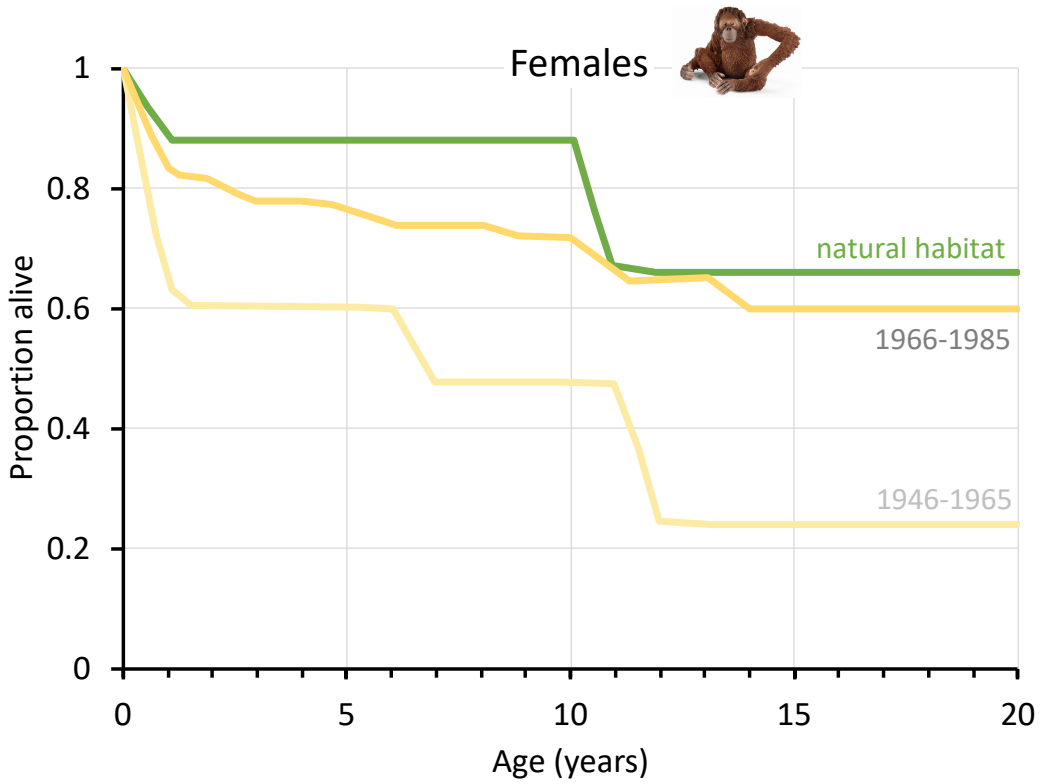

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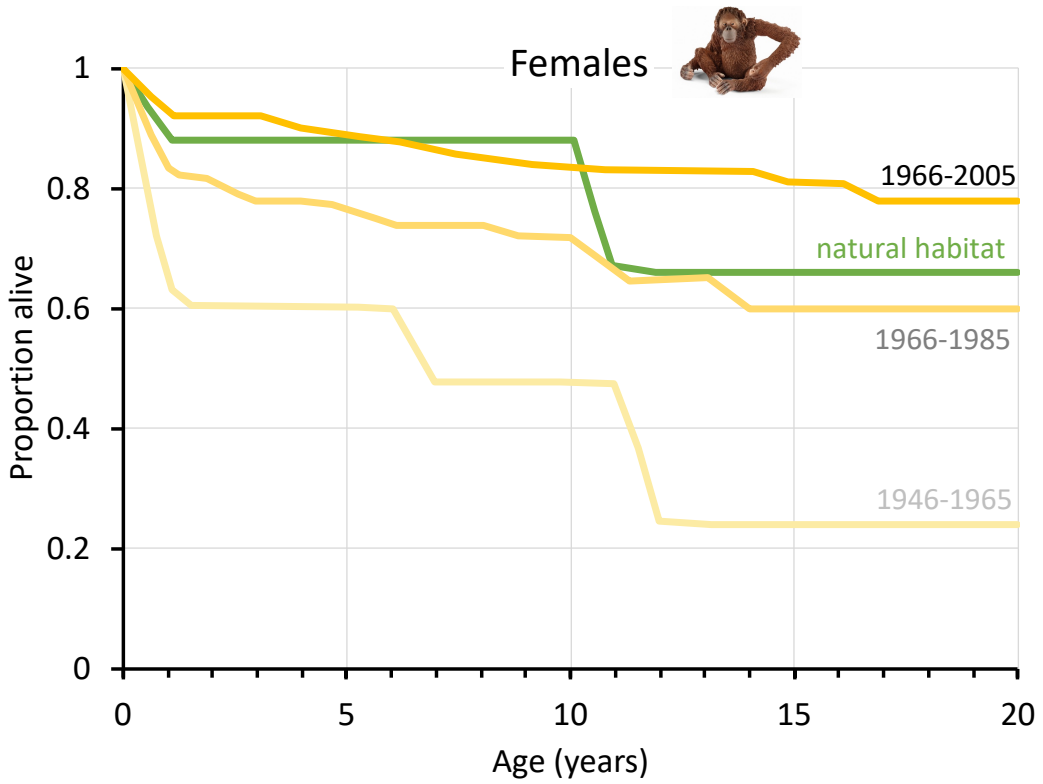

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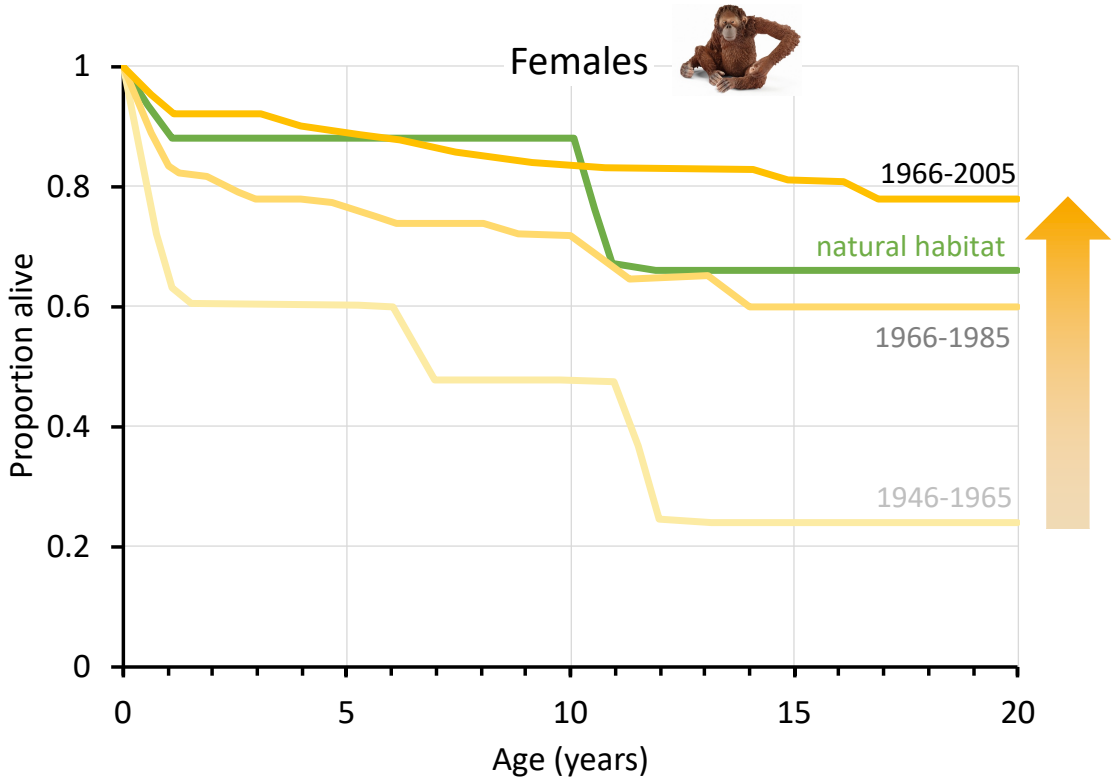
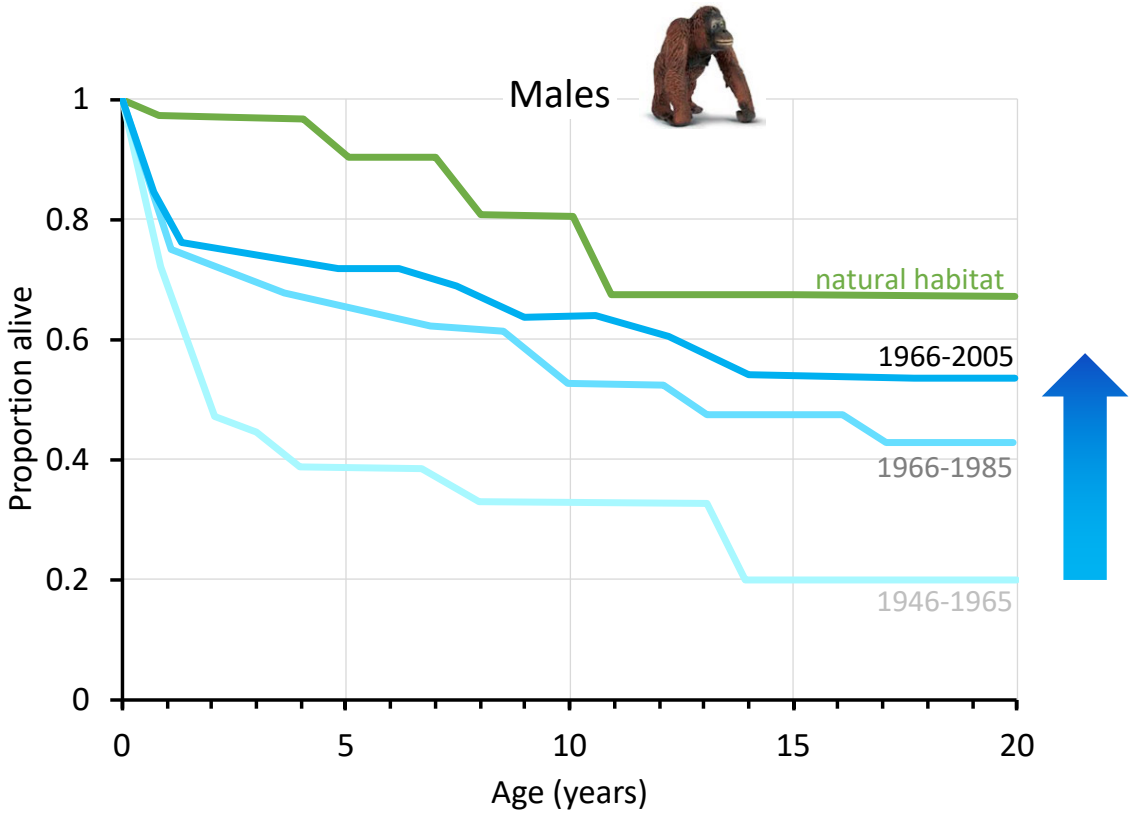
S.A. WICH[1]*, R.W. SHUMAKER[1], L. PERKINS[2], AND H. DE VRIES[3]
[1]*Great Ape Trust of Iowa, Des Moines, Iowa*
[2]*Zoo Atlanta, Atlanta, Georgia*
[3]*Research Group Behavioural Biology, Utrecht University, Utrecht, The Netherlands*

American Journal of Primatology 71:680–686 (2009)





Entwickeln sich Zoos weiter oder bleiben sie stehen ?

Entwickeln sich Zoos weiter oder bleiben sie stehen ?

Lara Scherer
Klinik für Zoo-, Heim- und Wildtiere

Marco Roller,
Zoological Garden of Karlsruhe

Werden Zoos besser ?

Werden Zoos besser ?

TECHNICAL REPORT

ZOOBIOLOGY WILEY

The historical development of juvenile mortality and adult longevity in zoo-kept carnivores

Marco Roller[1] | Dennis W. H. Müller[2] | Mads F. Bertelsen[3] |
Laurie Bingaman Lackey[4] | Jean-Michel Hatt[5] | Marcus Clauss[5]

Werden Zoos besser ?

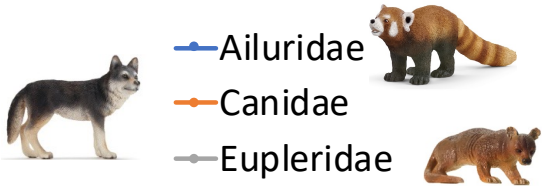
Ailuridae 

Werden Zoos besser ?

Ailuridae

Canidae

Werden Zoos besser ?



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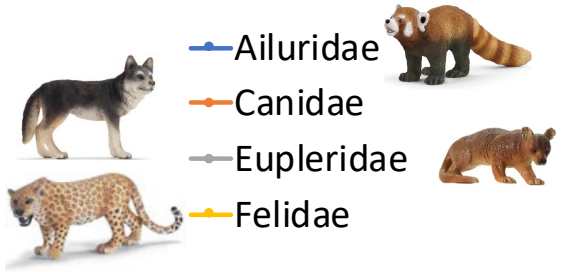

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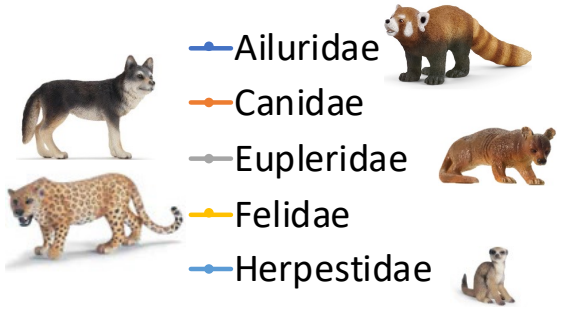

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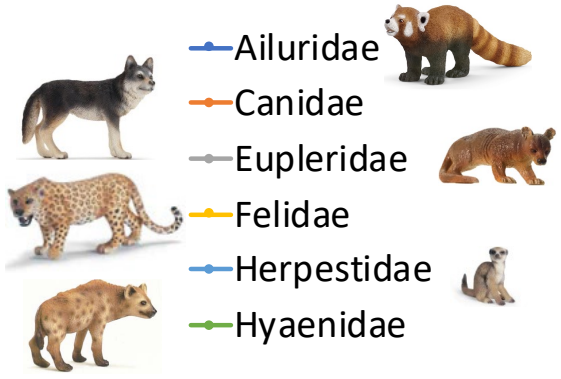

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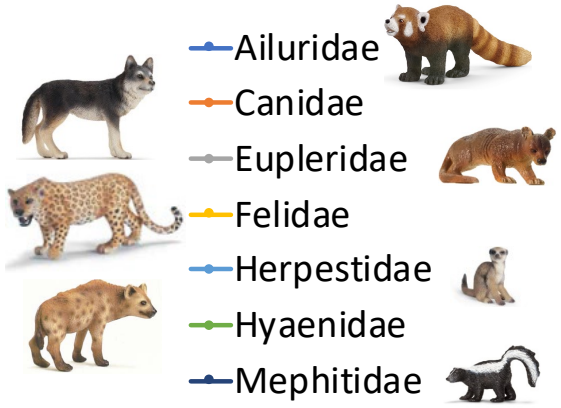

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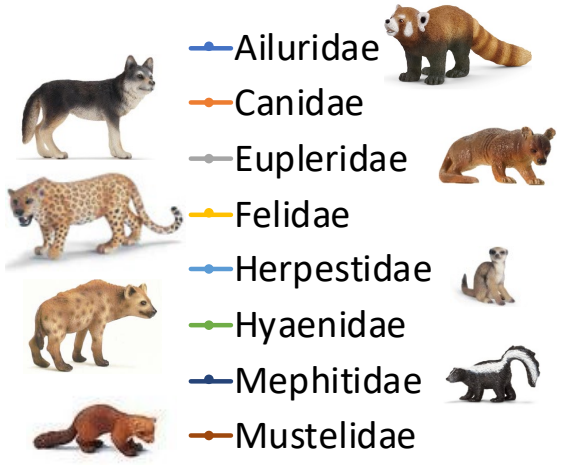

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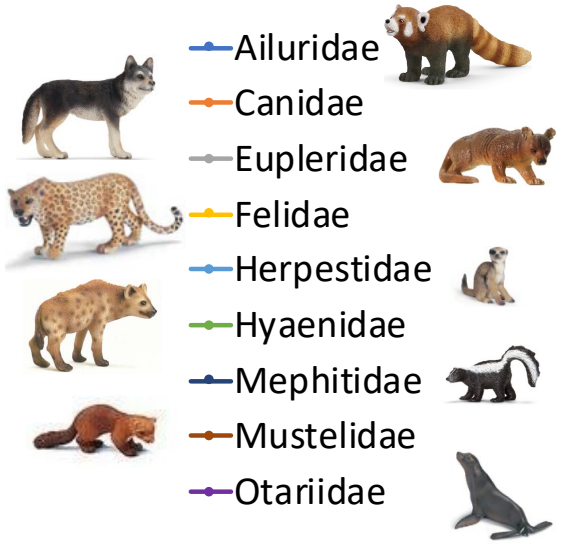

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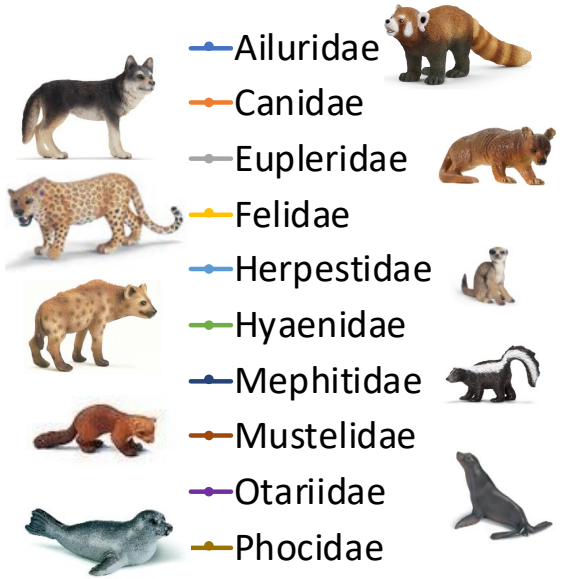

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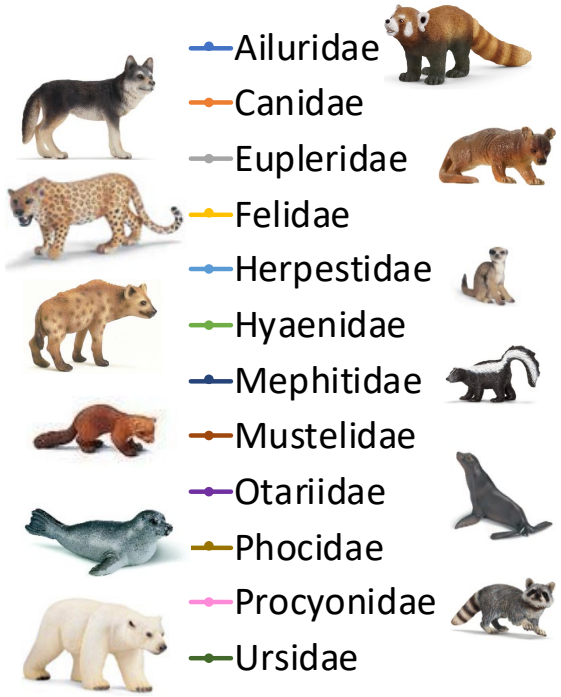

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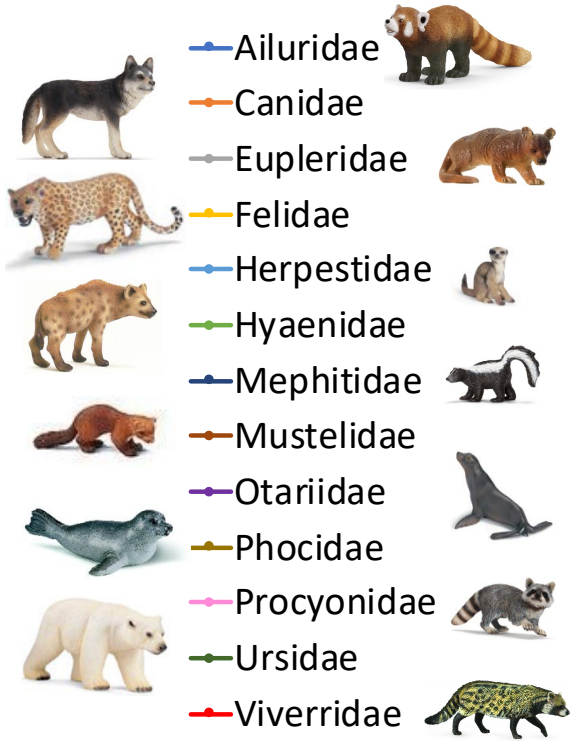

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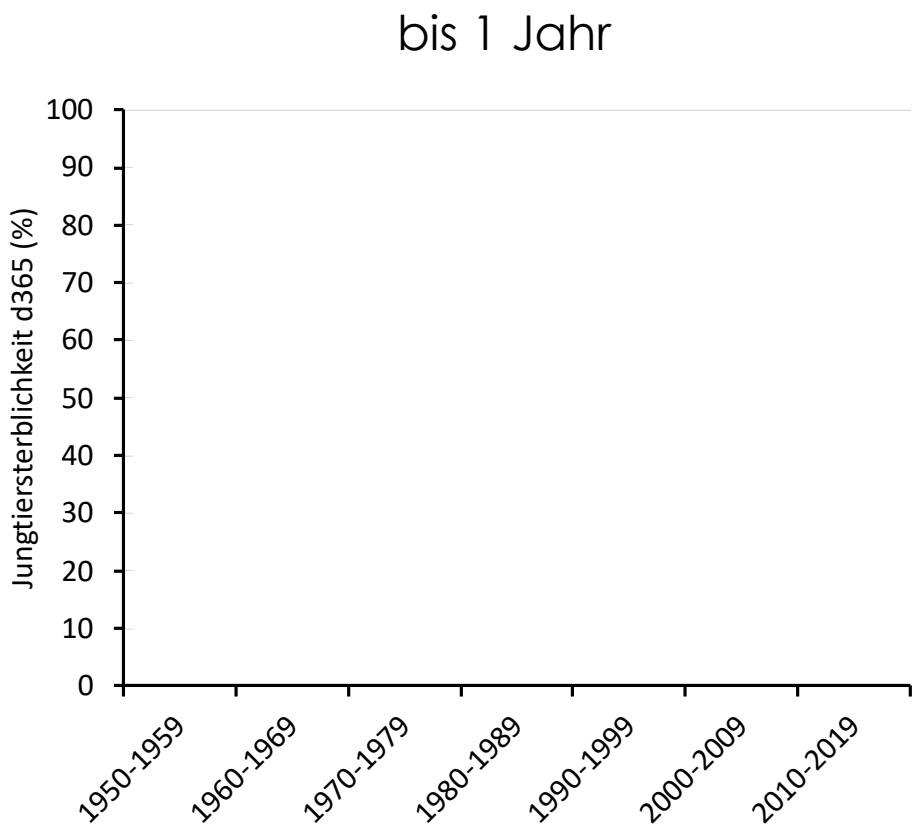

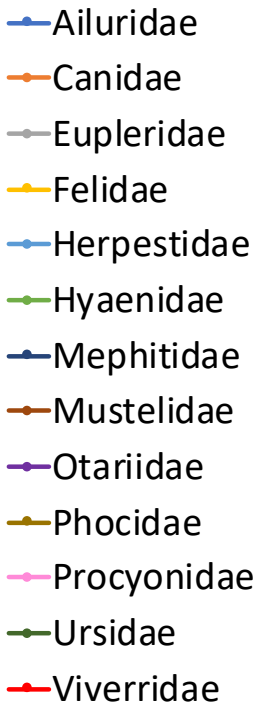

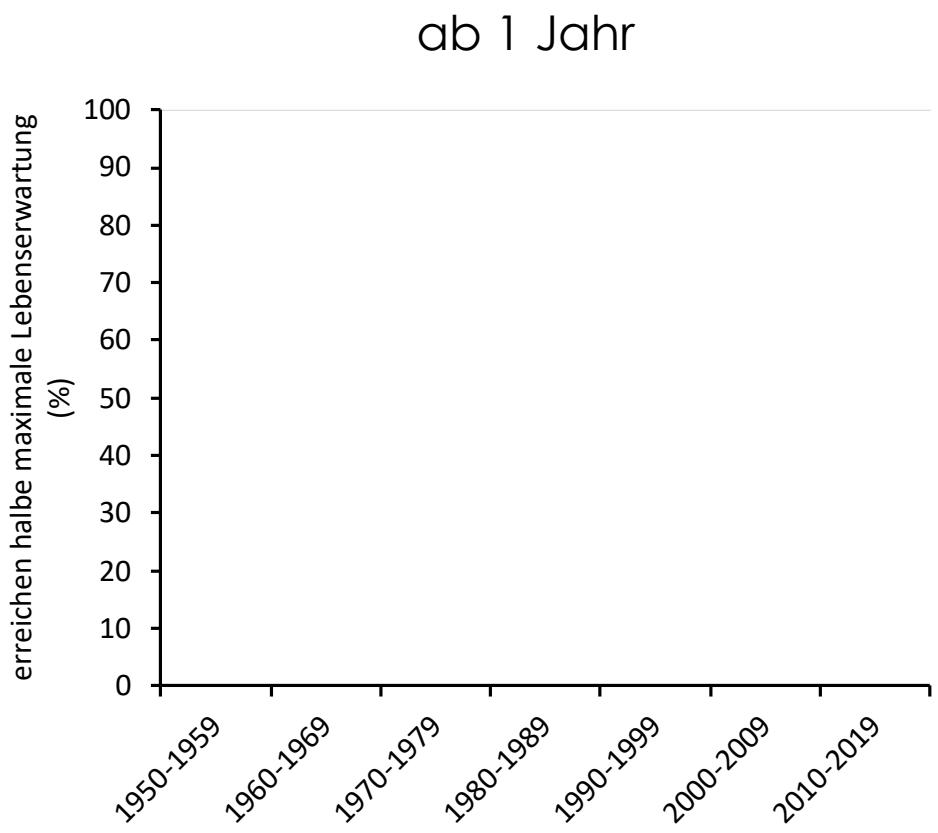

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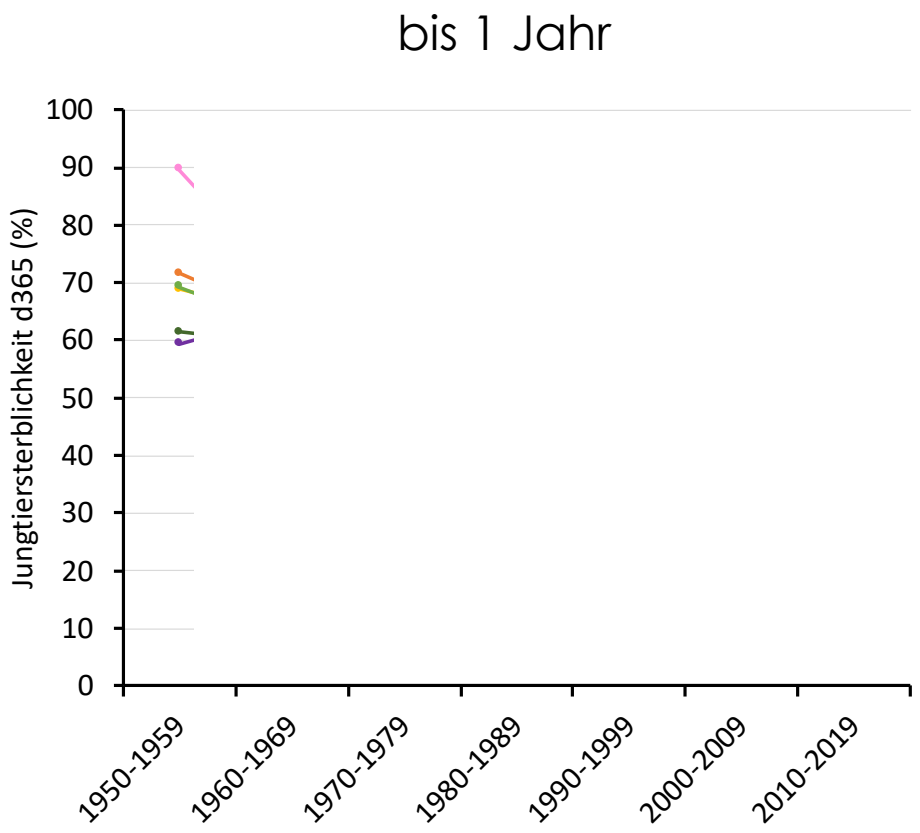

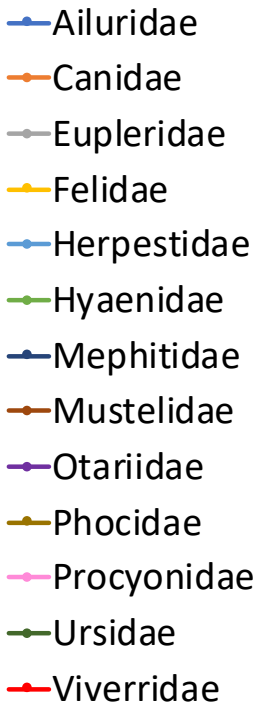

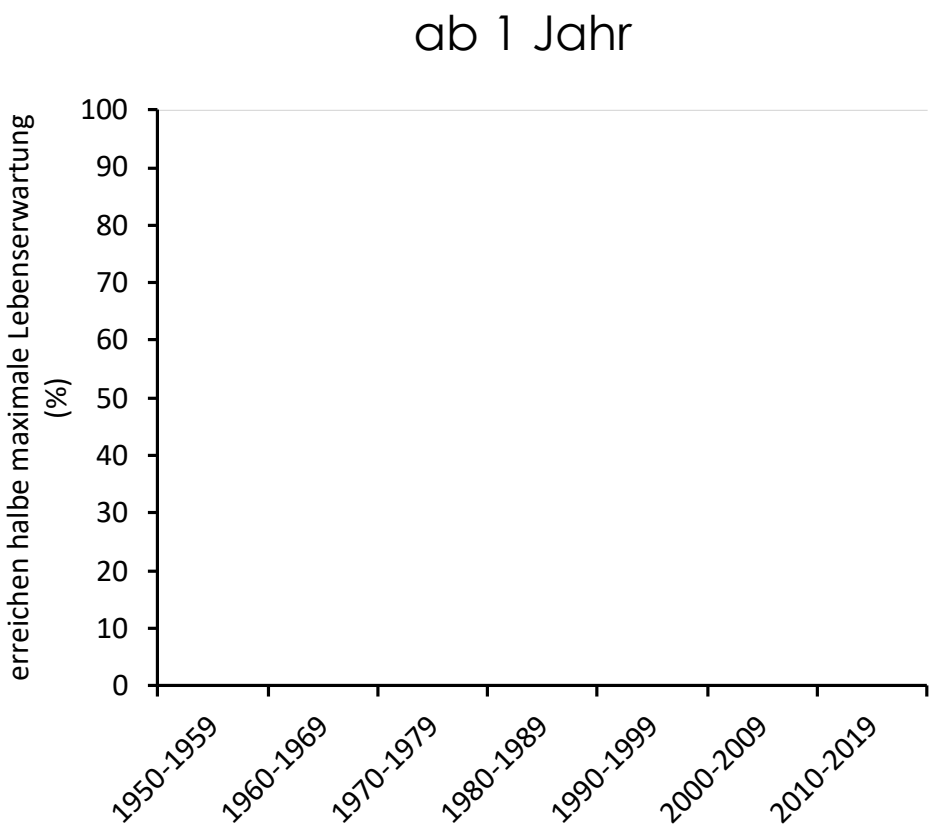

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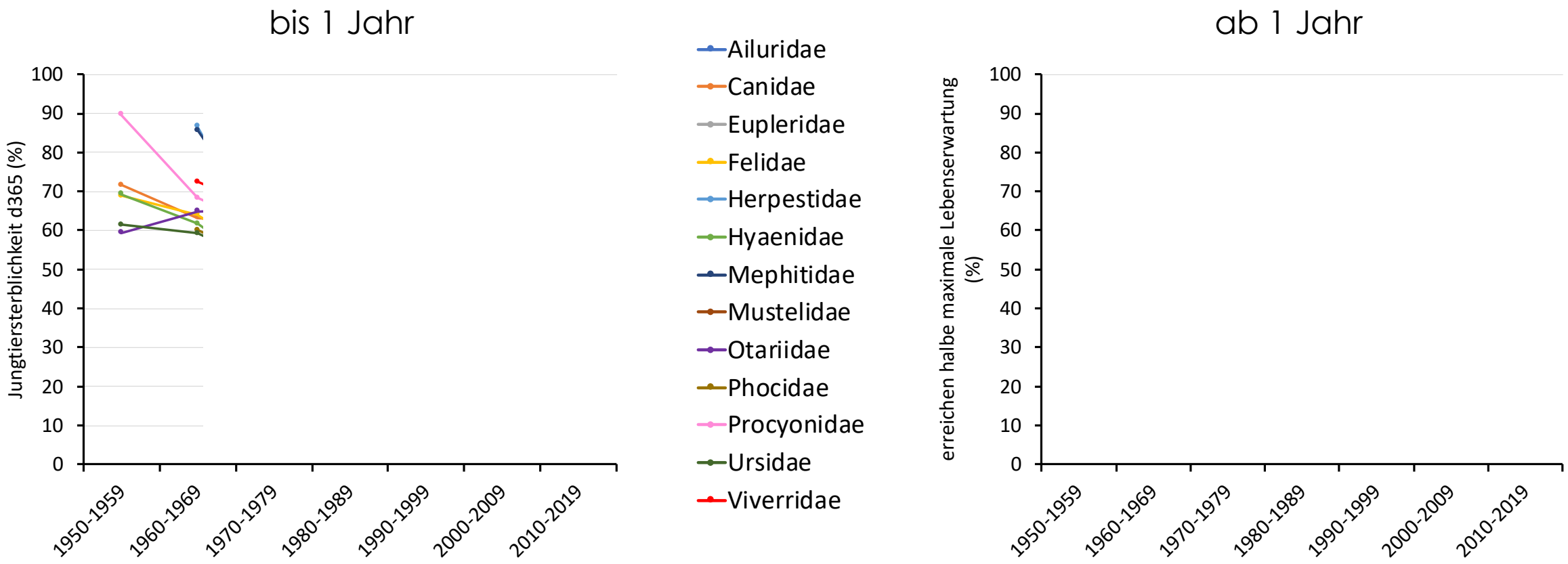

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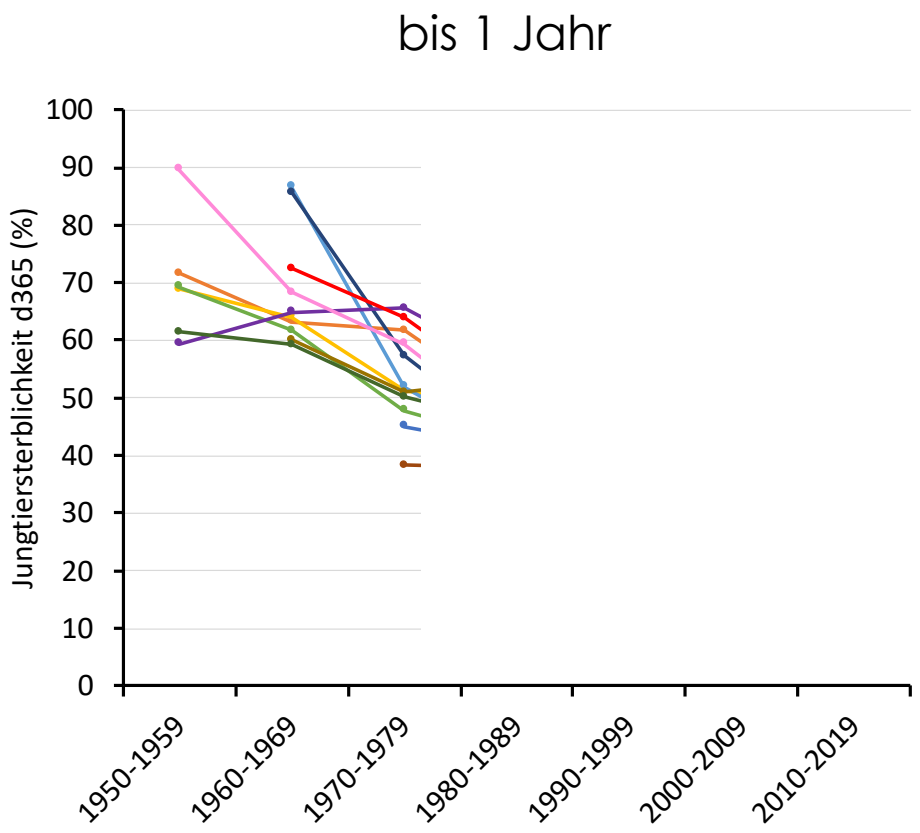

