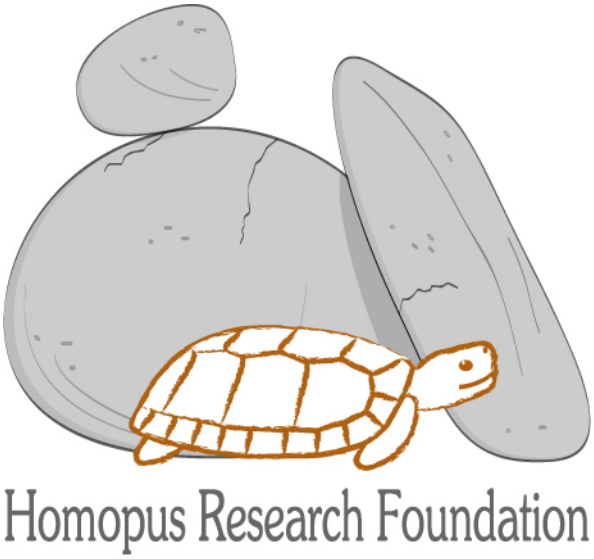
Homopus Research Foundation



Annual Report

2017

Victor Loehr
January 2018

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1. INTRODUCTION AND ACHIEVEMENTS IN 2017

The Homopus Research Foundation aims to facilitate the long-term survival of *Chersobius* (previously *Homopus*) 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. In 2017, several activities contributed to this aim. The current report presents an overview of achievements in 2017, as well as activities planned for 2018 and thereafter. Moreover, the actual studbook populations of *Chersobius signatus*, *Homopus areolatus* and *Homopus femoralis* are described, focussing on changes that occurred in 2017. All previous annual reports since 1995 can be found on the website of the Homopus Research Foundation.

1.1. Policies and permanent action points

From time to time, the Homopus Research Foundation communicates policies and permanent action points to the participants in the *Chersobius* and *Homopus* studbooks and to other stakeholders. To avoid losing sight on these important issues, they are listed here.

- *Homopus Research Foundation and illegal activities (1 May 2011)*
  The Homopus Research Foundation strongly condemns illegal activities. All *Chersobius* and *Homopus* individuals kept in the studbooks and at studbook locations have legal and traceable origins. Each participant is responsible for the paperwork for his or her tortoises and will not fraud. The Homopus Research Foundation 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 illegally activities will be unable to continue their participation.

- *DNA samples from deceased wild-caught and F1 offspring C. signatus (22 November 2015)*
  In case a *C. signatus* individual that was caught in the wild in 2015 or any of its F1 offspring dies, two DNA samples (e.g., tail or feet clips) will be collected immediately. One sample will be stored in 70% ethanol, and the other one will be dried using silica gel. Samples will be stored in the dark, out of reach of heat sources and sunlight. Keepers of *C. signatus* collected in 2015 or their offspring are advised to keep 70% ethanol and silica gel at hand to be prepared in case any animal would die unexpectedly.

- *Volunteer tasks at the European Studbook Foundation (23 May 2016)*
  The board of the European Studbook Foundation is always in need of volunteers to help with specific tasks. The overall work load has been broken down into smaller tasks to enable volunteers to engage in the foundation without needing to accept a formal position for indeterminate period of time. Studbook participants with time to spare are invited to contact the European Studbook Foundation directly.

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

1.2. Outstanding action points from the 2016 annual report

The 2016 annual report anticipated on several results for 2017. The following table summarises these plans, with results obtained in 2017.

