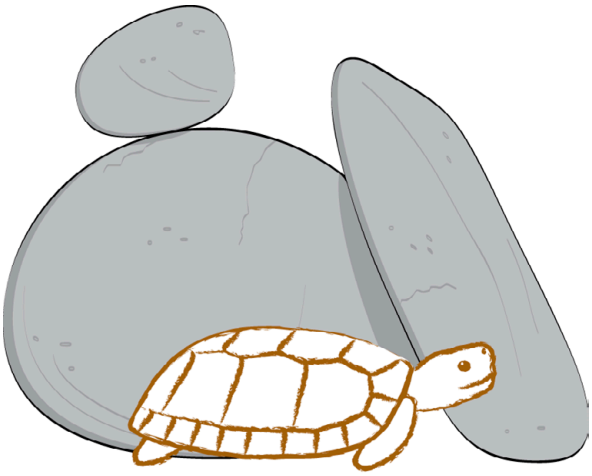
Dwarf Tortoise Conservation



Annual Report 2023
and
Action Plan 2024

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Dwarf Tortoise Conservation (previously Homopus Research Foundation) is a non-commercial organisation entirely run by volunteers. The aim of the foundation is to gather and distribute information on dwarf tortoises, to facilitate their survival in the wild. This aim is achieved through scientific field studies, and through the development and study of captive studbook populations. Our results are published in scientific and popular outlets.

1. INTRODUCTION AND ACHIEVEMENTS IN 2023

Dwarf Tortoise Conservation aims to facilitate the long-term survival of dwarf tortoises (*Chersobius* spp. and *Homopus* spp.) in the wild, by gathering and distributing information about their biologies and by the formation of genetically healthy *ex situ* populations. Dwarf Tortoise Conservation is the successor of the Homopus Research Foundation, which was renamed in 2018, following the resurrection of the genus *Chersobius* (previously *Homopus*). In 2023, several activities contributed to the aim of Dwarf Tortoise Conservation. The current report presents an overview of achievements in 2023, as well as activities planned for 2024 and thereafter. Moreover, the actual studbook populations for *Chersobius boulengeri*, *Chersobius signatus*, *Homopus areolatus* and *Homopus femoralis* are described, focusing on changes that occurred in 2023. All previous annual reports since 1995 can be found on the website of Dwarf Tortoise Conservation.

1.1. Policies and permanent action points

From time to time, Dwarf Tortoise Conservation communicates policies and permanent action points to the participants in the *Chersobius* and *Homopus* studbooks and to other stakeholders. To avoid losing sight of actual issues, they are listed here.

- *Dwarf Tortoise Conservation and illegal activities (1 May 2011)*
  Dwarf Tortoise Conservation strongly condemns illegal activities. All *Chersobius* and *Homopus* registered in the studbooks and at studbook participants have legal and traceable origins. Each participant is responsible for the paperwork for his or her tortoises and will not fraud. Dwarf Tortoise Conservation will fully collaborate with authorities in case of legal investigations, providing backgrounds of studbook tortoises, DNA samples, etc. Moreover, illegal activities noted within the studbooks will be actively reported to the authorities, to facilitate prosecution. Obviously, participants involved in illegal activities will be unable to continue their participation.

- *Information exchange with the studbook coordinators (20 December 2017)*
  Changes (births, deaths, transfers, physical and e-mail addresses, etc.) should be sent to the studbook coordinators by e-mail, and not via social media. The e-mail address that should be used is studbookhomopus@gmail.com.

- *New registrations of* H. areolatus *(January 2018)*
  Because offspring *H. areolatus* produced in the studbook has been transferred outside the studbook (i.e., were lost to follow-up), there is a risk that genetically related tortoises will be registered in the studbook as unrelated founders. To avoid this, the studbook will not accept new founders with unknown or uncertain origins.

- *Outdoor husbandry of* C. signatus *(February 2019)*
  Outdoor husbandry of *C. signatus* in Europe has yielded unacceptable mortality rates, possibly due to climatic mismatches or due to stress involved with frequent transfers among indoor and outdoor enclosures. Since *C. signatus* does well in indoor enclosures, tortoises loaned from Dwarf Tortoise Conservation should be housed indoors year-round. Exceptions require written consent.

- *Information for novice keepers of* C. signatus *(December 2023)*
  Novice keepers of *C. signatus* turned out to needlessly repeat husbandry and breeding errors previous participants had already made. To counter this finding, novice keepers of *C. signatus* are provided with various documents and publications that summarise the species' requirements.

1.2. Outstanding action points in the 2022 annual report

The following table summarises plans in the 2022 annual report, with results obtained in 2023.

Outstanding action points in 2022 annual report, and results in 2023	**Due**
Manuscripts submitted on: • tick infestation in a European indoor dwarf tortoise collection; • female aggression in *C. boulengeri*; • diet of wild *C. boulengeri*.	 31-12-2023 31-12-2023 31-12-2023
2023: A manuscript on tick infestation was submitted. The anticipated manuscript on female aggression in *C. boulengeri* was replaced by information about female aggression in a broader manuscript published in Radiata in 2023 (chapter 6). A scientific paper about natural diet of *C. boulengeri* was submitted, accepted and published (open access) in 2023. Several other manuscripts that had been submitted before 2023 were also published (chapter 6).	
Presentations held on: • decline in wild *C. boulengeri* (Herpetological Association of Africa, South Africa); • field research, husbandry and breeding of *C. boulengeri* (DGHT AG Schildkröten, Germany).	 18-01-2023 25-03-2023
2023: Both presentations were held as planned. Additional presentations were held on: ○ husbandry and breeding of *C. signatus* at Plzen Zoo (Prague Zoo, Czech Republic, 19 January, chapter 5); ○ introduction to the dwarf tortoises (Stockholm Herpetological Society, Sweden, 22 April); ○ field research, husbandry and breeding of *C. boulengeri* (Stockholm Herpetological Society, Sweden, 22 April); ○ *Chersobius signatus* (local primary school, Germany, August); ○ dwarf tortoises in the wild and in captivity (eight presentations at a meeting of participants in the studbook on *C. signatus*, Germany, 9–10 September); ○ a breeding station for *C. boulengeri* at Basel Zoo (European Association of Zoos and Aquaria, Finland, 16 September, and CITES enforcement unit of the Federal Food Safety and Veterinary Office, Switzerland, 18 November).	
Husbandry guidelines for *C. boulengeri*, *C. signatus*, *H. areolatus* and *H. femoralis* prepared following format of the Dutch-Belgian Turtle and Tortoise Society	31-12-2023
2023: Guidelines for *C. signatus* and *H. areolatus* were prepared following the format and placed on the website of the Dutch-Belgian Turtle and Tortoise Society; *C. boulengeri* and *H. femoralis* are rarely kept in the Netherlands and Belgium, so Dutch guidelines for these species did not appear useful at this moment. All existing guidelines in English remain available.	
Meeting held to discuss the future of the *C. signatus* studbook with participants	09/10-09-2023
2023: The meeting was held as planned, and succeeded in formulating a perspective for the future of the studbook (paragraph 1.3). A discussion paper and meeting report were posted on the website.	
Studbook management plan *C. signatus* updated	31-12-2023
2023: A draft of the updated studbook management plan was completed and send out to the studbook participants for review.	

Further achievements that are worth listing:

- A support letter from CapeNature (South Africa) was gratefully received. The letter acknowledges the contribution of Dwarf Tortoise Conservation to *in* and *ex situ* conservation of dwarf tortoises, specifically *C. boulengeri* and *C. signatus*.

- Datasets were shared for:
  - a meta-study on demographic buffering (mark-recapture data for *C. boulengeri* and *C. signatus*; Northeastern Illinois University, USA);
  - a meta-study on road mortality (road mortality data for *H. femoralis*; Research Centre in Biodiversity and Genetic Resources of the School of Agriculture, Portugal).

- Reprints of papers produced by Dwarf Tortoise Conservation were distributed through its website, ResearchGate, and directly to several researchers and private individuals. Studbook participants receive all papers produced.

- Review requests were received from Journal of Arid Environments, Conservation Science and Practice, and Biological Communications.

- An ecologists working on a power grid extension near Beaufort West (South Africa) requested input on the likeliness of occurrences of *C. boulengeri* in this area. Wind farms may offer benefits for conservation of *C. boulengeri* and its habitat.

- Dwarf Tortoise Conservation assisted the Endangered Wildlife Trust (South Africa) design methodologies (including an app) to survey *C. boulengeri* and *C. signatus* in the Northern Cape (South Africa).

- The Stockholm Herpetological Society (SHF) was proposed to raise financial support for the conservation work on *C. boulengeri* and *C. signatus* by the Endangered Wildlife Trust. Consequently, a society symposium had three lectures on dwarf tortoises by Dwarf Tortoise Conservation and the Endangered Wildlife Trust.

SHF´s symposium schedule 2023

Saturday 22/4

09:00 – 10:30 Breakfast

10:30 –10:45 Welcome and opening of the symposium including a short introduction

10:45 – 11:45 ***Petr Nečas*** – How to find a (new) chameleon

12:00 – 13:00 ***Victor Loehr*** - Dwarf tortoises of southern Africa, *Homopus & Chersobius sp.*

13:00 – 14:00 ***Otto Bylén Claesson & Didrik Claesson*** – Tanzania: among bush vipers & chameleons

14:00 – 15:30 Lunch

15:30 – 16:30 ***Victor Loehr*** - Field study, captive care and breeding of *Homopus sp. & Chersobius sp.* for studbook development

16:30 – 17:30 ***Petr Nečas*** – Herpetoculture as an option for saving endangered species

17:30 – 17:45 Coffee

17:45 – 19:00 ***Fernando Martinez-Freiria*** – The reptiles of north-western Africa with a particular focus on the evolution, ecology and conservation of vipers.

19:00 – 19:30 ***SHF*** **Conservation project support 2023.** The Conservation Efforts to Protect South Africa´s Endemic and Threatened Dryland Tortoises – with ***Bonnie Schumann*** – zoom

19:30 – BBQ dinner

20:00 – book sales, sauna, bar & Book- auction with ***Eric Renman***

Sunday 23/4

09:00 – 10:00 Breakfast

10:00 – 11:00 ***Otto Bylén Claesson & Didrik Claesson*** – In search of vipers in Namibia

11:00 – 12:30 ***Otto Bylén Claesson & Didrik Claesson*** – *South Africa – in quest of the world´s smallest adder*

12:30 – 13:30 Lunch

13.30 – 14.30 ***Petr Nečas*** – Travels to Madagascar, Seychelles, and Mauritius and it´s herpetofauna

15:00 Thank-you and group picture!

- Scent samples of *C. boulengeri* and *C. signatus* were collected in the studbook population and sent to the Endangered Wildlife Trust to train a sniffer dog for field surveys and enforcement.

- A scientist at the South African National Biodiversity Institute, who is based at Pretoria Zoo (South Africa), reached out to Dwarf Tortoise Conservation and Pretoria Zoo to explore collaboration on tortoise work.

- Basel Zoo opened a dedicated breeding facility for *C. boulengeri*. Here, a large portion of the first-generation offspring in the studbook will be held, a second-generation will be bred, and data on reproduction and growth will be gathered. The opening was covered by various media:
    - https://www.baseljetzt.ch/hoechstens-13-zentimeter-lang-diese-mini-schildkroete-gibt-es-nur-im-basler-zolli-zu-sehen/52506
    - https://www.bzbasel.ch/basel/basel-stadt/basler-zoo-neuheit-im-zolli-dieses-seltene-und-gefaehrdete-tier-gibt-es-nur-im-basler-zoo-ld.2451524
    - https://www.nau.ch/news/schweiz/zoo-basel-halt-als-einziger-weltweit-seltene-flachschildkroten-66486785
    - https://www.blick.ch/schweiz/basel/einziger-zoo-weltweit-bedrohte-schildkroetenart-im-basler-zolli-zu-sehen-id18541764.html
    - https://www.imsueden.de/das-neue-radio-seefunk/neue-schildkroetenart-im-zoo-391158/
    - https://www.tierwelt.ch/artikel/wildtiere-zoo/boulengers-flachschildkroeten-sind-neu-im-zolli-zu-bestaunen-473106

- Crocodile Zoo Prague included their dwarf tortoise displays as a separate topic in their "tortoise VIP guided tour". Also the standard tours for visitors pay attention to the conservation of dwarf tortoises.

- At a board meeting of the European Studbook Foundation (Netherlands), Dwarf Tortoise Conservation shared its expectations regarding admin studbook support (e.g., availability and development of software), and offered its help to train coordinators of other studbooks.