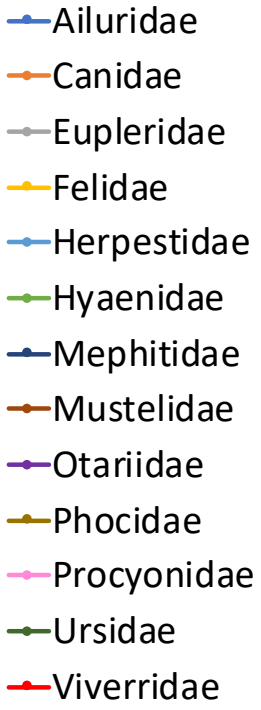

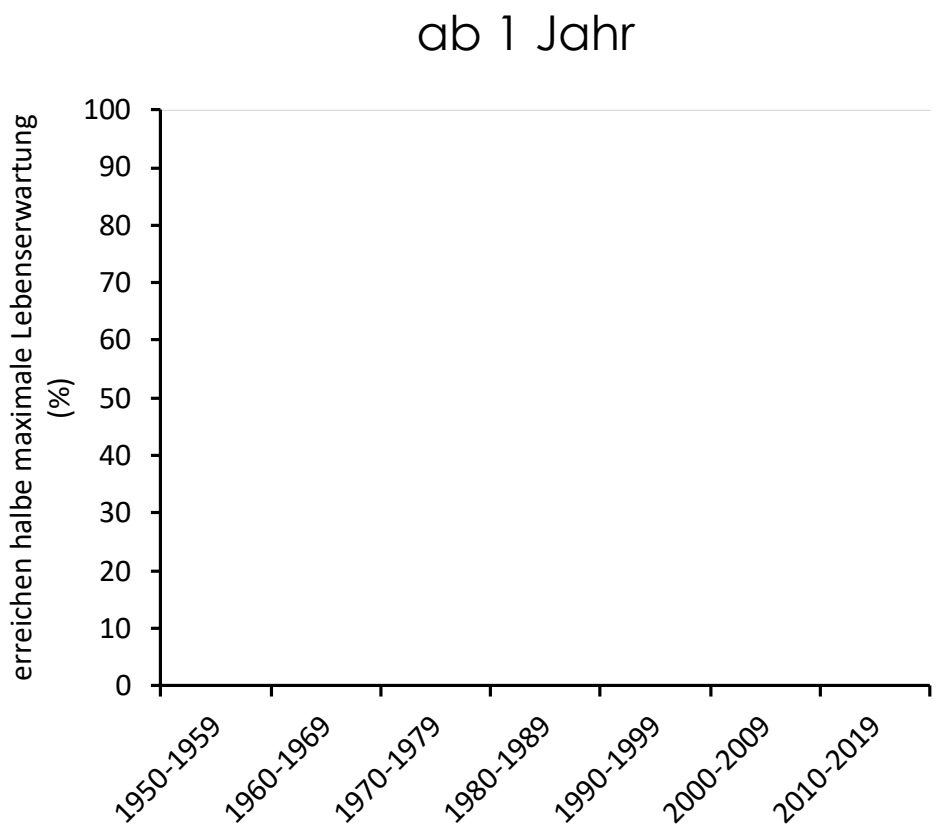

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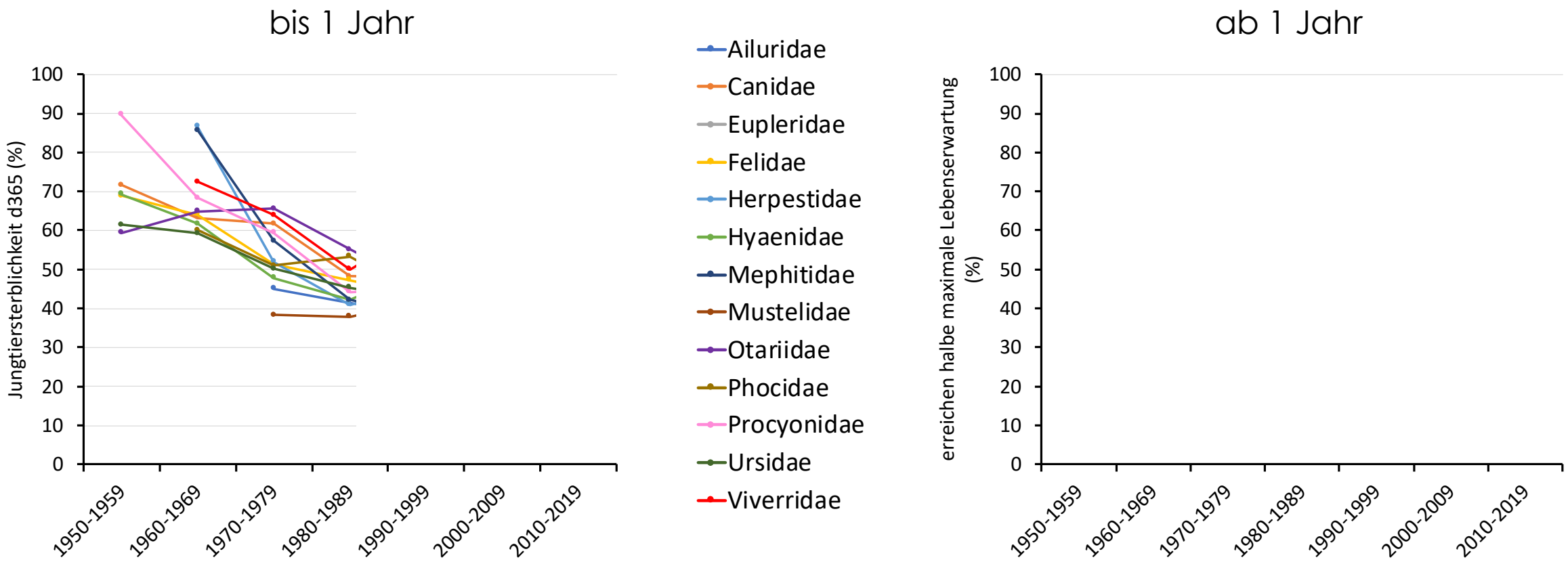

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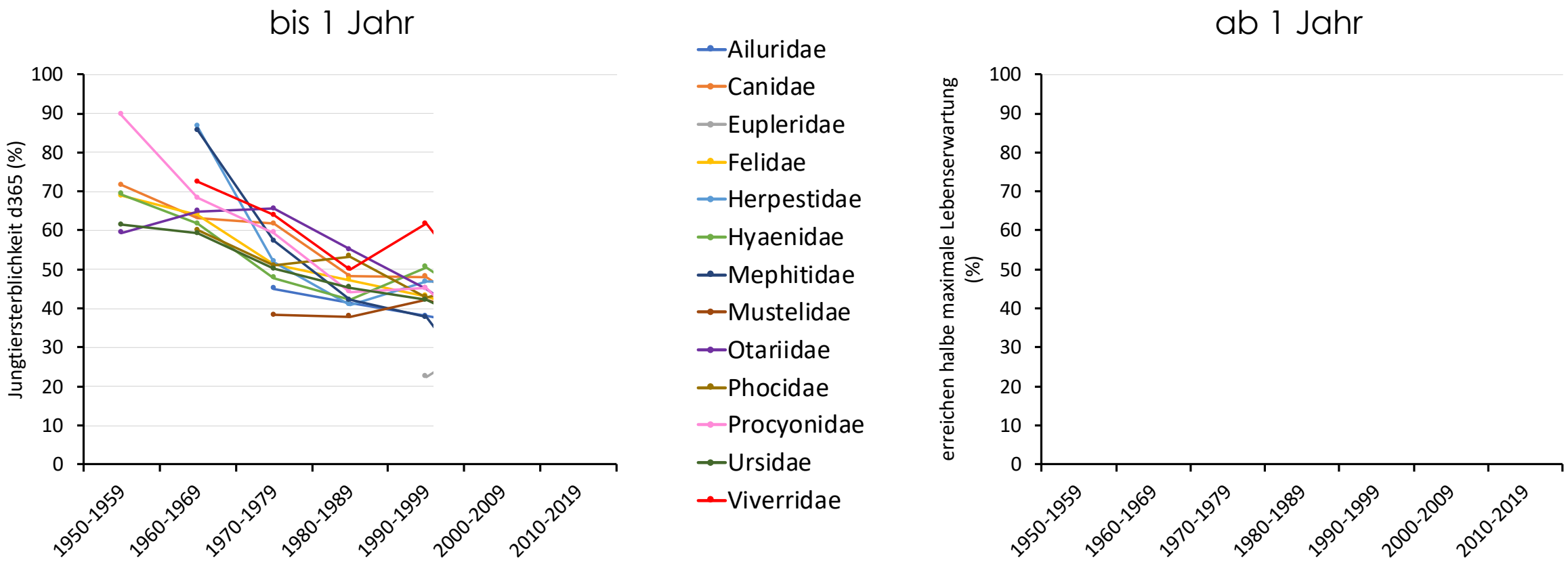

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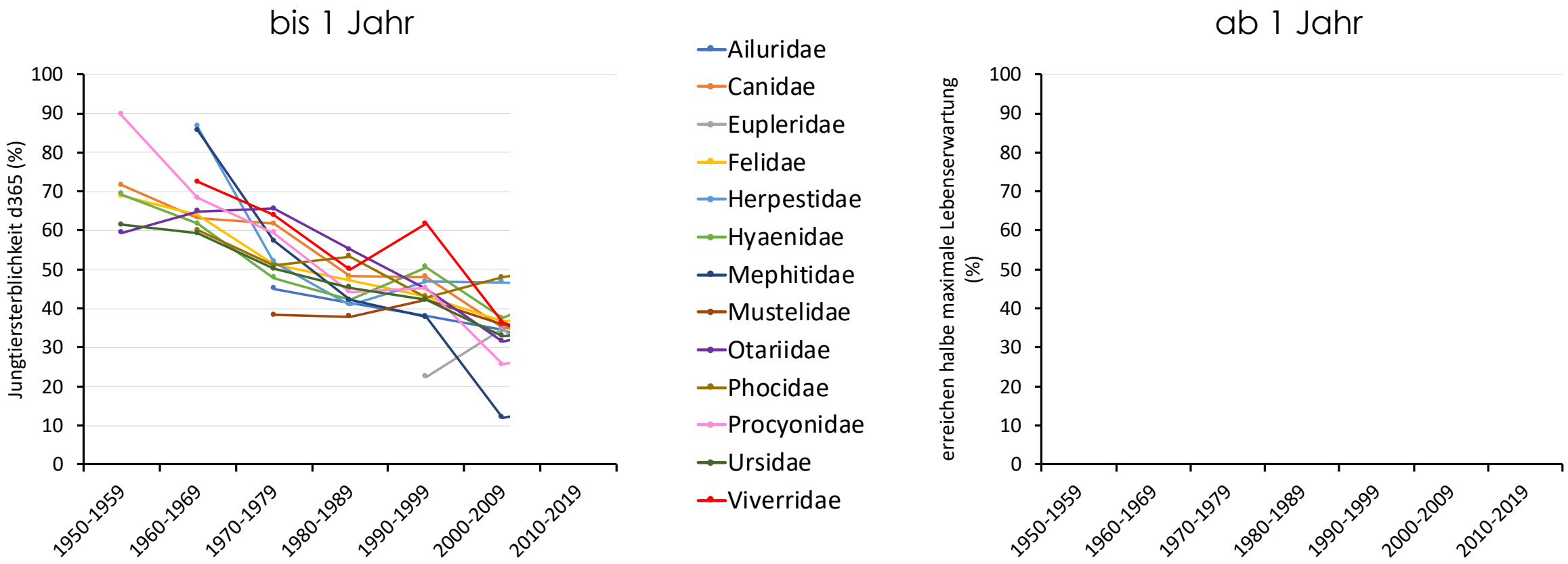

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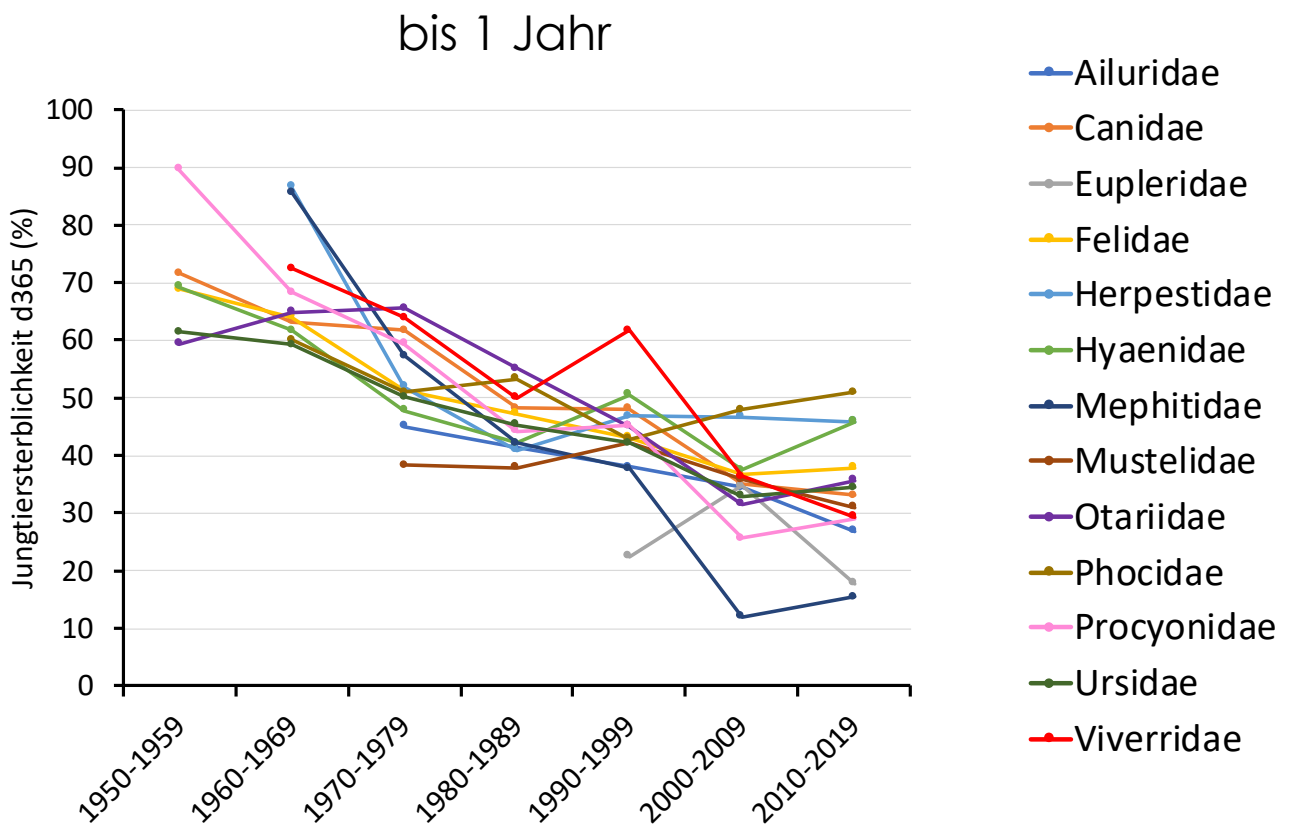

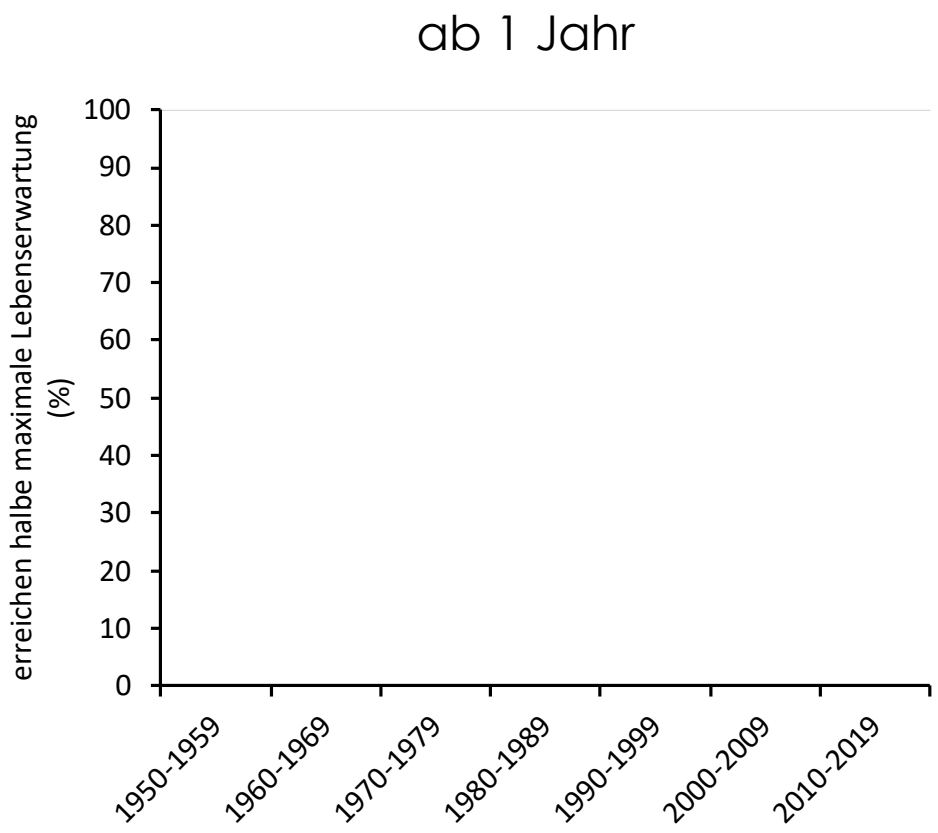

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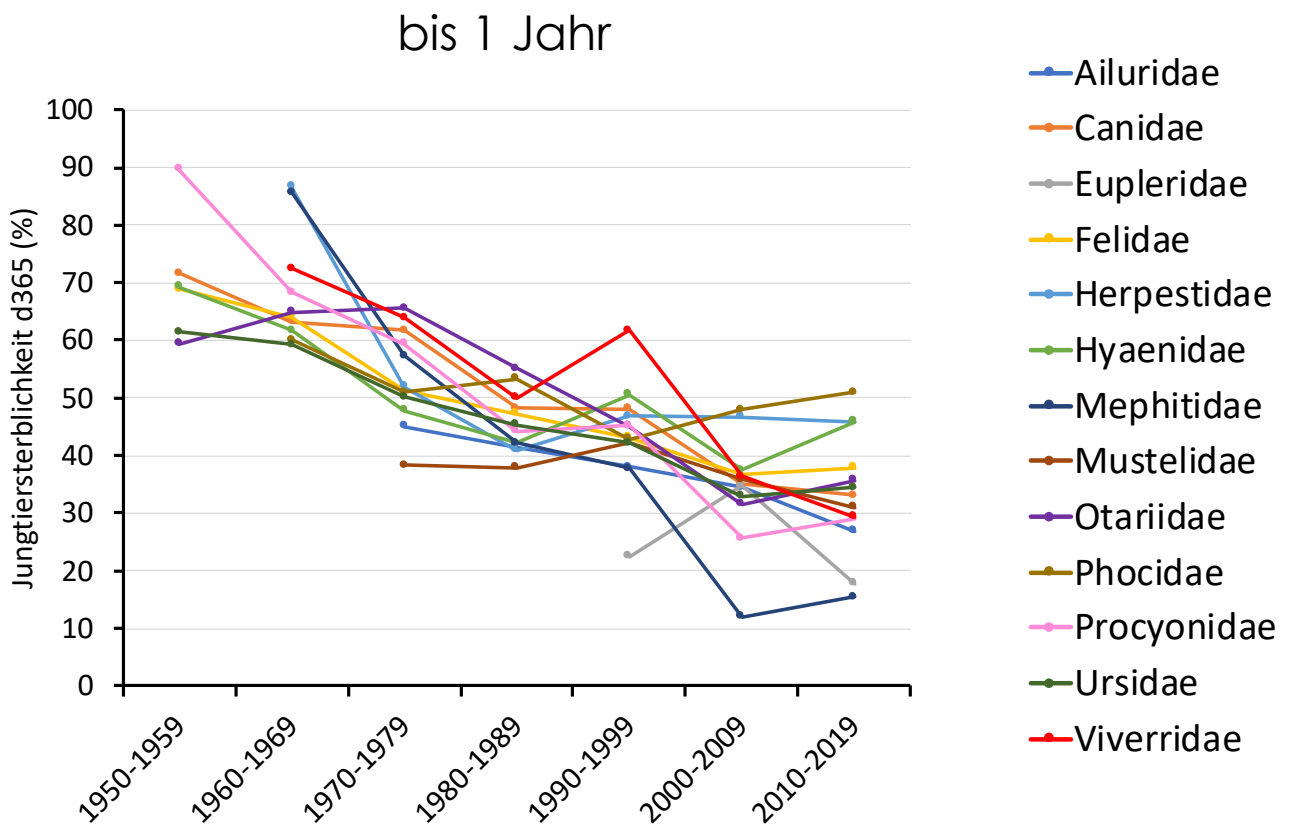
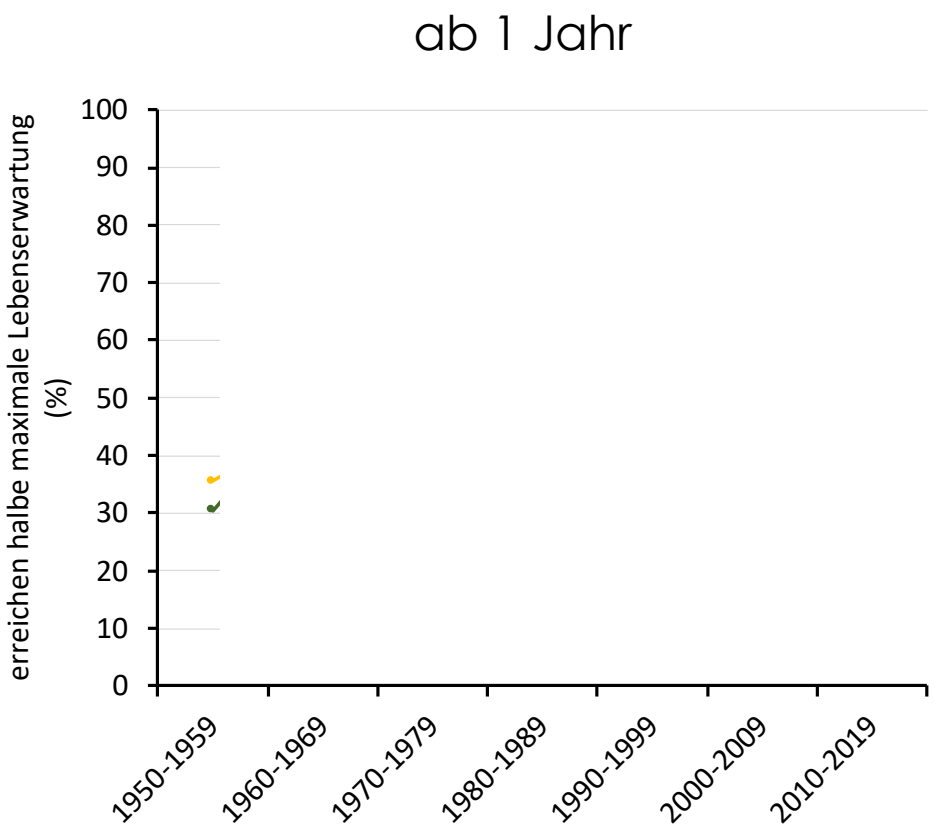
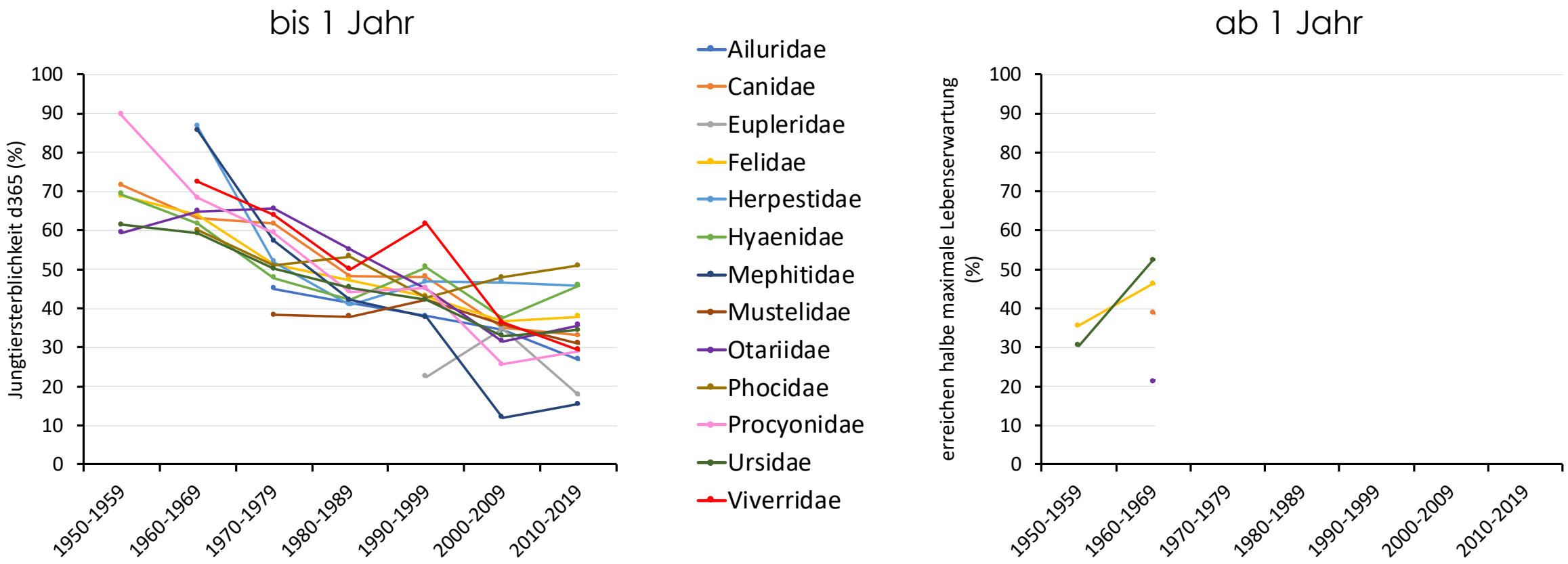




- Ailuridae
- Canidae
- Eupleridae
- Felidae
- Herpestidae
- Hyaenidae
- Mephitidae
- Mustelidae
- Otariidae
- Phocidae
- Procyonidae
- Ursidae
- Viverridae

Werden Zoos besser ?



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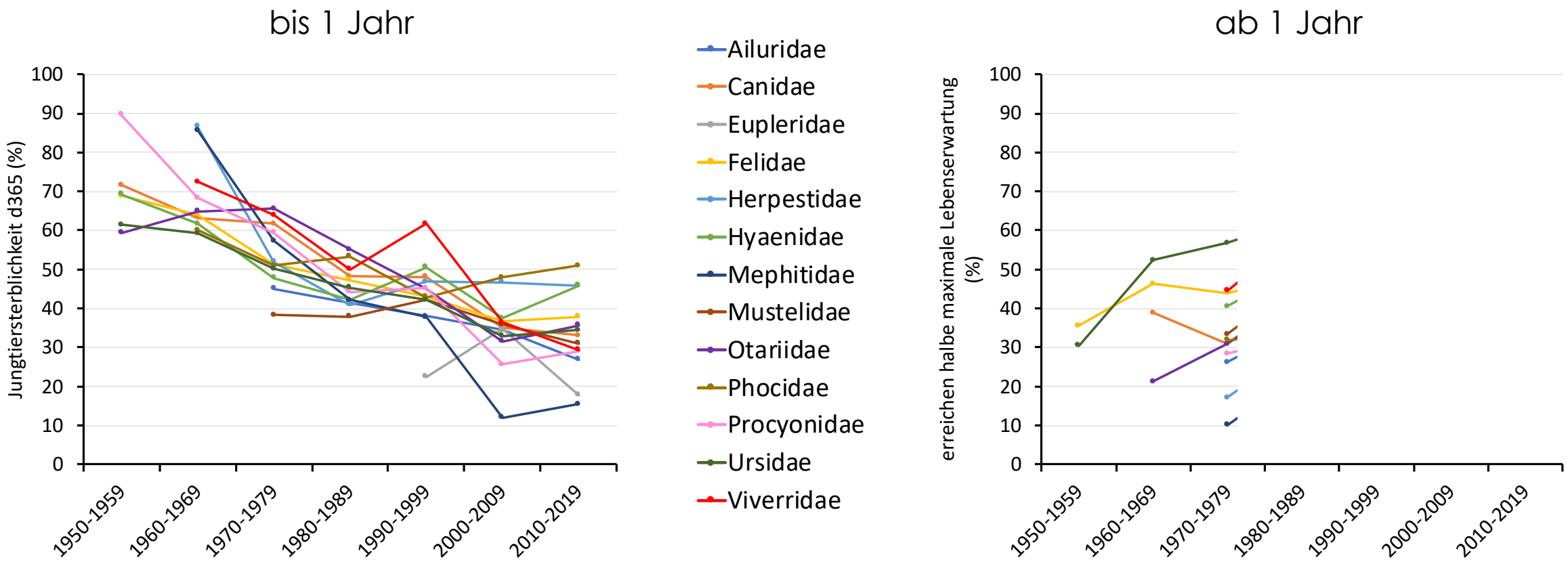

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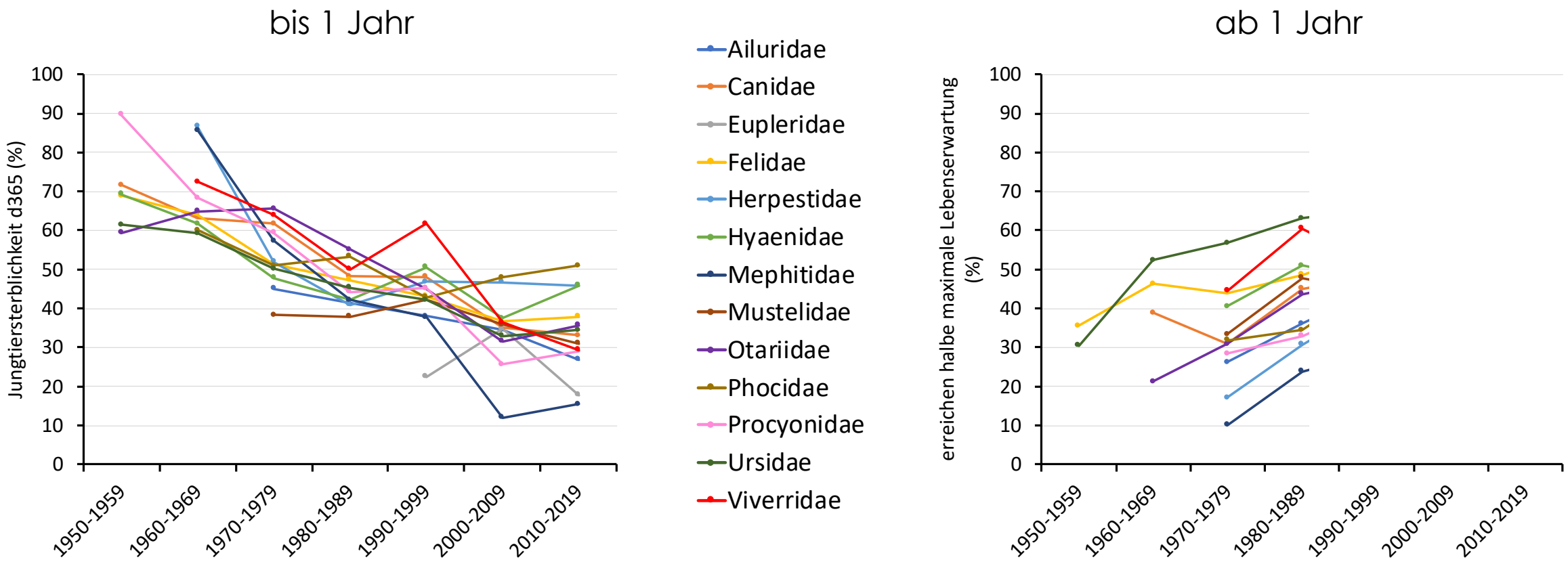

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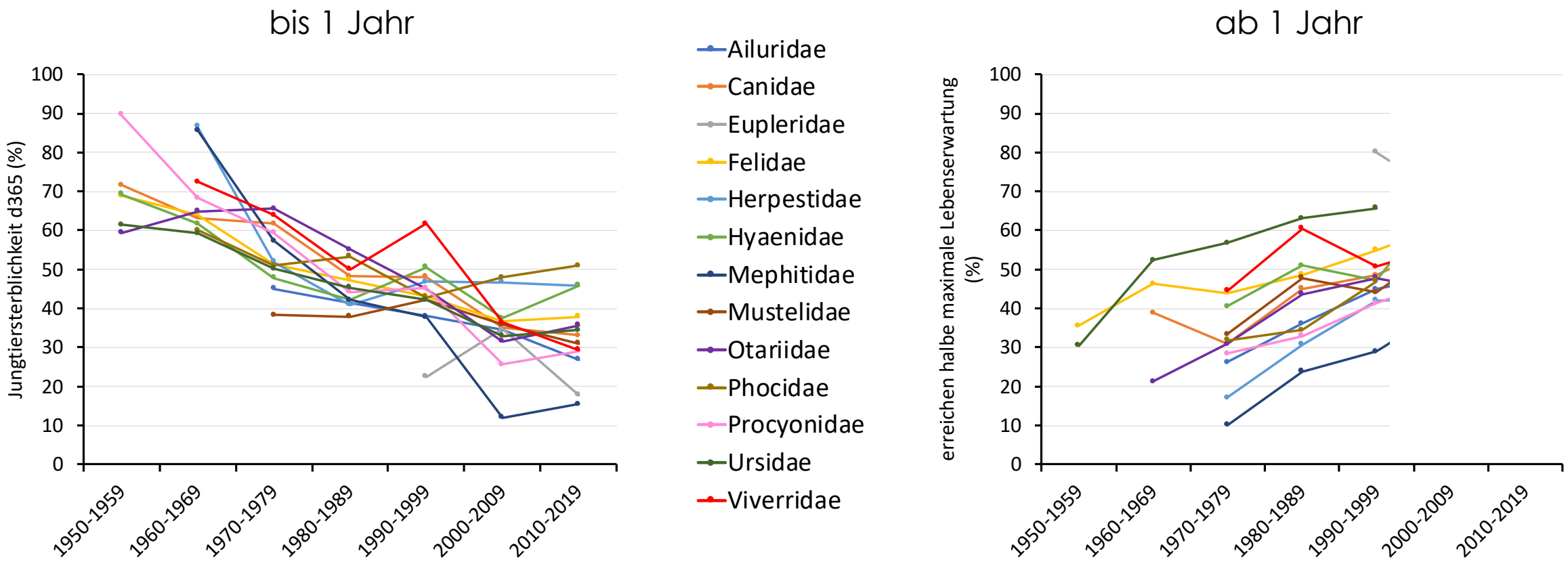

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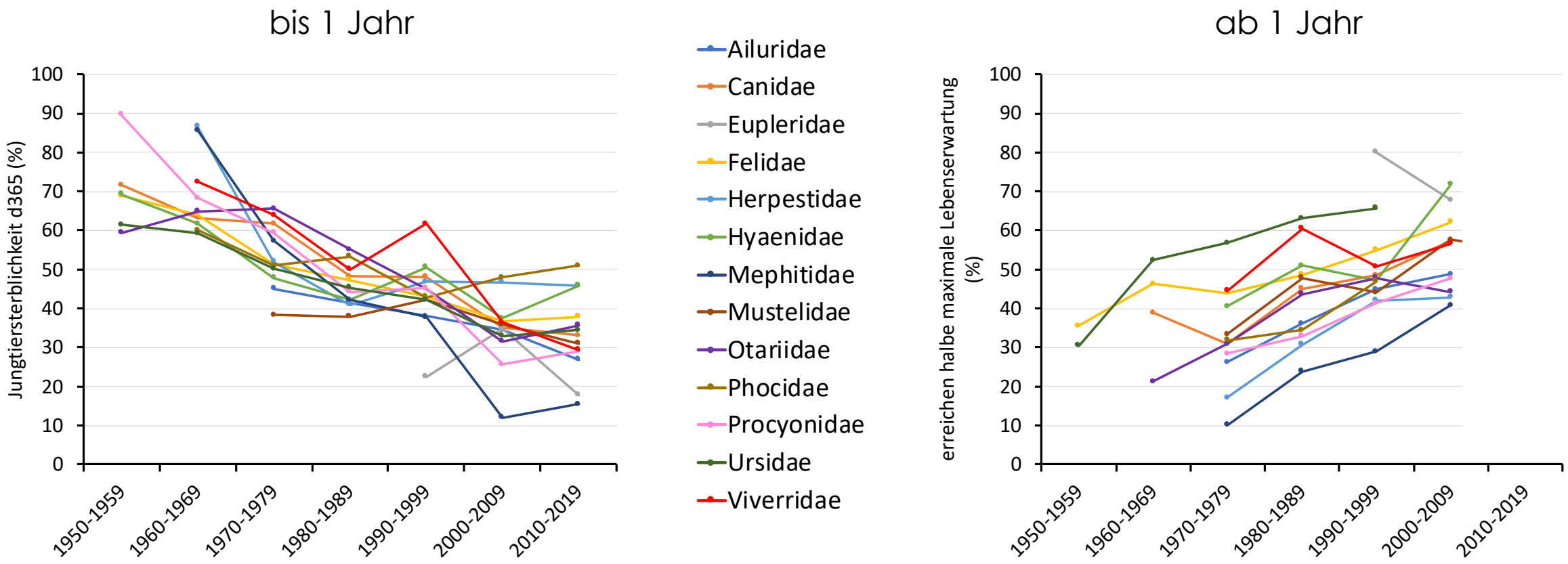

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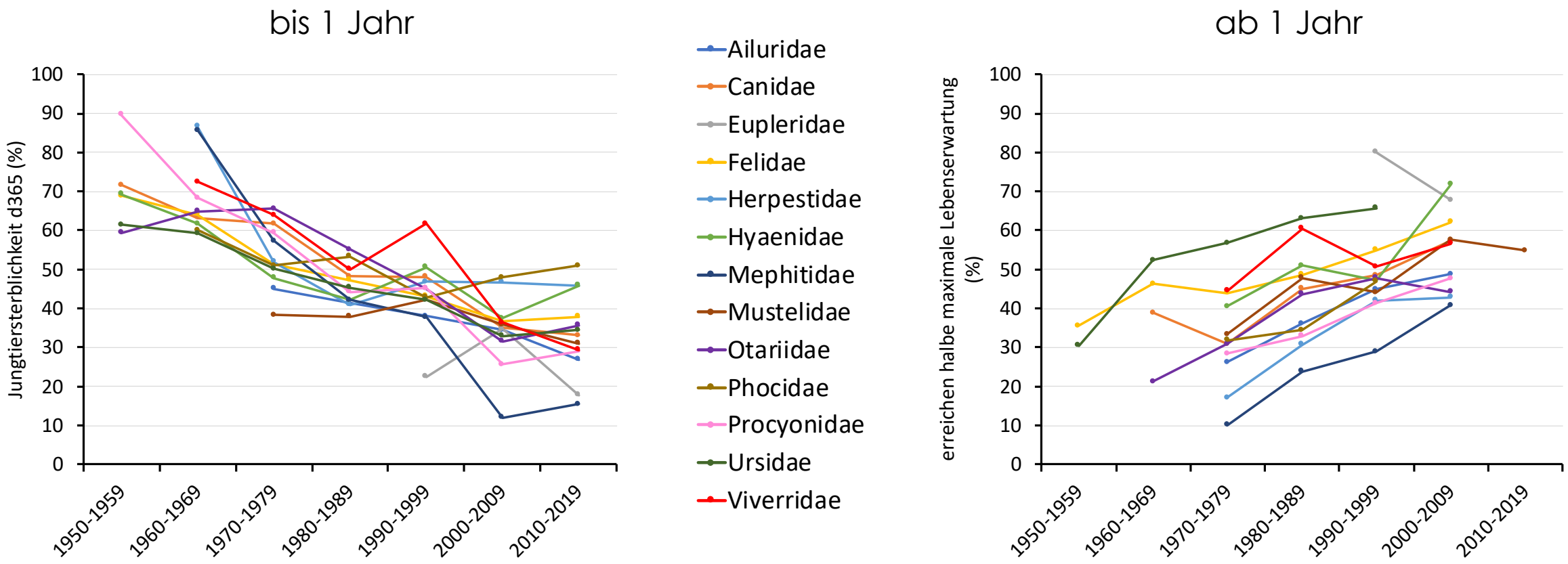

ein Grund zum stolz sein – aber kein Grund zur Selbstzufriedenheit

Beispiel Nashörner

Animal Behaviour 85 (2013) 1113–1126

Contents lists available at SciVerse ScienceDirect

Animal Behaviour

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

Special Issue

Plastic animals in cages: behavioural flexibility and responses to captivity

Georgia Mason [a,*], Charlotte C. Burn [b], Jamie Ahloy Dallaire [a], Jeanette Kroshko [a], Heather McDonald Kinkaid [a], Jonathan M. Jeschke [c]

[a] Animal Sciences Department, University of Guelph, Guelph, ON, Canada
[b] Veterinary Clinical Sciences Department, Royal Veterinary College, Hatfield, U.K.
[c] Department of Ecology and Ecosystem Management, Restoration Ecology, Technische Universität München, Freising-Weihenstephan, Germany

Are Species That Adjust Well to Captivity Also Resilient to HIREC?