Outstanding action points and results	**Due**
Manuscripts submitted on:	
• thermoregulation in wild *H. signatus* '12–'15;	31-12-2017
• parasite infestations in wild *H. signatus*.	31-12-2017

Outstanding action points and results	**Due**
2017: A manuscript on thermoregulation was submitted, reviewed, revised, accepted and published in 2017. A manuscript on parasite infestations was initiated and will be submitted for publication in 2018. The manuscript on population dynamics in *C. signatus* that had been accepted in 2016 was published in 2017. In addition, a field note on wild reproduction in *Chersobius boulengeri* and a captive note on a two-egg clutch in *C. signatus* were published in 2017. See Chapter 6.	
Field survey on *Homopus boulengeri* conducted	Jan/Feb-2017
2017: A field survey was conducted from 30 January until 3 February 2017. Quite unexpectedly, a population was discovered. See Paragraph 1.5.	
Meeting held on husbandry and breeding of *H. areolatus*	31-12-2017
2017: On November 2017, a meeting was held at Wuppertal Zoo. See Paragraph 1.4.	
Update website due to finalisation of *H. signatus* fieldwork	31-12-2017
2017: All relevant fieldwork information on the website was updated.	
Presentations held on:	
• unexpected decline in a population of *H. signatus* (Symposium of the Herpetological Association of Africa, Bonamanzi Game Reserve, South Africa);	Jan-2017
• tortoises of the genus *Homopus*: overview, field research and husbandry (Conference on Herpetology and Reptile Breeding, Pilsen Zoo, Czech Republic);	Feb-2017
• in South Africa for the mysterious tortoise *H. boulengeri* (Spring meeting of the Prague terrarium society, Charles University, Czech Republic);	Mar-2017
• infestations of wild *H. signatus* by viruses, bacteria, round worms and ticks (International Conference on Avian, Herpetological and Exotic Mammal Medicine, Venice, Italy).	Mar-2017
2017: All presentations were held as scheduled. In addition, presentations were given on: • tortoises of Africa (Vienna Zoo, Austria); • surveying for *C. boulengeri* (Pilsen Zoo, Czech Republic); • research proposal for a field study on *C. boulengeri* (Dutch-Belgian Turtle and Tortoise Society, Netherlands); • keeping and breeding *C. signatus* (Charles University, Prague, Czech Republic); • tortoises of the genera *Chersobius* and *Homopus*, husbandry and breeding of *C. signatus* and *H. areolatus*, and veterinary aspects of tortoise keeping (Wuppertal Zoo, Germany).	

Further achievements that are worth listing:

- The Homopus Research Foundation and its projects (including a new project on *C. boulengeri*) were updated in the Dutch National Academic Research and Collaborations Information System.

- Reprints of papers produced by the Homopus Research Foundation were distributed through ResearchGate, with circa 20 downloads per week. In addition, reprint requests were received via e-mail from individuals in Canada, Namibia and the United States of America.

- IUCN Red List assessments were co-authored for *C. boulengeri* and *C. signatus* (both taxa proposed Endangered).

- Chimaira publishers and the German Chelonia Group requested to submit a paper for publication in a book (Mertensiella series) on captive breeding of turtles.

- Review requests were received from:
  - Journal of Herpetology;
  - African Journal of Herpetology (two manuscripts);
  - IUCN Red List (several southern African turtles);
  - Turtles of the World Checklist and Atlas;
  - private author from Belgium (friendly review).

- The Czech national radio and television covered the husbandry and breeding of *C. signatus* at two Czech studbook locations. Reports can be found here and here (at 20:21).

- Information requests were received regarding:
  - application of bitter tasting decoys to train crows near *C. signatus* populations not to eat tortoises;
  - methodology and meeting assumptions of mark-recapture studies in (small) reptile populations;
  - preferred sites for nesting and incubation temperatures in wild and captive *H. areolatus*, to help select a site for a field study;
  - correlations between seasonal tortoise diets and photoperiod;
  - identification of *H. femoralis* confiscated in Austria (the Homopus Research Foundation offered to include the tortoise in the studbook for this species);
  - acquisition of *C. signatus* and *H. areolatus* for husbandry and breeding in the United States of America, Italy and Ireland (Dublin Zoo).

- The Association for Tropical Biology and Conservation (ATBC) requested the Homopus Research Foundation to present a talk on wild and captive conservation work on *Chersobius* spp. and *Homopus* spp. at the 55th Annual Meeting in Kuching, Sarawak, Malaysia.