- A South African breeder of *H. areolatus* outside the studbook contacted Dwarf Tortoise Conservation to offer new bloodlines for the studbook in a few years.

- Information requests were received regarding:
    - identification of dead tortoises (shell fragments) from dwarf tortoise habitats near Montagu

and Sutherland (South Africa);
  - identification of a dead tortoise (single scute) from a Dutch shipwreck between South Africa and Australia dated 1656 (a friendly review was also conducted on a manuscript for Australasian Journal of Maritime Archaeology);
  - identification of dead tortoises (tortoise shell containers) from the Namibian Kalahari, collected in the early 20th century (now in the collections of the Museum Africa in Johannesburg);
  - localities of wild *C. signatus* in South Africa;
  - opportunities to volunteer in dwarf tortoise fieldwork;
  - acquiring land in South Africa by a Canadian citizen for the conservation of *C. signatus*, including a space where researchers could come for conservation work;
  - recuperation of confiscated *H. areolatus* and *Psammobates* sp. at the Catalonian Rescue Centre for Amphibians and Reptiles (Spain);
  - acquisition of *C. signatus* from the studbook for captive husbandry (private individuals and zoos in Germany, UK, and Ireland);
  - legal origin of *H. areolatus* in a collection from a deceased Swedish keeper;
  - verification of the legitimacy of a *H. areolatus* offered with a studbook number in Sweden.

- Photographic material was provided for:
  - a display of *C. boulengeri* at Basel Zoo;
  - a Slovak publication about tortoises;
  - a paper about hyperpredation of tortoises by corvids.

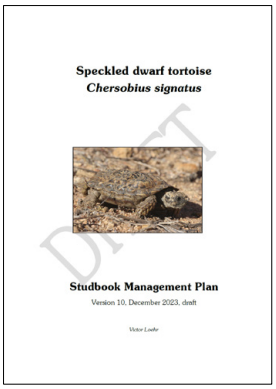
The work of Dwarf Tortoise Conservation was acknowledged by Jim Juvik (Turtle Conservancy, USA) at a Turtle Survival Alliance symposium in Charleston, USA (photo: Kevin Gepford).

- The Dwarf Tortoise Conservation website received minor updates, in particular the list of publications.

- The Dutch Scientific Authority for CITES and Working Group Reptiles and Amphibians of the European Scientific Review Group were requested to help change all common names of dwarf tortoises used within the framework of CITES to (direct translations of) the common names used in the South African Atlas and Red List (e.g., Karoo dwarf tortoise, Nama dwarf tortoise, speckled dwarf tortoise, parrot-beaked dwarf tortoise, and greater dwarf tortoise). The suggested English names were added to Species+. In addition, the English and German names were added to The Reptile Database.

1.3. Studbook management plan Chersobius signatus

The first version of the studbook management plan for *C. signatus* was finished in 2013. It has been updated several times, and a new draft was prepared in 2023. The plan provides directions for the development of the studbook in the next years and decades, and will be updated every five years. The plan will also be updated after every supplementation of the studbook with new founders, and after each change in the IUCN conservation status of the taxon. The annual reports of Dwarf Tortoise Conservation report annual progress of the realisation of the plan.



Both available founder couples survived in 2023, but none produced offspring. Two partial founder couples also survived but produced no offspring. One solitary founder male died before producing offspring, so this bloodline went extinct. A second bloodline, representing a deceased founder, went extinct when its only remaining offspring in F1 and in F2 died.

The table at the right shows how well the genes of each founder (i.e., bloodline) are represented in the studbook population. Important changes for 2023 are the extinction of the two bloodlines already mentioned, along with the loss of the genetic material of founder WILD3 (a male in the wild that had fertilised a gravidly imported female). All live F1 offspring from deceased founders (e.g., 151, 153, 158, 159) have been combined with genetically unrelated mates at experienced studbook participants to produce a second generation.

Founder	F1 offspring		F2 offspring		F3 offspring		Remark
	All	Available	All	Available	All	Available	
WILD1	1	0	4	0	0	0	Founder in the wild
WILD2	3	0	0	0	0	0	Founder in the wild
WILD3	2	0	1	0	0	0	Founder in the wild
1	34	4	77	32	14	12	
2	14	1	27	11	5	5	
3	21	3	54	21	9	7	
4	0	0	0	0	0	0	Bloodline extinct
35	30	13	45	26	7	6	
36	30	13	45	26	7	6	
37	22	10	20	16	0	0	
38	12	6	15	11	0	0	
60	13	1	2	1	0	0	
150	3	2	0	0	0	0	
151	5	1	0	0	0	0	
152	3	3	0	0	0	0	
153	8	5	1	1	0	0	
154	0	0	0	0	0	0	Bloodline extinct
155	0	0	0	0	0	0	Bloodline extinct
156	7	3	0	0	0	0	
157	3	3	0	0	0	0	
158	8	5	1	1	0	0	
159	2	0	1	0	0	0	Bloodline extinct

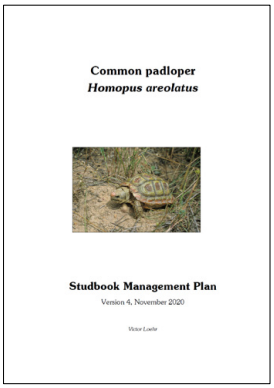
Grey numbers indicate unavailable founders. Red and green numbers indicate decreases and increases, respectively, compared to the previous annual report. Founders that were lost to follow-up and have no available offspring have been removed from the table. Unknown ancestors from offspring have been removed from the table. Note that each offspring has at least two founders, so numbers of offspring in a column should not be summed.

According to the studbook management plan, each founder couple should produce 12 (surviving, reproducing) offspring, and couples in subsequent generations should each produce two (surviving, reproducing) replacement offspring. Although all currently available mature individuals have been combined according to this schedule, the anticipated population composition is not fully achievable: Some deceased founders have produced too few offspring, as have some deceased captive-bred offspring (i.e., resulting in overrepresentation of other bloodlines). In addition, some couples have produced more offspring than needed. The new draft studbook management plan contains a detailed analysis, which is used for further development of the studbook population. Paragraph 3.2 provides quota for each available breeding couple in the studbook population in 2024, to help obtain the aims of the studbook management plan. Quota inherently mean that some eggs will need to be discarded. This will be a challenge for studbook participants who are keen on hatching eggs and producing offspring. Institutional studbook participants that are familiar with conservation breeding in zoo studbooks can play an exemplary role for private participants.

The evaluation of the success of the studbook that was conducted to update the studbook management plan shows that husbandry and breeding techniques used by novice participants need improvement. A set of documents and publications illustrating suitable husbandry and breeding techniques (e.g., husbandry guidelines drawn up by the studbook) has been prepared for distribution among novice keepers of *C. signatus*.

1.4. Studbook management plan Homopus areolatus

The first version of the studbook management plan for *H. areolatus* was finished in 2015, and the plan was updated in 2020. Most tortoises in the studbook on *H. areolatus* are privately owned, meaning that the development of the studbook population (i.e., the execution of the studbook management plan) is directly in hands of the participants, whereas the studbook coordinators have only a facilitating role.



The live founder couple and founder trio in the studbook survived in 2023, and the latter reproduced despite severe overrepresentation of the bloodline. In addition, genetic investigation showed that a group of seven captive-bred individuals (330, and 340–345) added in 2022 is genetically related, as was suspected, but the group is not related to any other tortoise in the studbook (i.e., originating from founders 348 and 349 outside the studbook). The origin of one tortoise (347) that appears to descend from founders 63 and 64 (outside the studbook) needs genetic verification.

The table at the right shows how well the genes of each founder are represented in the studbook population. Most decreases were caused by tortoises that were lost for the studbook (i.e., transferred to keepers outside the studbook). A major imbalance remains between founders 4, 5, 16, 17, 58, 59, 60, 63 and 64 that appear similarly represented in the second generation, and less well-represented founders 10, 11, 22, 24, 40, 223, 348 and 349. Moreover, genes of the former founders were transferred into a second and third generation via severe bottlenecks (in particular 94, 128, and 234); relatively few first-generation offspring produced the majority of second-generation offspring. If studbook participants wish to safeguard the genetic quality of the captive population, they should increase reproduction of individuals that have produced little or no offspring (especially in bloodlines originating from founders 10, 11, 22, 24, 40, 223, 348 and 349), and reduce or stop producing offspring from individuals that already have produced many offspring (particularly founder trio 58 x 59/60). Obviously, inbreeding should be avoided, but the number of inbred individuals grew in 2023.

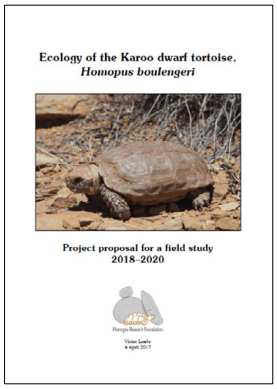
Founder	F1 offspring		F2 offspring		F3 offspring		Remark
	All	Available	All	Available	All	Available	
4	7	1	46	20	41	21	
5	7	1	46	20	41	21	
10	11	3	10	8	0	0	
11	14	3	10	8	0	0	
16	33	4	45	21	33	21	
17	34	4	45	21	33	21	
22	22	3	4	3	0	0	
24	22	3	4	3	0	0	
40	0	0	0	0	0	0	
47	9	0	8	0	0	0	Bloodline extinct
58	108	47	52	25	2	2	
59 60	108	47	52	25	2	2	
63	1	1	29	17	0	0	Founder outside studbook
64	1	1	29	17	0	0	Founder outside studbook
223	0	0	0	0	0	0	
348	7	7	0	0	0	0	Founder outside studbook
349	7	7	0	0	0	0	Founder outside studbook

Grey numbers indicate unavailable founders. Red and green numbers indicate decreases and increases, respectively, compared to the previous annual report. Founders that were lost to follow-up and have no available offspring have been removed from the table. Note that each offspring has at least two founders, so numbers of offspring in a column should not be summed.

Accepting tortoises from outside the studbook for registration in the studbook has become almost impossible without prior genetic testing. Many studbook tortoises have been transferred outside the studbook and reproduce there, and captive-bred individuals imported from South Africa may have been produced by the same founder stock outside the studbook. The 2025 update of the studbook management plan will need to address genetic testing and saving of genetic profiles of studbook tortoises.

1.5. Progress field study Chersobius boulengeri

All fieldwork for this study has been completed between 2018 and 2022. In 2023, data was processed and manuscript were prepared. The following papers have been published until now:



Loehr, V.J.T. 2018. *Chersobius boulengeri* (Duerden, 1906). Karoo padloper. Reproduction. African Herp News 68: 37–39.

Loehr, V.J.T. 2020. De Karoo dwergschildpad: een uitstervende soort. Veldrapport over *Chersobius boulengeri*. Trionyx 18: 4–15.

Loehr, V.J.T. 2021. The Karoo dwarf tortoise (*Chersobius boulengeri*): field report on a vanishing species. BCG Testudo 9: 20–36.

Loehr, V.J.T., Keswick, T, Reijnders, M.A.D.E. and Zweers, I.M.. 2021. High-level inactivity despite favorable environmental conditions in the rock-dwelling dwarf tortoise *Chersobius boulengeri*. Herpetologica 77: 232–238.

Loehr, V.J.T. 2022. Testudinidae, *Chersobius boulengeri* (Duerden, 1906). Karoo padloper. Severe population decline. African Herp News 81: 22–24.

Loehr, V.J.T. and Keswick, T. 2022. Structure and projected decline of a Karoo dwarf tortoise population. The Journal of Wildlife Management 86: e22159.

Loehr, V.J.T. and Keswick, T. 2022. Witnessing a population collapse: field research in South Africa reveals the perils closing in on the only documented population of endangered Karoo dwarf tortoises. The Tortoise 3: 118–123.

Loehr, V.J.T. 2023. Habitat use by the rock-dwelling Karoo dwarf tortoise, *Chersobius boulengeri*. Ichthyology & Herpetology 111: 360–367.

Loehr, V.J.T. and Keswick, T. 2023. Shell dimensions in a population of Karoo dwarf tortoises, *Chersobius boulengeri*. Chelonian Conservation and Biology 22: 119–122.

Loehr, V.J.T., Keswick, T. and Barten, N. 2023. Karoo dwarf tortoises (*Chersobius boulengeri*) prefer and disperse doll's roses (*Hermannia* spp.). Journal of Arid Environments 219: 105094.

Remaining data that needs to be processed and published include annual and seasonal variation in reproduction and body condition.