ARTICLE INFO

Article history:
Received 10 September 2012
Initial acceptance 11 January 2013
Final acceptance 29 January 2013
Available online 26 March 2013
MS. number: ASI-12-00696

Keywords:
captivity-induced rapid environmental change
conservation
environmental enrichment
stereotypic behaviour
welfare

Billions of wild and semiwild animals live in captive conditions very different from their ancestral environments. Some of the potential challenges they face here, such as greater human proximity, constrained natural behaviours and altered climates, resemble those occurring during urbanization, translocation and other forms of human-induced rapid environmental change (HIREC) in the wild. These parallels between HIREC and captivity suggest that certain species could be in double jeopardy: struggling in both wild and captive environments. This raises new hypotheses for future research, including one tested in this paper: that a species' presence in captivity predicts its chances of establishment when translocated to novel natural habitats. Furthermore, understanding the mechanisms that predispose captive populations to thrive or fail can yield new insights into how animals respond to HIREC. For example, populations adjusting to captivity demonstrate rapid developmental effects. Within one generation, captive-reared animals may show beneficial phenotypic changes (e.g. smaller stress responses than F0s wild caught as adults), illustrating how adaptive developmental plasticity can help populations succeed. However, captive-reared animals also illustrate the risks of developing in evolutionarily new environments (being prone to reduced behavioural flexibility, and sometimes impaired reproduction), suggesting that disrupted ontogeny is one reason why HIREC can be harmful. Overall, analogies between captivity and HIREC are thus interesting and useful. However, captivity and HIREC do differ in some regards, captivity tending to be safer yet more monotonous; we therefore end by discussing how species-typical risk/protective factors, and the phenotypic changes induced in affected animals, may vary between the two.

Humans are profoundly affecting the natural world. Examples of 'human-induced rapid environmental change' (HIREC: Sih 2011; Sih et al. 2011) include deforestation, urbanization, climate change, introductions of novel predators or parasites, local extinctions of preferred food items and relocations to new sites (also see papers in this special issue by Sih 2013; Sol et al. 2013; Wingfield 2013; Slabbekoorn 2013). In response to such challenges, many populations or species move, decline or even become extinct; others, however, adapt, or even thrive and become invasive (e.g. Fisher & Owens 2004; Jeschke & Strayer 2006; Blackburn et al. 2009; Sih et al. 2011; Tuomainen & Candolin 2011; Van Dyck 2012; Sol et al. 2013): HIREC is reducing the number of species on the planet and modifying the phenotypes of populations that persist. This paper examines similarities between HIREC and the drastic changes to animals' lives caused by placing them in captivity. We argue that capturing and enclosing wild animals, and breeding them there, present them with threats, constraints and opportunities similar to those arising from certain forms of HIREC (particularly urbanization, translocation and ecotourism). Species that prosper in captivity thus may be particularly good at coping with these types of HIREC, and similar traits, including behavioural plasticity, the focus of this special issue, might help predict which animals fare well in both situations. Studying captive wild animals could also be a good way (albeit with caveats) to model and understand individual-level impacts of HIREC and the mechanisms involved when animals either adjust well or fail to cope.

First, we describe the diversity and scale of captive wild animal populations. Second, we compare the challenges and opportunities presented by HIREC and captivity, in three ways: (1) we review the potential parallels between captive life and HIREC; (2) we present evidence, including new analyses of translocation data, that wild species preadapted to thrive in response to HIREC also fare well in captivity; and (3) we discuss potentially important traits, including

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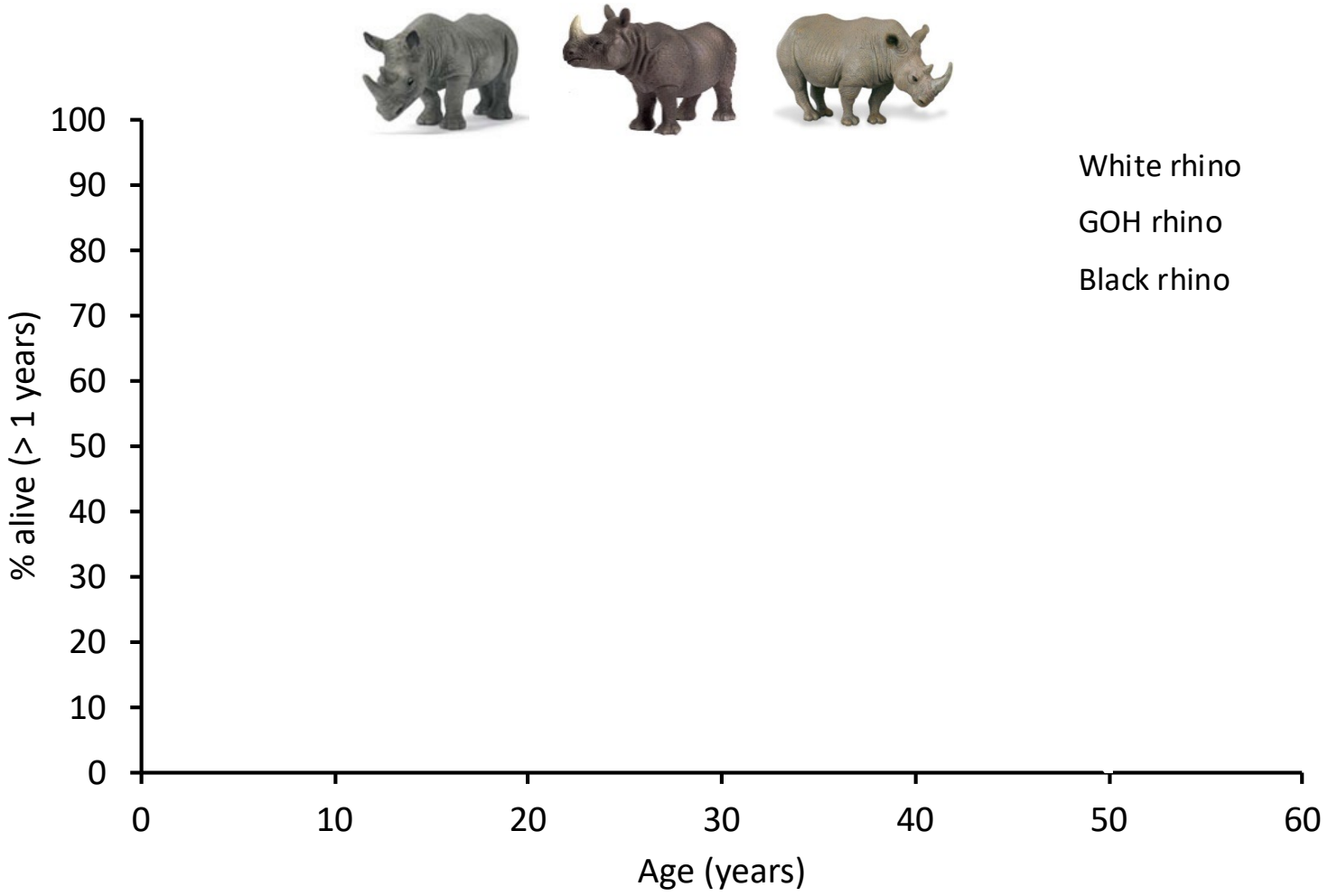
http://dx.doi.org/10.1016/j.anbehav.2013.02.002

Sind Arten, die sich gut im Zoo einfinden, auch solche, die im natürlichen Habitat weniger bedroht sind ?

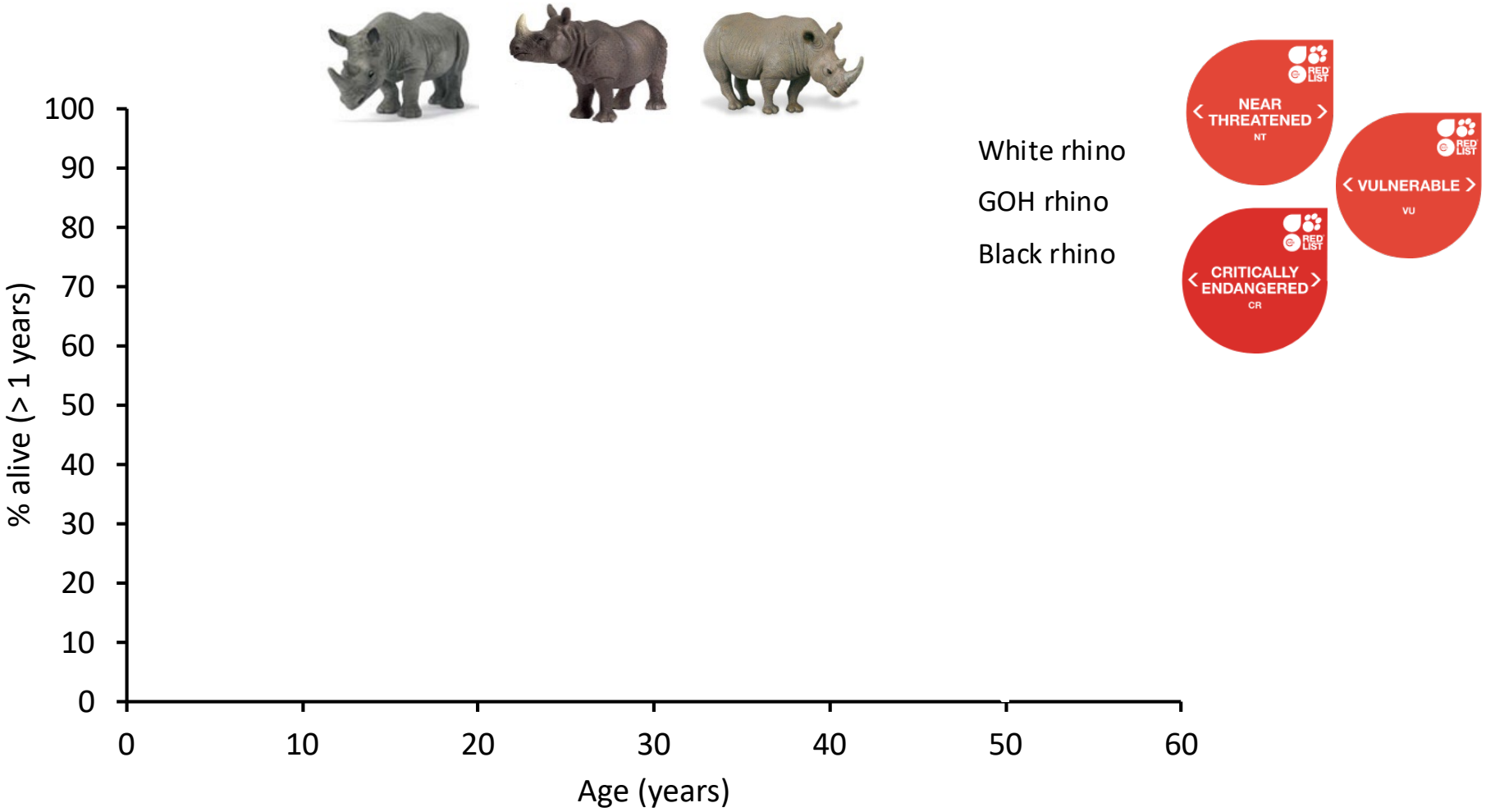
(der Umkehrschluss gilt nicht !)

Nashörner



Wittwer et al. (preliminary results): Species360 Research Data Agreement # 2019-Q3-RR3

Nashörner



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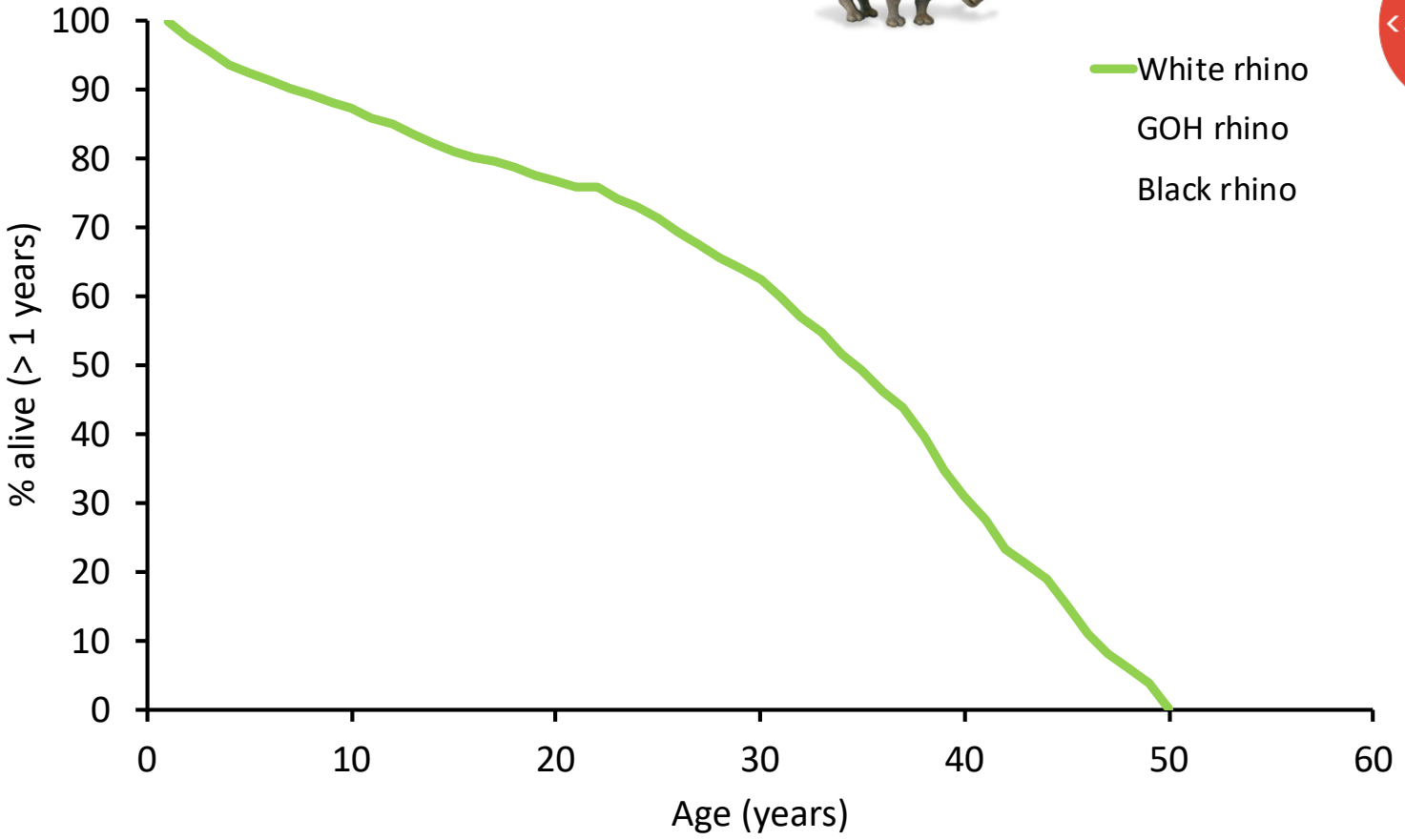

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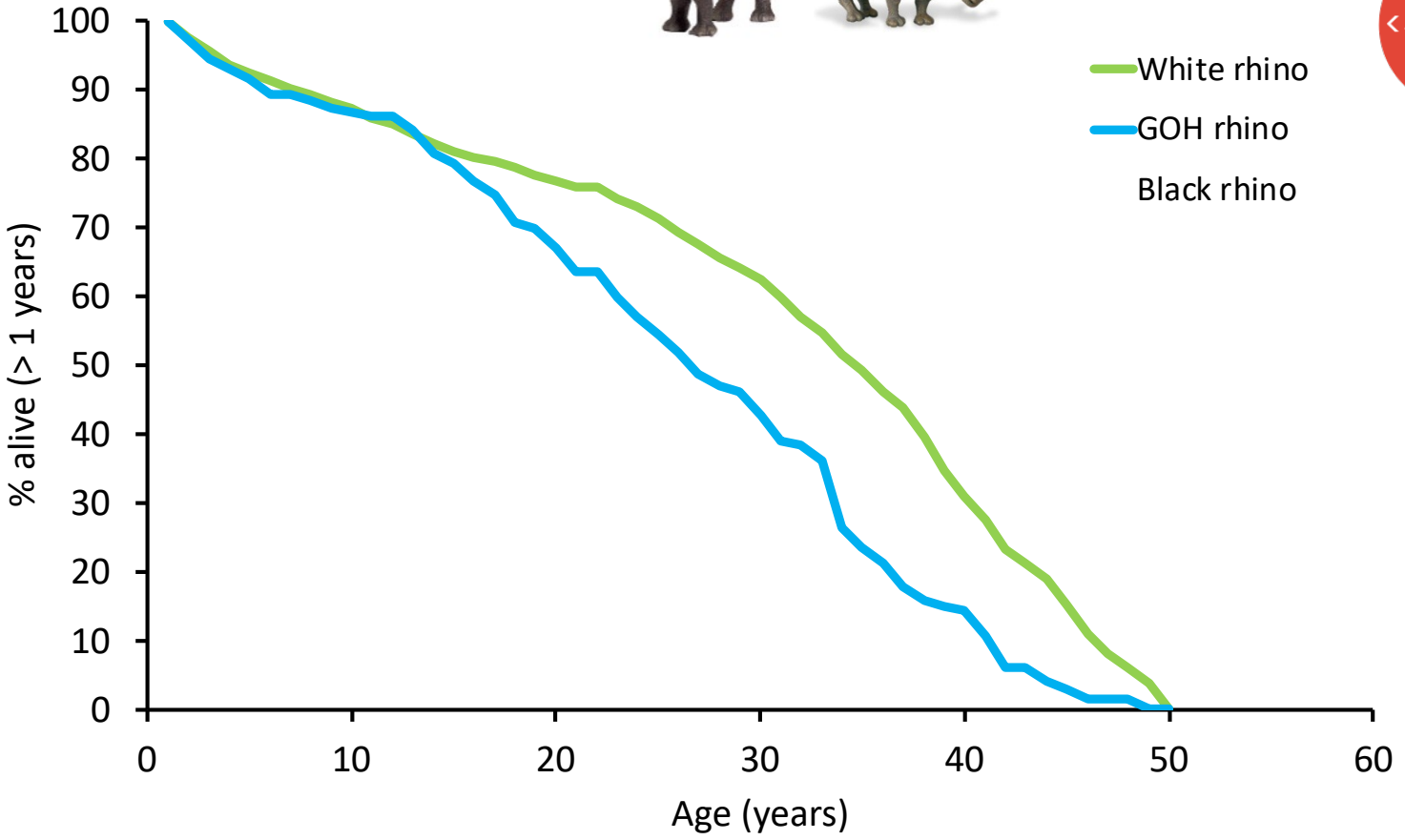

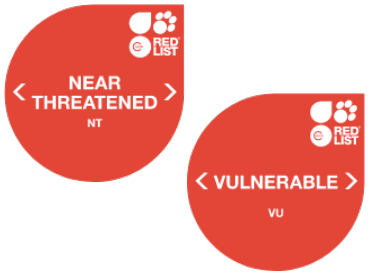

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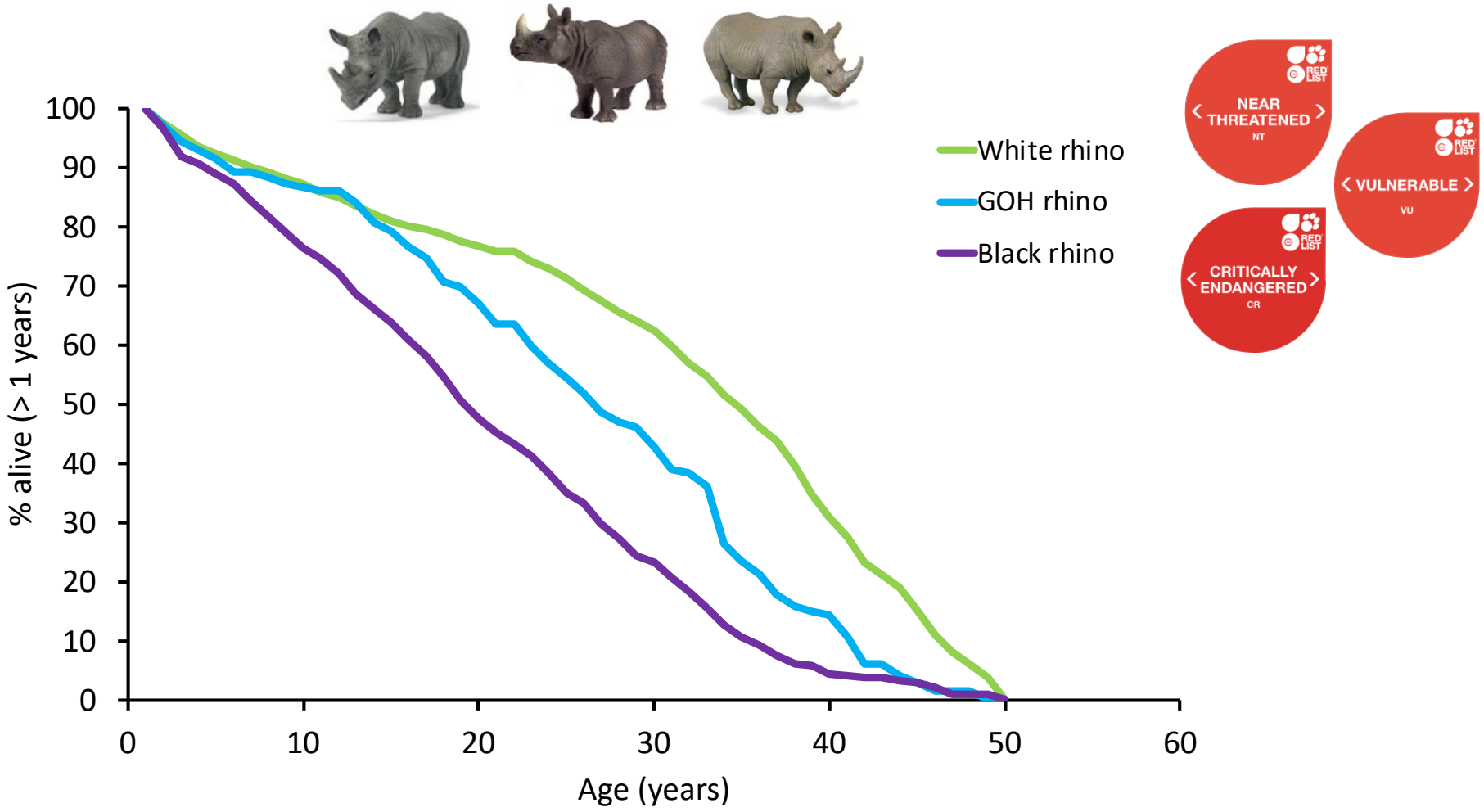

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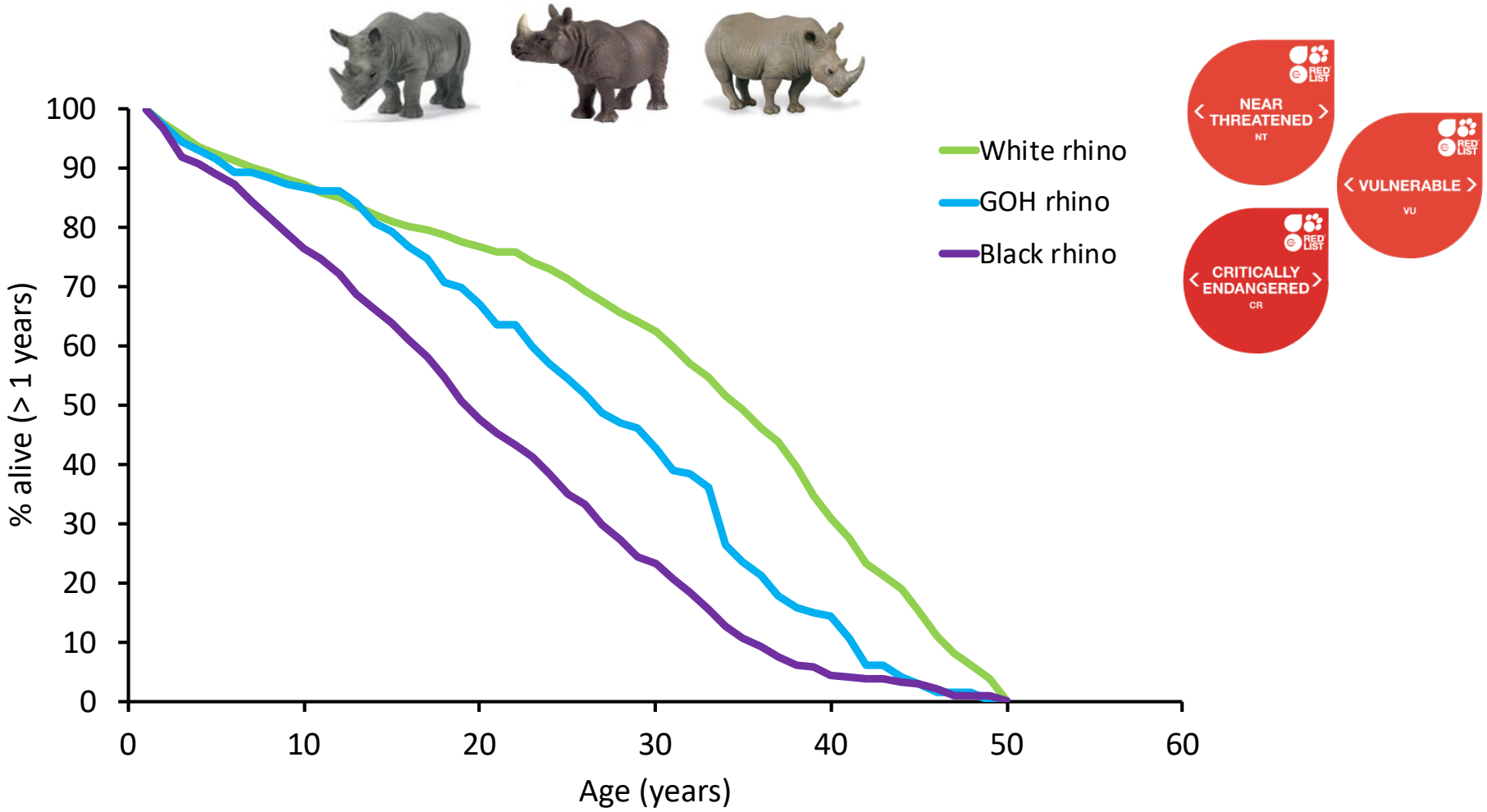

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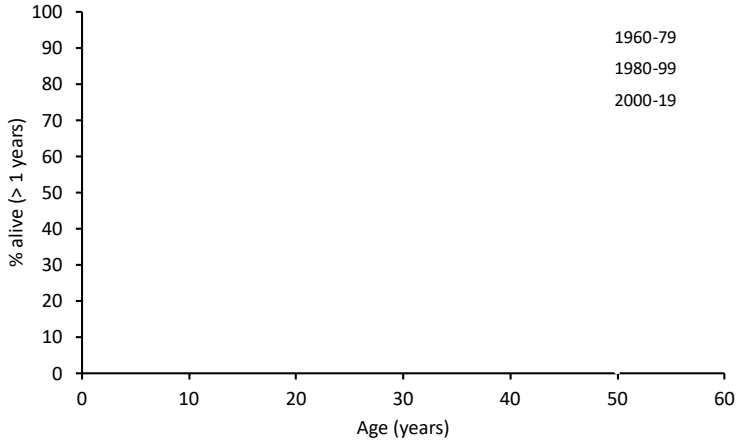

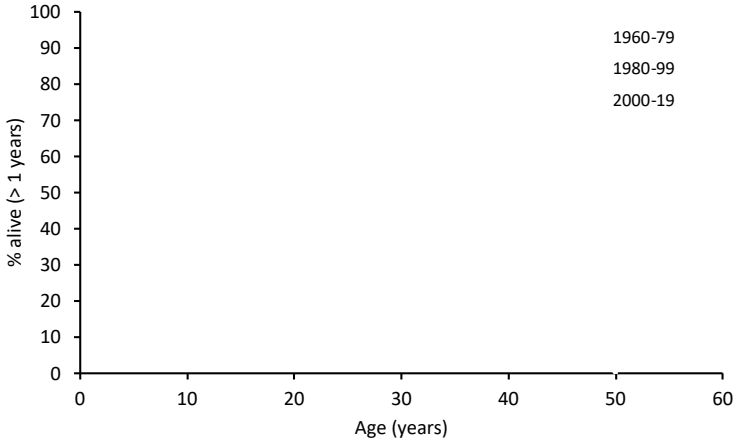

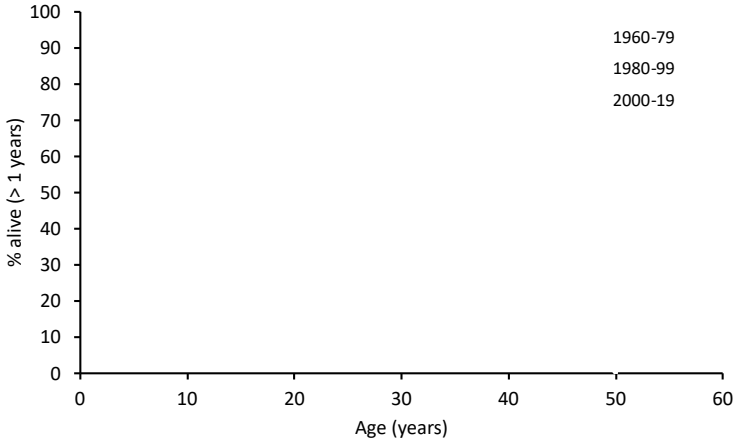

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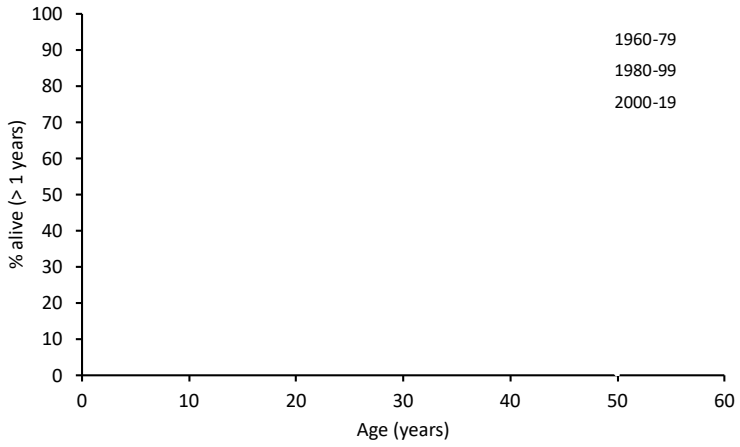

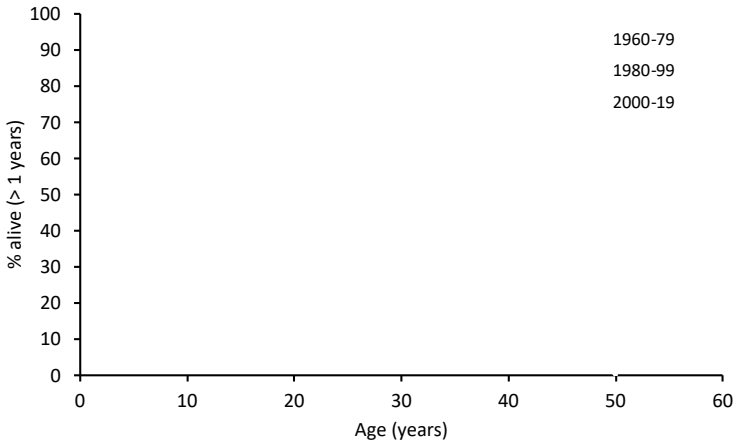

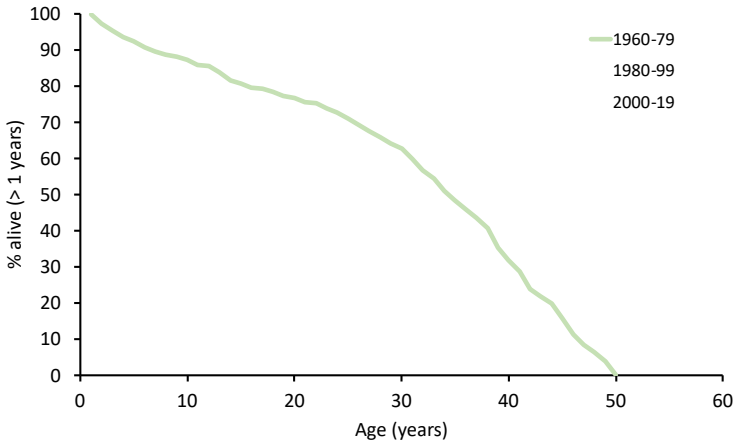

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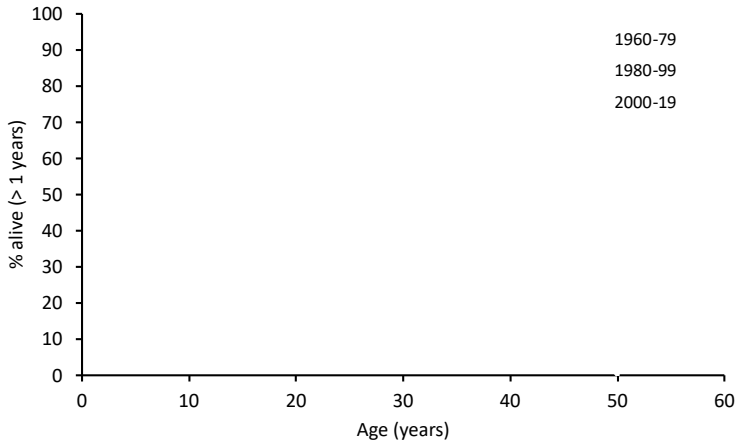