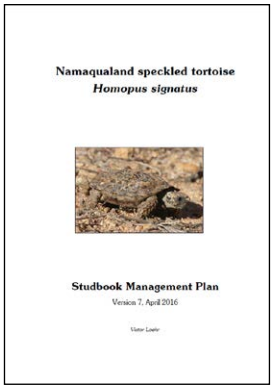
- At an expert meeting of the European Studbook Foundation, two *Chersobius* and *Homopus* studbook participants formulated concrete recommendations to improve the foundation's online database for studbook management.

- Photographic material was provided to several book authors (e.g., Anders Rhodin, Shi Hai-Tao), a magazine (*Bild der Wissenschaft*, Germany), webmasters (e.g., www.cheloniophilie.com) and social media publishers.

- The website of the Homopus Research Foundation received several updates. Most importantly, pages with information about the field projects on *C. signatus* were changed to reflect that these projects have been finalised, a page with information about a new *C. boulengeri* field project was added (including a link to the project proposal and a list of sponsors), the list of publications was updated, as were the husbandry guidelines for *C. signatus* and all studbook overviews.

1.3. Studbook management plan Chersobius signatus

The first version of the studbook management plan for *C. signatus* was finished in 2013, and the plan was updated in 2016. It provides clear 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 the Homopus Research Foundation will report annual progress of the realisation of the studbook management plan.


Namaqualand speckled tortoise
Homopus signatus

Studbook Management Plan
Version 7, April 2016

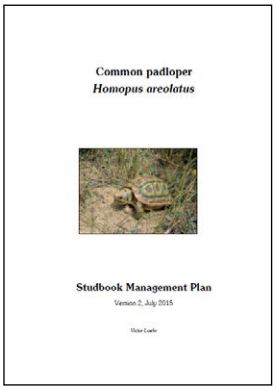
In 2017, four of the seven available founder couples produced offspring. Two other founder couples did not reproduce, but had already produced offspring previously. One female that had been imported in 2015 (studbook number 155) died without having produced offspring (see Chapters 3 and 5 for details). In

addition, the last surviving tortoise (studbook number 76) carrying genetic material from an unregistered wild male died, resulting in loss of genetic material for the studbook. The current focus is on optimising husbandry conditions to reproduce all present founder couples each year. Eventually, the single male that remained after the death of female number 155 should be coupled to another wild-caught female that has produced sufficient offspring, to safeguard the genes of the male in the population. Further genetic material that requires preservation originates from an unregistered wild male (present in studbook numbers 161 and 162) and from a wild-caught female lost to follow-up (female number 60; genetic material present in studbook numbers 82, 86–89, 92).

The limited presence of the genes of founder number 2 (deceased) in the population was reinforced by the birth of two F2 offspring originating from this female. Moreover, one more offspring from founder number 60 (lost to follow-up) was combined with offspring from bloodline 35 x 36 to hopefully reinforce the presence of the genes of number 60 in the next generation. Overall, the current genetic quality of the studbook population is good (i.e., no inbreeding whatsoever and reasonable genetic variation) and in line with the aims of the studbook management plan.

The conservation status of *C. signatus* was elevated from Near Threatened to Vulnerable in the IUCN Red List of Threatened Species, and a proposal for elevation to Endangered is in preparation. Consequently, the studbook management plan will be updated in 2018. Because the production of offspring by the founder couples imported in 2015 proceeds relatively slowly, the addition of further founders to increase the genetic variation of the studbook population will be postponed from 2020 to 2021.

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 will be updated every five years. It follows the same format as the studbook management plan for *C. signatus*. A major difference between the two plans is that nearly all tortoises in the studbook on *H. areolatus* are privately owned, meaning that the development of the captive population (i.e., the execution of the studbook management plan) is directly in hands of the studbook participants, whereas the studbook coordinator has only a facilitating role.