The *C. boulengeri* field study is a co-production of Dwarf Tortoise Conservation and an independent South African researcher (Toby Keswick). Moreover, the study collaborates with the University of the Western Cape (South Africa; Retha Hofmeyr), Utrecht University (Netherlands; Ineke Westerhof), Van Hall Larenstein University of Applied Sciences (Netherlands; Ralf Mullers and Marcella Dobbelaar) and the Northern Cape Department of Environment and Nature Conservation (South Africa). Several organisations and individuals have generously provided funds, discounted prices, or in-kind contributions to the project:

- Knoxville Zoo (Quarters for Conservation Program)
- Turtle Conservation Fund and Conservation International
- Holohil Systems Ltd.
- Dutch-Belgian Turtle and Tortoise Society
- British Chelonia Group
- Turtle Survival Alliance Europe
- Crocodile Zoo Prague
- Pedak

- Jan Barth
- Kurt Engl
- Sheryl Gibbons
- Silja Heller
- Brian Henen
- Retha Hofmeyr
- Courtney Hundermark
- Lutz Jakob
- Johann Klutz
- Martijn Kooijman
- Matthias Kupferschmid
- Koos and Coby Loehr
- Frank van Loon
- Marcel and Lydia Reck
- Peter Sandmeier
- Uwe Seidel
- Paul van Sloun

1.6. Progress captive study Chersobius boulengeri

During the field study on *C. boulengeri* (paragraph 1.5), it became clear that the composition of the population and secretive behaviour of the species hampered collection of data on reproduction and growth. Consequently, a small-scale captive study was initiated. Two males and two females were collected and transferred to captivity in February–March 2019, and acclimated in 2019–2020. In 2023, the acclimated tortoises continued to reproduce and growth recordings of their offspring were taken. The following paper has been published until now:

Loehr, V. J. T. 2023. Acclimation, husbandry and breeding of wild-caught Karoo Dwarf Tortoises, *Chersobius boulengeri* (Duerden, 1906). Radiata 32: 4-19.

Reproductive data will be incorporated in a broad manuscript on reproduction in *C. boulengeri*, and data on growth will be published when sufficient data will have accumulated. To manage the studbook population, all individuals have been entered in a studbook (paragraph 3.1)

2. ACTION PLAN 2024 AND THEREAFTER

The table below lists results anticipated for 2024 and thereafter, with progress indicated:

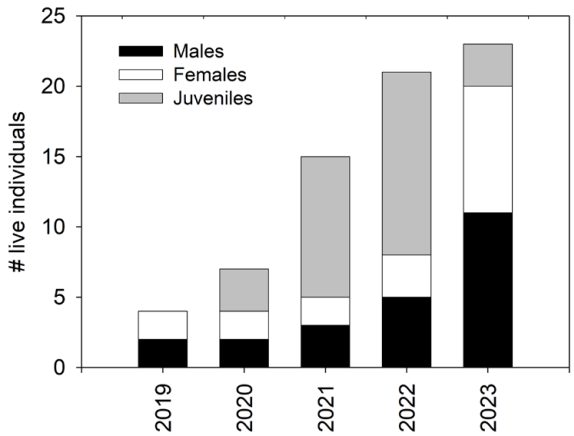
Result	Due	Current status
Manuscripts submitted on:		
• Reproduction in wild and captive *C. boulengeri;*	31-12-2024	Data available
• body condition in wild *C. boulengeri*;	31-12-2025	Data available
• growth in captive *C. boulengeri*.	31-12-2026	Data partly available
Presentations held on:		
• husbandry and breeding of *C. signatus* (Dutch-Belgian Turtle and Tortoise Society).	23-11-2024	Presentation available
Dwarf Tortoise Conservation website updated, including implementation of a forum for studbook participants	23-12-2024	Not yet started
Permit application for the collection and export of additional founders *C. signatus* submitted	15-02-2024	Not yet started
Studbook management plan *C. signatus* updated	31-12-2029	Not yet started
Studbook management plan *H. areolatus* updated	31-12-2025	Not yet started

3. STUDBOOK SUMMARIES AND BREEDING QUOTA FOR 2024

To keep the studbook registrations up to date, it is vital that all studbook participants keep the coordinators informed of any changes. In the studbooks on *C. boulengeri*, *C. signatus* and *H. femoralis*, each participant has accepted this obligation in a formal agreement between participant and Dwarf Tortoise Conservation. Regardless of the agreements, participants are generally motivated and inform the coordinators spontaneously when changes occur throughout the year. However, sometimes participants remain silent for an entire year or longer, despite repeated requests from the studbook coordinators. In order to keep track where these communication flaws occur, the annual reports include a list of unresponsive participants. This will make it easier for the reader to assess the validity of studbook information per participant and will facilitate the coordinators when approaching a silent participant. In 2023, the only unresponsive participant was Turtle Conservancy.

3.1. Chersobius boulengeri

Live specimens on 1 January 2023:
21 (no specimens lost to follow-up)
Number of participants on 1 January 2023:
4 (4 countries, including 2 zoos)
New registrations:
0
Births:
2, at 1 participant
Deaths:
0



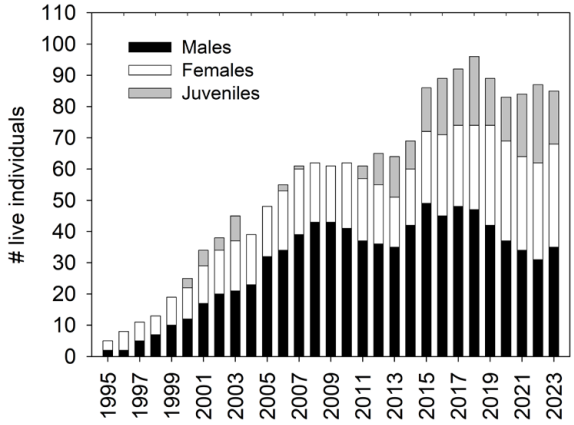
Live specimens on 31 December 2023:
23 (no specimens lost to follow-up)
Live inbred specimens on 31 December 2023:
0
Number of participants on 31 December 2023:
4 (4 countries, including 2 zoos)

The studbook population continued to grow, due to births and lack of mortality. In 2023, it became clear that incubation conditions used to produce males and females have been successful in achieving a

balanced sex ratio. Offspring was transferred among participants to spread risks and to increase sample size for recordings of growth and reproduction for future publication.

3.2. Chersobius signatus

Live specimens on 1 January 2023:
88 (excluding 21 specimens lost to follow-up)
Number of participants on 1 January 2023:
35 (11 countries, including 5 zoos)
New registrations:
0
Births:
3, at 3 participants
Deaths:
6 (1 wild-caught, 5 captive-bred), at 6 participants



Live specimens on 31 December 2023:
85 (excluding 21 specimens lost to follow-up)
Live inbred specimens on 31 December 2023:
2 (72 and 215; ancestry uncertain, possibly inbred)
Number of participants on 31 December 2023:
31 (11 countries, including 6 zoos)

The studbook population shrank slightly. One founder male collected in 2015 died from unknown causes. All other deaths were captive-bred individuals. A female that had been housed with the founder male died immediately after a transfer; it was emaciated, unable to walk, and should have received veterinary care long before. The studbook participant who had kept it was addressed. A second female died, probably from renal issues given its swollen appearance prior to death, but the cause of the issues remains unknown. During a power failure, a male died from hypothermia. Another male died from unknown causes (after post-mortem). A final male died from an infestation with hookworms and associated sepsis. The infestation was probably caused by the collection and feeding of wild herbs (e.g., dogs and cats can disperse hookworms and their eggs).

Reproduction was low, and most participants with mature breeding couples failed to produce offspring according to breeding quota. Currently, 77% of all participants (23 of 30, two more than in 2022) are keeping genetically unrelated couples. All offspring produced was in accordance with the breeding quota and thus contributed to the aims of the studbook management plan for *C. signatus*.

The draft studbook management plan includes actions to improve husbandry and breeding results, by providing participants with suitable information. A WhatsApp group has been created, novice keepers of *C. signatus* receive various documents and publications, and the Dwarf Tortoise Conservation website will be expanded with a forum for studbook participants. Furthermore, to avoid unbalanced representation of founder genes in the population, updated breeding quota were formulated for 2024 (see paragraph 1.3 for a substantiation). These quota are based on the following starting points, following the studbook management plan:

- Each founder couple should produce at least 12 (surviving, reproducing) offspring. When sufficient offspring is available, reproduction ceases until offspring dies and requires replacement.
- Couples in subsequent generations should produce at least 2 (surviving, reproducing) offspring, starting when a couple in the previous generation becomes unavailable (i.e., an individual dies and cannot be replaced). When sufficient offspring is available, reproduction ceases until offspring dies and requires replacement.
- Offspring should have an equal sex ratio.
- Participants with breeding couples that would not need to reproduce may breed a small number of offspring to develop breeding experience.

The analysis leads to the following breeding quota for 2024. In subsequent annual reports, the table will be updated based on mortality and (re)combination of breeding couples.

Breeding couple		Maximum number of offspring		
Male	Female	Males	Females	Remark
11	79	2	1	
35	181	2	2	
37	77	0	1	
41	166	2	2	
71	142	1	1	
74	96	0	0	
99	110	0	0	
100	9	2	1	
106	191	1	1	
113	118	1	1	
115	168	2	2	
119	163	0	0	
123	179	1	1	
126	174	1	1	
137	136	2	2	
145	190	1	1	
147	200	1	1	
148	171	1	1	
150	156	5	7	
152	157	7	5	
182	177	2	2	
188	169	1	1	
220	178	2	2	
222	170	2	2	
88	107	2	2	To be formed in 2024

In order to breed males and females according to the breeding quota, the following incubation instructions should be used:

Incubation for females

- Day 1–29: diurnal temperature cycle of 33°C and 28°C
- Day 30–50: constant temperature of 33°C
- Day 51–hatching: diurnal temperature cycle of 33°C and 28°C

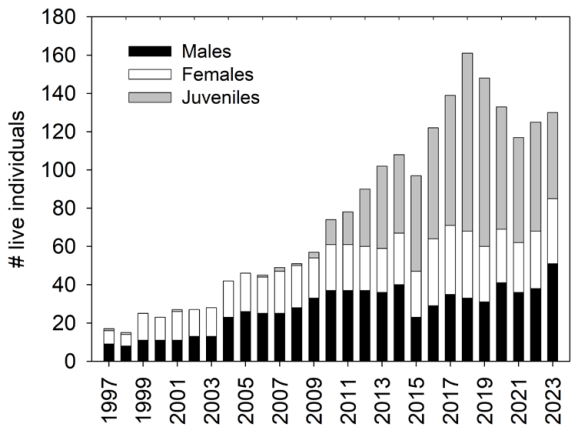
Incubation for males

- Day 1–29: diurnal temperature cycle of 33°C and 28°C
- Day 30–50: constant temperature of 30°C
- Day 51–hatching: diurnal temperature cycle of 33°C and 28°C

All temperatures should be measured with a calibrated thermometer at the incubation spot(s).

3.3. *Homopus areolatus*

Live specimens on 1 January 2023:
124 (excluding 124 specimens lost to follow-up)
Number of participants on 1 January 2023:
22 (9 countries, including 1 zoo)
New registrations:
0
Births:
15, at 3 participants
Deaths:
5, at 5 participants (all captive-bred)



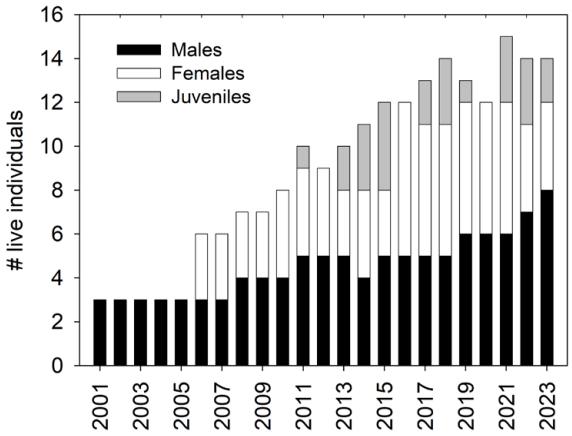
Live specimens on 31 December 2023:
129 (excluding 130 specimens lost to follow-up)
Live inbred specimens on 31 December 2023:
≥13 (studbook numbers 322, 323, 325, 336, 360, 361, 362, 363, 364, 328, 350, 351, 352, and possibly 346)
Number of participants on 31 December 2023:
26 (11 countries, including 2 zoos)

The studbook population grew slightly, due to relatively high reproduction compared to mortality, and despite several tortoises being lost for the studbook (i.e., transferred to keepers outside the studbook). Unfortunately, a third of all births resulted from inbreeding. One female died from a *Mycoplasma* infection, after veterinary treatment. The collection where this tortoise originated from, and the collections of two other studbook participants, tested negative. Thus, the studbook appears to contain one collection (currently one *H. areolatus*, and no other dwarf tortoises) with *Mycoplasma*. Transfers from this collection will require prior testing and extensive quarantine to avoid distribution of the pathogen. A female at another participant's had metabolic issues, possibly due to renal issues, and a female died from pneumonia (indicated through a post-mortem examination). The remaining deaths had unknown causes.