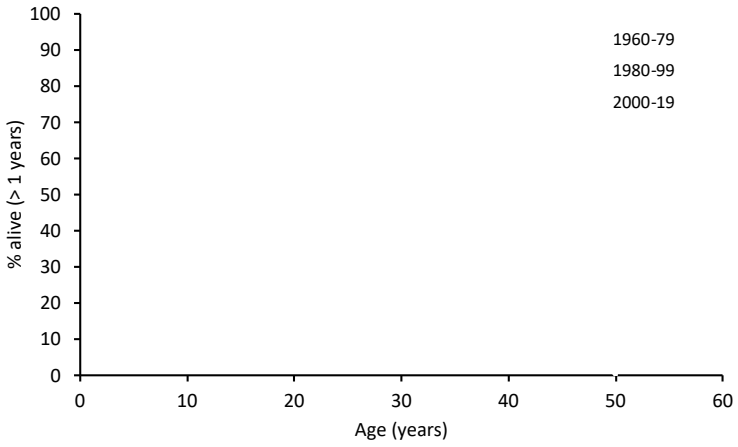

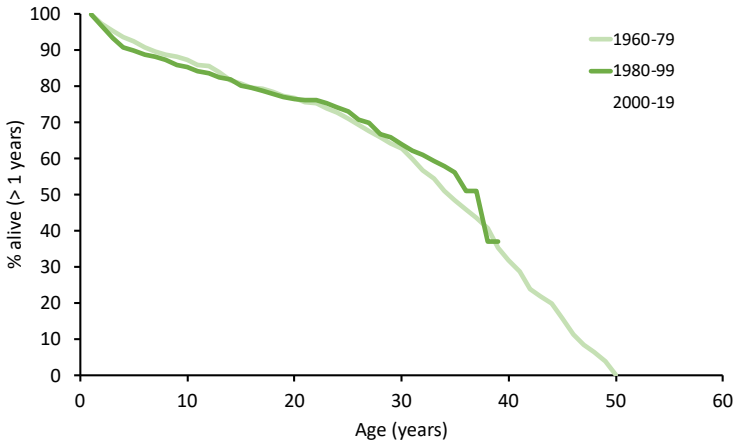

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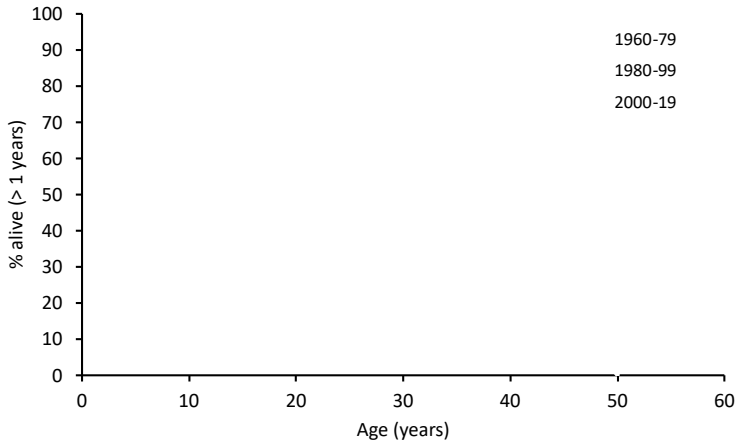

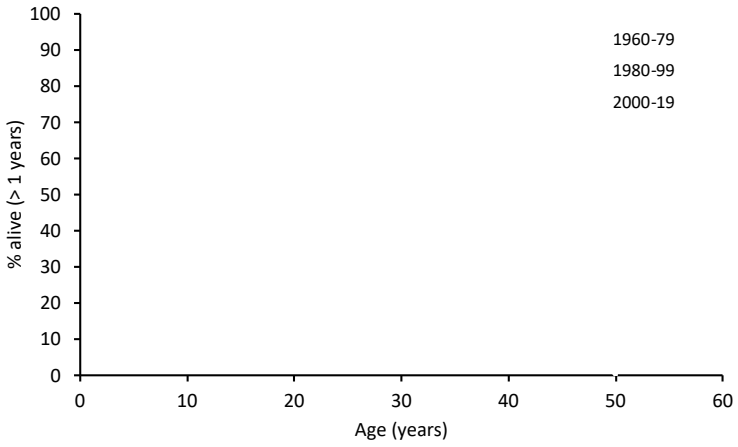

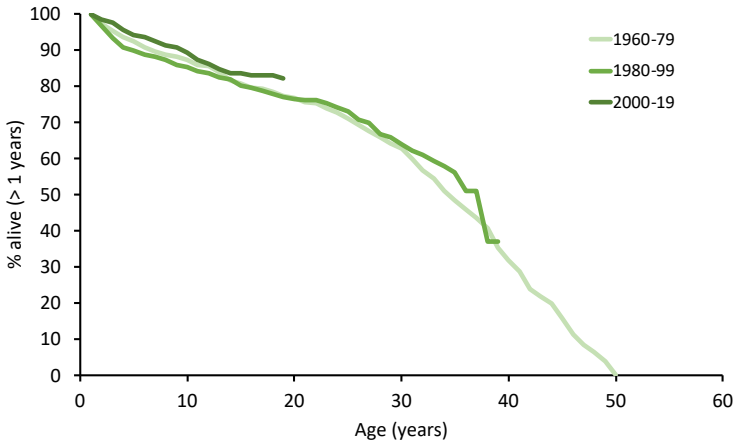

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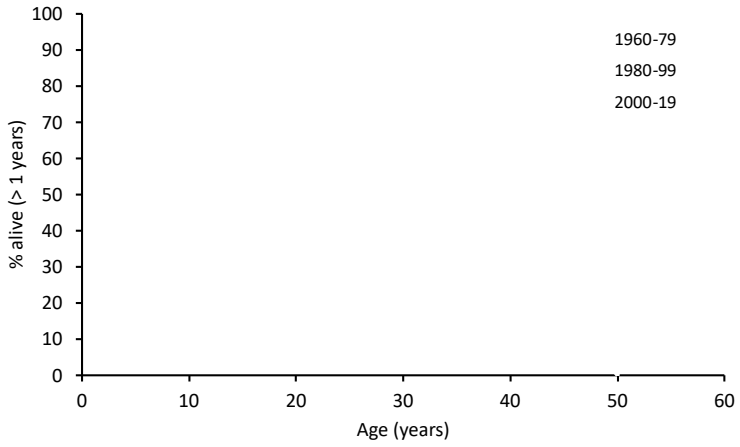

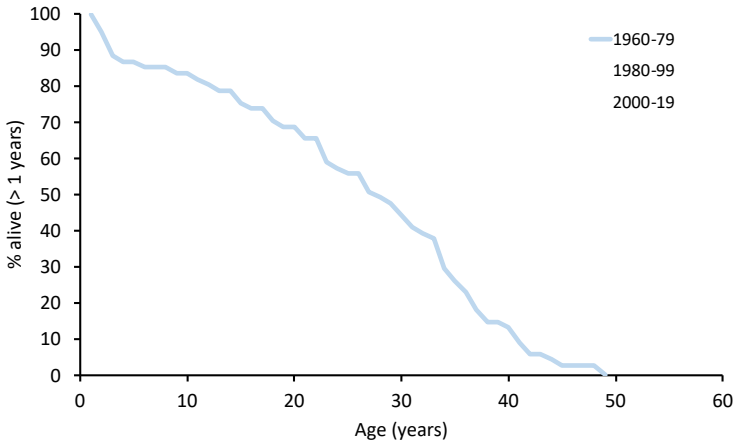

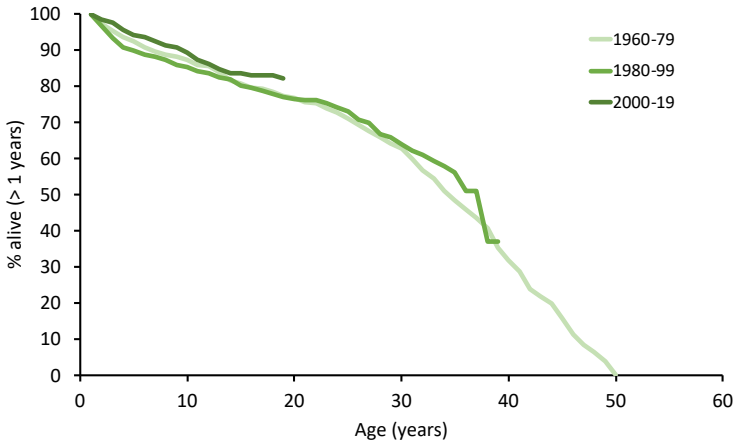

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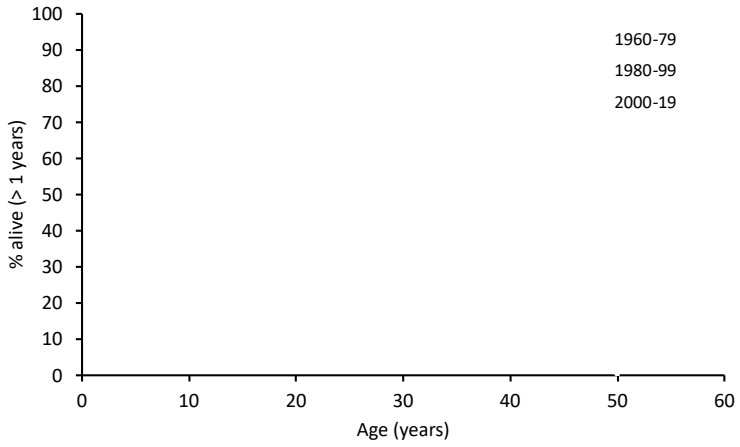

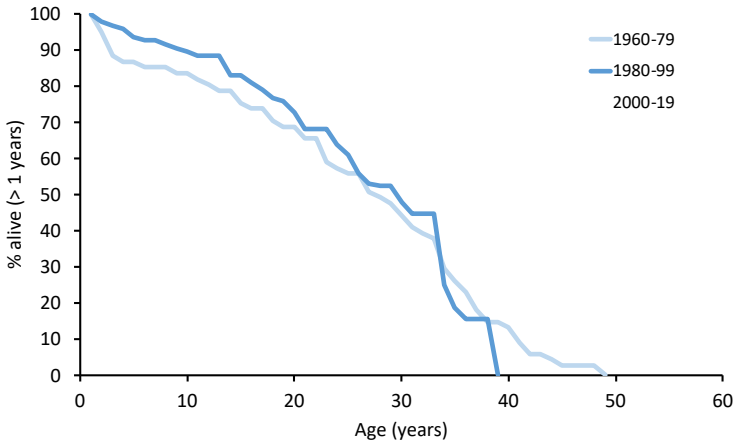

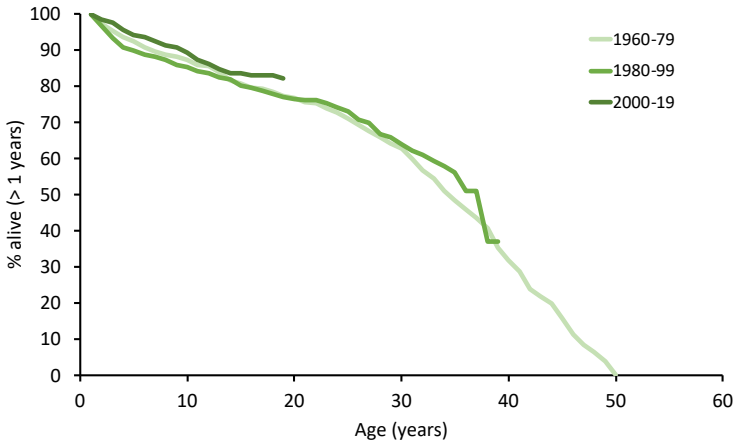

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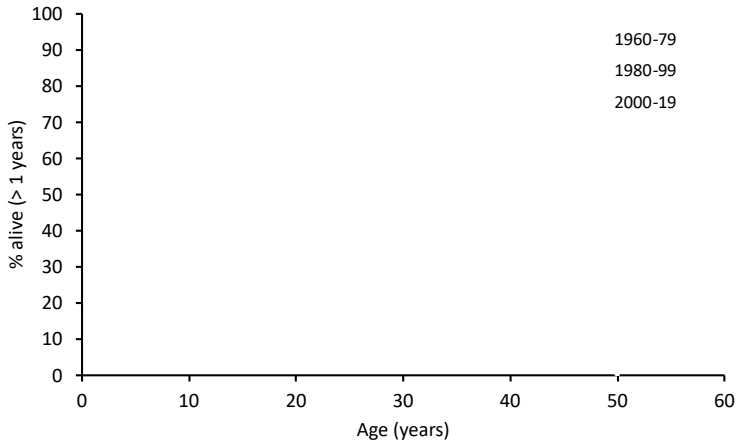

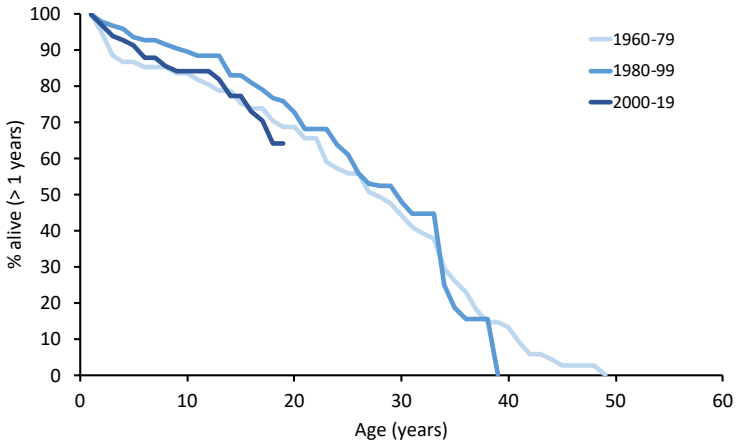

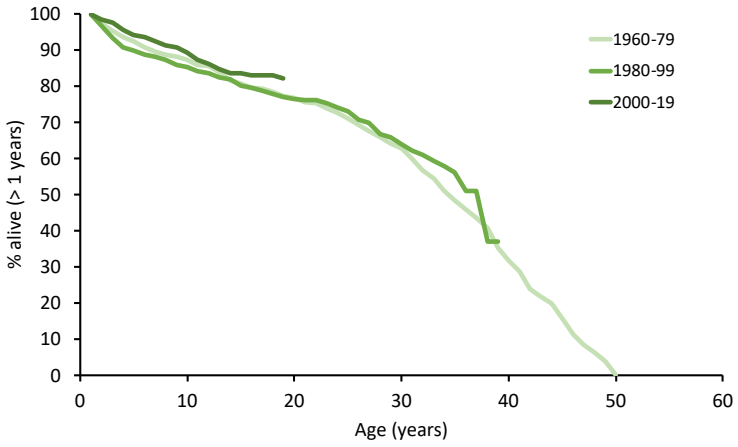

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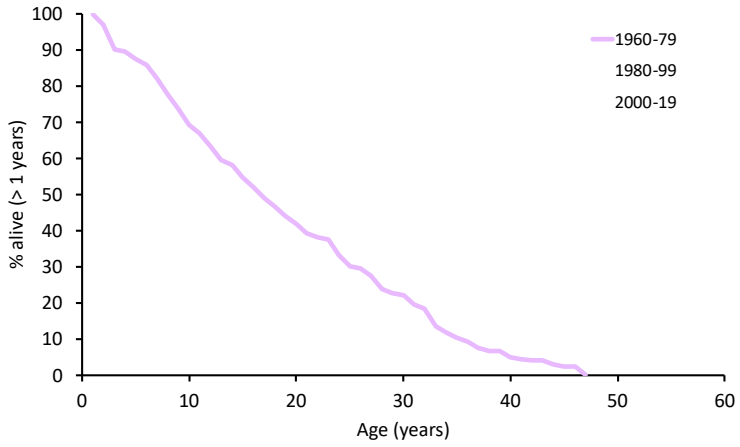

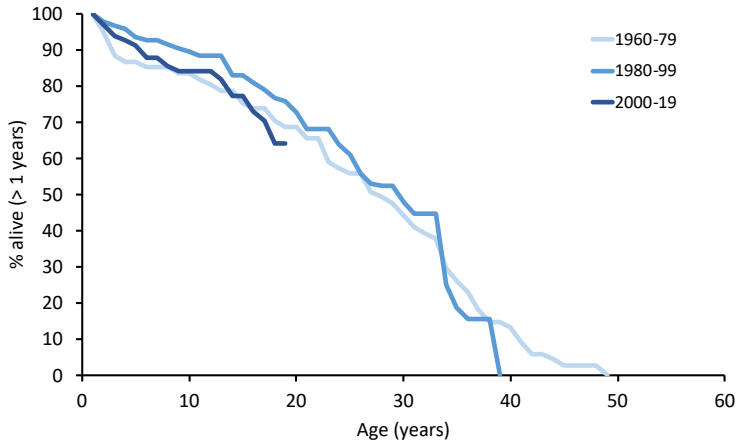

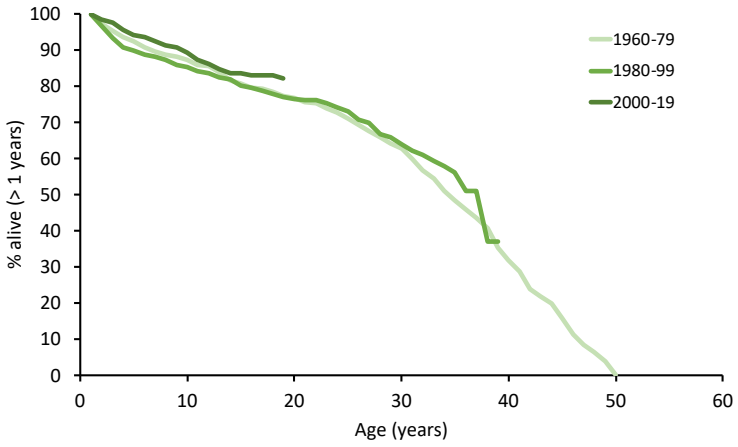

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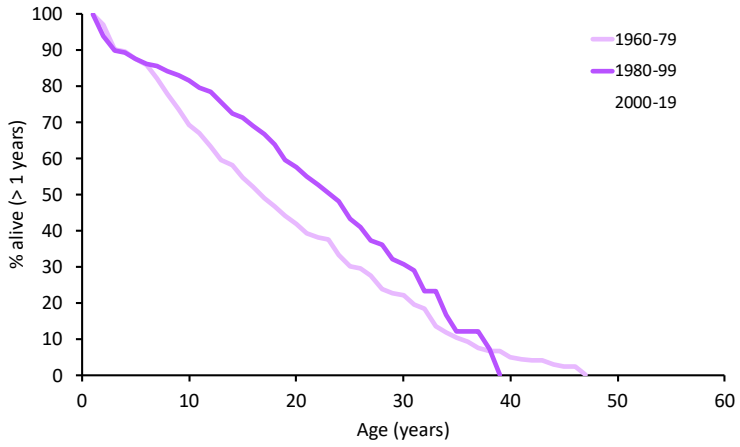

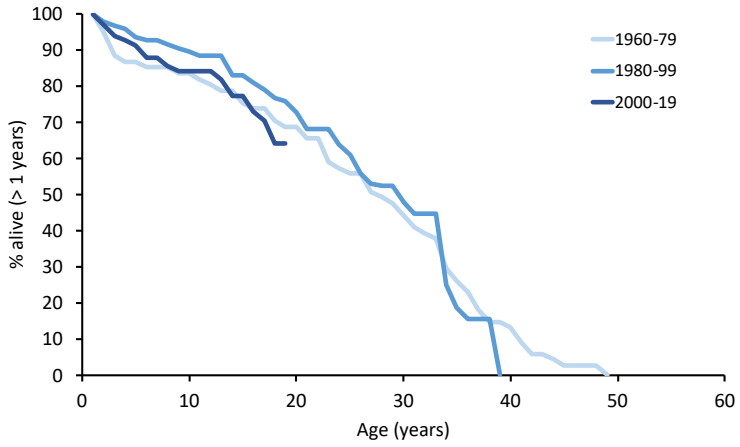

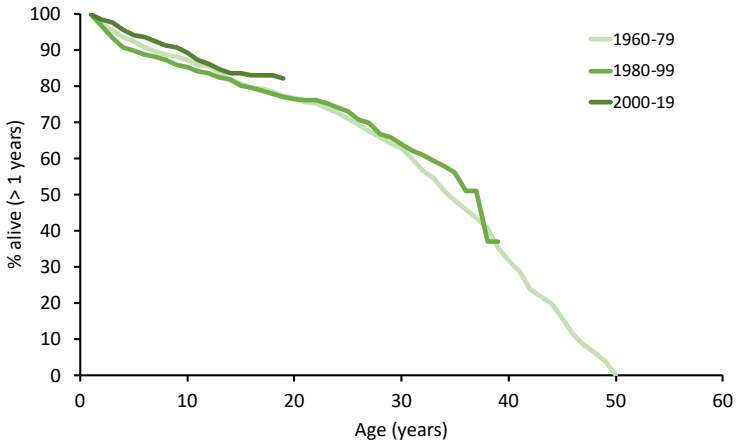

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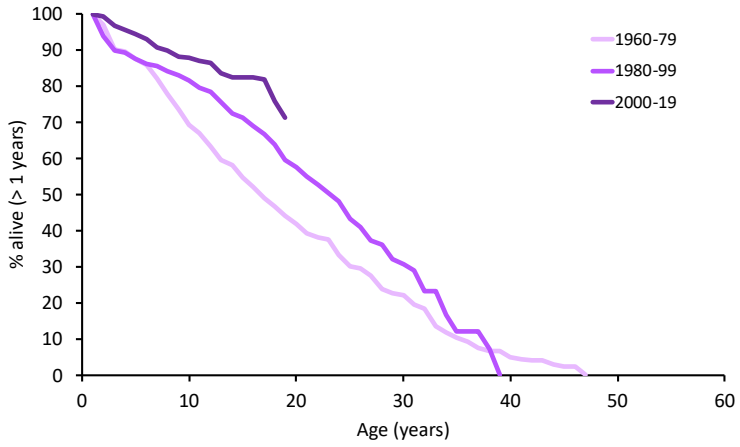

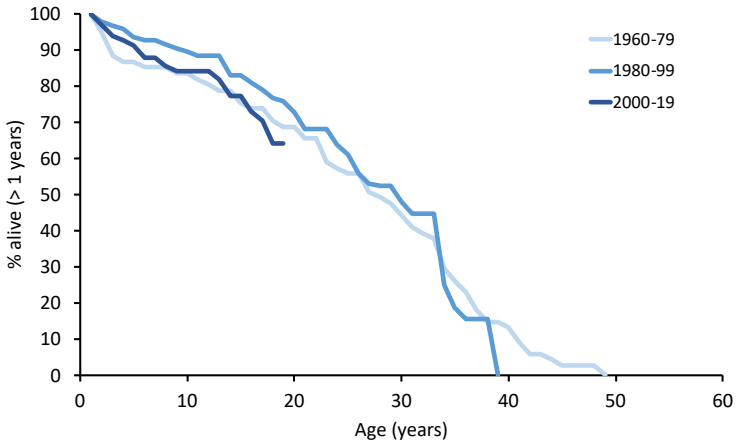

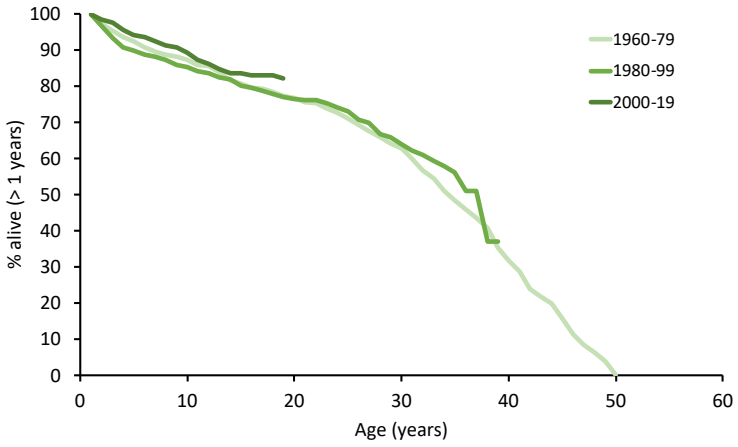

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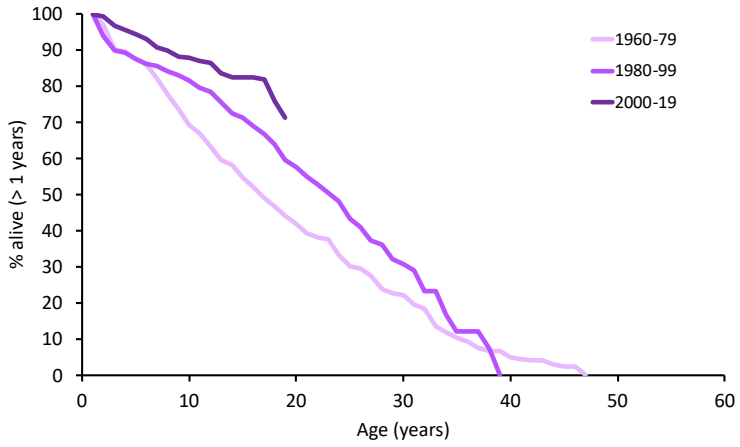

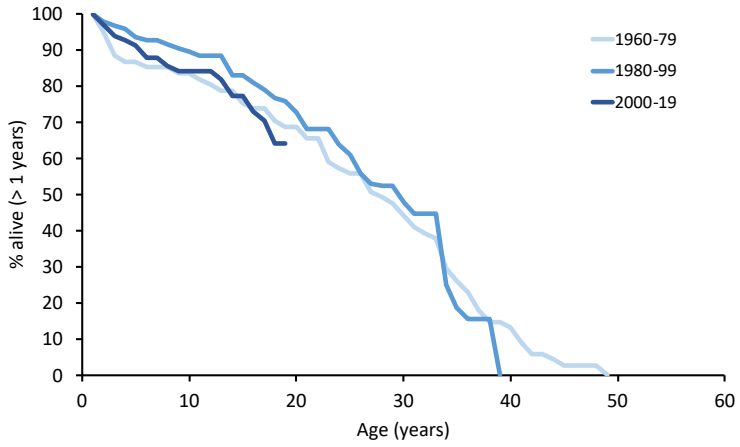

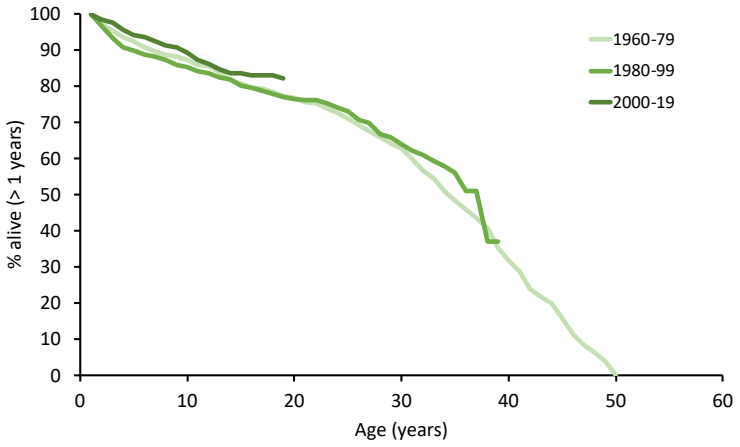

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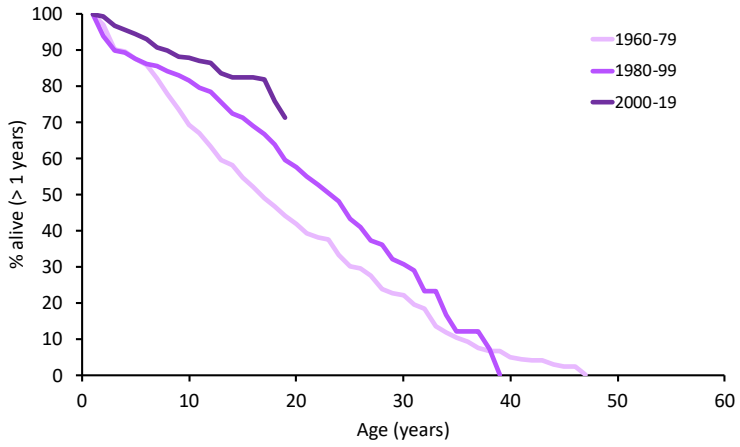

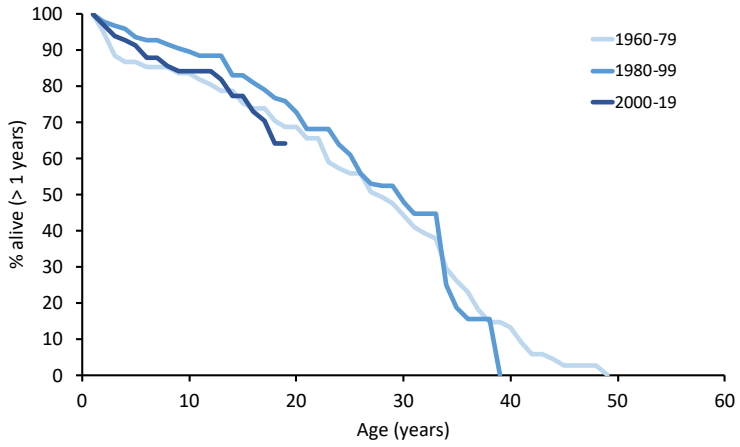

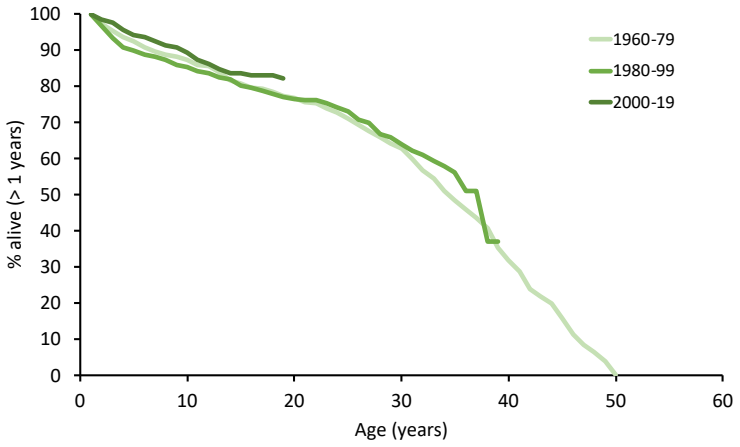

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wenig Potential für Verbesserung bei einer Art, die schon immer gut zu halten war ?

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Beispiel Elefanten

Compromised Survivorship in Zoo Elephants

Ros Clubb,[1] Marcus Rowcliffe,[2] Phyllis Lee,[3,4] Khyne U. Mar,[2,5] Cynthia Moss,[4] Georgia J. Mason[6]*

Wild animals can experience poor welfare when held captive (*1*), an effect with ethical and practical implications. In zoos, the welfare of African elephants (*Loxodonta africana*) and Asian elephants (*Elephas maximus*) has long caused concern. Infanticide, *Herpes*, tuberculosis, lameness, infertility, and stereotypic behavior are prevalent (*2*), and zoo elephant populations are not self-sustaining without importation (*3*). We compiled data from over 4500 individuals to compare survivorship in zoos with protected populations in range countries. Data representing about half the global zoo population (1960 to 2005) came from European "studbooks" and the European Elephant Group (*4*). We focused on females as relevant to population viability ($N = 786$, both wild-caught and captive-born; 302 African and 484 Asian). African elephants in Amboseli National Park, Kenya ($N = 1089$), and Asian elephants in the Burmese logging industry (Myanma Timber Enterprise, M.T.E., $N = 2905$, wild-caught and captive-born) acted as well-provisioned reference populations [for details, see (*2*) and (*5*)].

For African elephants, median life spans (excluding premature and still births) were 16.9 years [95% confidence interval (CI) 16.4 to unknown; upper estimate for median not reached] for zoo-born females and 56.0 years (95% CI 51.5 to unknown) for Amboseli females undergoing natural mortality (35.9 years with human-induced deaths, 95% CI 33.8 to 40.3). Neither infant nor juvenile mortality differed between populations (Fig. 1A and tables S1 and S2), but adult females died earlier in zoos than in Amboseli (Fig. 1B and table S2). Zoo adult African survivorship has improved in recent years [$z = -2.75$, $P < 0.01$ (*5*)], but mortality risks in our data set's final year (2005) remained 2.8 times higher (95% CI 1.2 to 6.5) than that of Amboseli females undergoing natural mortality.

For Asian elephants, median life spans (excluding premature and still births) for captive-born females were 18.9 years in zoos (95% CI 17.7 to 34.0) and 41.7 years in the M.T.E. population (95% CI 38.2 to 44.6). Zoo infant mortality rates were high (over double those of M.T.E.): A female's first pregnancy therefore had only a 42% chance of yielding a live year-old in zoos compared with 83% in M.T.E. (table S1). Rates have not significantly improved over time (e.g., live births controlling for parity: $z = 1.19$, $P > 0.10$). For juveniles, captive-born survivorship did not significantly differ between populations, whereas wild-born survivorship was poorer in Burma (Fig. 1C and table S2) because of after-effects of capture (*5*). In adulthood, however, survivorship was lower in zoos (Fig. 1D and table S2), with no detectable improvement in recent years ($z = -1.48$, $P > 0.10$).

Within zoos, captive-born Asians have poorer adult survivorship than wild-born Asians (Fig. 1D and table S2). This is a true birth origin effect: Whereas zoo-born elephants are more likely to have been born recently and to primiparous dams, neither dam parity ($z = 0.86$, $P > 0.10$) nor recency ($z = -1.48$, $P > 0.10$) predict adult survivorship (controlling for recency makes birth origin more significant: $z = -3.52$, $P < 0.001$). Because the median importation age of wild-born females was about 3.4 years, this suggests that zoo-born Asians' elevated adult mortality risks are conferred during gestation or early infancy.

Interzoo transfers also reduced Asian survivorship (see supporting online text), an effect lasting 4 years posttransfer ($z = -2.10$, $P < 0.05$, controlling for birth origin). Additionally, survivorship tended to be poorer in Asian calves removed from mothers at young ages ($z = -1.92$, $P < 0.10$) (*5*).

Overall, bringing elephants into zoos profoundly impairs their viability. The effects of early experience, interzoo transfer, and possibly maternal loss, plus the health and reproductive problems recorded in zoo elephants [e.g., (*2*)], suggest stress and/or obesity as likely causes.

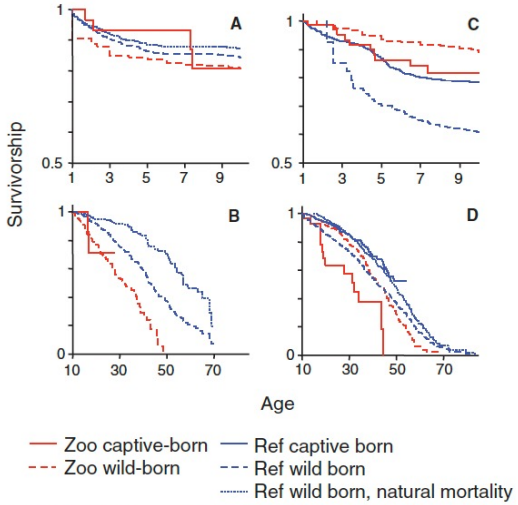

Fig. 1. Kaplan-Meier survivorship curves for female African (**A** and **B**) and Asian (**C** and **D**) elephants aged 1 to 10 [juveniles in (**A**) and (**C**)] and 10+ years [adults in (**B**) and (**D**)]. For wild-born reference (Ref, Amboseli or M.T.E.) populations, natural mortality excludes human-caused deaths; all mortality includes them (*5*). Results of statistical comparisons are given in table S2.

References and Notes

1. R. Clubb, G. Mason, *Nature* **425**, 473 (2003).
2. R. Clubb, G. Mason, *A Review of the Welfare of Zoo Elephants in Europe* (RSPCA, Horsham, UK, 2002).
3. M. Hutchins, M. Keele, *Zoo Biol.* **25**, 219 (2006).
4. European Elephant Group, "Elefanten in zoos und safariparks Europa" (European Elephant Group, Grünwald, Germany, 2002).
5. Methods and supplementary results are available as supporting material on *Science* Online.

6. G.J.M. thanks the Natural Science and Engineering Research Council for funding; R.C. and G.J.M. thank R. Ripley for statistical advice; P.L. and C.M. thank many conservation nongovernmental organizations and private donors for supporting the Amboseli Elephant Trust; K.U.M. thanks colleagues at M.T.E. for data compilation and comments. G.J.M. is a visiting professor at The Royal Veterinary College, London, UK. K.U.M. has received funding from Prospect Burma Foundation, Charles Wallace Burma Trust, Three Oaks Foundation, Whitney-Laing Foundation (Rufford Small Grants), Toyota Foundation, Fantham Memorial Research Scholarship, and University College London. K.U.M. has been a paid consultant for Woburn Safari Park, UK. G.J.M. has been a paid consultant to Disney's Animal Kingdom, USA.