In 2017, little progress was made towards the aims outlined in the studbook management plan. Few tortoises were transferred to form genetically unrelated breeding pairs. One new wild-caught founder entered the studbook through a confiscation in the Netherlands and a second new captive-bred founder was registered by a studbook participant. To evaluate the progress made so far and to assess if the aims of the studbook might need adjustment, a studbook meeting was held at Wuppertal Zoo (Germany) on 25 November 2017. The meeting decided that the studbook aims should not be adjusted and that the relatively slow progress was acceptable, considering the private ownership of studbook animals. Moreover, the meeting encouraged studbook participants to acquire unrelated captive *H. areolatus* outside the studbook (i.e., registering new founders) and to make direct arrangements about transfers with other studbook participants. The studbook coordinator will continue to monitor and make recommendations regarding genetically preferred combinations of tortoises or bloodlines. For 2018, several agreements were made for strategic transfers of studbook tortoises to form unrelated breeding couples and to maximise reproduction of founders. This will be reported in the 2018 annual report.

Two studbook locations have transferred tortoises (e.g., studbook numbers 105, 119, 120, 176) outside the studbook. Because these tortoises are lost to follow-up, it is imaginable that they (or their offspring) will eventually be re-submitted to the studbook. To avoid genetically related tortoises entering the studbook as unrelated founders, the studbook will no longer accept new founders with unknown or uncertain origin.

1.5. Progress field study on Chersobius boulengeri

Upon the unexpected discovery of a wild *C. boulengeri* population in February 2017 (currently the only verified population of this species), great efforts were made to instantly prepare a broad ecological field study. A project proposal was drafted, permits obtained (see Chapter 8), volunteers recruited, accommodation arranged, and grant applications submitted. The invested time and efforts have led to a broad enthusiasm for the study. The study will be co-produced by the Homopus Research Foundation and an independent South African researcher (Toby Keswick). Moreover, the study will collaborate with the

University of the Western Cape (South Africa; Retha Hofmeyr), Utrecht University (Netherlands; Ineke Westerhof) and the Northern Cape Department of Environment and Nature Conservation (South Africa).

October to December were used to develop a GIS model for the field site, a database, field protocols and forms, and to select and purchase equipment. The field site is at a remote location and time in the field should be maximised, so that meticulous preparations are necessary. Several companies were prepared to provide discounted prices for this project. Purchased equipment includes radiotransmitters, temperature, relative humidity and rainfall dataloggers, (calibrated) infrared thermometers, callipers and balances, GPS receivers, and robust, bright flashlights to inspect rock crevices. Other purchases are poles, rebar and barrier tape to mark the study site and vegetation plots, planks, bolts and wingnuts to assemble plant presses, a cooling box and containers to transport tortoises, and vials to collect faeces.

Two Master's students (Veterinary Department, Utrecht University, Netherlands) will investigate activity, behaviour, thermoregulation and possibly retreat use during the first sampling period in February–March 2018. In 2017, time was spent guiding the students in preparing individual proposals, field protocols and forms.

The following organisations and individuals have allocated funds, discounted prices, or in-kind contributions to the project:

- Turtle Conservation Fund and Conservation International
- Holohil Systems Ltd.
- British Chelonia Group
- Knoxville Zoo
- Dutch-Belgian Turtle and Tortoise Society
- Pedak
- Jan Barth
- Kurt Engl
- Silja Heller
- Brian Henen
- 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

In 2017, nearly all preparations for the sampling period in February–March 2018 were finalised.

2. PLANS FOR 2018 AND THEREAFTER

The table below lists results anticipated for 2018 and thereafter, with progress indicated:

Result	Due	Current status
Manuscripts submitted on:		
• parasite infestations in wild *C. signatus*;	31-12-2018	Manuscript in preparation
• egg shell ultrastructure in wild and captive *C. signatus*;	31-12-2018	Data available
• captive husbandry and breeding of *C. signatus* (Mertensiella);	28-02-2018	Data available
• captive reproduction and growth in *H. femoralis*.	31-12-2020	Data partly available
Manuscript co-authored on:		
• ultrasound recordings in *C. signatus*.	31-12-2018	Manuscript in preparation
Studbook management plan for *C. signatus* updated due to elevated IUCN conservation status	30-06-2018	Not yet started
First sampling period in field study on *C. boulengeri* conducted	Feb/Mar-2018	Sampling period prepared
Website updated due to resurrection of the genus *Chersobius*	31-12-2018	Not yet started
Second sampling period in field study on *C. boulengeri* conducted	Dec/Mar-2018/19	Not yet started
Third sampling period in field study on *C. boulengeri* conducted	Feb/Mar-2020	Not yet started
5.5 *C. signatus* collected in the wild and added to the captive population[1]	31-12-2021	Not yet started

[1] Conditional are granted permits, tortoise activity, and field personnel.