Paragraph 1.4 interprets population changes in light of the studbook management plan for *H. areolatus*, and contains recommendations for participants.

3.4. Homopus femoralis

Live specimens on 1 January 2023:
14 (including 2 specimens lost to follow-up)
Number of participants on 1 January 2023:
7 (6 countries, including 1 zoo)
New registrations:
0
Births:
1
Deaths:
1 (captive-bred)



Live specimens on 31 December 2023:
14 (excluding 2 specimens lost to follow-up)
Live inbred specimens on 31 December 2023:
4 (studbook numbers 22, 23, 24 and 25)
Number of participants on 31 December 2023:
7 (6 countries, including 1 zoo)

Besides one death (male with a phallus prolapse and associated dehydration, shock and circulatory system failure) and one birth (first reproduction by this participant), the studbook population remained unchanged. Currently, three mature breeding couples (and a fourth to be formed in 2024) may produce future offspring.

4. ACTUAL STUDBOOK OVERVIEWS

The tables below give an overview of all live tortoises that are available in the studbooks on *C. boulengeri*, *C. signatus*, *H. areolatus* and *H. femoralis*. The tables do not include dead tortoises and tortoises lost for the studbook. Full overviews of all tortoises registered in the studbooks may be downloaded from the website.

Chersobius boulengeri: live and available studbook population.

Keeper	Studbook number	Sex	Mother	Father	Date	Event	Keeper	Owner
Basel Zoo	10	Male	3	1	17-04-2023	Transfer	18225	Dwarf Tortoise Conservation
					15-04-2023	Transfer	1392	Dwarf Tortoise Conservation
					18-07-2022	Transfer	14121	Dwarf Tortoise Conservation
					09-01-2021	Hatch - birth	1392	Dwarf Tortoise Conservation
	13	Female	3	1	22-02-2022	Transfer	18225	Dwarf Tortoise Conservation
					25-05-2021	Hatch - birth	1392	Dwarf Tortoise Conservation
	14	Male	4	2	22-02-2022	Transfer	18225	Dwarf Tortoise Conservation
					20-06-2021	Hatch - birth	1392	Dwarf Tortoise Conservation
	15	Male	4	2	22-02-2022	Transfer	18225	Dwarf Tortoise Conservation
					14-08-2021	Hatch - birth	1392	Dwarf Tortoise Conservation
	18	Female	4	2	17-04-2023	Transfer	18225	Dwarf Tortoise Conservation
					08-02-2022	Hatch - birth	1392	Dwarf Tortoise Conservation
	19	Male	4	2	17-04-2023	Transfer	18225	Dwarf Tortoise Conservation
					15-04-2023	Transfer	1392	Dwarf Tortoise Conservation
					18-07-2022	Transfer	14121	Dwarf Tortoise Conservation
					30-04-2022	Hatch - birth	1392	Dwarf Tortoise Conservation
	21	Male	3	1	17-04-2023	Transfer	18225	Dwarf Tortoise Conservation
					19-08-2022	Hatch - birth	1392	Dwarf Tortoise Conservation
	22	Unknown	3	1	17-04-2023	Transfer	18225	Dwarf Tortoise Conservation
					31-12-2022	Hatch - birth	1392	Dwarf Tortoise Conservation
Crocodile Zoo Prague	5	Male	4	2|7	05-09-2022	Transfer	17756	Dwarf Tortoise Conservation
					01-08-2020	Hatch - birth	1392	Dwarf Tortoise Conservation
	9	Female	4	2	05-09-2022	Transfer	17756	Dwarf Tortoise Conservation
					02-01-2021	Hatch - birth	1392	Dwarf Tortoise Conservation
	16	Female	3	1	05-09-2022	Transfer	17756	Dwarf Tortoise Conservation
					15-12-2021	Hatch - birth	1392	Dwarf Tortoise Conservation
	17	Male	3	1	05-09-2022	Transfer	17756	Dwarf Tortoise Conservation
					15-01-2022	Hatch - birth	1392	Dwarf Tortoise Conservation
14121	6	Female	4	2|7	17-07-2021	Transfer	14121	Dwarf Tortoise Conservation
					19-08-2020	Hatch - birth	1392	Dwarf Tortoise Conservation
	8	Male	3	1	17-07-2021	Transfer	14121	Dwarf Tortoise Conservation
					11-12-2020	Hatch - birth	1392	Dwarf Tortoise Conservation
	11	Female	4	2	17-07-2021	Transfer	14121	Dwarf Tortoise Conservation
					08-02-2021	Hatch - birth	1392	Dwarf Tortoise Conservation
	12	Female	3	1	17-07-2021	Transfer	14121	Dwarf Tortoise Conservation
					15-02-2021	Hatch - birth	1392	Dwarf Tortoise Conservation
1392	1	Male			23-03-2019	Transfer	1392	Dwarf Tortoise Conservation
					~01-01-1900	Hatch - birth	Wild	Wild
	2	Male			23-03-2019	Transfer	1392	Dwarf Tortoise Conservation
					~01-01-1900	Hatch - birth	Wild	Wild
	3	Female			23-03-2019	Transfer	1392	Dwarf Tortoise Conservation
					~01-01-1900	Hatch - birth	Wild	Wild
	4	Female			23-03-2019	Transfer	1392	Dwarf Tortoise Conservation
					~01-01-1900	Hatch - birth	Wild	Wild
	20	Male	3	1	22-07-2022	Hatch - birth	1392	Dwarf Tortoise Conservation
	23	Unknown	4	2	03-07-2023	Hatch - birth	1392	Dwarf Tortoise Conservation
	24	Unknown	4	2	08-08-2023	Hatch - birth	1392	Dwarf Tortoise Conservation

Chersobius signatus: live and available studbook population.

Keeper	Studbook number	Sex	Mother	Father	Date	Event	Keeper	Owner
Amsterdam Zoo	11	Male	3	1	25-02-2022	Transfer	14237	Dwarf Tortoise Conservation
					23-10-2016	Transfer	14204	Dwarf Tortoise Conservation
					14-03-2015	Transfer	14221	Dwarf Tortoise Conservation
					16-09-2000	Transfer	14161	Dwarf Tortoise Conservation
					05-07-2000	Transfer	14120	Dwarf Tortoise Conservation
					22-11-1998	Transfer	14119	Dwarf Tortoise Conservation

Keeper	Studbook number	Sex	Mother	Father	Date	Event	Keeper	Owner
					10-11-1997	Hatch - birth	1392	Dwarf Tortoise Conservation
	79	Female	38	37	03-02-2022	Transfer	14237	Dwarf Tortoise Conservation
					17-05-2016	Transfer	14217	Dwarf Tortoise Conservation
					05-11-2009	Transfer	14195	Dwarf Tortoise Conservation
					09-08-2006	Hatch - birth	1392	Dwarf Tortoise Conservation
	194	Female	149	11	25-02-2022	Transfer	14237	Dwarf Tortoise Conservation
					25-07-2019	Hatch - birth	14204	Dwarf Tortoise Conservation
Crocodile Zoo Prague	132	Male	36	35	13-03-2023	Transfer	17756	Dwarf Tortoise Conservation
					11-04-2015	Transfer	1103	Dwarf Tortoise Conservation
					~23-10-2013	Hatch - birth	14121	Dwarf Tortoise Conservation
Heidelberg Zoo	215	Unknown	118	72	10-08-2023	Transfer	18531	Dwarf Tortoise Conservation
					02-09-2021	Hatch - birth	14242	Dwarf Tortoise Conservation
Plzen Zoo	136	Female	9	37	27-09-2016	Transfer	14238	Dwarf Tortoise Conservation
					02-09-2014	Hatch - birth	1392	Dwarf Tortoise Conservation
	137	Male	36	35	25-12-2020	Transfer	14238	Dwarf Tortoise Conservation
					08-04-2016	Transfer	1268	Dwarf Tortoise Conservation
					21-06-2014	Hatch - birth	14121	Dwarf Tortoise Conservation
	219	Unknown	136	137	03-05-2022	Hatch - birth	14238	Dwarf Tortoise Conservation
	225	Unknown	136	137	02-06-2022	Hatch - birth	14238	Dwarf Tortoise Conservation
	229	Unknown	136	137	14-09-2023	Hatch - birth	14238	Dwarf Tortoise Conservation
Wroclaw Zoo	119	Male	7	44	19-05-2018	Transfer	14241	Dwarf Tortoise Conservation
					08-09-2012	Transfer	14222	Dwarf Tortoise Conservation
					~20-04-2011	Hatch - birth	14121	Dwarf Tortoise Conservation
	126	Male	9	37	12-08-2022	Transfer	14241	Dwarf Tortoise Conservation
					13-06-2015	Transfer	14136	Dwarf Tortoise Conservation
					16-08-2012	Hatch - birth	1392	Dwarf Tortoise Conservation
	163	Female	96	74	30-06-2022	Transfer	14241	Dwarf Tortoise Conservation
					10-08-2016	Hatch - birth	14222	Dwarf Tortoise Conservation
	174	Female	36	35	14-07-2022	Transfer	14241	Dwarf Tortoise Conservation
					31-08-2017	Hatch - birth	14191	Dwarf Tortoise Conservation
Wuppertal Zoo	72	Male	9|38	13|37	03-09-2018	Transfer	14242	Dwarf Tortoise Conservation
					17-10-2009	Transfer	14203	Dwarf Tortoise Conservation
					24-07-2005	Hatch - birth	1392	Dwarf Tortoise Conservation
	113	Male	38	37	~01-07-2022	Transfer	14242	Dwarf Tortoise Conservation
					03-12-2011	Transfer	14197	Dwarf Tortoise Conservation
					16-06-2010	Hatch - birth	1392	Dwarf Tortoise Conservation
	118	Female	7	44	06-05-2018	Transfer	14242	Dwarf Tortoise Conservation
					22-02-2012	Transfer	14217	Dwarf Tortoise Conservation
					22-01-2012	Transfer	14121	Dwarf Tortoise Conservation
					10-11-2011	Transfer	14196	Dwarf Tortoise Conservation
					01-05-2010	Hatch - birth	14121	Dwarf Tortoise Conservation
18267	123	Male	38	37	06-10-2023	Transfer	18267	Dwarf Tortoise Conservation
					13-12-2014	Transfer	14228	Dwarf Tortoise Conservation
					24-06-2012	Hatch - birth	1392	Dwarf Tortoise Conservation
	179	Female	107	14	06-10-2023	Transfer	18267	Dwarf Tortoise Conservation
					19-09-2021	Transfer	14228	Dwarf Tortoise Conservation
					15-12-2017	Hatch - birth	14133	Dwarf Tortoise Conservation
	210	Unknown	107	14	10-06-2022	Transfer	18267	Dwarf Tortoise Conservation
					06-06-2021	Hatch - birth	14133	Dwarf Tortoise Conservation
18169	196	Female	96	74	17-10-2021	Transfer	18169	Dwarf Tortoise Conservation
					24-04-2019	Hatch - birth	14222	Dwarf Tortoise Conservation
18476	213	Male	96	74	31-08-2023	Transfer	18476	Dwarf Tortoise Conservation
					23-06-2021	Hatch - birth	14222	Dwarf Tortoise Conservation
	221	Unknown	96	74	31-08-2023	Transfer	18476	Dwarf Tortoise Conservation
					02-06-2022	Hatch - birth	14222	Dwarf Tortoise Conservation
18121	71	Male	7	44	09-09-2023	Transfer	18121	Dwarf Tortoise Conservation
					10-03-2012	Transfer	14216	Dwarf Tortoise Conservation
					22-01-2012	Transfer	14121	Dwarf Tortoise Conservation
					06-05-2008	Transfer	14196	Dwarf Tortoise Conservation
					25-06-2005	Hatch - birth	14121	Dwarf Tortoise Conservation
	142	Female	38	37	09-09-2023	Transfer	18121	Dwarf Tortoise Conservation
					19-01-2018	Transfer	14203	Dwarf Tortoise Conservation
					15-05-2015	Hatch - birth	1392	Dwarf Tortoise Conservation
	203	Unknown	96	74	04-06-2022	Transfer	18121	Dwarf Tortoise Conservation
					16-09-2020	Hatch - birth	14222	Dwarf Tortoise Conservation
18167	145	Male	36	35	09-05-2022	Transfer	18167	Dwarf Tortoise Conservation
					10-09-2016	Transfer	14143	Dwarf Tortoise Conservation
					20-06-2015	Hatch - birth	14121	Dwarf Tortoise Conservation