Supporting Online Material
www.sciencemag.org/cgi/content/full/322/5908/1649/DC1
Materials and Methods
SOM Text
Tables S1 and S2
References

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10.1126/science.1164298

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Compromised Survivorship in Zoo Elephants

as Compared to Some Selected *in situ* Populations Declared 'Benchmarks'

Ros Clubb,[1] Marcus Rowcliffe,[2] Phyllis Lee,[3,4] Khyne U. Mar,[2,5] Cynthia Moss,[4] Georgia J. Mason[6]*

Wild animals can experience poor welfare when held captive (*1*), an effect with ethical and practical implications. In zoos, the welfare of African elephants (*Loxodonta africana*) and Asian elephants (*Elephas maximus*) has long caused concern. Infanticide, *Herpes*, tuberculosis, lameness, infertility, and stereotypic behavior are prevalent (*2*), and zoo elephant populations are not self-sustaining without importation (*3*). We compiled data from over 4500 individuals to compare survivorship in zoos with protected populations in range countries. Data representing about half the global zoo population (1960 to 2005) came from European "studbooks" and the European Elephant Group (*4*). We focused on females as relevant to population viability ($N = 786$, both wild-caught and captive-born; 302 African and 484 Asian). African elephants in Amboseli National Park, Kenya ($N = 1089$), and Asian elephants in the Burmese logging industry (Myanma Timber Enterprise, M.T.E., $N = 2905$, wild-caught and captive-born) acted as well-provisioned reference populations [for details, see (*2*) and (*5*)].

For African elephants, median life spans (excluding premature and still births) were 16.9 years [95% confidence interval (CI) 16.4 to unknown; upper estimate for median not reached] for zoo-born females and 56.0 years (95% CI 51.5 to unknown) for Amboseli females undergoing natural mortality (35.9 years with human-induced deaths, 95% CI 33.8 to 40.3). Neither infant nor juvenile mortality differed between populations (Fig. 1A and tables S1 and S2), but adult females died earlier in zoos than in Amboseli (Fig. 1B and table S2). Zoo adult African survivorship has improved in recent years [$z = -2.75$, $P < 0.01$ (*5*)], but mortality risks in our data set's final year (2005) remained 2.8 times higher (95% CI 1.2 to 6.5) than that of Amboseli females undergoing natural mortality.

For Asian elephants, median life spans (excluding premature and still births) for captive-born females were 18.9 years in zoos (95% CI 17.7 to 34.0) and 41.7 years in the M.T.E. population (95% CI 38.2 to 44.6). Zoo infant mortality rates were high (over double those of M.T.E.): A female's first pregnancy therefore had only a 42% chance of yielding a live year-old in zoos compared with 83% in M.T.E. (table S1). Rates have not significantly improved over time (e.g., live births controlling for parity: $z = 1.19$, $P > 0.10$). For juveniles, captive-born survivorship did not significantly differ between populations, whereas wild-born survivorship was poorer in Burma (Fig. 1C and table S2) because of after-effects of capture (*5*). In adulthood, however, survivorship was lower in zoos (Fig. 1D and table S2), with no detectable improvement in recent years ($z = -1.48$, $P > 0.10$).

Within zoos, captive-born Asians have poorer adult survivorship than wild-born Asians (Fig. 1D and table S2). This is a true birth origin effect: Whereas zoo-born elephants are more likely to have been born recently and to primiparous dams, neither dam parity ($z = 0.86$, $P > 0.10$) nor recency ($z = -1.48$, $P > 0.10$) predict adult survivorship (controlling for recency makes birth origin more significant: $z = -3.52$, $P < 0.001$). Because the median importation age of wild-born females was about 3.4 years, this suggests that zoo-born Asians' elevated adult mortality risks [illegible] ling for birth origin). Additionally, survivorship tended to be poorer in Asian calves removed from mothers at young ages ($z = -1.92$, $P < 0.10$) (*5*).

Overall, bringing elephants into zoos profoundly impairs their viability. The effects of early experience, interzoo transfer, and possibly maternal loss, plus the health and reproductive problems recorded in zoo elephants [e.g., (*2*)], suggest stress and/or obesity as likely causes.

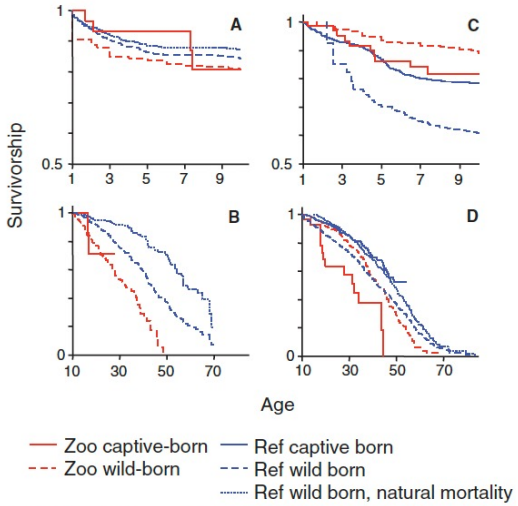

Fig. 1. Kaplan-Meier survivorship curves for female African (**A** and **B**) and Asian (**C** and **D**) elephants aged 1 to 10 [juveniles in (**A**) and (**C**)] and 10+ years [adults in (**B**) and (**D**)]. For wild-born reference (Ref, Amboseli or M.T.E.) populations, natural mortality excludes human-caused deaths; all mortality includes them (*5*). Results of statistical comparisons are given in table S2.

References and Notes

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5. Methods and supplementary results are available as supporting material on *Science* Online.
6. G.J.M. thanks the Natural Science and Engineering Research Council for funding; R.C. and G.J.M. thank R. Ripley for statistical advice; P.L. and C.M. thank many conservation nongovernmental organizations and private donors for supporting the Amboseli Elephant Trust; K.U.M. thanks colleagues at M.T.E. for data compilation and comments. G.J.M. is a visiting professor at The Royal Veterinary College, London, UK. K.U.M. has received funding from Prospect Burma Foundation, Charles Wallace Burma Trust, Three Oaks Foundation, Whitney-Laing Foundation (Rufford Small Grants), Toyota Foundation, Fantham Memorial Research Scholarship, and University College London. K.U.M. has been a paid consultant for Woburn Safari Park, UK. G.J.M. has been a paid consultant to Disney's Animal Kingdom, USA.

Supporting Online Material
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6 August 2008; accepted 22 September 2008
10.1126/science.1164298

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*To whom correspondence should be addressed. E-mail: gmason@uoguelph.ca

Compromised Survivorship in Zoo Elephants

as Compared to Some Selected *in situ* Populations Declared 'Benchmarks'

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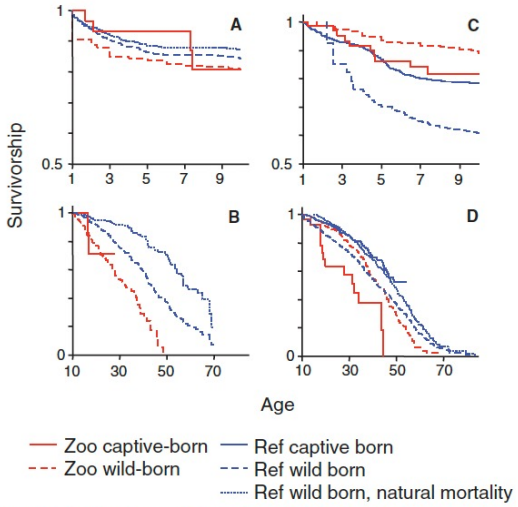

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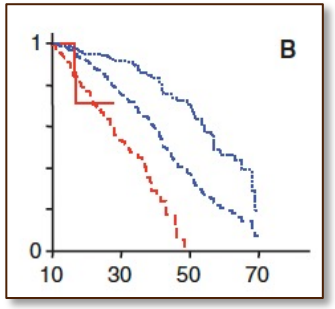
Daten von 1960-2008

1. Überlebensrate ist niedriger im Zoo als *in situ*
2. Obwohl es Verbesserungen in der Überlebensrate Afrikanischer Elefanten seit 1960 gab, gab es bei Asiatischen Elefanten keine Anzeichgen für eine Verbesserung.

Wie will man vergleichen ?



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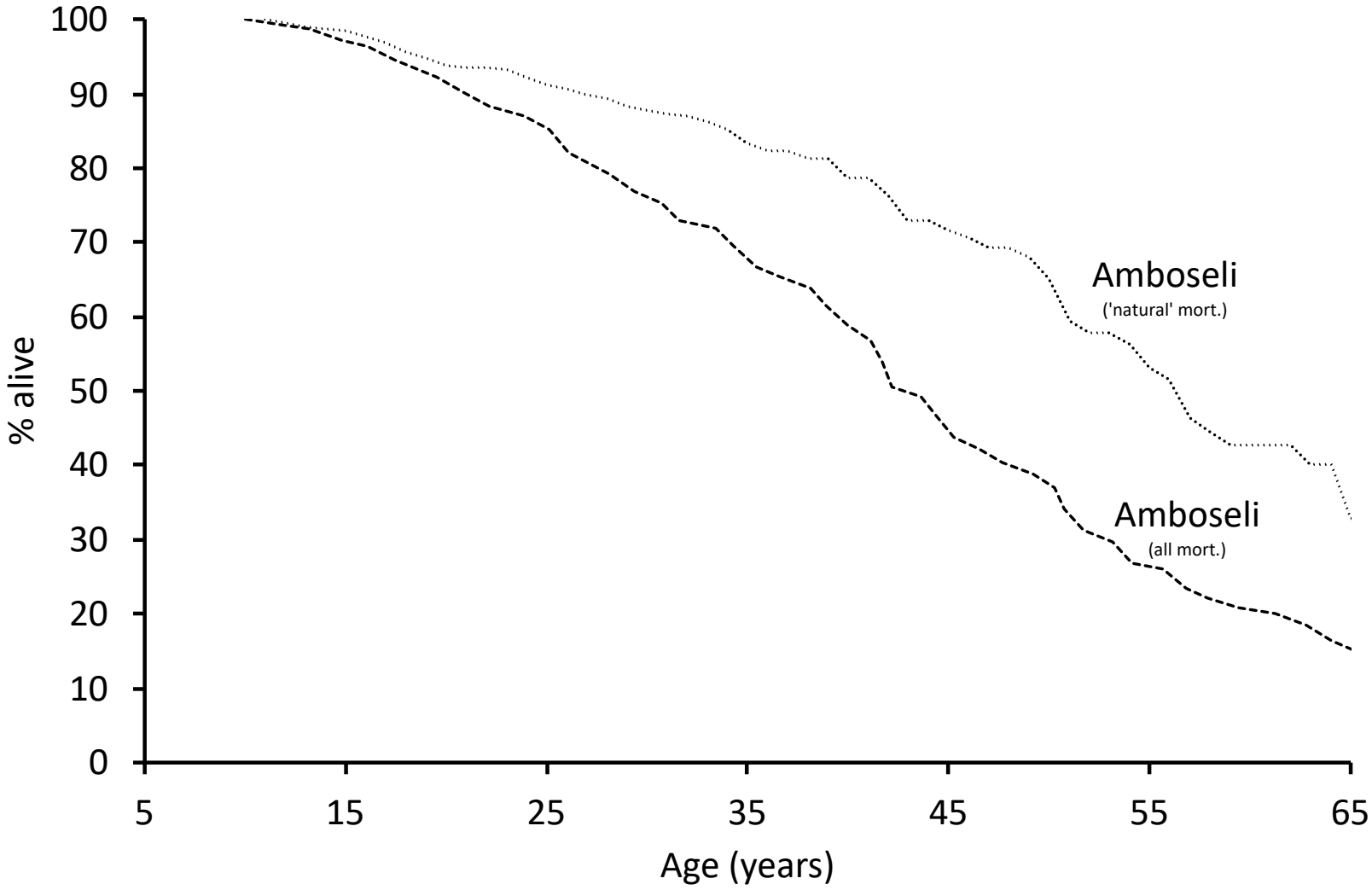
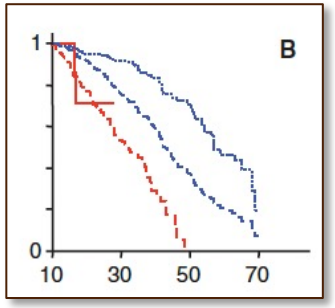
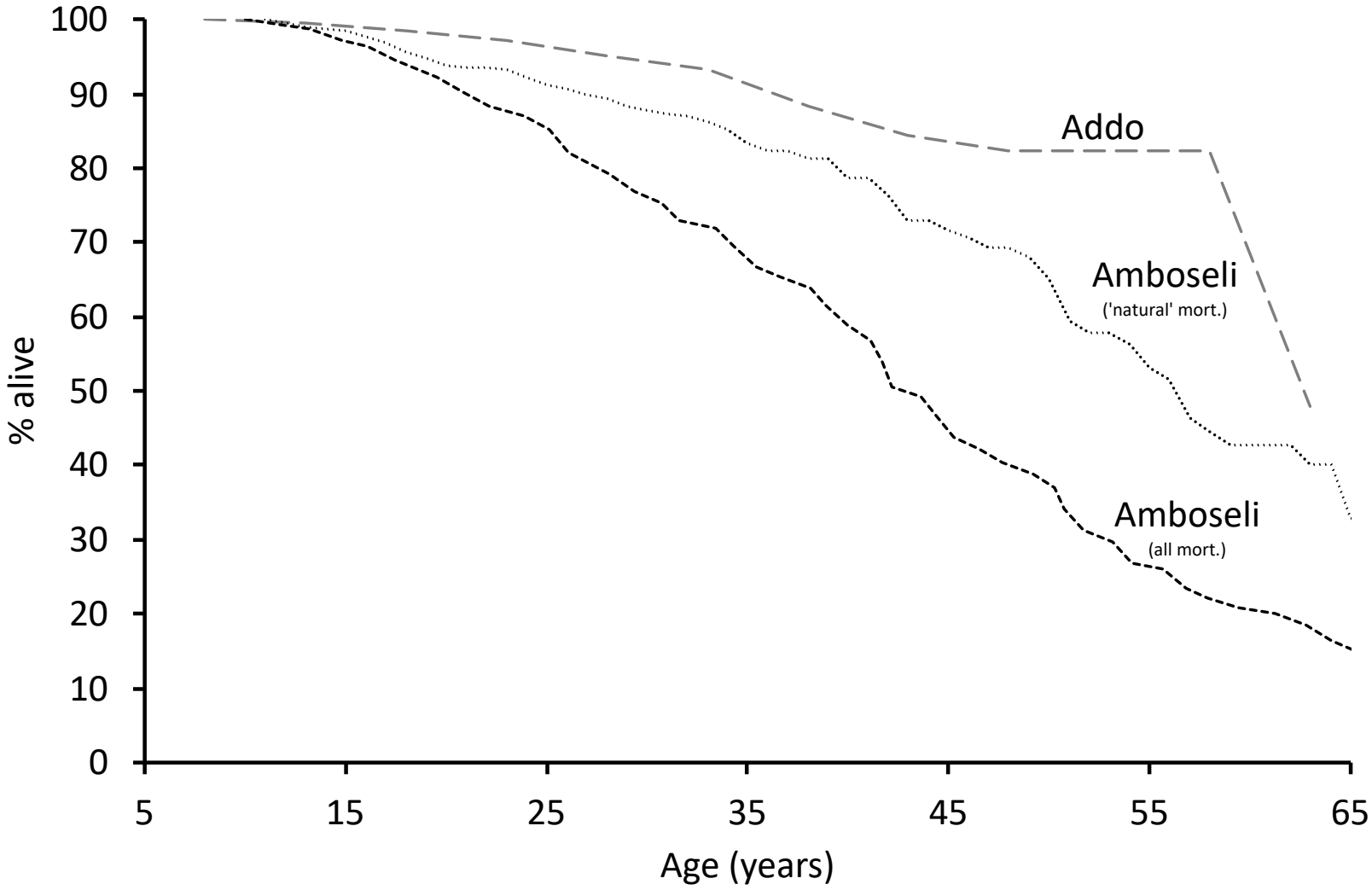
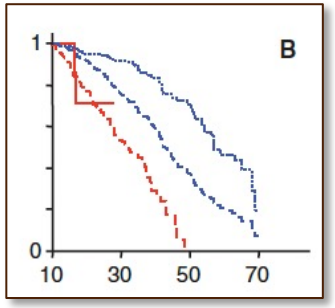




Moss et al. (2001)
Amboseli Natl Park,
Kenya (1972-2000)

Wie will man vergleichen ?





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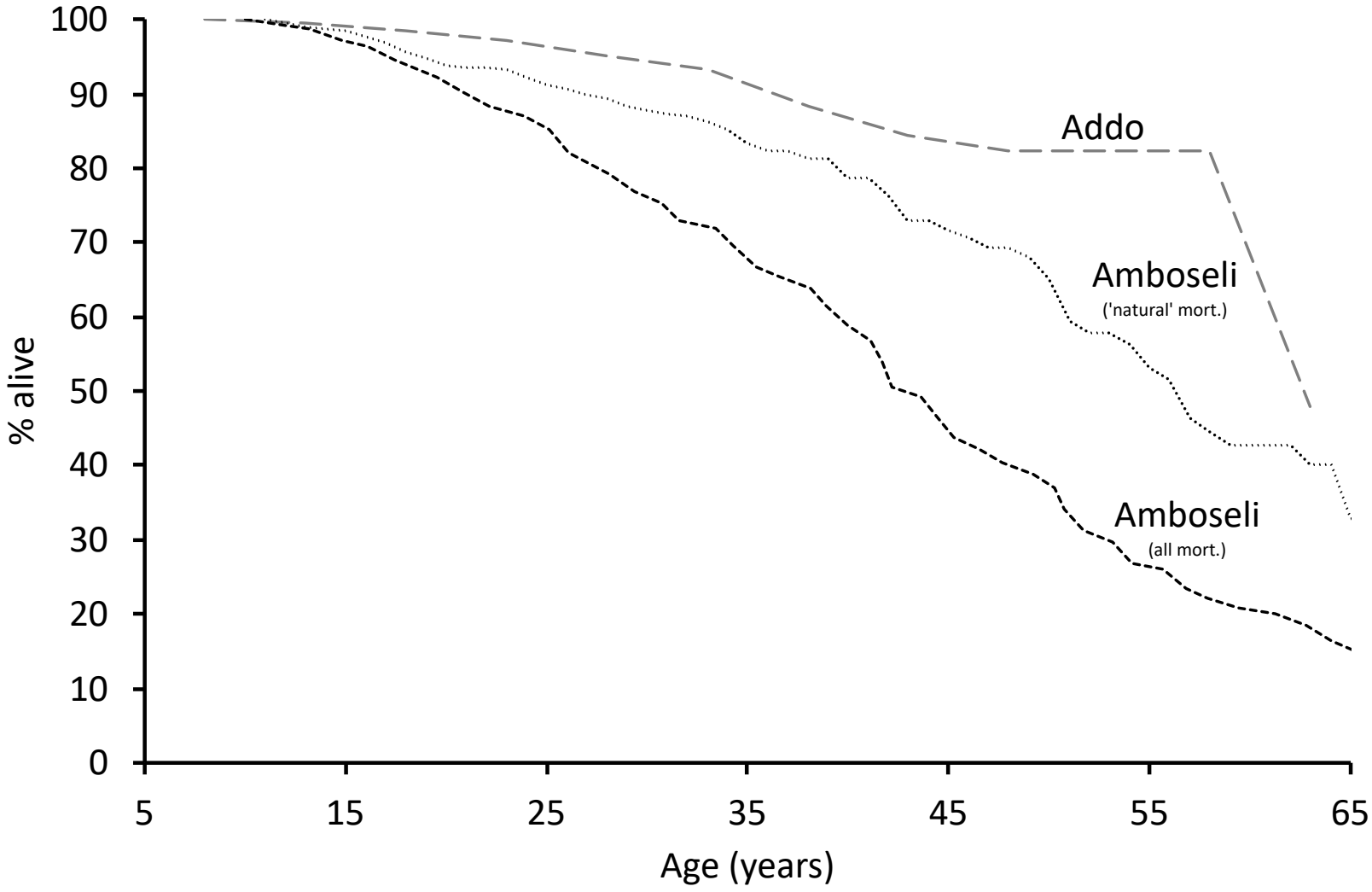

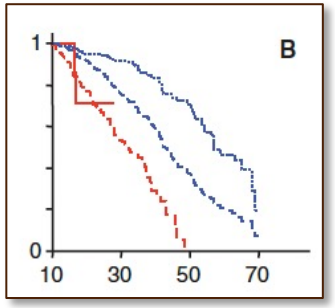

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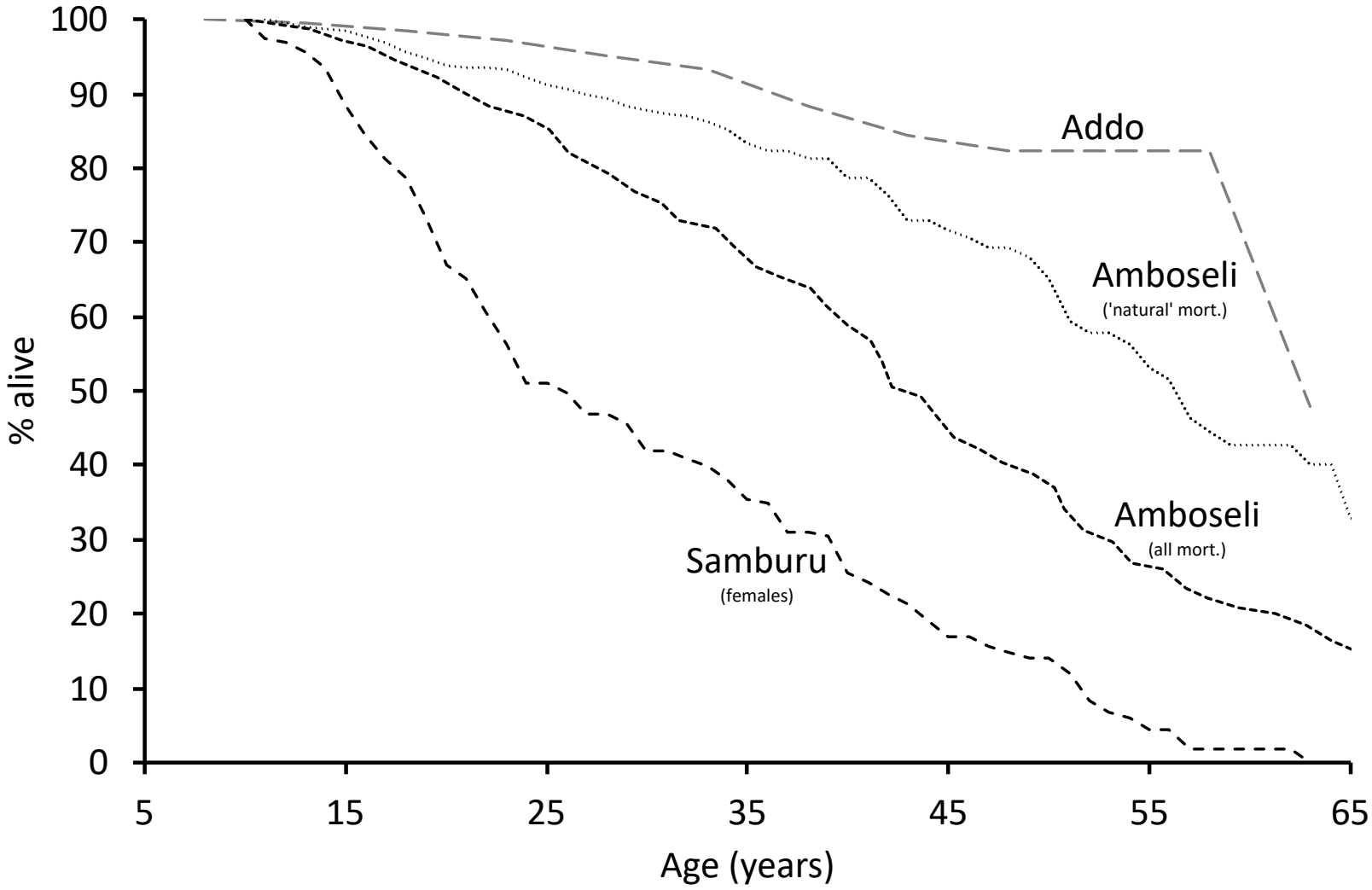

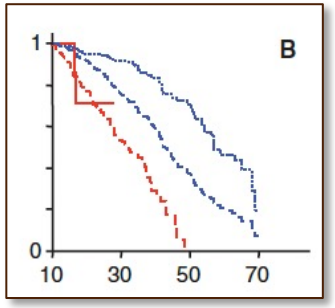

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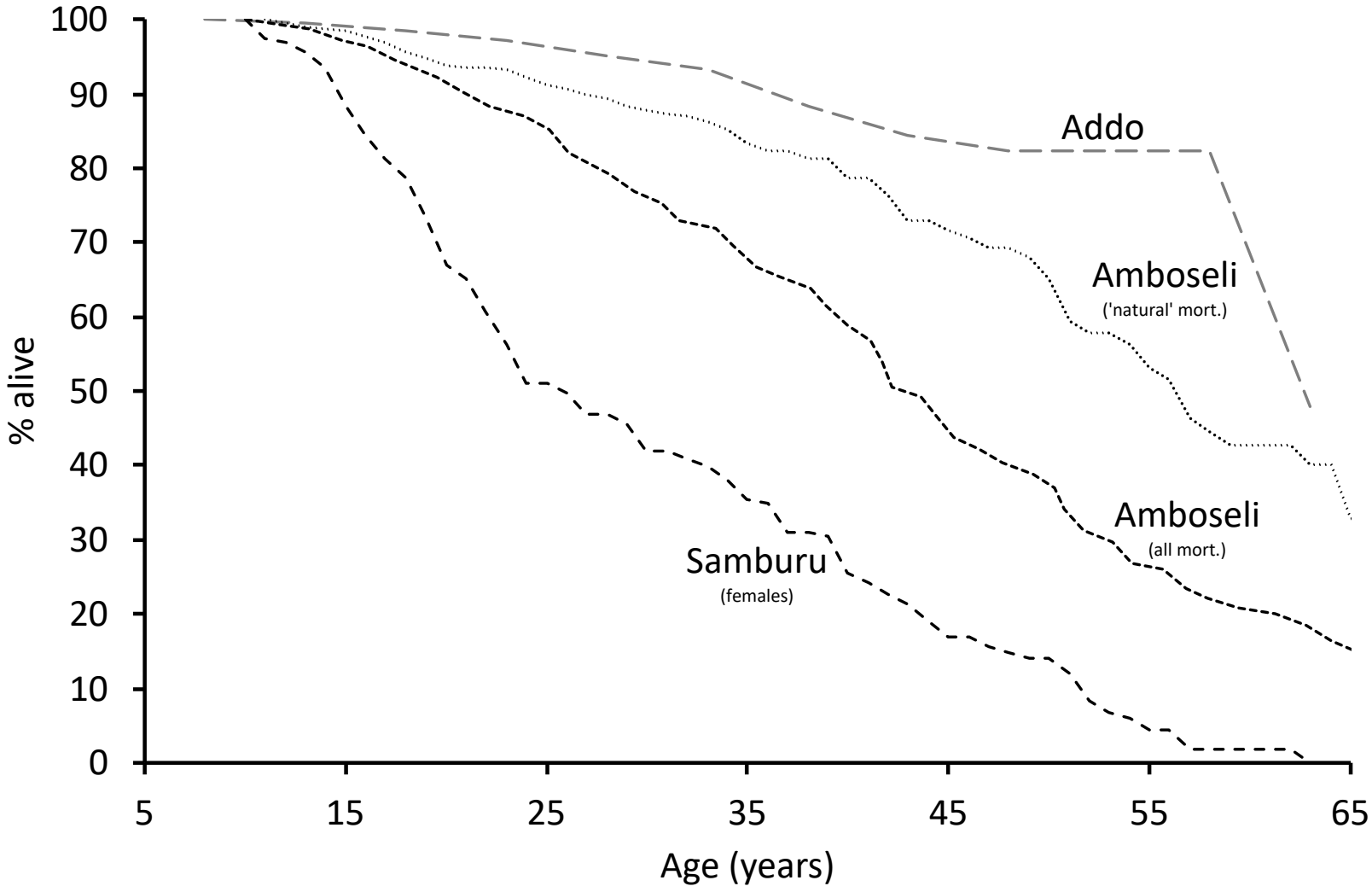

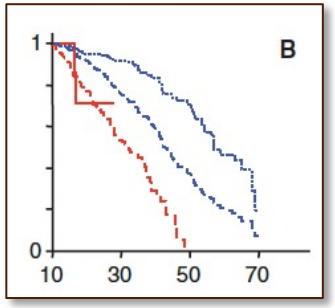

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Wie will man vergleichen ?

Welche Konsequenzen will man aus solchen Daten ziehen?
Die Population in Samburu abschaffen?
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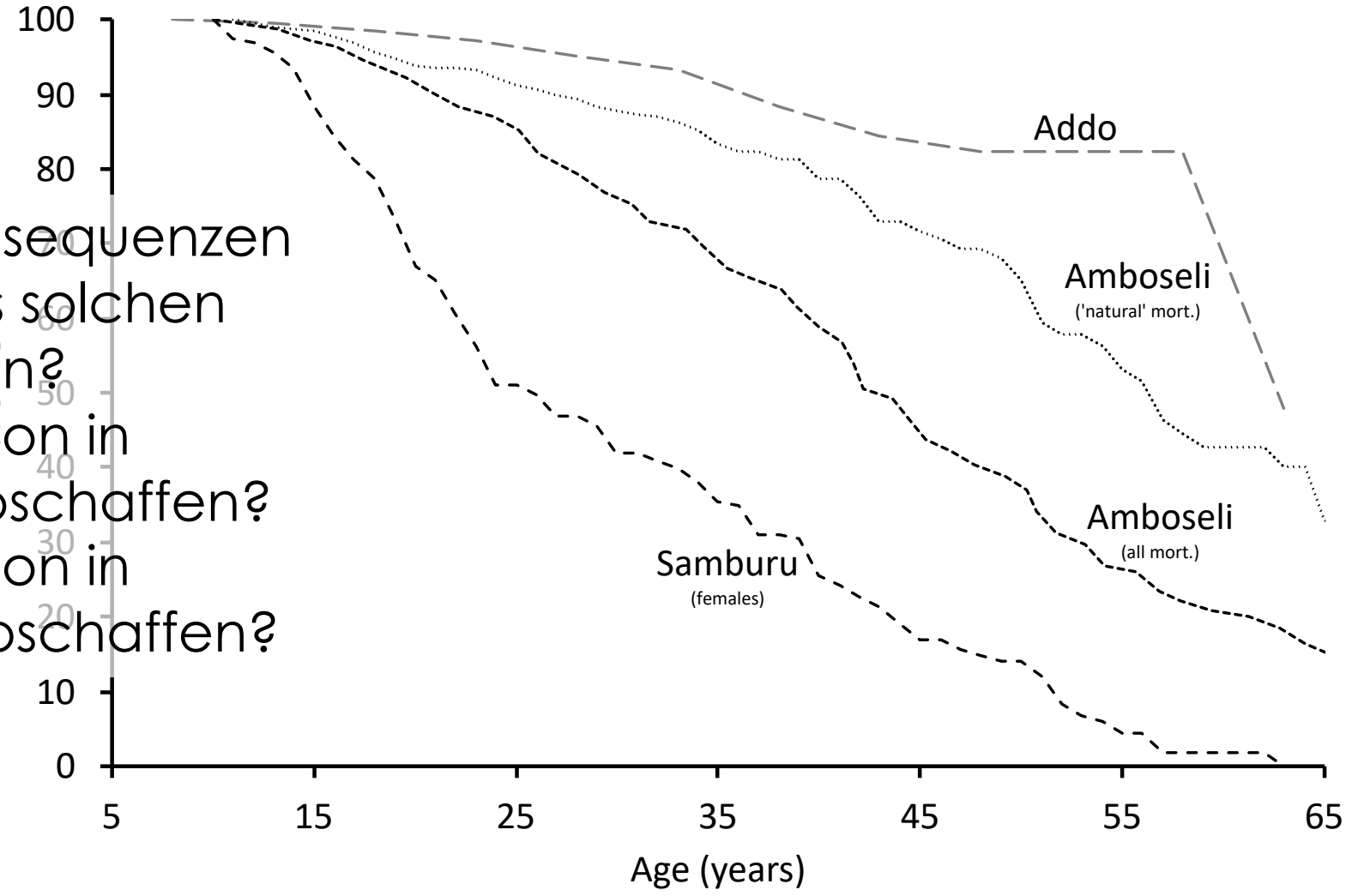

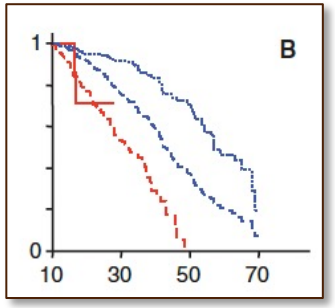

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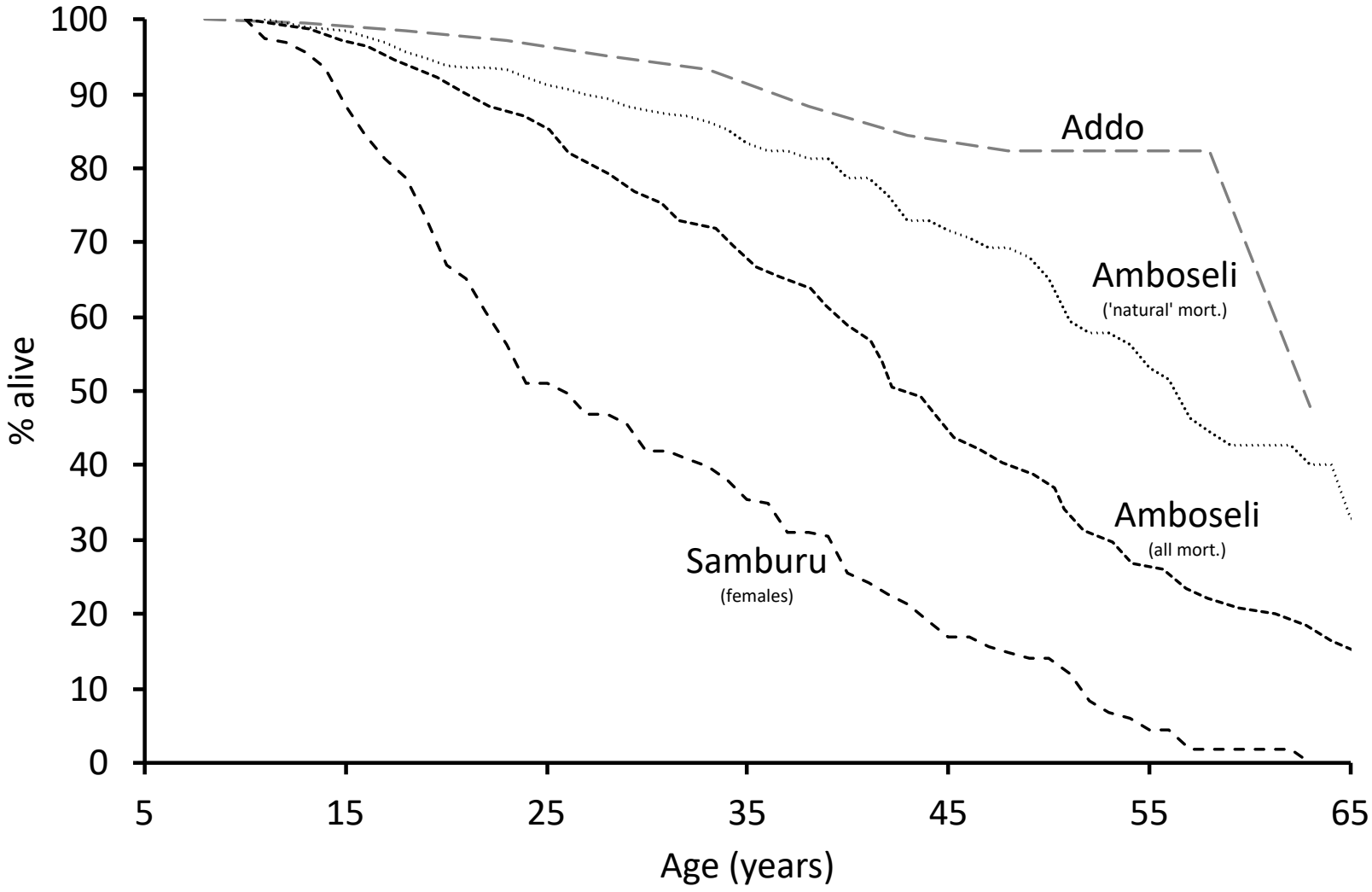

