Introducing a survey of mite lifespans: How long do Acari live?

ZHI-QIANG ZHANG1,2
1Manaaki Whenua-Landcare Research, Private Bag 92170, Auckland, New Zealand.
2School of Biological Sciences, Centre for Biodiversity & Biosecurity, The University of Auckland, Auckland, New Zealand

The reasons for some animals being long-lived and others short-lived, and, in a word, causes of the length and brevity of life call for investigation.

We find this distinction affecting not only entire genera opposed as wholes to one another, but applying also to contrasted sets of individuals within the same species.”

— “On Longevity and Shortness of Life” by Aristotle (350 B.C.), English translation by G.R.T. Ross

How long do animals live and why are some long-lived whereas others short-lived? These questions have long fascinated scholars, including Aristotle. Incidentally, it is also Aristotle who first named mites “Acari” according to new research on the Greek origin of acarology by Zaborowski & Daszkiewicz (2017):

“And on honeycomb, the one that grew old, there are, as well as in the wood, animals which seem to be the shortest of all animals and are called acari [άκαρί], being white and small.”

— “History of Animals” by Aristotle

Is Aristotle the reason we are conducting a survey on lifespans in the Acari here? Not really, or not entirely, to be more precise. I have been interested in the ecology and evolution of animal aging and lifespan, and have collaborated with numerous students and colleagues on this subject in recent years. As acarologists, we very much appreciate the life history diversity in the Acari (Houck 1994) and understand the ease with which many species of mites can be cultured in the laboratory and experimentally manipulated to address questions in biology. We have used different groups of mites as experimental systems to study several aspects of animal aging and lifespan: e.g., the extension of lifespan by different methods of diet restriction (Li & Zhang 2019, 2021a; Lee et al. 2020), the effects of pathogenic fungi on mite host lifespan (Liu et al. 2019), the effects of delayed/repeated mating (Li & Zhang 2021a,c), intrasexual and intersexual interactions within species (Li & Zhang 2021b) or stress induced by predators (Wei & Zhang 2019; Li & Zhang 2020) on the lifespan and/or other related life history traits. During our research, it becomes apparent that there is a vast body of literature on mite lifespans scattered in many journals and books, yet mites (and indeed many other arthropods) are very poorly represented in the gerontological literature and databases, which are heavily focused on vertebrate models and selected invertebrates such as Drosophila. For example, over 98% of the records for lifespans in “AnAge: The Animal Ageing and Longevity Database” are for Chordata, which only accounts for about 5% of all animal species (Fig. 1); the Arthropoda, which accounts for over 78% species of all animals, are poorly represented in this database and no mite species are included. Although selected model species provide useful in-depth studies of some subjects, it is crucial to employ a comparative approach to use different animal species across the tree of life in aging research (Cohen 2018). Houck (1994) collected several excellent reviews of life history modifications in different groups, with some coverages on mite lifespans. Our project here is focused on mite lifespan data. Numerous mite specialists provided surveys of lifespan and related life history data such as
immature development time for their groups, including Sarcoptiformes (Oribatida by Pfingstl & Schatz 2021; Winterschmidtidae by Zhang 2021a and Eriophyoidea by Ozman-Sullivan & Sullivan 2021), Trombidiformes (Tydeidae by Johann & Da Silva 2021, Anystidae by Zhang 2021b and Cheyletidae by Zheng & Xia 2021) and Mesostigmata (Blattisociidae by Zhang and Xie 2021). A second volume in the next year will include lifespan surveys on other mite taxa. I hope the comprehensive data reviewed and analysed in this series of surveys will appeal to both acarologists and non-acarologists and will stimulate further research on both the patterns and mechanisms of animal aging and lifespan.

![FIGURE 1. Animal phyla with % of longevity records databased in AnAge (left columns) versus % species diversity of these phyla (right columns; data from Zhang 2013). AnAge is The Animal Ageing and Longevity Database available from https://genomics.senescence.info/species/index.html (data from Build 14 dated 14 Oct 2017; last accessed on 29 Dec 2021.](#)

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