Keeper	Studbook number	Sex	Mother	Father	Date	Event	Keeper	Owner
	190	Female	158	153	09-09-2023	Transfer	18167	Dwarf Tortoise Conservation
					06-06-2018	Hatch - birth	14121	Dwarf Tortoise Conservation
18294	106	Male	36	35	22-06-2022	Transfer	18294	Dwarf Tortoise Conservation
					09-10-2018	Transfer	14153	Dwarf Tortoise Conservation
					19-01-2016	Transfer	14218	Dwarf Tortoise Conservation
					13-03-2010	Transfer	14205	Dwarf Tortoise Conservation
					20-05-2009	Hatch - birth	14120	Dwarf Tortoise Conservation
	191	Female	158	153	09-09-2023	Transfer	18294	Dwarf Tortoise Conservation
					21-08-2018	Hatch - birth	14121	Dwarf Tortoise Conservation
18245	74	Male	3	1	09-09-2023	Transfer	18245	Dwarf Tortoise Conservation
					12-03-2016	Transfer	14222	Dwarf Tortoise Conservation
					24-03-2007	Transfer	1276	Dwarf Tortoise Conservation
					31-07-2005	Hatch - birth	14170	Dwarf Tortoise Conservation
	96	Female	36	35	09-09-2023	Transfer	18245	Dwarf Tortoise Conservation
					12-03-2016	Transfer	14222	Dwarf Tortoise Conservation
					12-09-2009	Transfer	1276	Dwarf Tortoise Conservation
					10-05-2009	Transfer	14202	Dwarf Tortoise Conservation
					13-04-2008	Transfer	14190	Dwarf Tortoise Conservation
					30-07-2007	Hatch - birth	14120	Dwarf Tortoise Conservation
	207	Female	107	14	17-04-2022	Transfer	18245	Dwarf Tortoise Conservation
					13-05-2021	Hatch - birth	14133	Dwarf Tortoise Conservation
14159	212	Female	107	14	10-06-2022	Transfer	14159	Dwarf Tortoise Conservation
					17-07-2021	Hatch - birth	14133	Dwarf Tortoise Conservation
14116	115	Male	9	37	24-10-2019	Transfer	14116	Dwarf Tortoise Conservation
					06-11-2012	Transfer	14237	Dwarf Tortoise Conservation
					06-07-2011	Hatch - birth	1392	Dwarf Tortoise Conservation
	168	Female	36	35	20-04-2018	Transfer	14116	Dwarf Tortoise Conservation
					18-09-2016	Hatch - birth	14121	Dwarf Tortoise Conservation
	217	Unknown	168	115	16-05-2022	Hatch - birth	14116	Dwarf Tortoise Conservation
	227	Unknown	168	115	07-08-2023	Hatch - birth	14116	Dwarf Tortoise Conservation
14214	9	Female	2	1	06-09-2020	Transfer	14214	Dwarf Tortoise Conservation
					15-05-2014	Transfer	14206	Dwarf Tortoise Conservation
					30-11-1996	Hatch - birth	1392	Dwarf Tortoise Conservation
	100	Male	38	37	06-09-2020	Transfer	14214	Dwarf Tortoise Conservation
					05-06-2010	Transfer	14206	Dwarf Tortoise Conservation
					24-06-2008	Hatch - birth	1392	Dwarf Tortoise Conservation
	138	Female	36	35	22-08-2020	Transfer	14214	Dwarf Tortoise Conservation
					15-04-2016	Transfer	14127	Dwarf Tortoise Conservation
					22-08-2014	Hatch - birth	14121	Dwarf Tortoise Conservation
14121	178	Female	158	153	11-11-2017	Hatch - birth	14121	Dwarf Tortoise Conservation
	220	Male	156	150	11-06-2023	Transfer	14121	Dwarf Tortoise Conservation
					05-06-2022	Hatch - birth	1392	Dwarf Tortoise Conservation
14134	99	Male	38	37	14-09-2019	Transfer	14134	Dwarf Tortoise Conservation
					05-06-2010	Transfer	14206	Dwarf Tortoise Conservation
					21-05-2008	Hatch - birth	1392	Dwarf Tortoise Conservation
	110	Female	7	44	03-05-2015	Transfer	14134	Dwarf Tortoise Conservation
					22-02-2012	Transfer	14219	Dwarf Tortoise Conservation
					22-01-2012	Transfer	14121	Dwarf Tortoise Conservation
					10-11-2011	Transfer	14196	Dwarf Tortoise Conservation
					23-03-2010	Hatch - birth	14121	Dwarf Tortoise Conservation
	214	Unknown	110	99	01-09-2021	Hatch - birth	14134	Dwarf Tortoise Conservation
	218	Unknown	110	99	22-05-2022	Hatch - birth	14134	Dwarf Tortoise Conservation
	224	Unknown	110	99	07-11-2022	Hatch - birth	14134	Dwarf Tortoise Conservation
	228	Unknown	110	99	20-07-2023	Hatch - birth	14134	Dwarf Tortoise Conservation
14217	35	Male			25-07-2021	Transfer	14217	Dwarf Tortoise Conservation
					16-07-2016	Transfer	14191	Dwarf Tortoise Conservation
					26-10-2012	Transfer	14121	Dwarf Tortoise Conservation
					16-12-2001	Transfer	14120	Dwarf Tortoise Conservation
					06-10-2001	Transfer	1392	Dwarf Tortoise Conservation
					~01-01-1900	Hatch - birth	Wild	Wild
	181	Female	79	10	01-05-2018	Hatch - birth	14217	Dwarf Tortoise Conservation
	189	Male	79	10	28-10-2018	Hatch - birth	14217	Dwarf Tortoise Conservation
	198	Male	79	10	21-04-2019	Hatch - birth	14217	Dwarf Tortoise Conservation
	202	Male	79	10	13-06-2020	Hatch - birth	14217	Dwarf Tortoise Conservation
14125	94	Male	7	44	08-03-2014	Transfer	14125	Dwarf Tortoise Conservation
					18-03-2013	Transfer	14229	Dwarf Tortoise Conservation
					10-03-2012	Transfer	14220	Dwarf Tortoise Conservation
					27-08-2007	Hatch - birth	14121	Dwarf Tortoise Conservation

Keeper	Studbook number	Sex	Mother	Father	Date	Event	Keeper	Owner
	177	Female	158	153	14-12-2019	Transfer	14125	Dwarf Tortoise Conservation
					18-08-2017	Hatch - birth	14121	Dwarf Tortoise Conservation
	182	Male	156	151	14-12-2019	Transfer	14125	Dwarf Tortoise Conservation
					12-04-2018	Hatch - birth	1276	Dwarf Tortoise Conservation
14201	37	Male			17-04-2016	Transfer	14201	Dwarf Tortoise Conservation
					12-06-2004	Transfer	1392	Dwarf Tortoise Conservation
					06-10-2001	Transfer	14170	Dwarf Tortoise Conservation
					~01-01-1900	Hatch - birth	Wild	Wild
	77	Female	7	44	08-03-2022	Transfer	14201	Dwarf Tortoise Conservation
					02-05-2014	Transfer	14237	Dwarf Tortoise Conservation
					14-08-2010	Transfer	14201	Dwarf Tortoise Conservation
					13-07-2006	Hatch - birth	14121	Dwarf Tortoise Conservation
	216	Unknown	170	71	10-09-2023	Transfer	14201	Dwarf Tortoise Conservation
					~21-06-2022	Hatch - birth	14216	Dwarf Tortoise Conservation
14231	88	Male	60	25	11-03-2017	Transfer	14231	Dwarf Tortoise Conservation
					17-03-2014	Transfer	14201	Dwarf Tortoise Conservation
					24-11-2011	Transfer	14180	Dwarf Tortoise Conservation
					30-08-2010	Transfer	14207	Dwarf Tortoise Conservation
					~15-11-2005	Hatch - birth	14178	Dwarf Tortoise Conservation
	226	Unknown	139	88	22-03-2022	Hatch - birth	14231	Dwarf Tortoise Conservation
14154	148	Male	36	35	03-04-2018	Transfer	14154	Dwarf Tortoise Conservation
					16-09-2015	Hatch - birth	14121	Dwarf Tortoise Conservation
	171	Female	42	73	14-09-2019	Transfer	14154	Dwarf Tortoise Conservation
					01-08-2017	Hatch - birth	14139	Dwarf Tortoise Conservation
14222	170	Female	158	153	09-09-2023	Transfer	14222	Dwarf Tortoise Conservation
					08-09-2019	Transfer	14216	Dwarf Tortoise Conservation
					21-09-2016	Hatch - birth	14121	Dwarf Tortoise Conservation
	222	Male	156	150	09-09-2023	Transfer	14222	Dwarf Tortoise Conservation
					17-07-2022	Hatch - birth	1392	Dwarf Tortoise Conservation
	223	Unknown	96	74	03-11-2022	Hatch - birth	14222	Dwarf Tortoise Conservation
14137	124	Male	9	37	12-09-2015	Transfer	14137	Dwarf Tortoise Conservation
					30-06-2012	Hatch - birth	1392	Dwarf Tortoise Conservation
14139	125	Male	96	74	31-01-2016	Transfer	14139	Dwarf Tortoise Conservation
					25-08-2015	Transfer	1276	Dwarf Tortoise Conservation
					01-03-2013	Transfer	1199	Dwarf Tortoise Conservation
					07-07-2012	Hatch - birth	1276	Dwarf Tortoise Conservation
	169	Female	36	35	30-10-2021	Transfer	14139	Dwarf Tortoise Conservation
					~27-04-2018	Transfer	14121	Dwarf Tortoise Conservation
					20-04-2018	Transfer	14152	Dwarf Tortoise Conservation
					07-09-2016	Hatch - birth	14121	Dwarf Tortoise Conservation
	188	Male	42	73	16-10-2018	Hatch - birth	14139	Dwarf Tortoise Conservation
14183	41	Male	3	1	22-01-2010	Transfer	14183	Dwarf Tortoise Conservation
					12-10-2009	Transfer	14198	Dwarf Tortoise Conservation
					19-04-2003	Transfer	1277	Dwarf Tortoise Conservation
					25-07-2002	Hatch - birth	1392	Dwarf Tortoise Conservation
	166	Female	36	35	01-04-2018	Transfer	14183	Dwarf Tortoise Conservation
					07-06-2016	Hatch - birth	14121	Dwarf Tortoise Conservation
14133	107	Female	36	35	11-03-2017	Transfer	14133	Dwarf Tortoise Conservation
					12-03-2016	Transfer	14231	Dwarf Tortoise Conservation
					08-03-2014	Transfer	14197	Dwarf Tortoise Conservation
					13-03-2010	Transfer	14205	Dwarf Tortoise Conservation
					21-07-2009	Hatch - birth	14120	Dwarf Tortoise Conservation
	186	Female	107	14	12-08-2018	Hatch - birth	14133	Dwarf Tortoise Conservation
	209	Male	107	14	02-07-2021	Hatch - birth	14133	Dwarf Tortoise Conservation
1776	147	Male	36	35	10-09-2016	Transfer	1776	Dwarf Tortoise Conservation
					28-08-2015	Hatch - birth	14121	Dwarf Tortoise Conservation
	200	Female	9	100	12-09-2020	Transfer	1776	Dwarf Tortoise Conservation
					01-08-2020	Hatch - birth	14206	Dwarf Tortoise Conservation
14197	152	Male			23-09-2015	Transfer	14197	Dwarf Tortoise Conservation
					22-09-2015	Transfer	1392	Dwarf Tortoise Conservation
					~01-01-1900	Hatch - birth	Wild	Wild
	157	Female			23-09-2015	Transfer	14197	Dwarf Tortoise Conservation
					22-09-2015	Transfer	1392	Dwarf Tortoise Conservation
					~01-01-1900	Hatch - birth	Wild	Wild
	172	Female	157	152	01-08-2017	Hatch - birth	14197	Dwarf Tortoise Conservation
	183	Female	157	152	30-06-2018	Hatch - birth	14197	Dwarf Tortoise Conservation
	201	Unknown	157	152	31-08-2020	Hatch - birth	14197	Dwarf Tortoise Conservation
1392	150	Male			30-03-2018	Transfer	1392	Dwarf Tortoise Conservation

Keeper	Studbook number	Sex	Mother	Father	Date	Event	Keeper	Owner
					23-09-2015	Transfer	14195	Dwarf Tortoise Conservation
					22-09-2015	Transfer	1392	Dwarf Tortoise Conservation
					~01-01-1900	Hatch - birth	Wild	Wild
	156	Female			09-06-2020	Transfer	1392	Dwarf Tortoise Conservation
					23-09-2015	Transfer	1276	Dwarf Tortoise Conservation
					22-09-2015	Transfer	1392	Dwarf Tortoise Conservation
					~01-01-1900	Hatch - birth	Wild	Wild

Homopus areolatus: live and available studbook population.