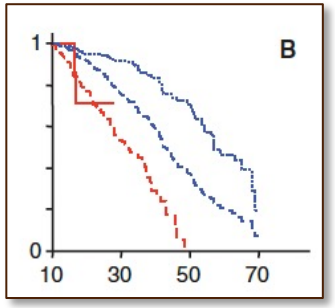

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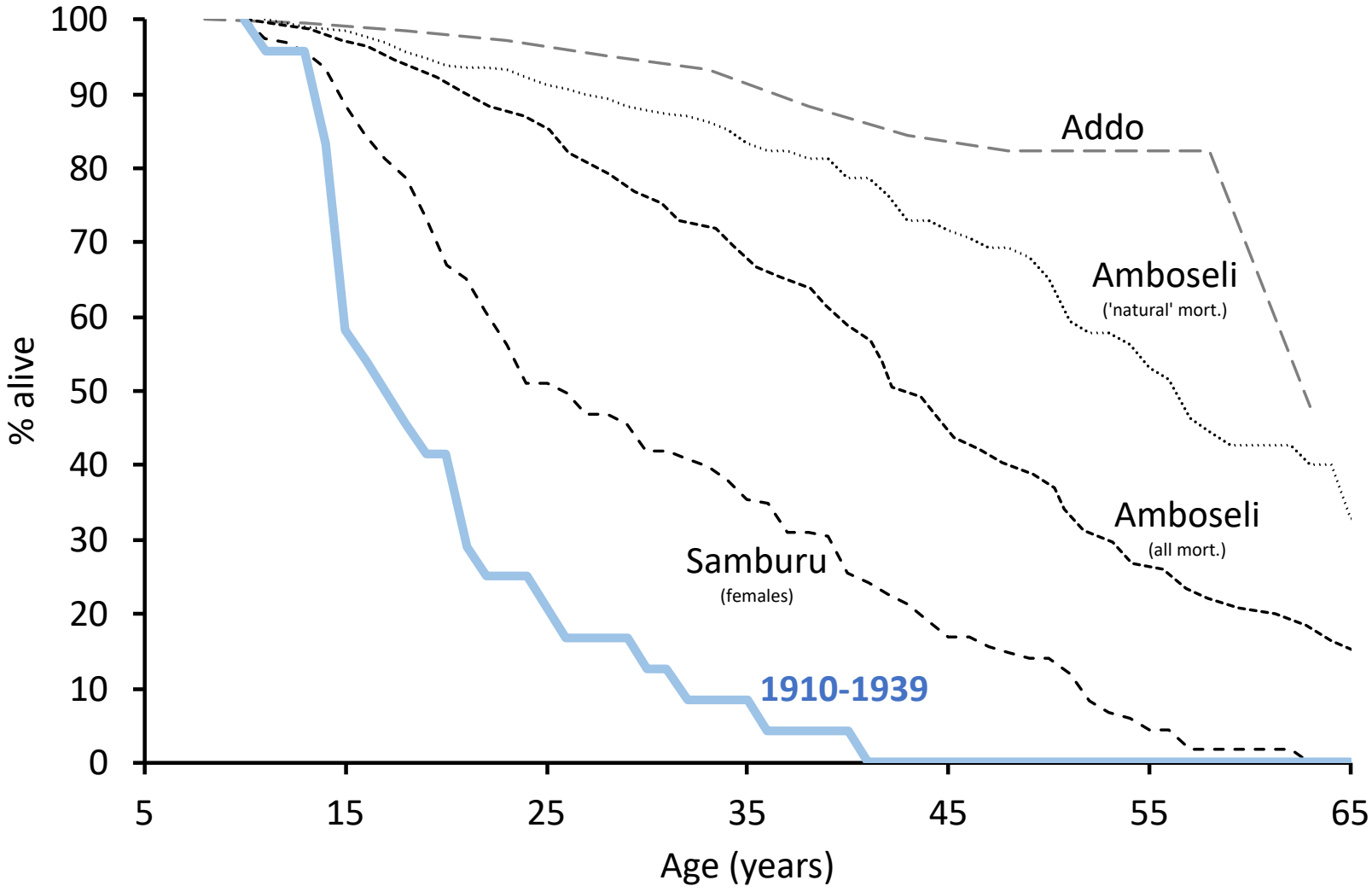

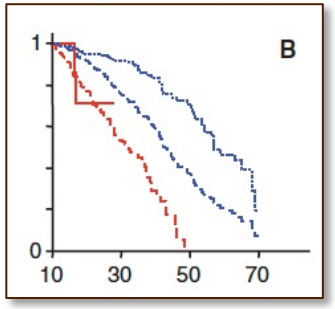

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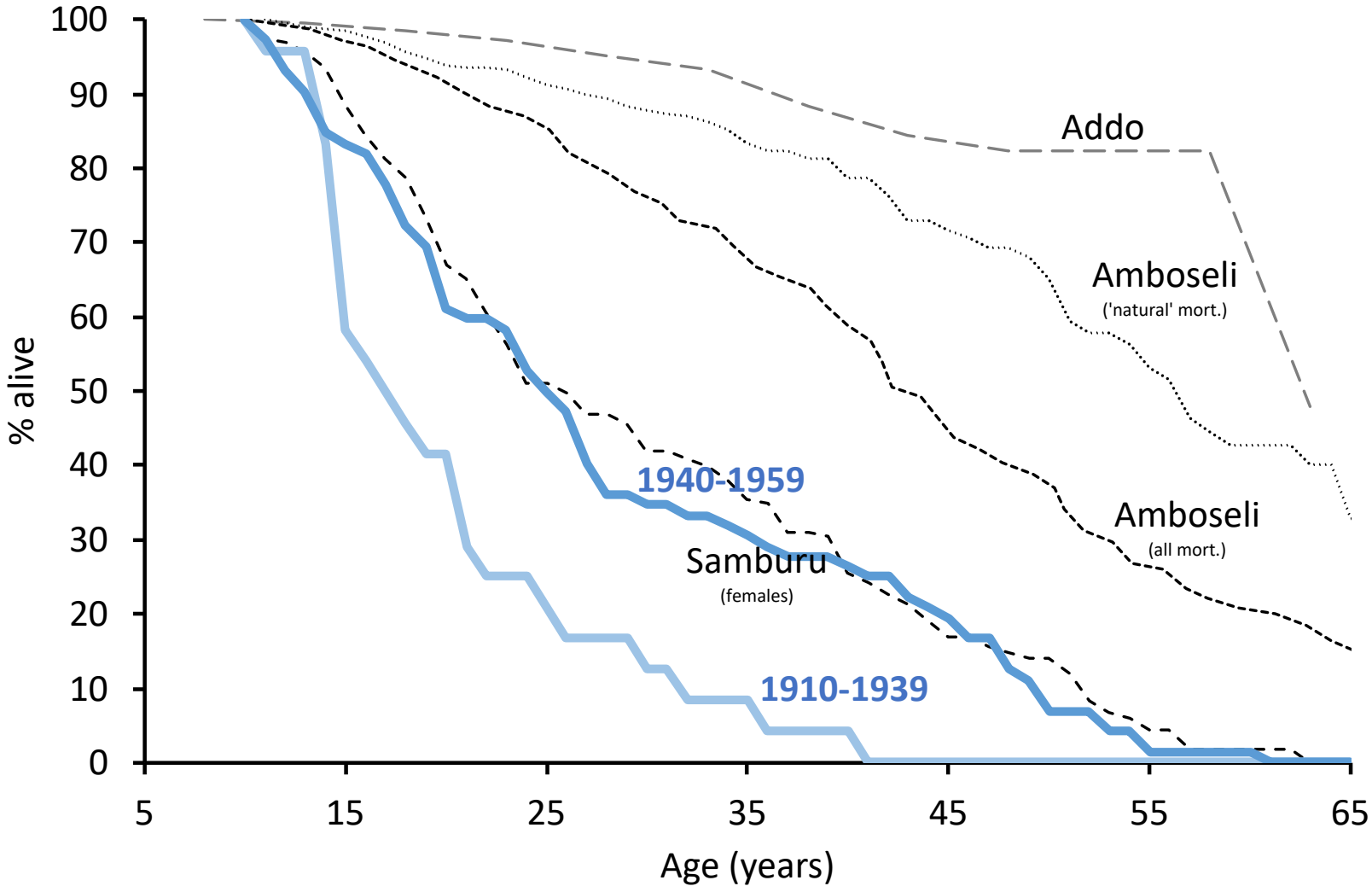

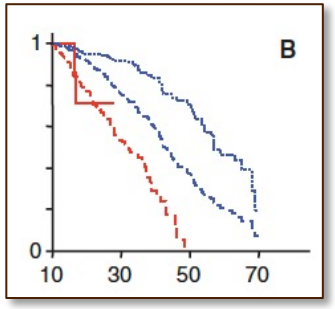

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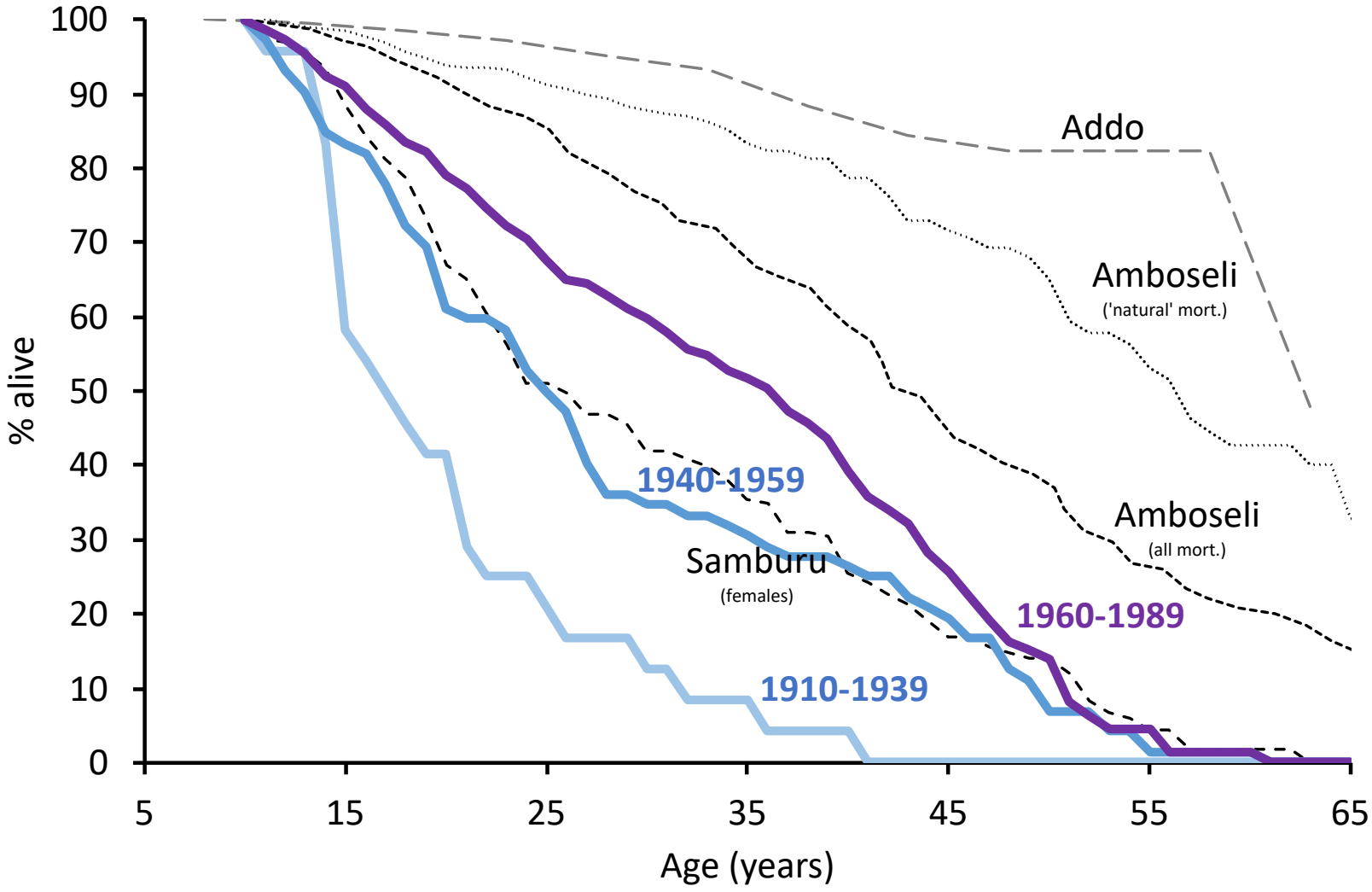

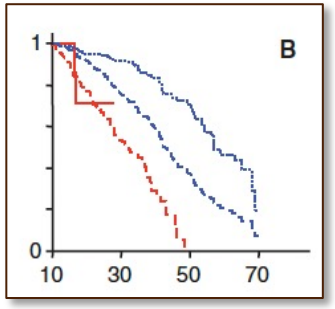

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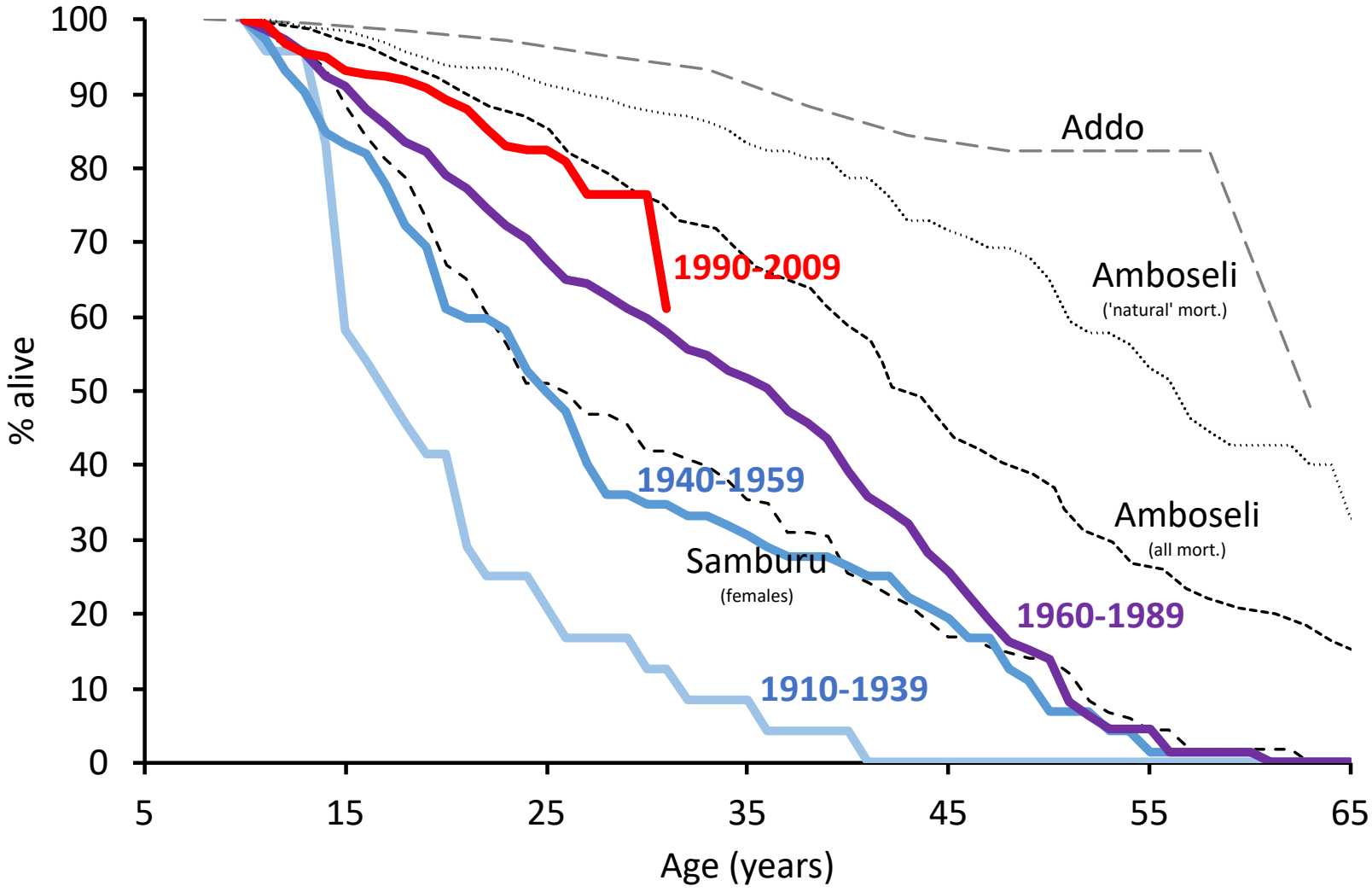

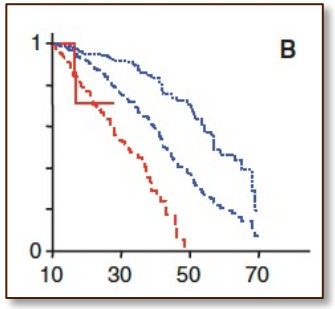

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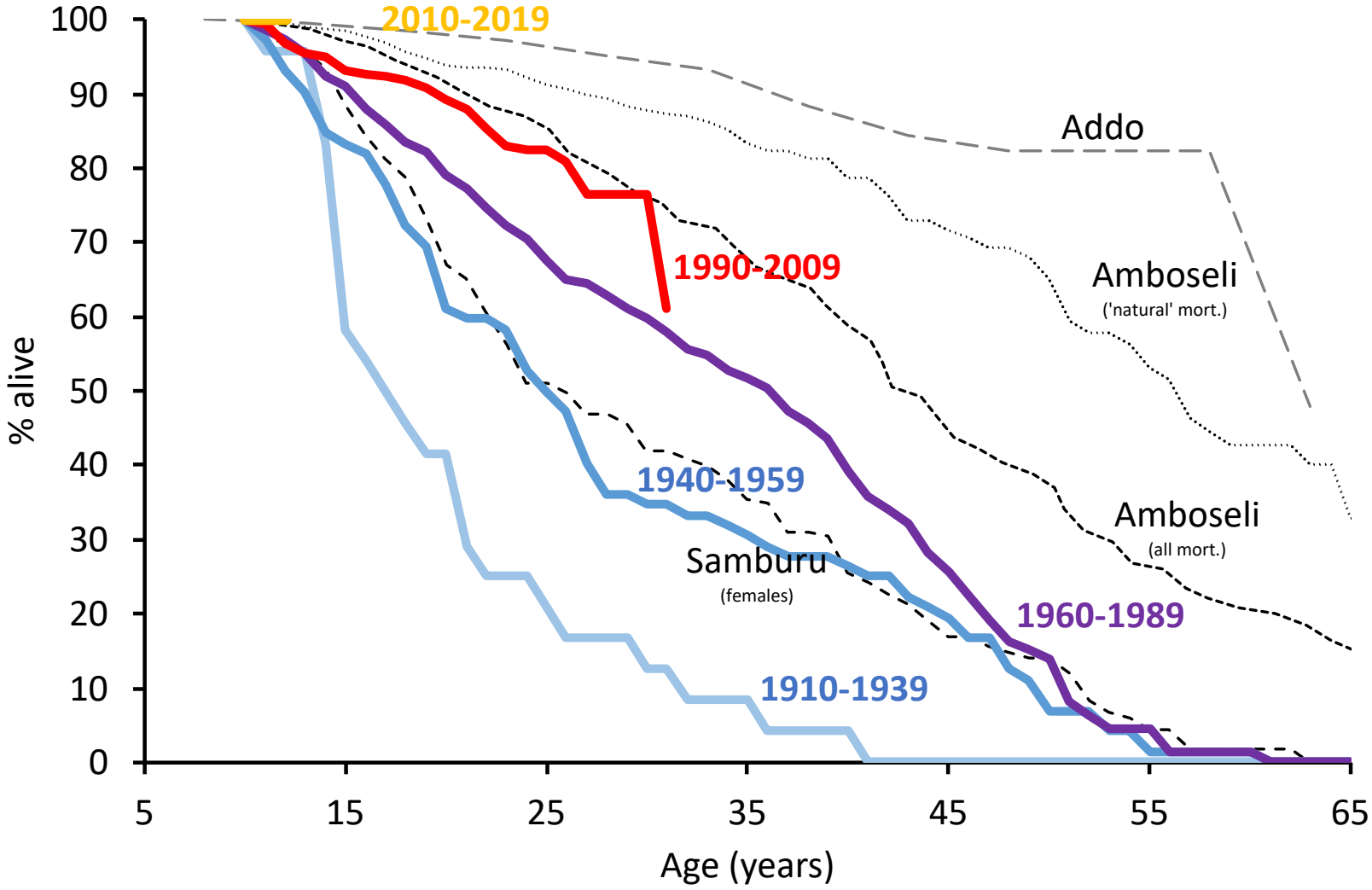

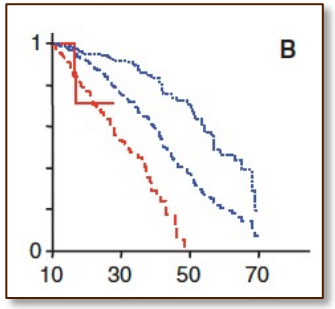

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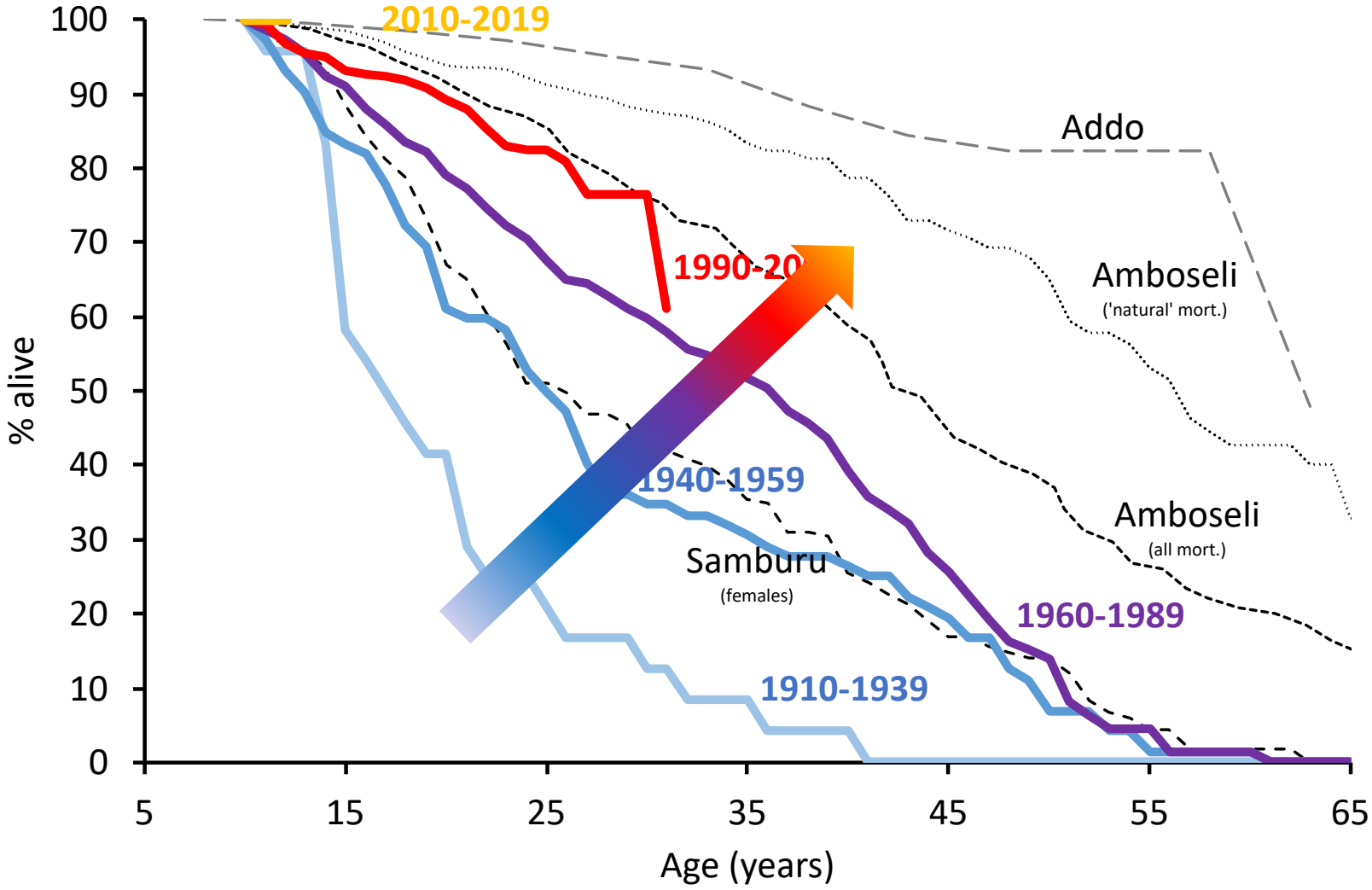

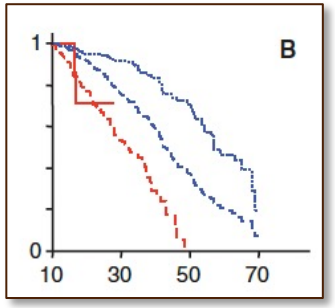

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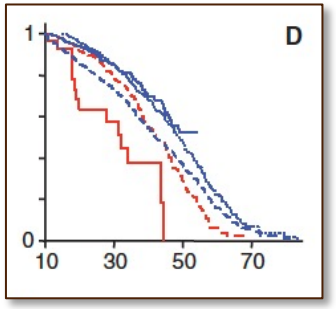

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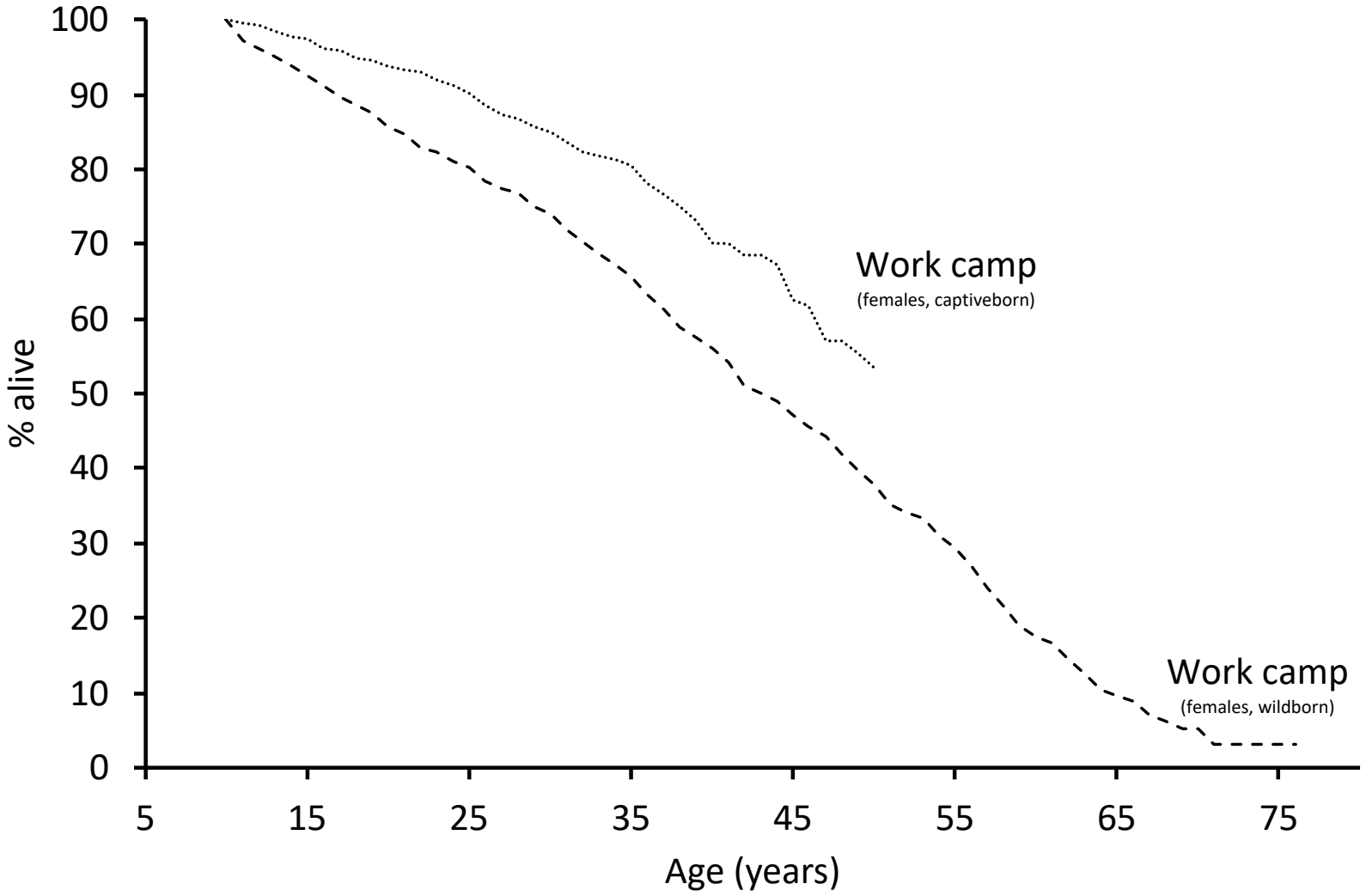

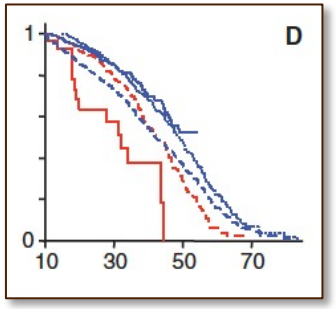

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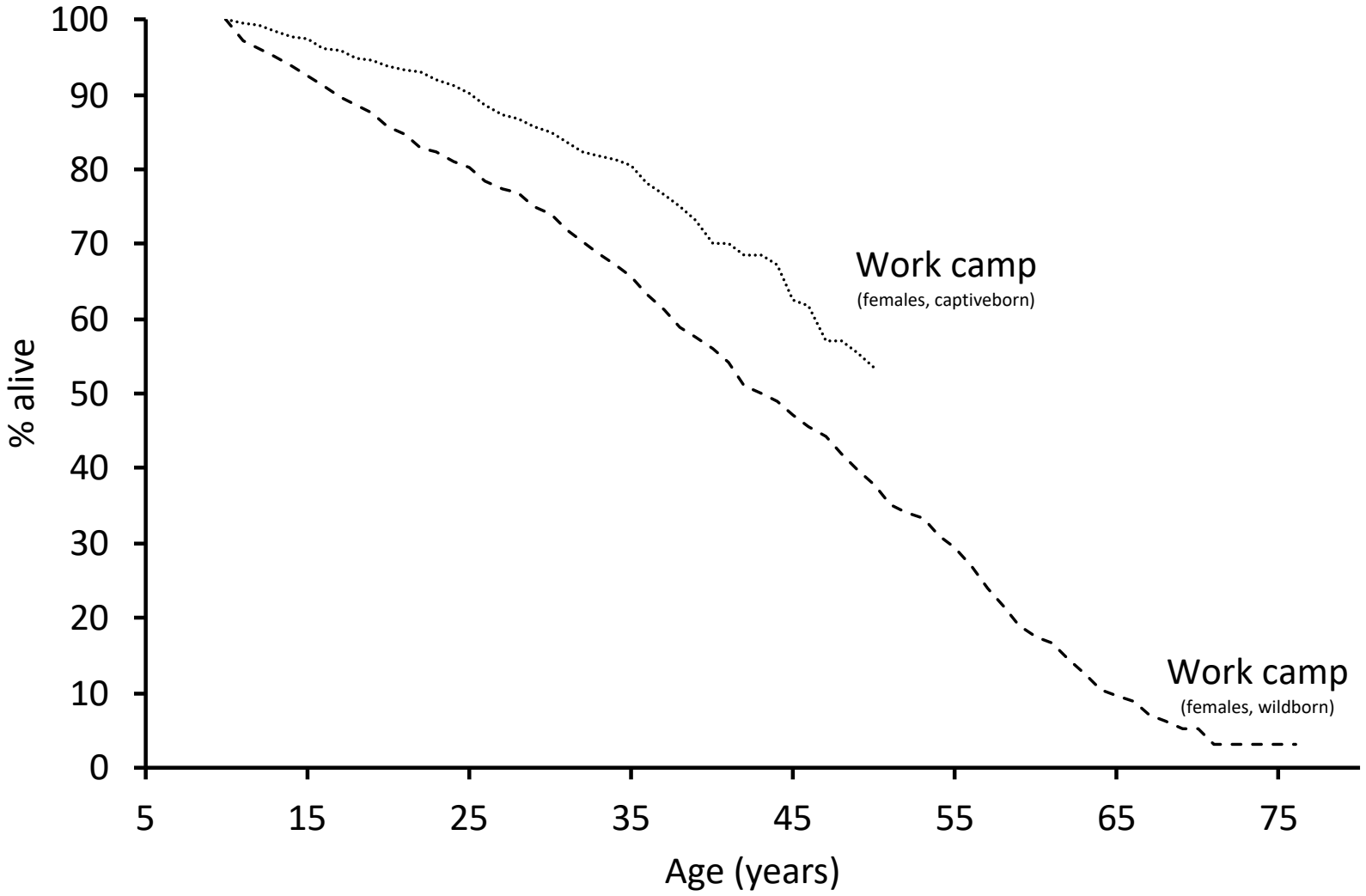

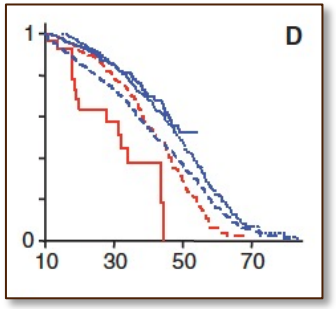

Mar (2007) Myanmar Timber (1950-2000)

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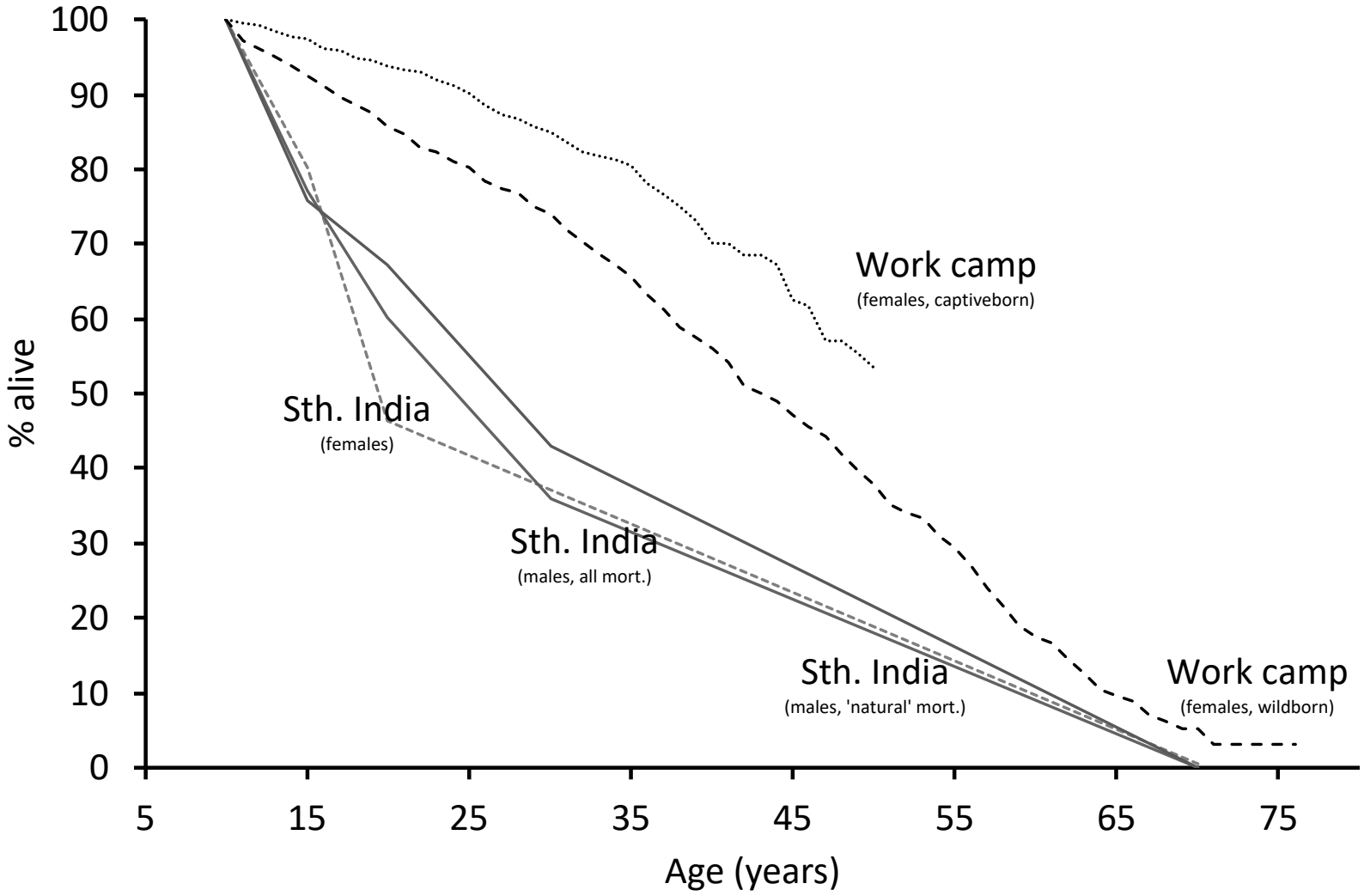