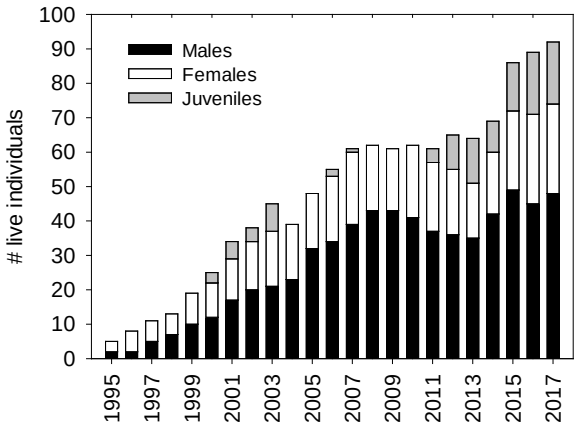
3. STUDBOOK SUMMARIES

To keep the studbook registrations up to date, it is vital that all studbook participants keep the coordinator informed of any changes. In the studbooks on *C. signatus* and *H. femoralis*, each participant has accepted this obligation in a formal agreement between participant and the Homopus Research Foundation. Regardless of the agreements, most participants are very motivated and inform the coordinator spontaneously when changes occur throughout the year. Others choose to wait until information is requested by the coordinator at the end of each year. However, sometimes participants remain silent for an entire year or longer, despite repeated messages from the studbook coordinator. In order to keep track of where these communication flaws occur, the annual reports include a list of unresponsive locations. This will make it easier for the reader to assess the validity of studbook information per location, and will facilitate the coordinator when approaching a silent participant. In 2017, all locations have responded.

Chersobius signatus

Live specimens on 1 January 2017:
89 (excluding 16 specimens lost to follow-up)
Number of locations on 1 January 2017:
43 (11 countries, including 2 zoos)
New registrations:
0
Births:
10, at 7 locations
Deaths:
7 (1 wild-caught, 6 captive-bred), at 7 locations

Live specimens on 31 December 2017:
92 (excluding 16 specimens lost to follow-up)
Live inbred specimens on 31 December 2017:
0
Number of locations on 31 December 2017:
41 (13 countries, including 2 zoos)



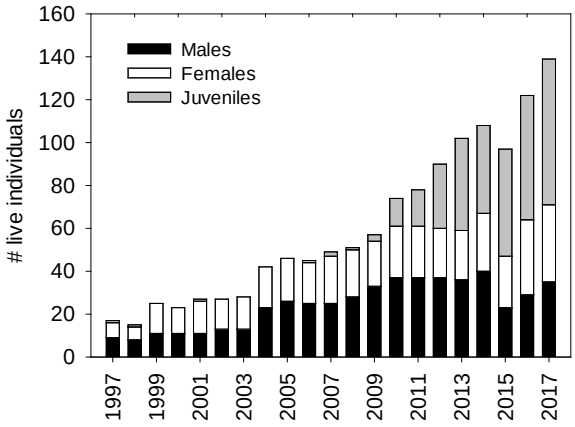
Similar to 2016, the potential growth of the studbook population due to produced offspring was suppressed by relatively high mortality. The number of locations with successful breeding was large, although there were additional locations with adult couples and consent to breed where no offspring was produced. Of particular relevance was the fact that half the produced offspring originated from founders that had been newly added to the studbook population in 2015. A sixth hatchling originated from a founder couple that had been imported in 2001 and two other hatchlings originated from a rare F2 bloodline (i.e., descending from founder number 2). Consequently, the offspring produced in 2017 had a high genetic importance. Locations with adult couples and consent to breed should optimise husbandry, and if necessary exchange individuals, to promote breeding results. Furthermore, all locations should regularly review their husbandry conditions to reduce mortality. The information in Chapter 5 (see also previous annual reports), current husbandry guidelines, and the contact addressed from other studbook locations provide sources for optimisations.