Keeper	Studbook number	Sex	Mother	Father	Date	Event	Keeper	Owner
Crocodile Zoo Prague	273	Male	128	234	11-08-2020	Transfer	17756	17756
					20-06-2020	Transfer	17691	17691
					31-08-2019	Transfer	14145	14145
					02-06-2019	Hatch - birth	14236	14236
	274	Male	129	234	20-08-2020	Transfer	17756	17756
					20-06-2020	Transfer	17691	17691
					31-08-2019	Transfer	14145	14145
					05-06-2019	Hatch - birth	14236	14236
Turtle Conservancy	207	Female	11	10	11-04-2016	Hatch - birth	14439	14439
	209	Male	11	10	15-05-2016	Hatch - birth	14439	14439
	236	Male	11	10	04-04-2017	Hatch - birth	14439	14439
	328	Unknown	207	209	20-08-2021	Hatch - birth	14439	14439
	350	Unknown	207	209	20-08-2022	Hatch - birth	14439	14439
	351	Unknown	207	209	20-08-2022	Hatch - birth	14439	14439
	352	Unknown	207	209	20-08-2022	Hatch - birth	14439	14439
18267	239	Male	128	234	10-06-2023	Transfer	18267	18267
					09-06-2023	Transfer	1368	1368
					24-06-2018	Transfer	14145	14145
					16-03-2018	Hatch - birth	14236	14236
17255	242	Male	59|60	58	14-12-2019	Transfer	17255	17255
					12-12-2019	Transfer	14236	14236
					27-01-2018	Hatch - birth	14187	14187
	243	Male	59|60	58	14-12-2019	Transfer	17255	17255
					12-12-2019	Transfer	14236	14236
					28-01-2018	Hatch - birth	14187	14187
18015	278	Female	59|60	58	15-10-2022	Transfer	18015	18015
					15-12-2019	Transfer	17355	17355
					12-12-2019	Transfer	14236	14236
					01-02-2019	Hatch - birth	14187	14187
	309	Male	145	174	12-06-2021	Transfer	18015	18015
					24-02-2021	Hatch - birth	14122	14122
18159	96	Male	59|60	58	12-06-2021	Transfer	18159	18159
					~13-07-2013	Transfer	14122	14122
					~01-06-2012	Transfer	14194	14187
					~18-01-2010	Hatch - birth	14187	14187
18167	138	Male	59|60	58	31-05-2021	Transfer	18167	18167
					19-03-2017	Transfer	14122	14122
					~01-09-2016	Transfer	14236	14187
					~27-01-2013	Hatch - birth	14187	14187
18527	241	Male	128	234	10-06-2023	Transfer	18527	18527
					09-06-2023	Transfer	1368	1368
					09-09-2018	Transfer	14145	14145
					26-04-2018	Hatch - birth	14236	14236
18270	162	Male	59|60	58	04-10-2023	Transfer	18270	18270
					09-06-2023	Transfer	1368	1368
					09-09-2018	Transfer	14145	14145
					11-06-2018	Transfer	14236	14187
					29-01-2014	Hatch - birth	14187	14187
	330	Female	349	348	17-12-2022	Transfer	18270	18270
					~01-01-2017	Hatch - birth	1343	1343
	340	Male	349	348	17-12-2022	Transfer	18270	18270
					~01-01-2017	Hatch - birth	1343	1343
	341	Male	349	348	17-12-2022	Transfer	18270	18270
					~01-01-2017	Hatch - birth	1343	1343
	342	Female	349	348	17-12-2022	Transfer	18270	18270
					~01-01-2017	Hatch - birth	1343	1343

Keeper	Studbook number	Sex	Mother	Father	Date	Event	Keeper	Owner
	343	Female	349	348	17-12-2022	Transfer	18270	18270
					~01-01-2017	Hatch - birth	1343	1343
	344	Female	349	348	17-12-2022	Transfer	18270	18270
					~01-01-2017	Hatch - birth	1343	1343
	345	Female	349	348	17-12-2022	Transfer	18270	18270
					~01-01-2017	Hatch - birth	1343	1343
18431	270	Unknown	128	234	27-03-2023	Transfer	18431	18431
					31-05-2019	Transfer	14145	14145
					06-05-2019	Hatch - birth	14236	14236
	271	Unknown	128	234	27-03-2023	Transfer	18431	18431
					31-05-2019	Transfer	14145	14145
					26-04-2019	Hatch - birth	14236	14236
18465	251	Male	129	234	24-08-2023	Transfer	18465	18465
					09-09-2018	Transfer	14145	14145
					20-06-2018	Hatch - birth	14236	14236
14187	58	Male			09-09-1997	Transfer	14187	14187
					~01-01-1900	Hatch - birth	Wild	Wild
	59	Female			09-09-1997	Transfer	14187	14187
					~01-01-1900	Hatch - birth	Wild	Wild
	60	Female			25-03-1999	Transfer	14187	14187
					~01-01-1900	Hatch - birth	Wild	Wild
	277	Male	59|60	58	01-02-2019	Hatch - birth	14187	14187
	279	Male	59|60	58	01-02-2019	Hatch - birth	14187	14187
	280	Female	59|60	58	01-02-2019	Hatch - birth	14187	14187
	302	Unknown	59|60	58	14-01-2021	Hatch - birth	14187	14187
	303	Unknown	59|60	58	20-01-2021	Hatch - birth	14187	14187
	304	Unknown	59|60	58	22-01-2021	Hatch - birth	14187	14187
	305	Unknown	59|60	58	25-01-2021	Hatch - birth	14187	14187
	306	Unknown	59|60	58	25-01-2021	Hatch - birth	14187	14187
	307	Unknown	59|60	58	13-02-2021	Hatch - birth	14187	14187
	308	Unknown	59|60	58	13-01-2021	Hatch - birth	14187	14187
	331	Unknown	59|60	58	09-02-2022	Hatch - birth	14187	14187
	332	Unknown	59|60	58	21-02-2022	Hatch - birth	14187	14187
	333	Unknown	59|60	58	21-02-2022	Hatch - birth	14187	14187
	334	Unknown	59|60	58	22-02-2022	Hatch - birth	14187	14187
	335	Unknown	59|60	58	09-03-2022	Hatch - birth	14187	14187
	353	Unknown	59|60	58	04-02-2023	Hatch - birth	14187	14187
	354	Unknown	59|60	58	04-02-2023	Hatch - birth	14187	14187
	355	Unknown	59|60	58	05-02-2023	Hatch - birth	14187	14187
	356	Unknown	59|60	58	05-02-2023	Hatch - birth	14187	14187
	357	Unknown	59|60	58	05-02-2023	Hatch - birth	14187	14187
	358	Unknown	59|60	58	06-02-2023	Hatch - birth	14187	14187
	359	Unknown	59|60	58	28-02-2023	Hatch - birth	14187	14187
1268	317	Male	62	94	06-12-2020	Transfer	1268	1268
					30-07-2020	Hatch - birth	14121	14121
14159	128	Female	59|60	58	09-03-2019	Transfer	14159	14159
					01-09-2016	Transfer	14236	14187
					03-02-2012	Hatch - birth	14187	14187
	175	Female	24	22	03-10-2020	Transfer	14159	14159
					24-09-2016	Transfer	14225	14225
					15-01-2015	Hatch - birth	14178	14178
	228	Male	62	94	13-06-2021	Transfer	14159	14159
					08-09-2018	Transfer	14122	14122
					13-07-2017	Hatch - birth	14121	14121
	269	Male	17	16	23-01-2019	Transfer	14159	14159
					~01-01-1900	Hatch - birth	14161	14161
	301	Female	300	299	03-10-2020	Transfer	14159	14159
					~16-03-2014	Transfer	14225	14225
					15-03-2014	Hatch - birth	14224	14224
	337	Unknown	128	228	26-02-2022	Hatch - birth	14159	14159
	365	Unknown	175	228	26-08-2023	Hatch - birth	14159	14159
	366	Unknown	128	228	06-09-2023	Hatch - birth	14159	14159
	367	Unknown	128	228	06-09-2023	Hatch - birth	14159	14159
14155	253	Female	129	234	21-10-2018	Transfer	14155	14155
					21-08-2018	Hatch - birth	14236	14236
	254	Female	129	234	21-10-2018	Transfer	14155	14155
					22-08-2018	Hatch - birth	14236	14236
14149	292	Male	128	234	27-01-2023	Transfer	14149	14149

Keeper	Studbook number	Sex	Mother	Father	Date	Event	Keeper	Owner
					11-06-2022	Transfer	18321	18321
					12-06-2021	Transfer	18015	18015
					22-07-2019	Hatch - birth	14159	14159
14121	40	Male			25-02-2022	Transfer	14121	Dwarf Tortoise Conservation
					06-02-2018	Transfer	14204	Dwarf Tortoise Conservation
					18-01-2018	Transfer	14242	Dwarf Tortoise Conservation
					28-03-1991	Transfer	14242	14242
					~01-01-1900	Hatch - birth	Wild	Wild
	62	Female	4	5	25-07-2014	Transfer	14121	Dwarf Tortoise Conservation
					27-03-2011	Transfer	14185	Dwarf Tortoise Conservation
					~25-11-2007	Hatch - birth	14121	Dwarf Tortoise Conservation
	94	Male	17	16	~25-07-2014	Transfer	14121	14121
					05-06-2010	Transfer	14185	14185
					07-07-2009	Hatch - birth	14161	14161
	186	Female	62	94	15-09-2015	Hatch - birth	14121	14121
	223	Female			~11-10-2017	Transfer	14121	1177
					01-01-1900	Hatch - birth	Wild	Wild
	229	Female	62	94	15-07-2017	Hatch - birth	14121	14121
	256	Male	62	94	11-06-2018	Hatch - birth	14121	14121
	259	Male	62	94	17-08-2018	Hatch - birth	14121	Dwarf Tortoise Conservation
	261	Male	62	94	01-10-2018	Hatch - birth	14121	14121
	262	Male	62	94	28-08-2018	Hatch - birth	14121	14121
	290	Male	62	94	06-06-2019	Hatch - birth	14121	Dwarf Tortoise Conservation
	291	Male	62	94	06-06-2019	Hatch - birth	14121	14121
	321	Unknown	62	94	14-06-2021	Hatch - birth	14121	Dwarf Tortoise Conservation
	322	Unknown	186|201	126	29-05-2021	Hatch - birth	14121	14121
	325	Unknown	186|201	126	18-07-2021	Hatch - birth	14121	14121
	327	Unknown	186|201	126	19-08-2021	Hatch - birth	14121	14121
14145	136	Female	59|60	58	01-10-2017	Transfer	14145	14145
					01-09-2016	Transfer	14236	14187
					~18-01-2013	Hatch - birth	14187	14187
	165	Female	59|60	58	09-09-2018	Transfer	14145	14145
					11-06-2018	Transfer	14236	14187
					20-02-2014	Hatch - birth	14187	14187
	169	Female	59|60	58	09-09-2018	Transfer	14145	14145
					11-06-2018	Transfer	14236	14187
					13-02-2015	Hatch - birth	14187	14187
	170	Female	59|60	58	09-09-2018	Transfer	14145	14145
					11-06-2018	Transfer	14236	14187
					20-02-2015	Hatch - birth	14187	14187
	171	Female	59|60	58	09-09-2018	Transfer	14145	14145
					11-06-2018	Transfer	14236	14187
					20-03-2015	Hatch - birth	14187	14187
	199	Female	59|60	58	09-09-2018	Transfer	14145	14145
					11-06-2018	Transfer	14236	14187
					04-02-2016	Hatch - birth	14187	14187
	202	Female	59|60	58	09-09-2018	Transfer	14145	14145
					11-06-2018	Transfer	14236	14187
					20-02-2016	Hatch - birth	14187	14187
	204	Male	59|60	58	09-09-2018	Transfer	14145	14145
					11-06-2018	Transfer	14236	14187
					22-02-2016	Hatch - birth	14187	14187
	205	Male	59|60	58	09-09-2018	Transfer	14145	14145
					11-06-2018	Transfer	14236	14187
					03-03-2016	Hatch - birth	14187	14187
	206	Male	59|60	58	09-09-2018	Transfer	14145	14145
					11-06-2018	Transfer	14236	14187
					04-03-2016	Hatch - birth	14187	14187
	221	Male	59|60	58	09-09-2018	Transfer	14145	14145
					11-06-2018	Transfer	14236	14187
					02-02-2017	Hatch - birth	14187	14187
	235	Unknown	129	234	09-09-2017	Transfer	14145	14145
					05-09-2017	Hatch - birth	14236	14236
	240	Male	123	234	08-12-2018	Transfer	14145	14145
					27-03-2018	Hatch - birth	14236	14236
	245	Male	128	234	24-06-2018	Transfer	14145	14145
					16-03-2018	Hatch - birth	14236	14236
	248	Female	129	234	09-09-2018	Transfer	14145	14145