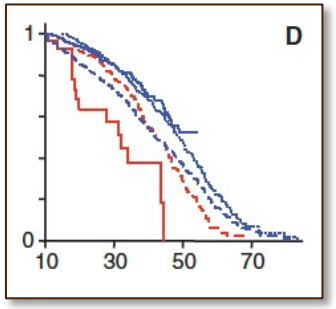

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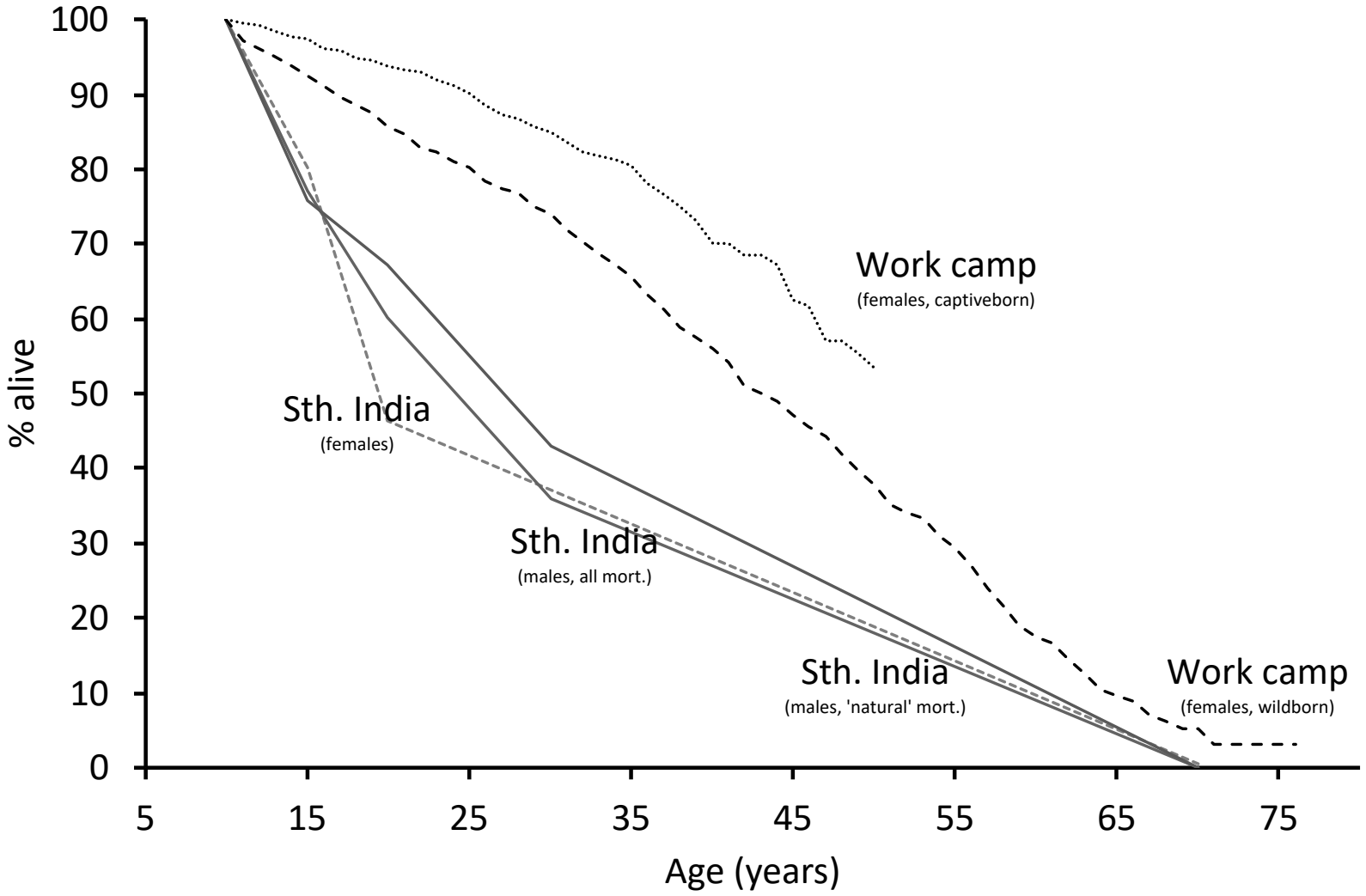

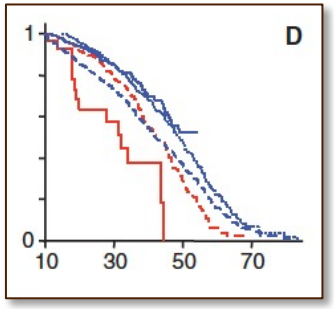

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Sukumar (1989) Southern India (1981-1983)

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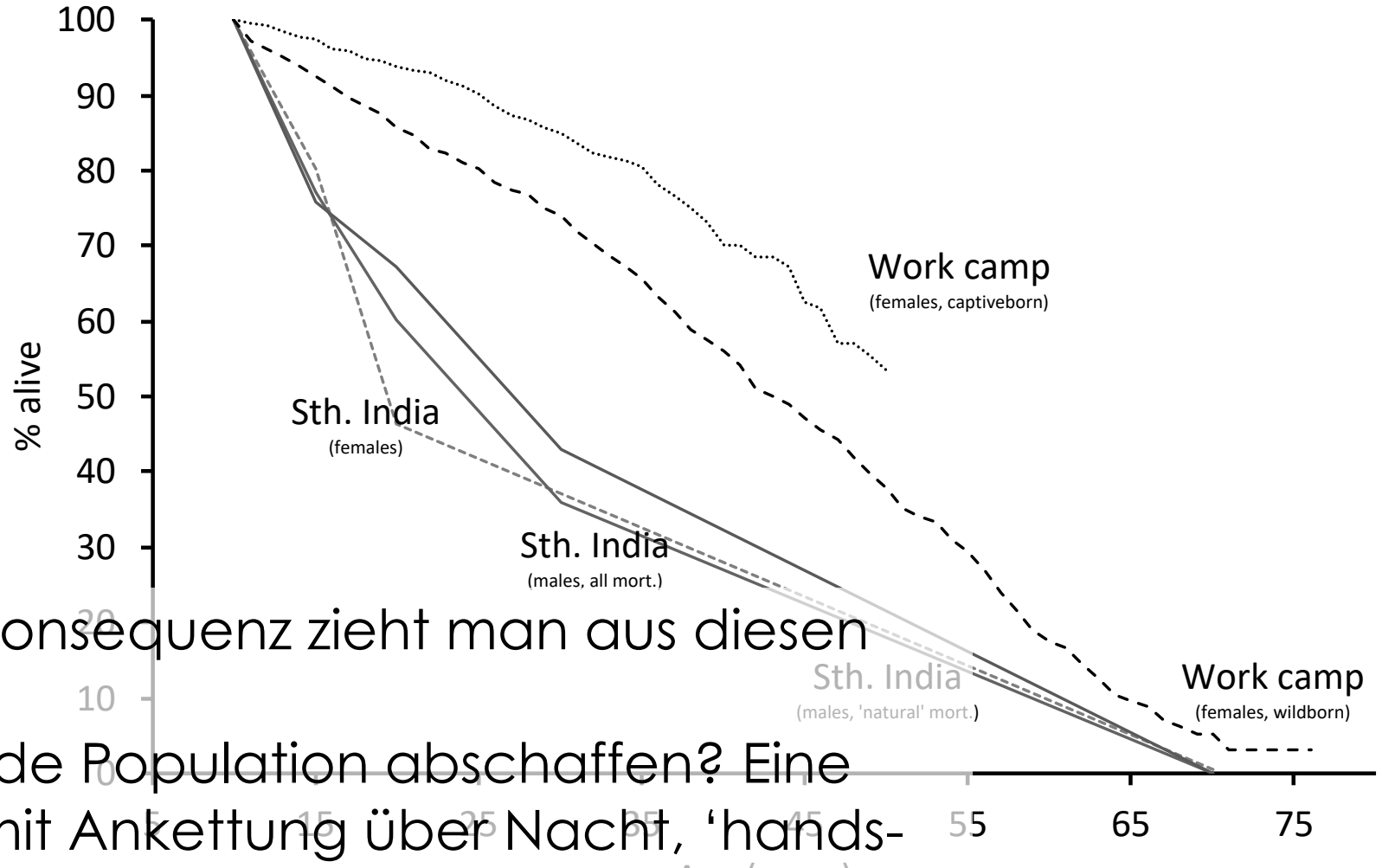
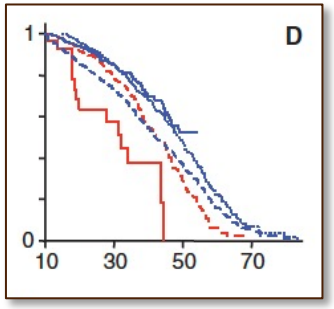


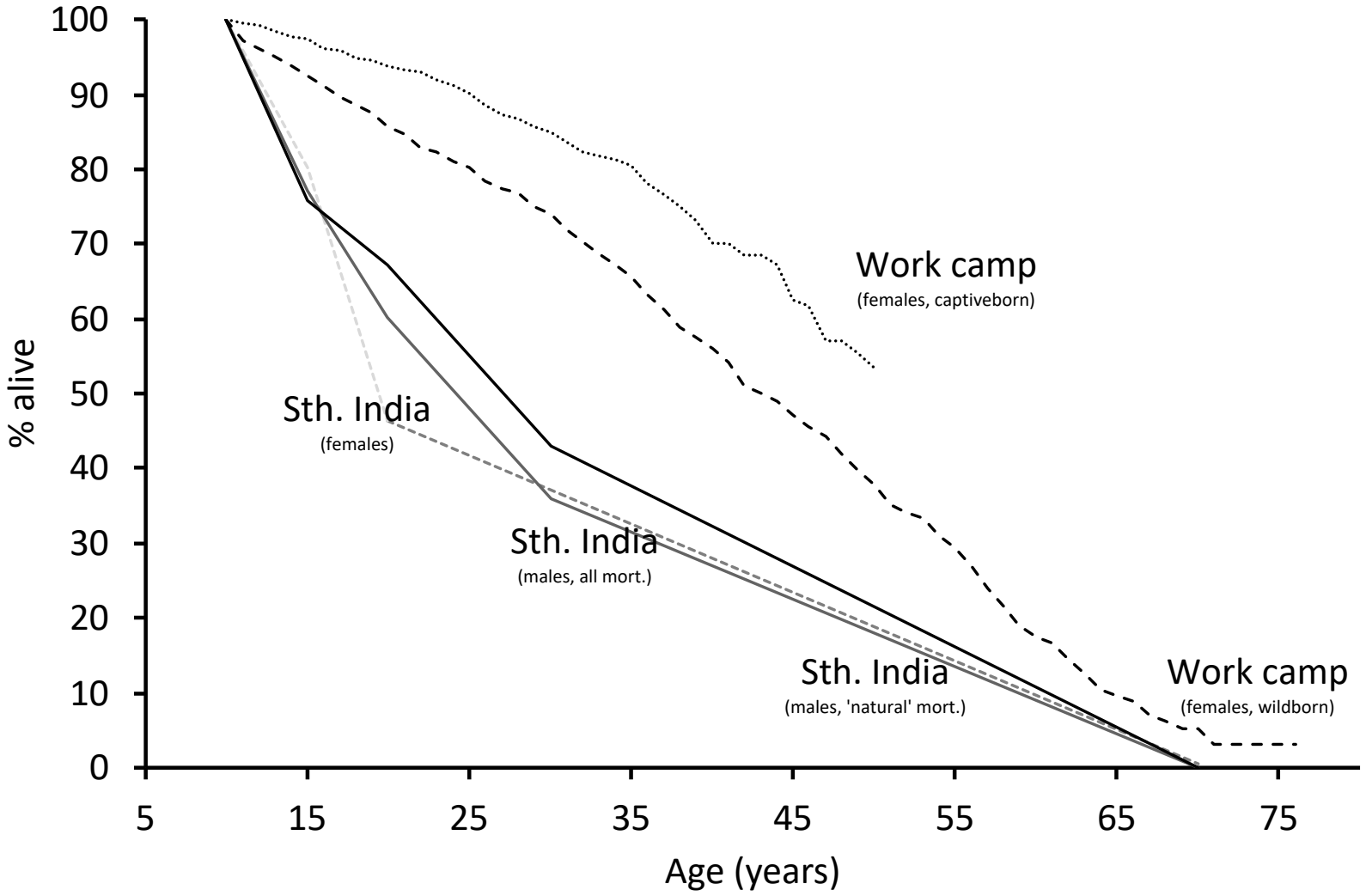


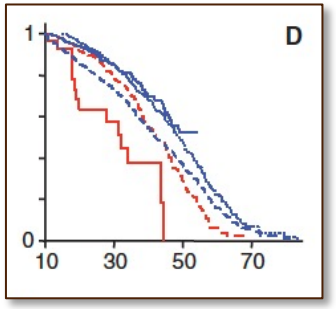
Mar (2007) Myanmar Timber (1950-2000)

Sukumar (1989) Southern India (1981-1983)

Welche Konsequenz zieht man aus diesen Daten?
Freilebende Population abschaffen? Eine Haltung mit Ankettung über Nacht, ‘hands-on’ incl. menschlicher Dominanz fördern?

Überlebensdaten Adulte – Asiat. Elefanten (N.Am. & EU)





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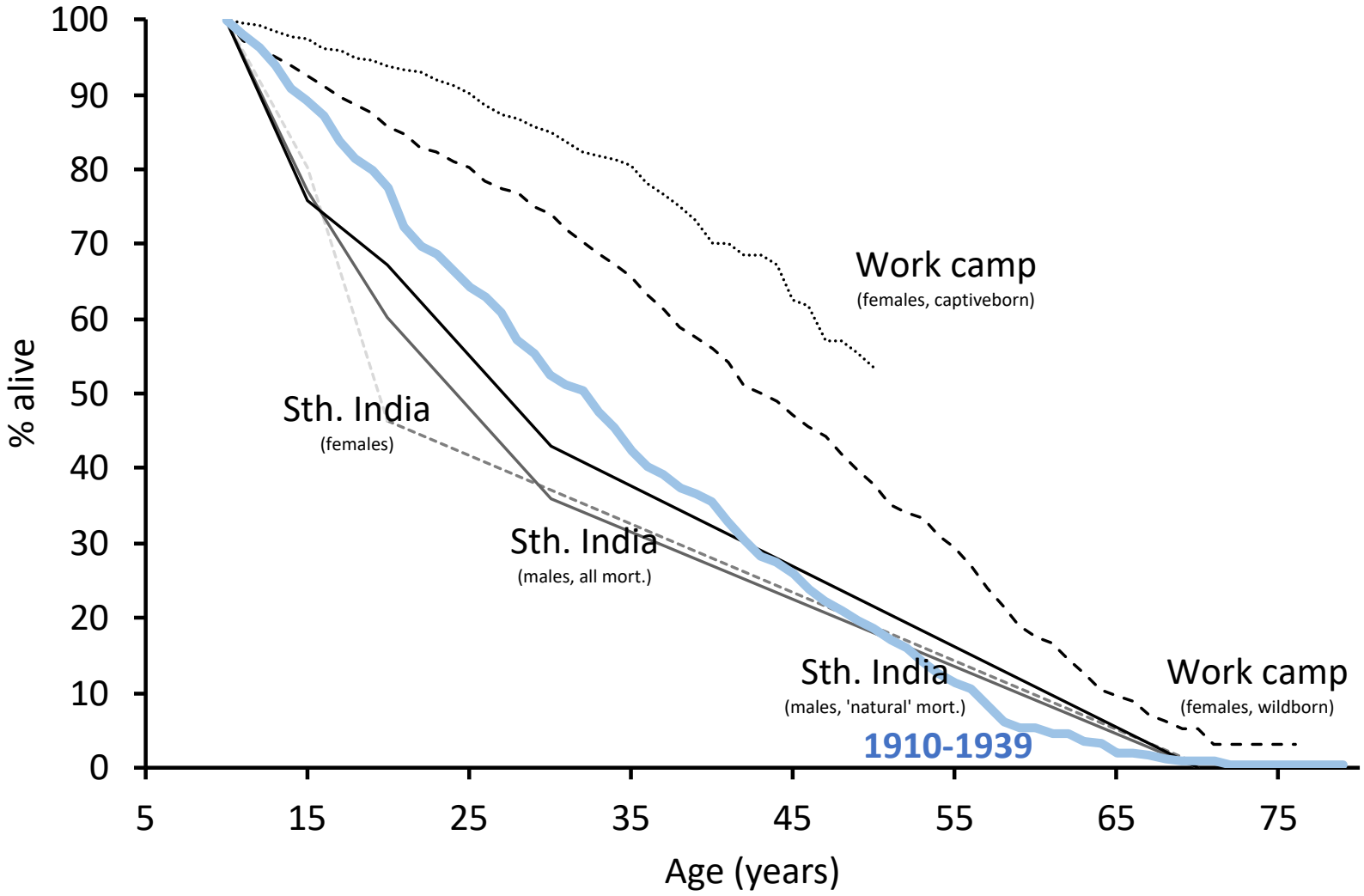

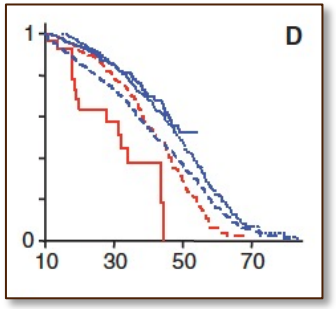

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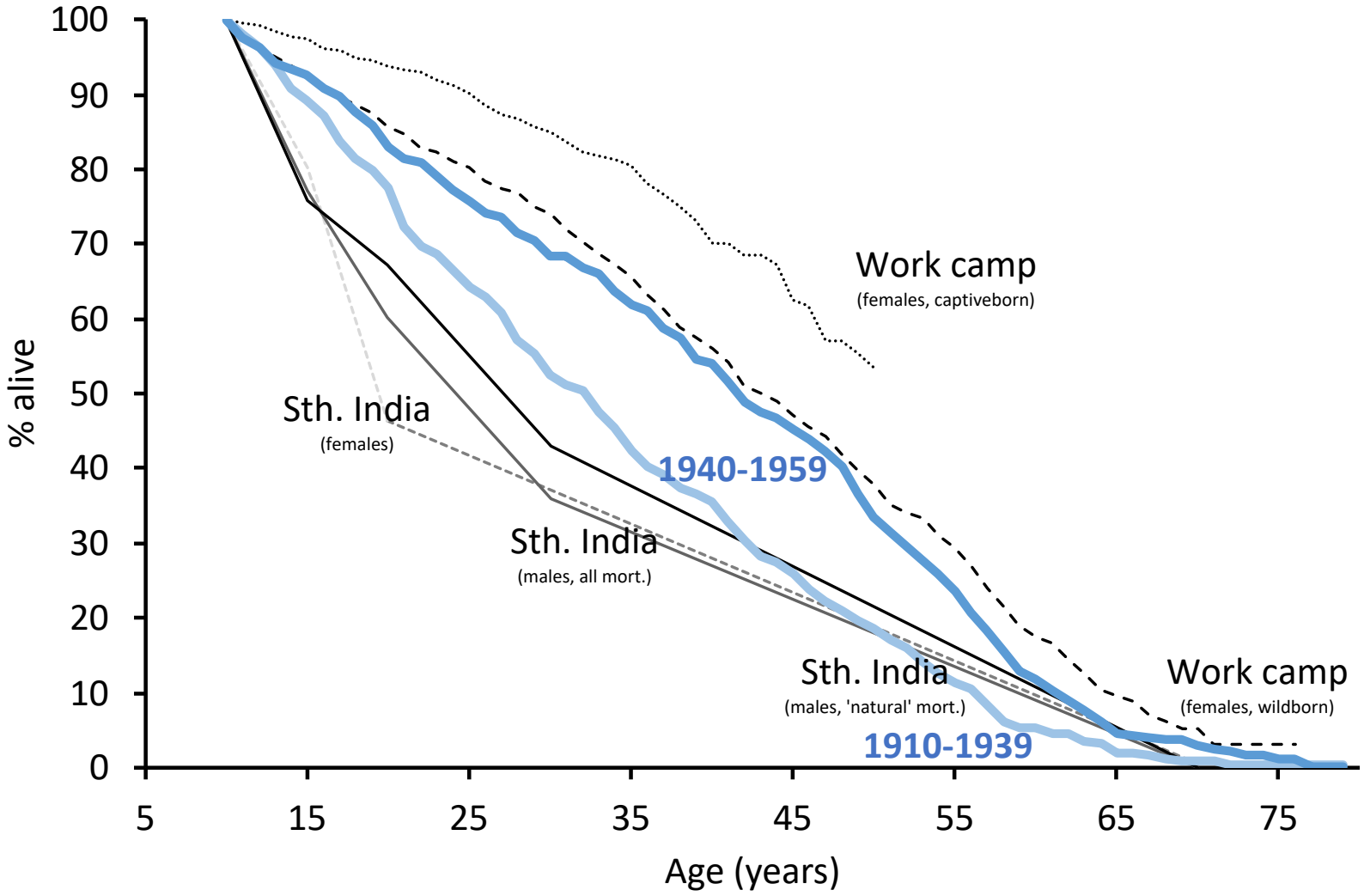

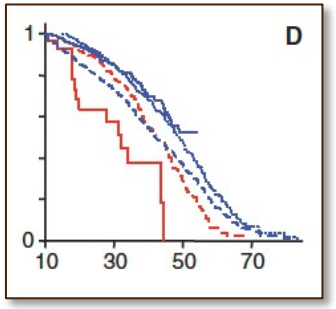

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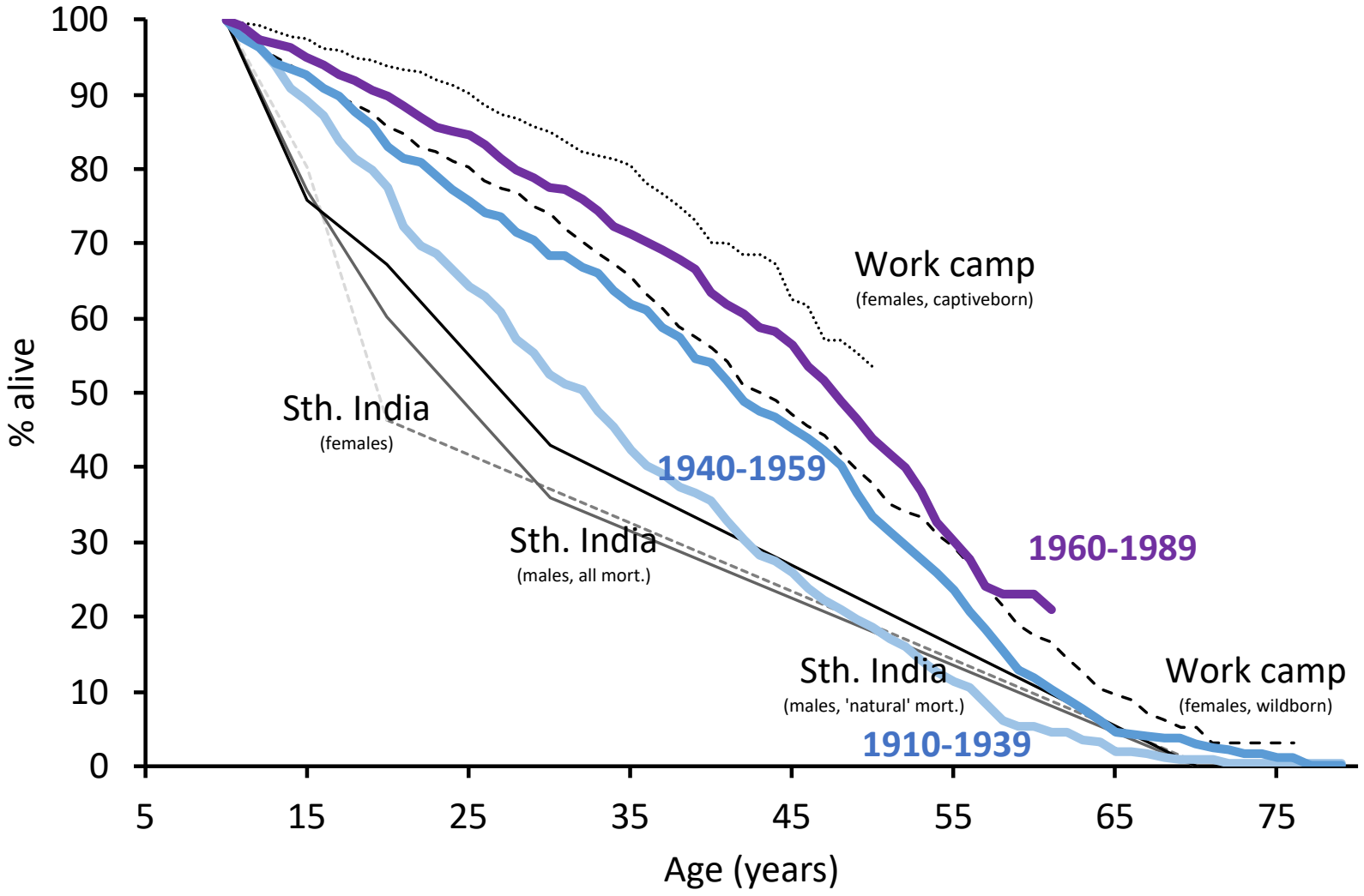

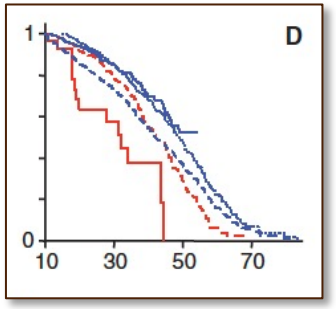

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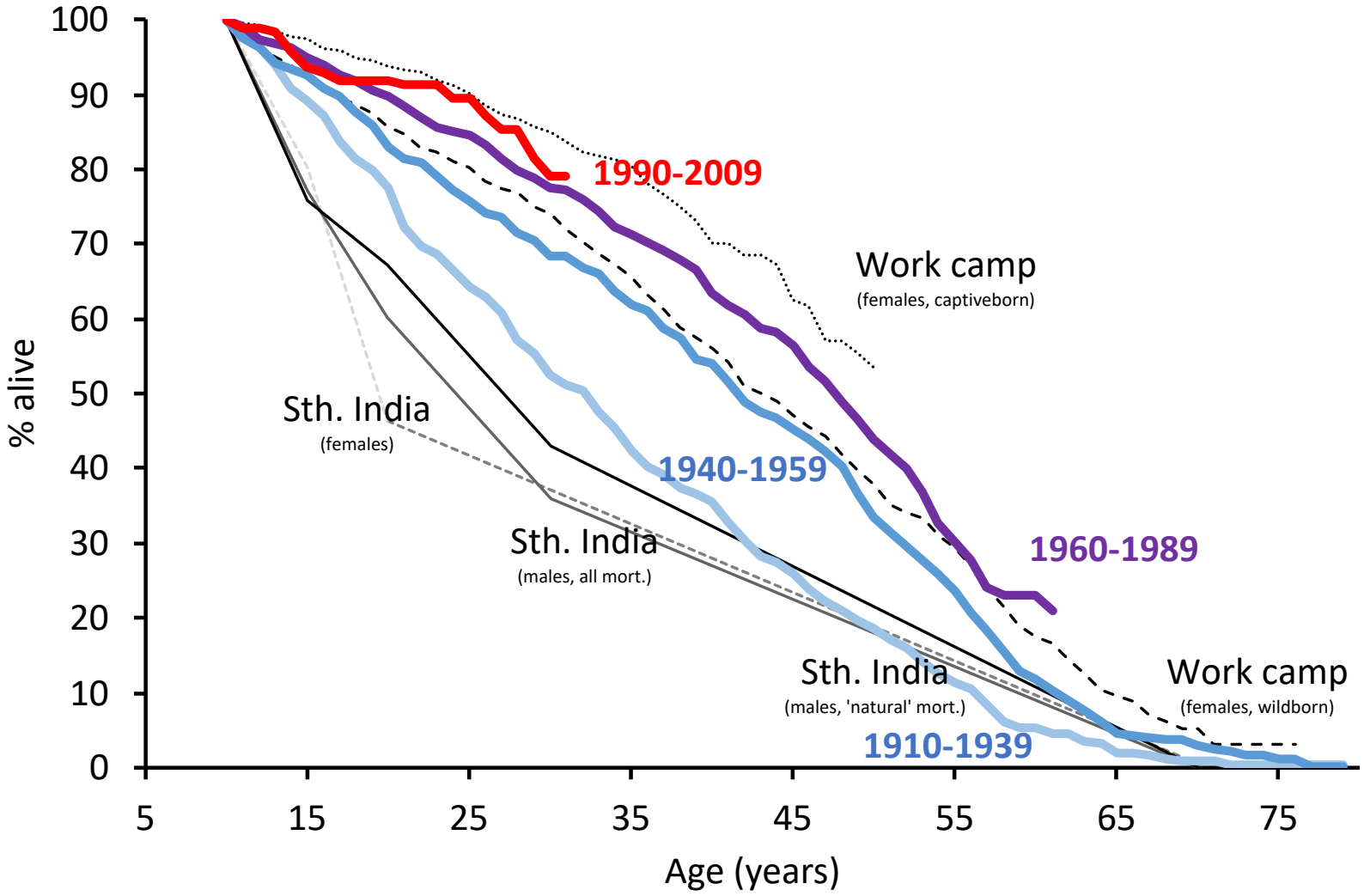

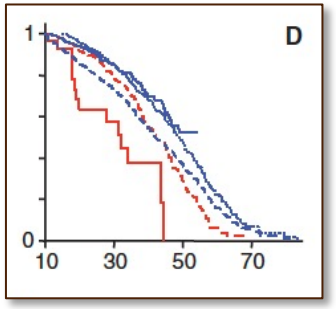

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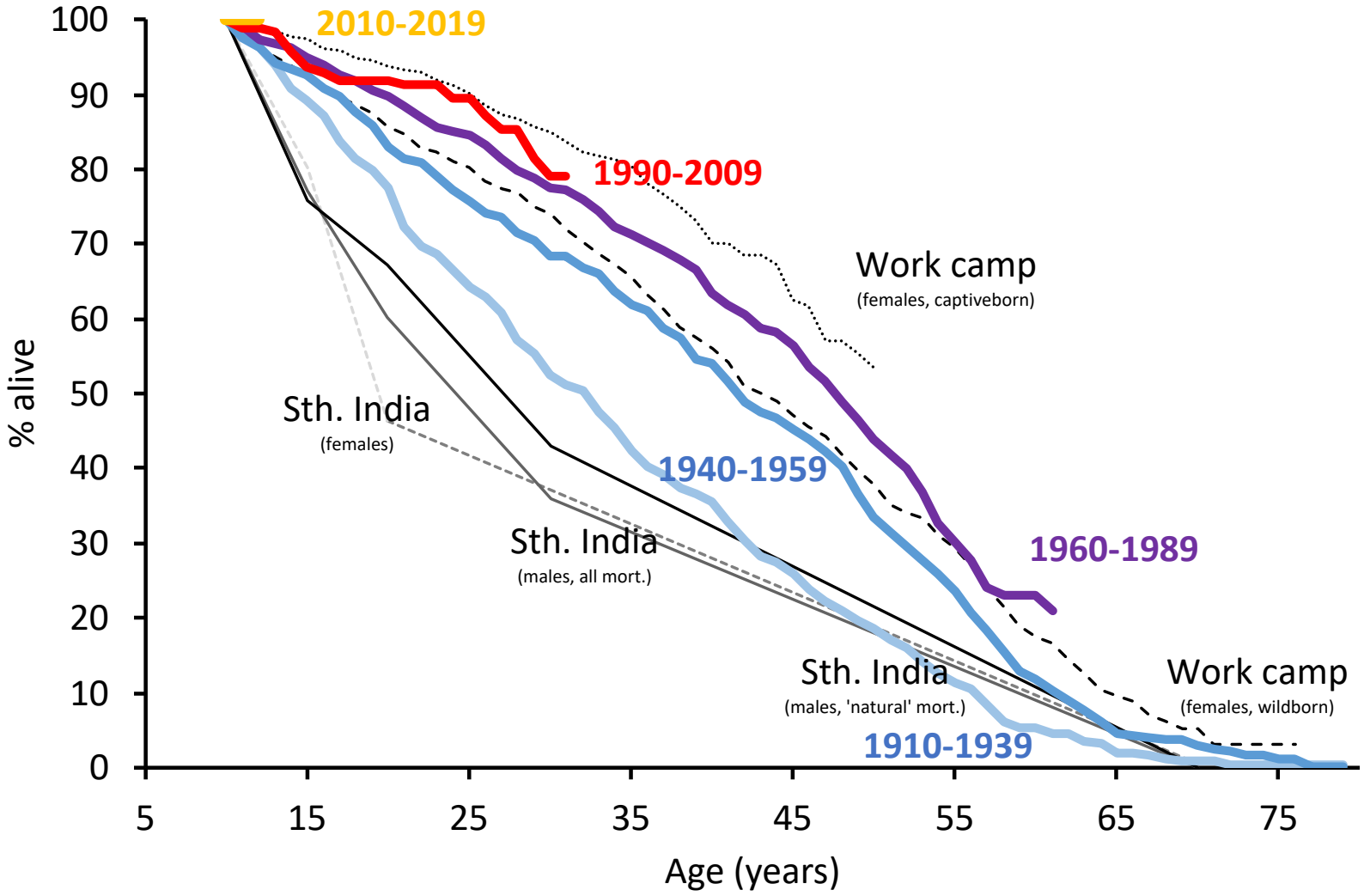

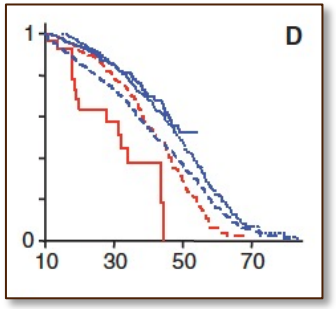

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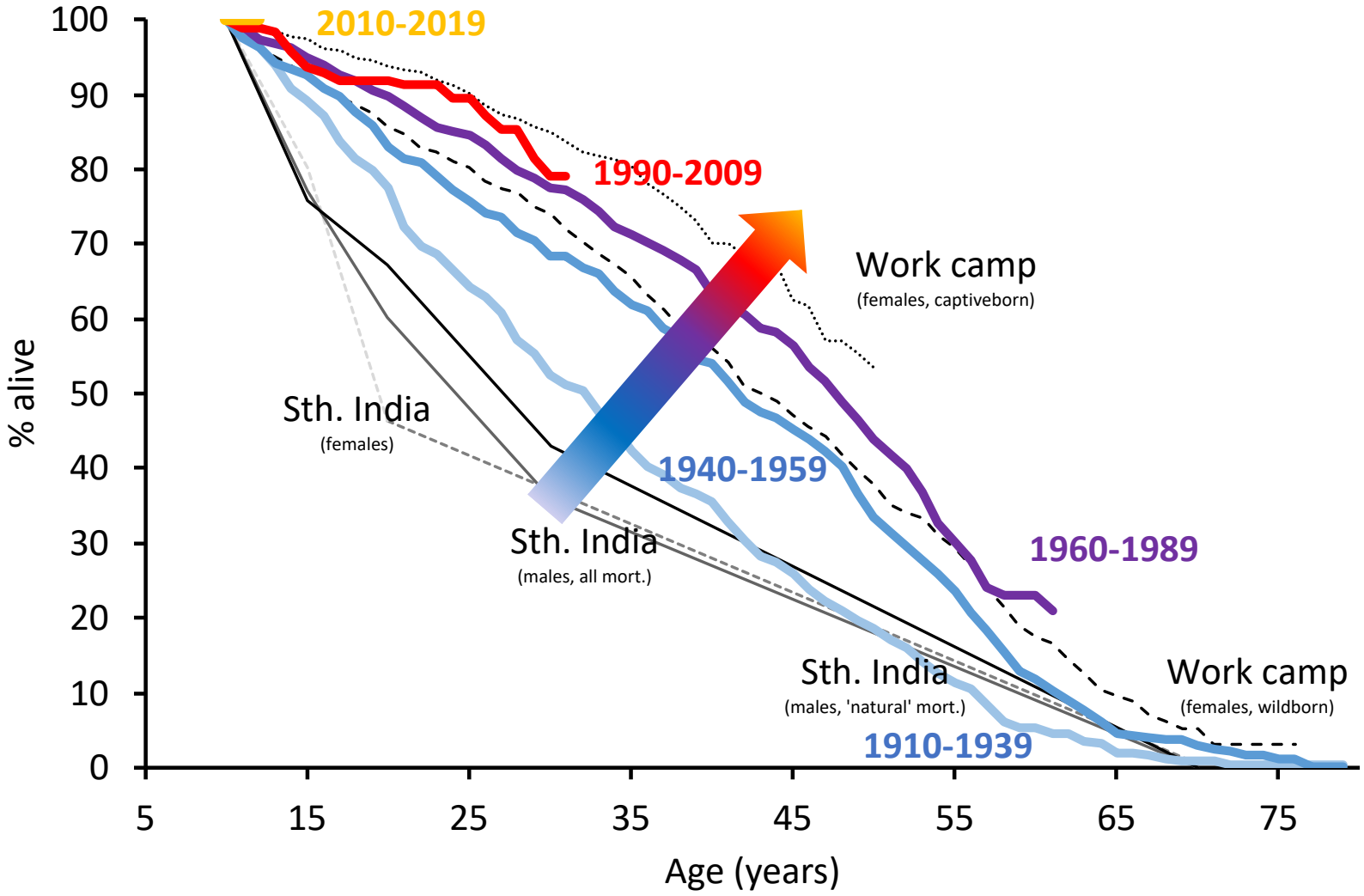

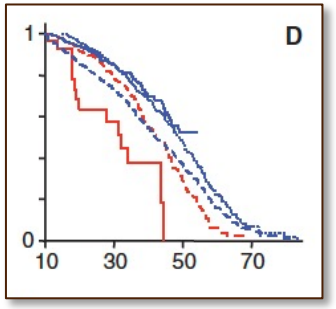

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TECHNICAL REPORT

ZOOBIOLOGY WILEY

The historical development of zoo elephant survivorship

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Abstract

In the discussion about zoo elephant husbandry, the report of Clubb et al. (2008, Science 322: 1649) that zoo elephants had a "compromised survivorship" compared to certain non-zoo populations is a grave argument, and was possibly one of the triggers of a large variety of investigations into zoo elephant welfare, and changes in zoo elephant management. A side observation of that report was that whereas survivorship in African elephants (*Loxodonta africana*) improved since 1960, this was not the case in Asian elephants (*Elephas maximus*). We used historical data (based on the Species360 database) to revisit this aspect, including recent developments since 2008. Assessing the North American and European populations from 1910 until today, there were significant improvements of adult (≥10 years) survivorship in both species. For the period from 1960 until today, survivorship improvement was significant for African elephants and close to a significant improvement in Asian elephants; Asian elephants generally had a higher survivorship than Africans. Juvenile (<10 years) survivorship did not change significantly since 1960 and was higher in African elephants, most likely due to the effect of elephant herpes virus on Asian elephants. Current zoo elephant survivorship is higher than some, and lower than some other non-zoo populations. We discuss that in our view, the shape of the survivorship curve, and its change over time, are more relevant than comparisons with specific populations. Zoo elephant survivorship should be monitored continuously, and the expectation of a continuous trend towards improvement should be met.