Mortality had reproductive causes in two adult females. One female had retained an egg, which had caused bacterial salpingitis (see information for location A66 in Chapter 5). A second, wild-caught female (see location A57 in Chapter 5) was diagnosed with inflammation of the ovaries, oviducts and large intestine, presumably bacterial. It remains unclear how the health problems in these two females could have been avoided. The death of another *C. signatus* female that was dissected had been caused by enteritis as a result of substantial infestation by nematodes. Because *C. signatus* are known to often carry significant numbers of nematodes, tortoises appear to benefit from routine treatment (e.g., annually at the end of summer, and after transfers) with fenbendazole (e.g., Panacur). The death of one female *C. signatus* was probably related to a bone tumour. For the remaining deaths, causes remain unknown, although one individual may have died as a result of compaction of the intestines by ingesting soil material. This is a cause that should be avoided by using a compact soil type and by offering food in proper feeding dishes.

Homopus areolatus

Live specimens on 1 January 2017:
120 (excluding 33 specimens lost to follow-up)
Number of locations on 1 January 2017:
17 (8 countries, including 2 zoos)
New registrations:
2 (1 wild-caught, 1 captive-bred)
Births:
23, at 6 locations
Deaths:
6, at 3 locations (2 wild-caught, 4 captive-bred)

Live specimens on 31 December 2017:
139 (excluding 34 specimens lost to follow-up)
Live inbred specimens on 31 December 2017:
1 (studbook number 235)
Number of locations on 31 December 2017:
20 (10 countries, including 2 zoos)



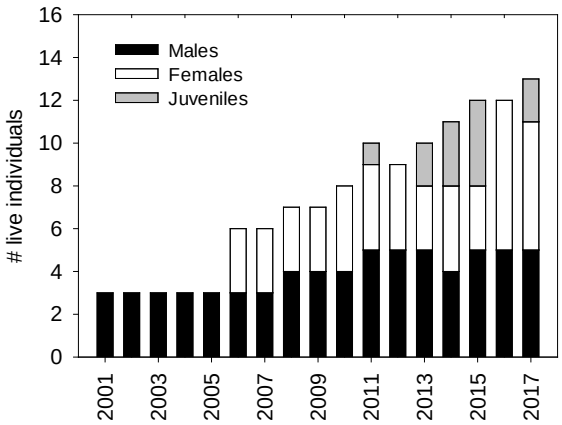
The genetic variation and size of the studbook population continued to grow as a result of two new registrations, a large number of births, and low mortality. One new registration was a wild-caught male that had been confiscated in the Netherlands and was offered to the studbook by the Dutch authorities. The second new registration was a captive-bred male that probably originated from bloodline 58 x MULT4. Offspring produced in 2017 contained a relatively small proportion originating from the over-represented bloodline 58 x MULT4, which was favourable for the genetic quality of the studbook population as a whole. One offspring (number 235) probably resulted from inbreeding. A major loss for the population was the death of a wild-caught couple at location TCBCC due to a wildfire. This event emphasises the importance of housing the captive population at many different locations. Two adult females, one adult male and one juvenile died at three locations, but post-mortems were not performed and consequently the causes of the deaths remain unknown. Two locations involved no longer keep *H. areolatus*.

In November, a studbook meeting facilitated the exchange of information about husbandry and breeding of *H. areolatus* (see Chapter 5). Exchanged information is expected to lead to husbandry and breeding optimisations at several locations.

Homopus femoralis

Live specimens on 1 January 2017:
12
Number of locations on 1 January 2017:
5 (4 countries)
New registrations:
0
Births:
2, at 1 locations
Deaths:
1

Live specimens on 31 December 2017:
13
Live inbred specimens on 31 December 2017:
0
Number of locations on 31 December 2017:
6 (4 countries)



The studbook population of *H. femoralis* slightly grew in 2017. Offspring was produced at the same location that had produced all previous offspring. A major loss was the death of an adult wild-caught female after it had turned upside down under a spotlight. Currently, location HRF is the only remaining location with an adult couple. However, two additional locations keep subadult couples, and solitary males and females at further locations may form more couples. Therefore, increased (F2) reproduction is anticipated in the future. Genetic variation in the population is extremely low, but the main focus of the studbook is to accumulate data on growth and reproduction.