Keeper	Studbook number	Sex	Mother	Father	Date	Event	Keeper	Owner
					26-05-2018	Hatch - birth	14236	14236
	249	Male	123	234	09-09-2018	Transfer	14145	14145
					29-05-2018	Hatch - birth	14236	14236
	266	Male	17	16	~01-06-2019	Transfer	14145	14145
					23-01-2019	Transfer	14159	14159
					~01-01-1900	Hatch - birth	14161	14161
	267	Male	17	16	~01-06-2019	Transfer	14145	14145
					23-01-2019	Transfer	14159	14159
					~01-01-1900	Hatch - birth	14161	14161
1368	167	Male	59|60	58	04-09-2021	Transfer	1368	1368
					09-09-2018	Transfer	14145	14145
					11-06-2018	Transfer	14236	14187
					27-02-2014	Hatch - birth	14187	14187
	220	Male	59|60	58	04-09-2021	Transfer	1368	1368
					09-09-2018	Transfer	14145	14145
					11-06-2018	Transfer	14236	14187
					18-10-2017	Hatch - birth	14187	14187
	323	Unknown	186|201	126	20-12-2021	Transfer	1368	1368
					26-06-2021	Hatch - birth	14121	14121
	347	Unknown	346	266	04-09-2021	Transfer	1368	1368
					11-01-2021	Hatch - birth	14145	14145
14122	145	Female	59|60	58	14-11-2017	Transfer	14122	14122
					~01-09-2016	Transfer	14236	14187
					~26-03-2013	Hatch - birth	14187	14187
	173	Male	24	22	24-09-2016	Transfer	14122	14122
					12-01-2014	Hatch - birth	14178	14178
	174	Male	24	22	24-09-2016	Transfer	14122	14122
					15-08-2014	Hatch - birth	14178	14178
	226	Female	62	94	08-09-2018	Transfer	14122	14122
					11-05-2017	Hatch - birth	14121	14121
14231	185	Unknown	62	94	12-09-2016	Transfer	14231	Dwarf Tortoise Conservation
					12-09-2015	Hatch - birth	14121	Dwarf Tortoise Conservation
	316	Unknown	62	94	06-12-2020	Transfer	14231	Dwarf Tortoise Conservation
					09-07-2020	Hatch - birth	14121	Dwarf Tortoise Conservation
	319	Unknown	62	94	06-12-2020	Transfer	14231	14231
					03-09-2020	Hatch - birth	14121	14121
14236	234	Male	64	63	~25-04-2014	Transfer	14236	14236
					~01-11-2012	Hatch - birth	14224	14224
14211	69	Male	59|60	58	19-06-2010	Transfer	14211	14211
					~21-05-2006	Transfer	14194	14187
					~22-04-2004	Hatch - birth	14187	14187
	71	Female	59|60	58	19-06-2010	Transfer	14211	14211
					~21-05-2006	Transfer	14194	14187
					~06-03-2004	Hatch - birth	14187	14187
	130	Female	62	94	05-04-2019	Transfer	14211	14211
					16-03-2012	Hatch - birth	14185	14185
	132	Male	62	94	05-04-2019	Transfer	14211	14211
					18-07-2012	Hatch - birth	14185	14185
	133	Female	62	94	05-04-2019	Transfer	14211	Dwarf Tortoise Conservation
					13-08-2012	Hatch - birth	14185	Dwarf Tortoise Conservation
	149	Male	62	94	05-04-2019	Transfer	14211	Dwarf Tortoise Conservation
					27-04-2013	Hatch - birth	14185	Dwarf Tortoise Conservation
	336	Unknown	130	132	01-03-2022	Hatch - birth	14211	14211
	360	Male	130	132	15-03-2023	Hatch - birth	14211	14211
	361	Male	130	132	27-03-2023	Hatch - birth	14211	14211
	362	Unknown	130	132	27-03-2023	Hatch - birth	14211	14211
	363	Unknown	133	149	02-07-2023	Hatch - birth	14211	14211
	364	Unknown	133	149	06-07-2023	Hatch - birth	14211	14211
14213	313	Unknown	128	234	~01-08-2021	Transfer	14213	14213
					06-02-2021	Hatch - birth	14159	14159
	314	Female	128	234	~01-08-2021	Transfer	14213	14213
					06-02-2021	Hatch - birth	14159	14159
	338	Unknown	175	228	~17-12-2023	Transfer	14213	14213
					10-04-2022	Hatch - birth	14159	14159
14215	84	Male	59|60	58	02-06-2011	Transfer	14215	14215
					~07-02-2008	Hatch - birth	14187	14187
	85	Male	59|60	58	02-06-2011	Transfer	14215	14215
					~07-02-2008	Hatch - birth	14187	14187

Keeper	Studbook number	Sex	Mother	Father	Date	Event	Keeper	Owner
14197	187	Female	62	94	12-09-2016	Transfer	14197	Dwarf Tortoise Conservation
					17-09-2015	Hatch - birth	14121	Dwarf Tortoise Conservation

Homopus femoralis: live and available studbook population.

Keeper	Studbook number	Sex	Mother	Father	Date	Event	Keeper	Owner
Crocodile Zoo Prague	22	Male	15	2	05-09-2022	Transfer	17756	Dwarf Tortoise Conservation
					01-06-2021	Hatch - birth	14121	Dwarf Tortoise Conservation
	24	Male	15	2	05-09-2022	Transfer	17756	Dwarf Tortoise Conservation
					05-07-2021	Hatch - birth	14121	Dwarf Tortoise Conservation
14131	17	Female	4	3	25-07-2019	Transfer	14131	Dwarf Tortoise Conservation
					26-06-2017	Hatch - birth	1392	Dwarf Tortoise Conservation
	18	Male	4	3	25-07-2019	Transfer	14131	Dwarf Tortoise Conservation
					08-07-2017	Hatch - birth	1392	Dwarf Tortoise Conservation
	19	Male	4	3	25-07-2019	Transfer	14131	Dwarf Tortoise Conservation
					26-06-2018	Hatch - birth	1392	Dwarf Tortoise Conservation
14116	10	Male	4	3	23-04-2022	Transfer	14116	Dwarf Tortoise Conservation
					27-06-2015	Transfer	1276	Dwarf Tortoise Conservation
					28-05-2011	Hatch - birth	1392	Dwarf Tortoise Conservation
	23	Unknown	15	2	10-09-2022	Transfer	14116	Dwarf Tortoise Conservation
					04-06-2021	Hatch - birth	14121	Dwarf Tortoise Conservation
14121	2	Male	21	20	06-07-2006	Transfer	14121	Dwarf Tortoise Conservation
					23-12-2001	Transfer	1277	Dwarf Tortoise Conservation
					~01-01-2001	Transfer	14172	14172
					~01-01-1900	Hatch - birth	Wild	Wild
	15	Female	4	3	09-03-2019	Transfer	14121	Dwarf Tortoise Conservation
					10-09-2016	Transfer	14222	Dwarf Tortoise Conservation
					19-06-2014	Hatch - birth	1392	Dwarf Tortoise Conservation
14191	3	Male	21	20	30-05-2019	Transfer	14191	Dwarf Tortoise Conservation
					23-12-2001	Transfer	1392	Dwarf Tortoise Conservation
					01-01-2001	Transfer	14172	14172
					~01-01-1900	Hatch - birth	Wild	Wild
14222	14	Female	4	3	10-09-2016	Transfer	14222	Dwarf Tortoise Conservation
					18-06-2014	Hatch - birth	1392	Dwarf Tortoise Conservation
14197	12	Male	4	3	02-08-2015	Transfer	14197	Dwarf Tortoise Conservation
					12-07-2013	Hatch - birth	1392	Dwarf Tortoise Conservation
	13	Female	4	3	10-09-2016	Transfer	14197	Dwarf Tortoise Conservation
					15-06-2014	Hatch - birth	1392	Dwarf Tortoise Conservation
	25	Unknown	13	12	31-05-2023	Hatch - birth	14197	Dwarf Tortoise Conservation

5. SPECIFIC INFORMATION FROM STUDBOOK PARTICIPANTS

Amsterdam Zoo

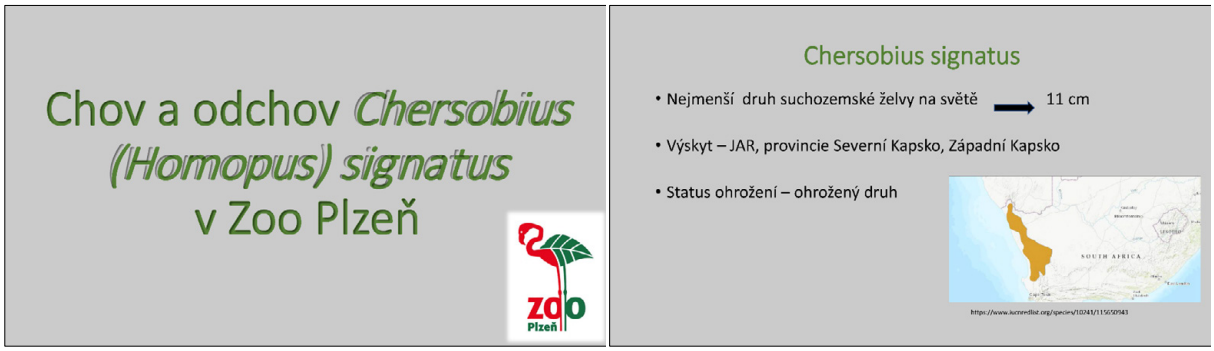
In September, two of three *C. signatus* in an open-top enclosure were severely injured, probably by a rat. All individuals have been removed from the enclosure and were housed solitarily. The two injured tortoises (130 and 90 g, respectively) have received specialist veterinary care, including surgery, antibiotics, disinfectant, painkiller, and force-feeding. Both are in reasonable condition. Unfortunately, one of them required amputation of a front limb.

Basel Zoo

Several 1-m^2 enclosures were constructed to raise and breed *C. boulengeri*. The enclosures are situated in a separate room that is visible for visitors through a window.

Plzen Zoo

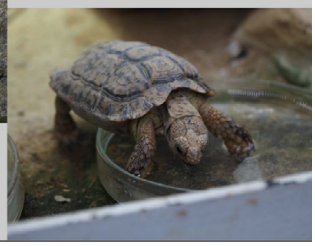
In January, husbandry and breeding of *C. signatus* at Plzen Zoo was presented at Prague Zoo.



Chersobius signatus začátek chovu v Zoo Plzeň

- Želvy jsou součástí projektu – Dwarf Tortoise Conservation
- Projekt pod vedením - Victor Loehr
- Samice – od 29.09. 2016 (z Nizozemska NZ 2014)
- Samec – od 25.12. 2020 (z Anglie NZ 2014)

Dwarf Tortoise Conservation



14.1.2023	samice	samec
Délka (cm)	9,48x7,35	8,23x5,96

Inkubace

- Zda se může inkubovat ??
- Počet jedinců ???
- Na jaké pohlaví ???