KEYWORDS
husbandry, mortality, Proboscidea, progress, survival

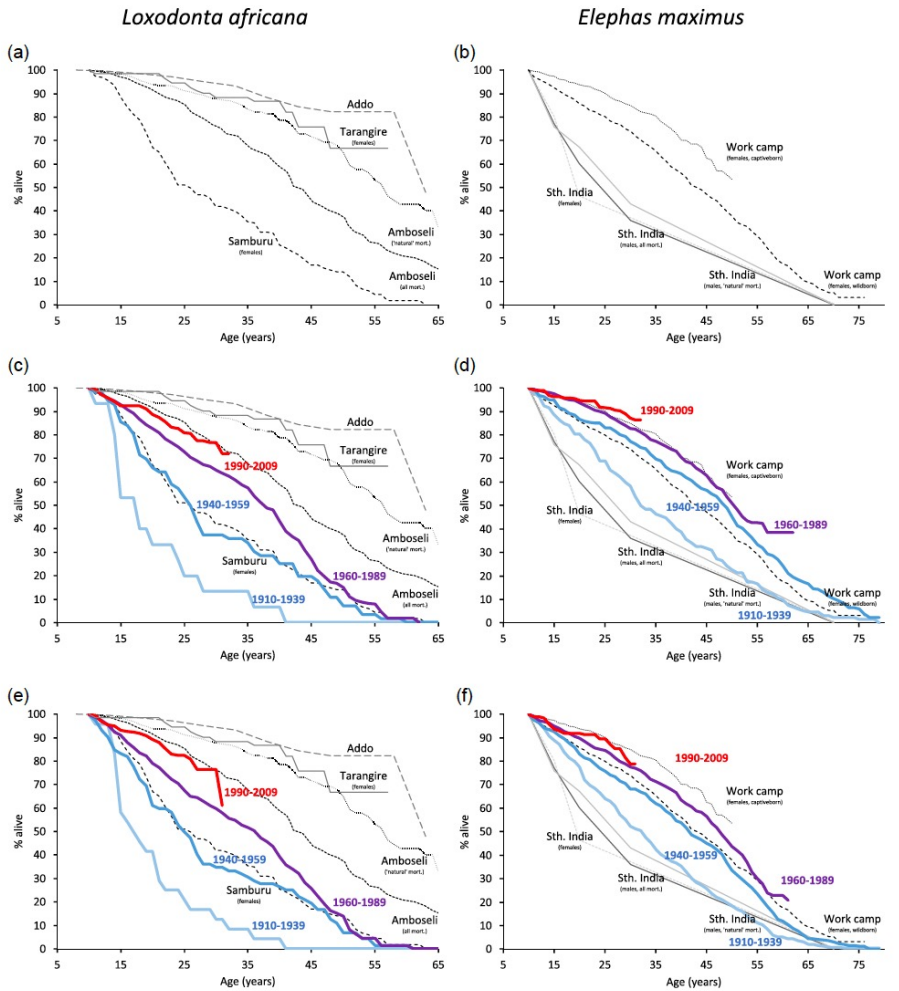


FIGURE 1 Survivorship graphs for African (*Loxodonta africana*; a, c, e) and Asian (*Elephas maximus*, b, d, f) elephants. "Natural" populations (a, b) of African elephants for Addo Elephant National Park (Gough & Kerley, 2006), Tarangire National Park (Foley & Faust, 2010), Karibu Amboseli National Park (excluding human-caused mortality from Moss, 2001; total mortality from Clubb et al., 2008), Samburu and National Springs National Reserves (Wittemyer et al., 2013) and of Asian elephants for Myanmar Timber elephants (Mar, 2007) and a free-ranging population in southern India (Sukumar, 1992); zoo populations by individual birth cohorts (c–f), for the global zoo populations (c, d) ("uncurated data sets"; for statistics, see Table 1), and the combined North American and European zoo populations (e, f) ("curated data sets"; for statistics, see Table 2). [Color figure can be viewed at wileyonlinelibrary.com]

… sind längere Leben wirklich besser ?

… sind längere Leben wirklich besser ?

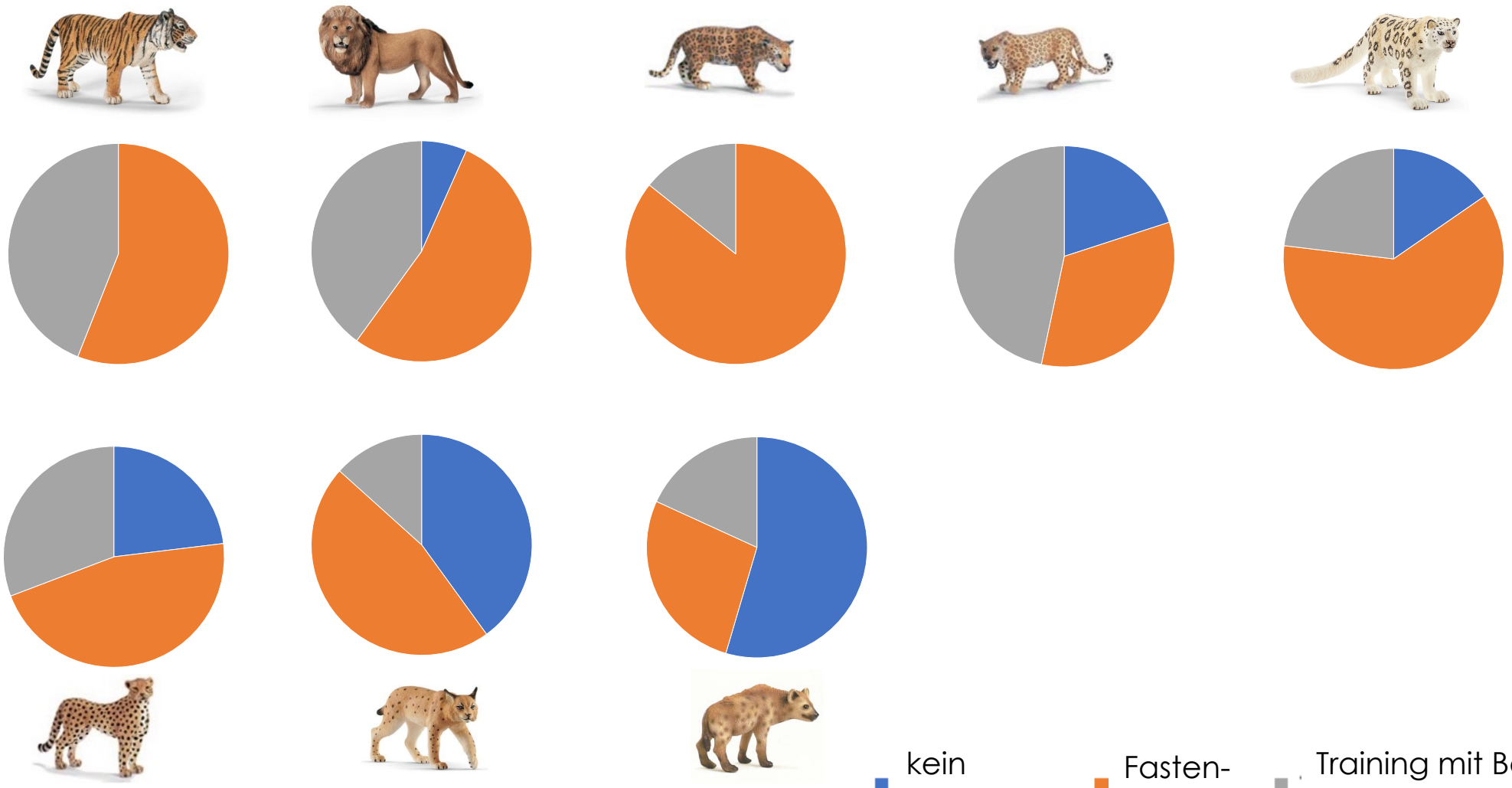
imagine the opposite !

Ob ein langes Leben gut ist …

Ob ein langes Leben gut ist …
… hängt davon ab, wie es ist.

Ob ein ~~langes~~ Leben gut ist …
… hängt davon ab, wie es ist.

Beispiel: Fastentage bei grossen Raubtieren



Cellina Kleinlugtenbelt (2022)

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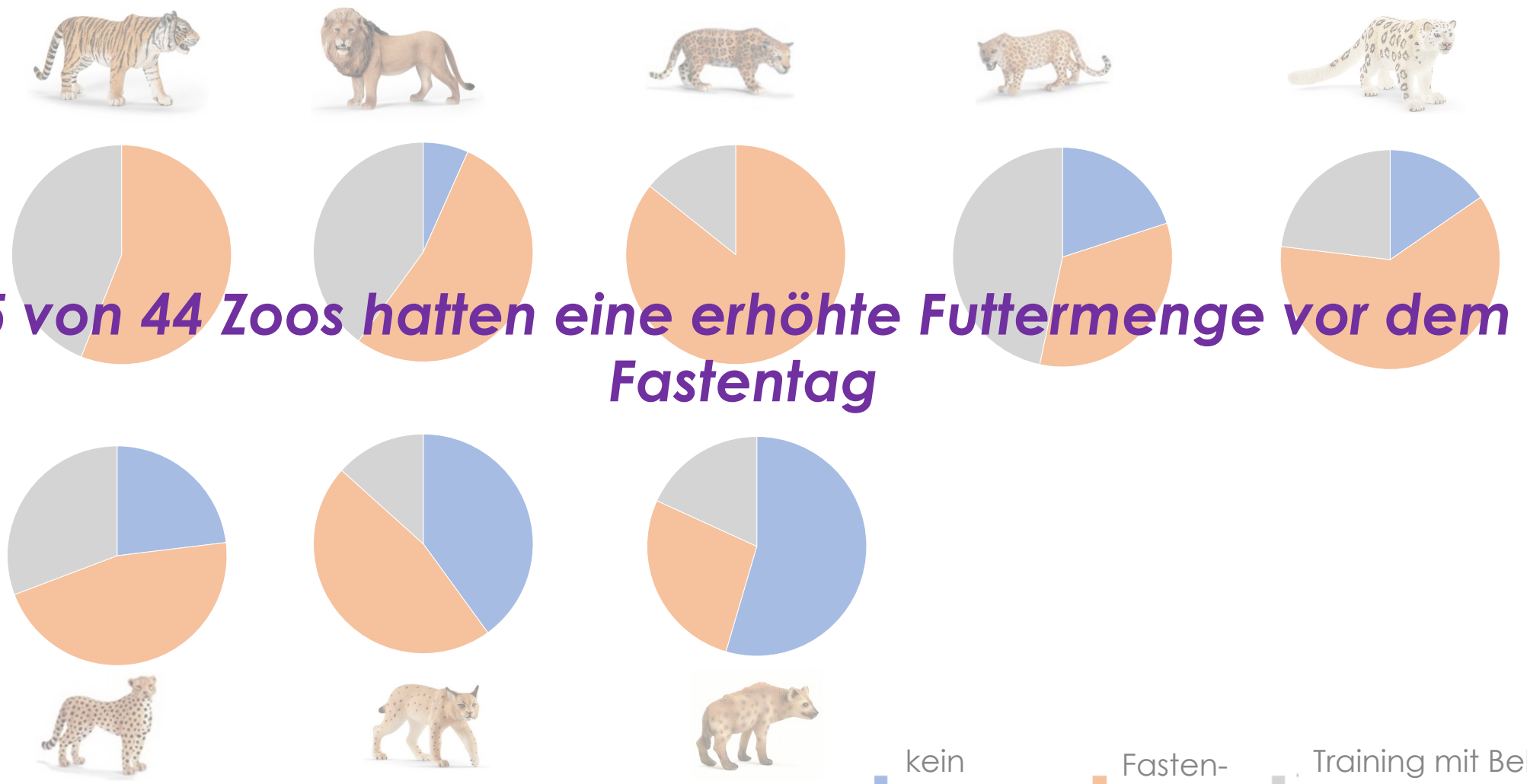


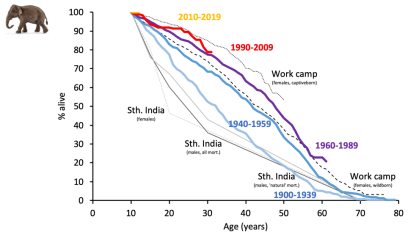
5 von 44 Zoos hatten eine erhöhte Futtermenge vor dem Fastentag

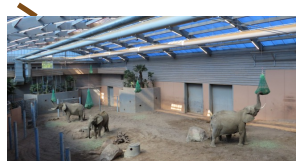
Cellina Kleinlugtenbelt (2022)

… wie erreicht man ‘längere Leben’ ?

Ausblick

Demographische Daten sind das Ergebnis vieler Einzel-Entscheidungen, können aber an sich zu keinen Empfehlung für solche Einzelentscheidungen führen – nur zu ‘grossen’ Entscheidungen.





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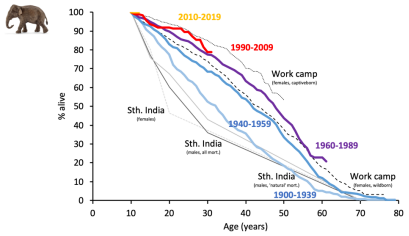
Um demographische Veränderungen zu verstehen, müssen wir im Detail wissen, was in den Zoos passiert …



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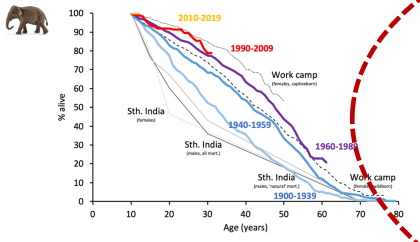

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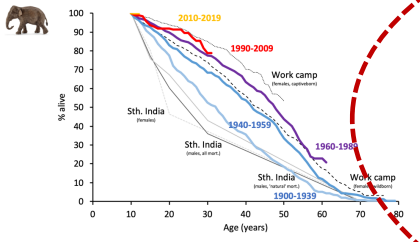

Ausblick

Wir brauchen Studien, die die Haltungsbedingungen bestimmter Arten immer wieder erheben, um Haltung und Demographie verknüpfen zu können.

European Association of Zoo- and Wildlife Veterinarians (EAZWV)
6th scientific meeting, May 24 - 28 - 2006. Budapest, Hungary

GIRAFFE HUSBANDRY AND FEEDING PRACTICES IN EUROPE RESULTS OF AN EEP SURVEY

J. HUMMEL[1,2], W. ZIMMERMANN[1], T. LANGENHORST[3], G. SCHLEUSSNER[4], M. DAMEN[5] and M. CLAUSS [6]

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4. Wilhelma Stuttgart, PO Box 501227, 70376 Stuttgart, Germany
5. Burger´s Zoo, Schelmseweg 85, 6816 SH Arnheim, The Netherlands
6. Division of Zoo Animals, Exotic Pets and Wildlife, Vetsuisse Faculty, University of Zurich, Winterthurer Str. 260, CH-8057 Zurich, Switzerland

Abstract

Problems of the locomotory system (like overgrown hooves, laminitis or joint problems) have been reported from the EEP giraffe population. To evaluate relevant husbandry practices and frequency of the problem, a survey was done covering EEP institutions (response to the questionnaire from 70 institutions representing 74 individually managed groups). 40 of the 74 groups reported that cases of problems of the locomotory system had occurred in their animals. Animals older than 8 years seemed to have a higher probability to develop such problems. Giraffe were generally kept on concrete (69%) or asphalt (16%) floors. Being known as demanding animals to feed, giraffe were offered considerable amounts of non-forage feeds. An influence on the occurrence of laminitis is therefore possible. Based on studies on dairy cattle, indoor sections with softer floor surfaces should be considered as a viable option for facilities were problems have occurred repeatedly.

Key words: giraffe, *Giraffa camelopardalis*, floor surface, overgrowth, laminitis, feeding

Introduction

Despite the broad distribution of giraffes over numerous European facilities, they are still regarded as demanding animals in captivity. Repeatedly occurring problems in captive giraffe are related to either their locomotory system like overgrown hooves and joint problems (Kovacs et al. 1975) or to nutrition (e. g. Junge and Bradley 1993, Clauss et al. 2002, Hummel et al. 2003). In cattle husbandry, problems of the locomotory system like overgrown hooves, laminitis or joint problems are regularly mentioned to occur in large animals confronted with the husbandry practice and floors of agricultural settings. They are regarded as multifactorially influenced (Cook et al. 2004), e. g. by nutrition, parturition and obviously floor characteristics like hardness, abrasiveness or humidity. They generally develop when animals are not on pasture, but in their stables (Maton 1987).

To get an overview of the situation in European zoos, an inventory of the “state of the art” of several relevant aspects of giraffe husbandry in the EEP was initiated.

Ausblick

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Research article

Feeding practices for captive giraffes (*Giraffa camelopardalis*) in Europe: a survey in EEP zoos

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[2]*Institute for Food and Resource Economics, University of Bonn, Nußallee 21, 53115 Bonn, Germany*
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**Correspondence: Jürgen Hummel, Department of Animal Sciences, University of Göttingen, Kellnerweg 6, 37077 Göttingen, Germany; jhummel@gwdg.de*

Keywords:
browse, concentrate, dietary proportion, dry matter intake, forage, produce

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Abstract

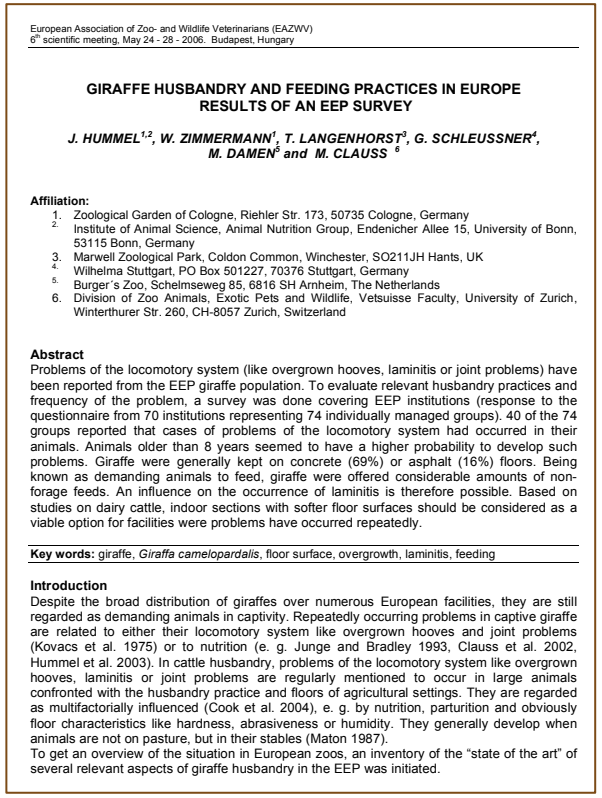
As with other browsing ruminants, the nutrition of giraffes (*Giraffa camelopardalis*) can be challenging. Feeding browse in very large amounts is not feasible. Therefore, substitutes need to be provided that have to meet requirements and the species' digestive capacity to the greatest possible extent. To achieve a comprehensive overview of current giraffe feeding practice in Europe, a survey was conducted among 153 member zoos of the European Endangered Species Programme. Information from 81 returned questionnaires showed a considerable variety of feeds being provided in varying proportions. The use of lucerne hay (89% of zoos) and fresh browse as trees or branches (96% of zoos) was more common than stated in previous studies. The use of a pelleted compound feed was almost standard practice, but many diets additionally contained cereal grains, as concentrate feeds high in rapidly fermentable starch. Eighty-five percent of the zoos reported feeding fresh fruits and vegetables, even though this is not recommended due to high sugar contents with a potentially negative influence on ruminal fermentation. The estimated non-forage proportion (sum of concentrate feeds and fresh fruits and vegetables) in the overall dietary dry matter (DM) was 37% in summer and 43% in winter (median), which is in accordance with recommendations. However, a considerable range of non-forage proportions was found, with 43% of the zoos providing amounts that were likely to be exceeding 50% of the potential daily DM intake. Data on dietary proportions revealed a geographical variation, with zoos from Western Europe showing the lowest and zoos from Eastern Europe showing the highest proportion of concentrate feeds in rations. An index of feeding appropriateness, oriented towards conformity with feeding recommendations, may be useful to evaluate and improve feeding management precisely and individually, as room for improvement was revealed for half of the participating zoos.

Introduction

The European Endangered Species Programme (EEP) for the giraffe (*Giraffa camelopardalis*) unites 153 giraffe facilities and increasing numbers of animals have been registered during the last decade (Jebram 2012). Nevertheless, giraffe husbandry poses challenges and the European Association of Zoos and Aquaria (EAZA) has published husbandry and management guidelines (EAZA Giraffe EEPs 2006). The feeding of giraffes is a matter of particular interest in these recommendations, since multiple husbandry problems in giraffes are reported to be nutrition related (e.g. Bashaw et al. 2001; Clauss et al. 2006; Hummel et al. 2006a). Giraffes are classified as browsing ruminants (Van Soest 1988; Hofmann 1989), which are generally considered to be more challenging to feed in captivity compared to grazing ruminants (Clauss et al. 2003; Clauss and Dierenfeld 2007). On the one hand, being a ruminant implies a forage fibre requirement to maintain efficient rumen function (Van Soest 1994). On the other hand, forages or fibrous feeds should match the digestive physiological adaptations of browsers against the background of chemical and structural particularities of browse compared to temperate grasses (Bailey 1964; Bailey and Ulyatt 1970; Robbins and Moen 1975; Demment and Van Soest 1985; Spalinger et al. 1986). Year-round feeding of browse in large amounts is logistically demanding in temperate zones with a period of dormant vegetation. Appropriate substitutes need to be combined in proper ratios to meet nutrient and energy requirements and to prevent pathological consequences (Potter and Clauss 2005; Clauss et al. 2006) or behavioural disturbances (Hummel et al. 2006a). The main focus in feeding instructions is on providing rations with sufficient amounts of palatable high quality forage (at least 50% of diet dry matter [DM]; Schmidt

Ausblick

Wir brauchen Studien, die die Haltungsbedingungen bestimmter Arten immer wieder erheben, um Haltung und Demographie verknüpfen zu können.



European Association of Zoo- and Wildlife Veterinarians (EAZWV)
6th scientific meeting, May 24 - 28 - 2006. Budapest, Hungary

GIRAFFE HUSBANDRY AND FEEDING PRACTICES IN EUROPE RESULTS OF AN EEP SURVEY

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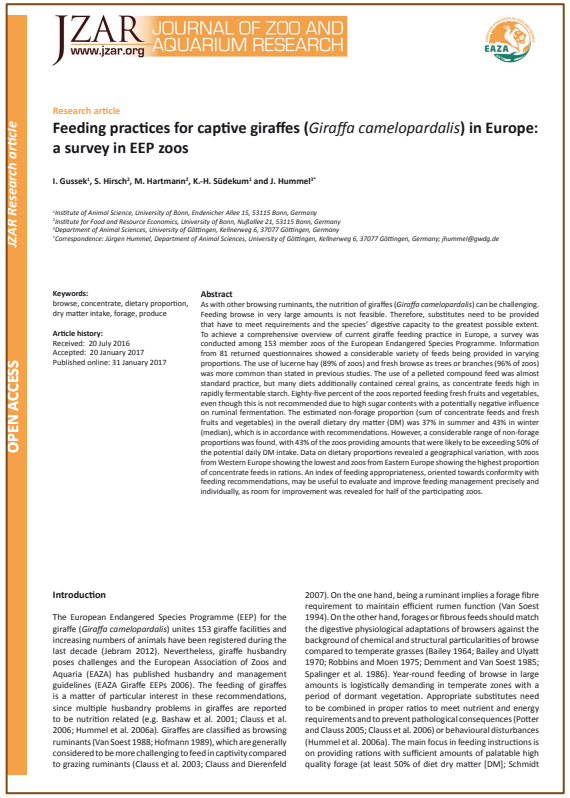
Abstract
Problems of the locomotory system (like overgrown hooves, laminitis or joint problems) have been reported from the EEP giraffe population. To evaluate relevant husbandry practices and frequency of the problem, a survey was done covering EEP institutions (response to the questionnaire from 70 institutions representing 74 individually managed groups). 40 of the 74 groups reported that cases of problems of the locomotory system had occurred in their animals. Animals older than 8 years seemed to have a higher probability to develop such problems. Giraffe were generally kept on concrete (69%) or asphalt (16%) floors. Being known as demanding animals to feed, giraffe were offered considerable amounts of non-forage feeds. An influence on the occurrence of laminitis is therefore possible. Based on studies on dairy cattle, indoor sections with softer floor surfaces should be considered as a viable option for facilities were problems have occurred repeatedly.

Key words: giraffe, *Giraffa camelopardalis*, floor surface, overgrowth, laminitis, feeding

Introduction
Despite the broad distribution of giraffes over numerous European facilities, they are still regarded as demanding animals in captivity. Repeatedly occurring problems in captive giraffe are related to either their locomotory system like overgrown hooves and joint problems (Kovacs et al. 1975) or to nutrition (e. g. Junge and Bradley 1993, Clauss et al. 2002, Hummel et al. 2003). In cattle husbandry, problems of the locomotory system like overgrown hooves, laminitis or joint problems are regularly mentioned to occur in large animals confronted with the husbandry practice and floors of agricultural settings. They are regarded as multifactorially influenced (Cook et al. 2004), e. g. by nutrition, parturition and obviously floor characteristics like hardness, abrasiveness or humidity. They generally develop when animals are not on pasture, but in their stables (Maton 1987).
To get an overview of the situation in European zoos, an inventory of the "state of the art" of several relevant aspects of giraffe husbandry in the EEP was initiated.



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Research article

Feeding practices for captive giraffes (*Giraffa camelopardalis*) in Europe: a survey in EEP zoos

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Keywords:
browse, concentrate, dietary proportion, dry matter intake, forage, produce

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Abstract
As with other browsing ruminants, the nutrition of giraffes (*Giraffa camelopardalis*) can be challenging. Feeding browse in very large amounts is not feasible. Therefore, substitutes need to be provided that have to meet requirements and the species' digestive capacity to the greatest possible extent. To achieve a comprehensive overview of current giraffe feeding practice in Europe, a survey was conducted among 153 member zoos of the European Endangered Species Programme. Information from 81 returned questionnaires showed a considerable variety of feeds being provided in varying proportions. The use of lucerne hay (89% of zoos) and fresh browse as trees or branches (96% of zoos) was more common than stated in previous studies. The use of a pelleted compound feed was almost standard practice, but many diets additionally contained cereal grains, as concentrate feeds high in rapidly fermentable starch. Eighty-five percent of the zoos reported feeding fresh fruits and vegetables, even though this is not recommended due to high sugar contents with a potentially negative influence on ruminal fermentation. The estimated non-forage proportion (sum of concentrate feeds and fresh fruits and vegetables) in the overall dietary dry matter (DM) was 37% in summer and 43% in winter (median), which is in accordance with recommendations. However, a considerable range of non-forage proportions was found, with 43% of the zoos providing amounts that were likely to be exceeding 50% of the potential daily DM intake. Data on dietary proportions revealed a geographical variation, with zoos from Western Europe showing the lowest and zoos from Eastern Europe showing the highest proportion of concentrate feeds in rations. An index of feeding appropriateness, oriented towards conformity with feeding recommendations, may be useful to evaluate and improve feeding management precisely and individually, as room for improvement was revealed for half of the participating zoos.

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	Hummel et al. (2006d)	Present study
Grass/lucerne		
Lucerne hay	81%	89%
Grass hay	40%	27%
Ensiled lucerne/grass	—	4%
Browse		
Fresh browse (trees and branches)	80%	96%
Dried/ensiled/frozen browse	4%	47%
Fresh forage		
Grass	53%	31%
Lucerne	—	19%
Nettles, thistles, blackberry, rose leaves	—	12%

Zusammenfassung

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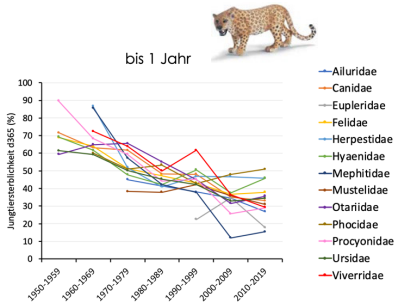
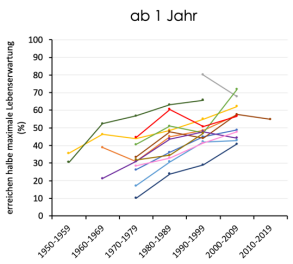
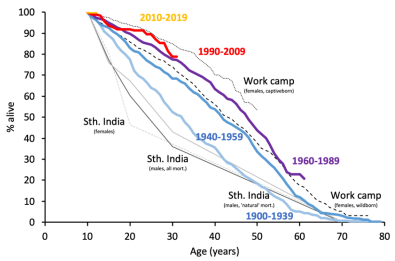
Ja, Zoos werden besser …







… um so deutlicher, je schlechter es einer Art zu Beginn der Zoo-Haltung ging.

Zusammenfassung

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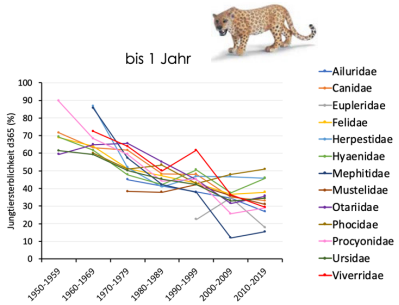

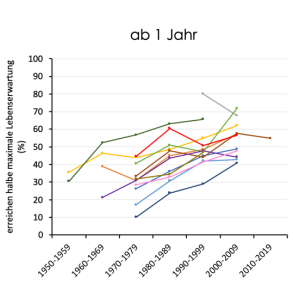

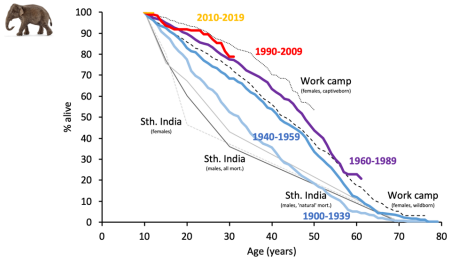

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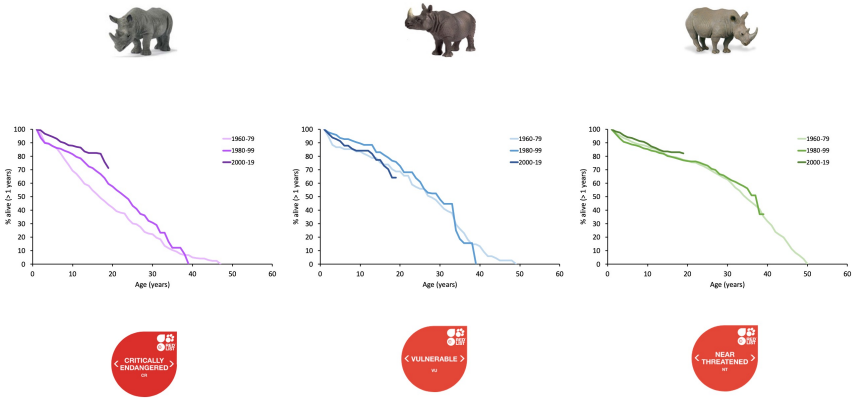

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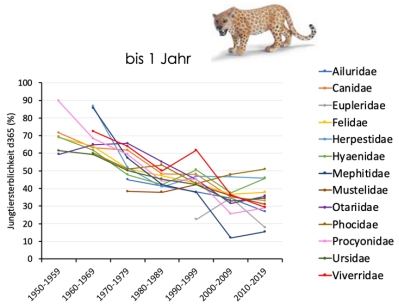

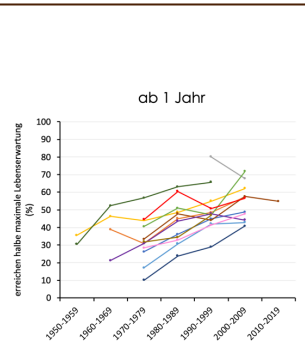

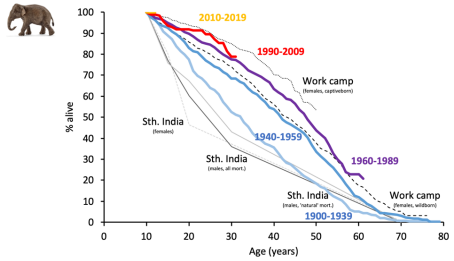

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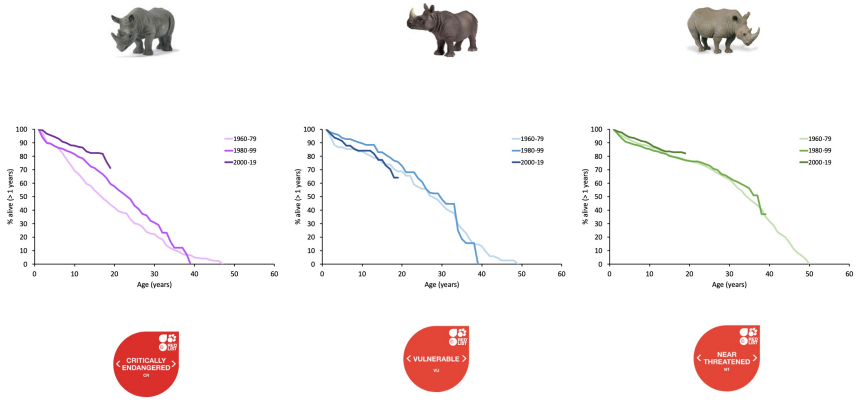

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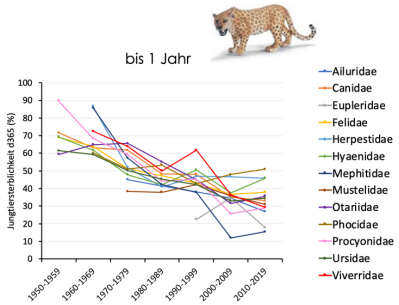

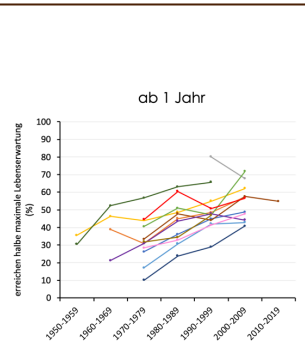

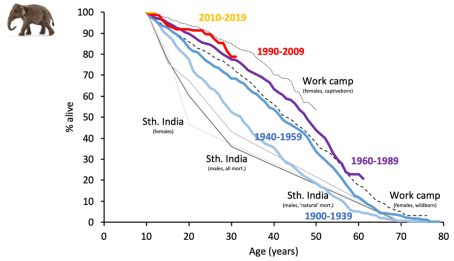

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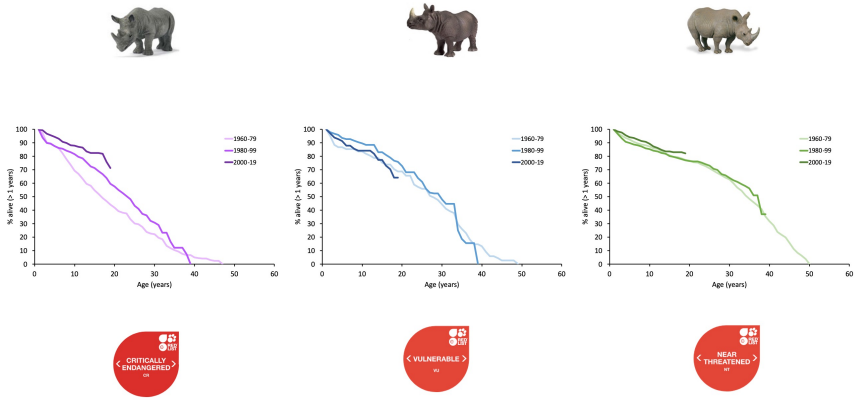

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Geht es schnell genug ? Was können wir mehr tun ?

Wie füllen wir die Leben unserer Zootiere ?

vielen Dank für Ihre Aufmerksamkeit