4. ACTUAL STUDBOOK OVERVIEWS

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

Chersobius signatus: live and available studbook population. MULT1 are specimens 18 and 19, MULT2 specimens 20 and 21, MULT3 are specimens 13 (with MULT4 = 9) or 37 and MULT4 are specimens 9 or 38. UNK1 and UNK2 are unknown specimens outside of the studbook.

Stud #	Sex	Hatch Date	Sire	Dam	Location	Date	Local ID	Event
A10 - Frank Van Loon, Wuustwezel, , Belgium								
148	M	16 Sep 2015	35	36	A10	16 Sep 2015	_____	Hatch
					HRF	16 Sep 2015	_____	Ownership
153	M	????	WILD	WILD	SPRINGBOK	22 Sep 2015	NONE	Capture
					HRF	22 Sep 2015	_____	Ownership
					A10	23 Sep 2015	_____	Loan to
158	F	????	WILD	WILD	SPRINGBOK	22 Sep 2015	NONE	Capture
					HRF	22 Sep 2015	_____	Ownership
					A10	23 Sep 2015	_____	Loan to
166	?	7 Jun 2016	35	36	A10	7 Jun 2016	_____	Hatch
					HRF	7 Jun 2016	_____	Ownership
167	?	26 Aug 2016	35	36	A10	26 Aug 2016	_____	Hatch
					HRF	26 Aug 2016	_____	Ownership
168	?	18 Sep 2016	35	36	A10	18 Sep 2016	_____	Hatch
					HRF	18 Sep 2016	_____	Ownership
169	?	7 Sep 2016	35	36	A10	7 Sep 2016	_____	Hatch
					HRF	7 Sep 2016	_____	Ownership
170	?	21 Sep 2016	153	158	A10	21 Sep 2016	_____	Hatch
					HRF	21 Sep 2016	_____	Ownership

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   176    ?    30 Apr 2017     153     158  A10        30 Apr 2017 ______     Hatch
                                           HRF        30 Apr 2017 ______     Ownership

   177    ?    18 Aug 2017     153     158  A10        18 Aug 2017 ______     Hatch
                                           HRF        18 Aug 2017 ______     Ownership

   178    ?    11 Nov 2017     153     158  A10        11 Nov 2017 ______     Hatch
                                           HRF        11 Nov 2017 ______     Ownership
Totals: 2.1.8 (11)
-------------------------------------------------------------------------------

A37
    86    M   ~20 Apr 2006      25      60  A37       ~20 Apr 2006 ______     Hatch

Totals: 1.0.0 (1)
-------------------------------------------------------------------------------

A40
    43    F    29 Sep 2002       1       2  HRF        29 Sep 2002 ______     Hatch
                                           A40         6 Jun 2003 ______     Loan to

    91    M     3 Aug 2007      37      38  HRF         3 Aug 2007 ______     Hatch
                                           A40        14 Nov 2009 ______     Loan to
Totals: 1.1.0 (2)
-------------------------------------------------------------------------------

A42
    41    M    25 Jul 2002       1       3  HRF        25 Jul 2002 III-14     Hatch
                                           A08        19 Apr 2003 ______     Loan to
                                           A60        12 Oct 2009 ______     Loan to
                                           A42        22 Jan 2010 ______     Loan to

Totals: 1.0.0 (1)
-------------------------------------------------------------------------------

A50
     1    M       ????        WILD    WILD  SPRINGBOK  27 Sep 1995   NONE     Capture
                                           HRF        30 Sep 1995      I     Transfer
                                           A25        12 Jun 2004 ______     Loan to
                                           A50         8 Mar 2009 ______     Loan to