Inkubační teploty

- Samec
  - den 1-29 33°C den/28°C noc
  - den 30-50 30°C den/noc
  - 50 – do líhnutí 33°C den/28°C noc
- Samice
  - den 1-29 33°C den/28°C noc
  - den 30-50 33°C den/noc
  - 50 – do líhnutí 33°C den/28°C noc

Snůšky

	Počet vajec	Datum vykladení	Počet dní v líhni	Datum líhnutí	Hmotnost vejce (g)	Rozměry vejce (cm)	Pohlaví	Poznámky
1. snůška	1	19.12.2021 po 51 dnech	135	3.5.2022	15,9	3,98x2,59	samec	Po roce samce v chovu (25.12.2020)
2. snůška	1	8.2.2022 po 28 dnech	114	2.6.2022	14,5	3,47x2,86	samec	
3. snůška	1	12.3.2022 po 53 dnech	54	-	15	3,88x2,59	(samice)	Neoplozené, 5.5. 2022 vyhození
4. snůška	1	4.5.2022	96	-	-	-	(samice)	Prasklé, neoplozené 6.8.2022 vyhození
5. snůška	1	4.1.2023			15	3,43x2,74	(samice)	V inkubátoru











Participant 1392

Wild-caught *C. signatus* female 156 continued to have a problematic health. Although it is housed solitarily in a large (150 x 60 cm), well-structured enclosure, its body mass tends to decrease to very low levels. In addition, the female appears unable to normally breath through its nostrils (i.e., during physical exercise, it opens its beak and breathes heavily). In 2023, a specialist veterinarian examined the tortoise, but could not find a cause. The tortoise tested negative for *Mycoplasma* and various viruses. Antibiotic treatment did not remove the symptoms. Because the female has never accepted water from a drinking bowl, it is routinely soaked one or two times per week to remain hydrated. Often, the female vigorously drinks during soaking.

Participant 14116

After some experimentation, a dry-type incubator was built. The incubator is reliable and works with a diurnal temperature cycle. Eggs from *C. signatus* were incubated on Seramis, in a plastic container that also contained a small water bowl. Holes in the plastic container ensured that the relative humidity would not rise too much.



Participant 14121

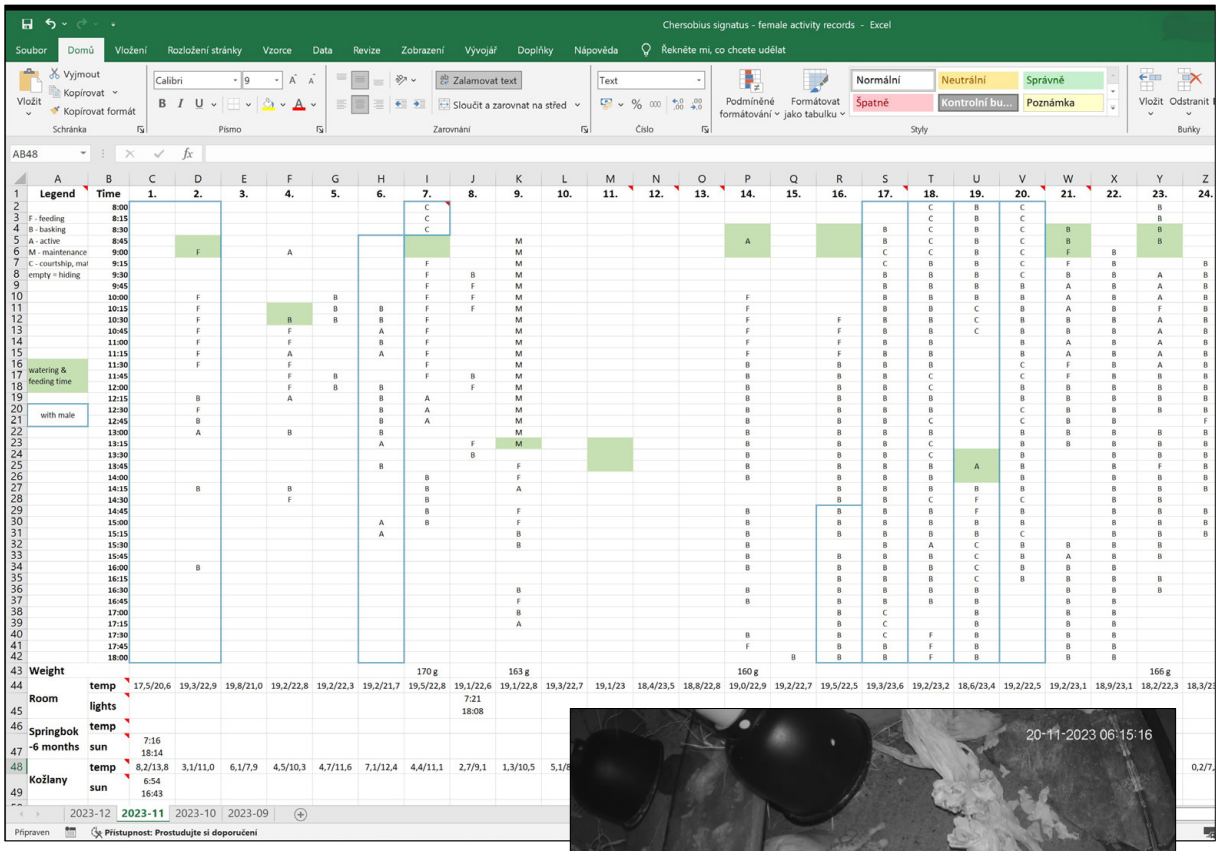
A captive-bred male and female *C. signatus* were housed solitarily in enclosures measuring 0.75 x 0.75 m (below). *Homopus areolatus* tested negative for *Mycoplasma*. Ten *H. areolatus* eggs were produced, but all embryos died due to too high incubation temperature (i.e., 33–34°C for multiple hours or days).


Participant 14133

Three *C. signatus* (no breeding couple) were kept in two open-top enclosures, measuring 120 x 60 cm and 170 x 60 cm.


Participant 14139

The enclosure of *C. signatus* (with separate compartments for the male and female) was enhanced with grass and fresh shrubs at the back of the enclosure; the tortoises often used these plants to hide. The camera monitoring system was also improved. Consequently, it was observed that the male started mating activity very early in the morning in darkness (6:15 hrs). Mating activity continued for 15–50 minutes. Records are kept in an Excel spreadsheet for future reference.



Participant 14217

Surprisingly, two offspring incubated according the incubation instructions for females turned out to be males, suggesting that incubation temperatures differed from the setpoints. The third (male) offspring was born in the adult enclosure.

Participant 18476

Two sibling *C. signatus* were housed in a 120 x 45 cm enclosure, but will be separated.

6. NEW PUBLICATIONS

The following overview summarises all manuscripts and articles that were submitted, accepted, published, or under review in 2023. A full list of publications authored or co-authored by Dwarf Tortoise Conservation is available at the website.

Subject	Submitted	Accepted	Published	Journal
Shell dimensions in a population of Karoo dwarf tortoises, *Chersobius boulengeri*	2021	2022	2023	Chelonian Conservation and Biology (English)
Acclimation, husbandry and breeding of wild-caught Karoo dwarf tortoises, *Chersobius boulengeri* (Duerden, 1906)	2022	2022	2023	Radiata (English and German)

Subject	Submitted	Accepted	Published	Journal
Testudinidae, *Chersobius boulengeri* (Duerden, 1906). Karoo padloper. Severe population decline.	2022	2022	2023	African Herp News (English)
Habitat use by the rock-dwelling Karoo dwarf tortoise, *Chersobius boulengeri*	2022	2023	2023	Ichthyology and Herpetology (English)
Diet and seed dispersal by Karoo dwarf tortoises (*C. boulengeri*)	2023	2023	2023	Journal of Arid Environments (English)
Chersobius signatus (speckled dwarf tortoise): annual survival	2022	2023		Herpetological Review (English)
Testudinidae, *Chersobius signatus* (Gmelin, 1789). Speckled padloper. Tick outbreak in a European indoor captive colony.	2023			African Herp News (English)

7. FINANCIAL REPORT

Funds were received from one organisation and three private individuals. In addition, some expenses (indicated as p.m.) were directly covered by private individuals, and one organisation refunded meeting costs that had been prepaid by Dwarf Tortoise Conservation. Most expenses involved publication costs for the open access publication of two research articles on *C. boulengeri*. Another major expense was a contribution to the Endangered Wildlife Trust for conservation work on *C. boulengeri* (e.g., developing agreements with farmers, specific land management measures, making water holes unavailable for crows and ravens, knocking down obsolete windmills and telephone poles, other control of crows and ravens). The latter amount will be supplemented with funds raised by the Stockholm Herpetological Society (paragraph 1.2). Most remaining funds at Dwarf Tortoise Conservation were allocated to cover publication costs of future scientific articles.

Revenues Net amount €	Item	***Expenses*** Amount €	Item
General donations			
500	Donation Crocodile Zoo Prague (CZ)	95	Reservation general expenses
21	Donation T. Dvorak (PL)		
521	Subtotal	95	Subtotal
Field ecology of Chersobius boulengeri		*Field ecology of Chersobius boulengeri*	
2,574	Remaining funds from 2022	3,000	Reservation publication costs
		p.m.	Privately funded publication costs (V. Loehr and T. Keswick, € 3,255)
		p.m.	Privately funded publication costs (V. Loehr, € 801)
2,574	Subtotal	3,000	Subtotal
Studbook management plan C. signatus		*Studbook management plan* C. signatus	
50	Refund prepaid meeting costs Wroclaw Zoo (PL)	50	Prepaid meeting costs Wroclaw Zoo (PL)
50	Subtotal	50	Subtotal
Conservation of C. boulengeri and C. signatus		*Conservation of C. boulengeri and C. signatus*	
702	Remaining funds from 2022	1,852	Contribution conservation measures *C. boulengeri*
1,150	Donation V. and D. Loehr (NL)	p.m.	Privately funded scent sample tubes to train sniffer dog (V. Loehr, € 107)
1,852	Subtotal	1,852	Subtotal
Other		*Other*	
151	Donation V. Loehr (NL) to cover overhead costs	151	Annual costs bank account
151	Subtotal	151	Subtotal
5,148	Total	5,148	Total

8. PERMIT OVERVIEW

The activities reported in this annual report would not have been possible without the following permits issued by the South African and Namibian authorities:

Collecting and exporting of C. boulengeri

- Collecting permit FAUNA 0952/2018 (Northern Cape Department of Environment and Nature Conservation, South Africa)
- CITES exporting permit 217387 (Northern Cape Department of Environment and Nature Conservation, South Africa)
- Health declaration 10814 (Department of Agriculture, South Africa)

Collecting and exporting of C. signatus

- Collecting permit 331/95 (Western Cape Nature Conservation Board, South Africa)
- Collecting permit 28/2001 (Northern Cape Nature Conservation, South Africa)
- Collecting permit 053/2015 (Northern Cape Department of Environment and Nature Conservation)
- CITES exporting permits 16579 and 281/95C (Department of Environmental Affairs and Tourism, South Africa)
- CITES exporting permit 148487 (Northern Cape Department of Environment and Nature Conservation)
- Permit to move animals/animal products 2001/10/3/A (Department of Agriculture, South Africa)
- Health declarations dated 03-10-01 and 19-09-15 (Department of Agriculture, South Africa)

Collecting and exporting of H. femoralis

- Collecting permit AAA004-00010-0035 (CapeNature, South Africa)
- CITES exporting permit 58679 (Department of Environmental Affairs and Tourism, South Africa)
- Health declaration dated 17-03-06 (Department of Agriculture, South Africa)

Exporting of H. areolatus

- Exporting permit 49683 (Ministry of Environment and Tourism, Namibia)
- CITES exporting permit 8830 (Ministry of Environment and Tourism, Namibia)
- CITES exporting permit 3558 (Ministry of Environment and Tourism, South Africa)
- Health certificate 13\1\4\2\ 09/2- 1676/04 (Ministry of Agriculture, Water and Rural Development, Namibia)
- Various additional permits issued to individual studbook participants (Namibia)

Field study and surveys on C. boulengeri

- Research permits 755/05, 43/2005 and 35/2005 (Northern Cape Nature Conservation, South Africa)
- Research permits 245/2/2015, FAUNA 0950/2017, FAUNA 0180/2022 and FAUNA 0181/2022 (Northern Cape Department of Environment and Nature Conservation, South Africa)
- Research permits FLORA 0066/2017 and FLORA 0067/2017 (Northern Cape Department of Environment and Nature Conservation, South Africa)
- Plant export permission NNO 1/10/3/6/ 39738

Field studies on C. signatus

- Research permits 137/99, 84/99, 019/2001, 010/2001, 46/2003, 26/2003, 8/2003, 168/2003, 43/2003, 158/2003, 633/2003, 25/2003, 158/2004 and 633/2004 (Northern Cape Nature Conservation, South Africa)
- Research permits 428/2002 and 41/2002 (Western Cape Nature Conservation Board, South Africa)
- Research permits 152/2012, 153/2012, 460/2013 and 052/2015 (Northern Cape Department of Environment and Nature Conservation, South Africa)

Field study on H. femoralis

- Research permits AAA-004-000185-0035, AAA-004-00020-0028, AAA-004-000392-0035, and AAA-004-00027-0028 (CapeNature, South Africa)