    35    M       ????        WILD    WILD  SPRINGBOK   4 Oct 2001   NONE     Capture
                                           HRF         6 Oct 2001 ______     Transfer
                                           A07        16 Dec 2001 ______     Loan to
                                           A10        26 Oct 2012 ______     Loan to
                                           A50        16 Jul 2016 ______     Loan to

    36    F       ????        WILD    WILD  SPRINGBOK   3 Oct 2001   NONE     Capture
                                           HRF         6 Oct 2001 ______     Transfer
                                           A07        16 Dec 2001 ______     Loan to
                                           A10        26 Oct 2012 ______     Loan to
                                           A50        16 Jul 2016 ______     Loan to

   174    ?    31 Aug 2017      35      36  A50        31 Aug 2017 ______     Hatch
                                           HRF        31 Aug 2017 ______     Ownership
Totals: 2.1.1 (4)
-------------------------------------------------------------------------------

A51
   147    M    28 Aug 2015      35      36  A10        28 Aug 2015 ______     Hatch
                                           HRF        28 Aug 2015 ______     Ownership
                                           A51        10 Sep 2016 ______     Loan to
Totals: 1.0.0 (1)
-------------------------------------------------------------------------------

A52
   132    M    23 Oct 2013      35      36  A10       ~23 Oct 2013 ______     Hatch
                                           HRF        23 Oct 2013 ______     Ownership
                                           A52        11 Apr 2015 ______     Loan to
Totals: 1.0.0 (1)
-------------------------------------------------------------------------------

A55
   144    M    20 Jun 2015      74      96  A55        20 Jun 2015 ______     Hatch
                                           HRF        20 Jun 2015 ______     Ownership

   151    M       ????        WILD    WILD  SPRINGBOK  22 Sep 2015   NONE     Capture
                                           HRF        22 Sep 2015 ______     Ownership
                                           A55        23 Sep 2015 ______     Loan to

   156    F       ????        WILD    WILD  SPRINGBOK  22 Sep 2015   NONE     Capture
                                           HRF        22 Sep 2015 ______     Ownership
                                           A55        23 Sep 2015 ______     Loan to

   165    ?    27 Oct 2016     151     156  A55        27 Oct 2016 ______     Hatch
                                           HRF        27 Oct 2016 ______     Ownership

   175    ?     9 Aug 2017     151     156  A55         9 Aug 2017 ______     Hatch
                                           HRF         9 Aug 2017 ______     Ownership
Totals: 2.1.2 (5)
-------------------------------------------------------------------------------
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```
A57
   150    M       ????        WILD    WILD  SPRINGBOK  22 Sep 2015   NONE     Capture
                                            HRF        22 Sep 2015 ______     Ownership
                                            A57        23 Sep 2015 ______     Loan to

   164    ?    15 Jun 2016      10      79  A57        15 Jun 2016 ______     Hatch
                                            HRF        15 Jun 2016 ______     Ownership
Totals: 1.0.1 (2)
-------------------------------------------------------------------------------------

A59
    51    M     1 Jul 2003       1       2  HRF         1 Jul 2003  II-13     Hatch
                                            A41         2 Nov 2003 ______     Loan to
                                            A59        13 Sep 2008 ______     Loan to

   113    M    16 Jun 2010      37      38  HRF        16 Jun 2010 ______     Hatch
                                            A59         3 Dec 2011 ______     Loan to

   152    M       ????        WILD    WILD  SPRINGBOK  22 Sep 2015   NONE     Capture
                                            HRF        22 Sep 2015 ______     Ownership
                                            A59        22 Sep 2015 ______     Loan to

   157    F       ????        WILD    WILD  SPRINGBOK  22 Sep 2015   NONE     Capture
                                            HRF        22 Sep 2015 ______     Ownership
                                            A59        22 Sep 2015 ______     Loan to

   172    ?     1 Aug 2017     152     157  A59         1 Aug 2017 ______     Hatch
                                            HRF         1 Aug 2017 ______     Ownership
Totals: 3.1.1 (5)
-------------------------------------------------------------------------------------

A63
    37    M       ????        WILD    WILD  SPRINGBOK   3 Oct 2001   NONE     Capture
                                            HRF         6 Oct 2001 ______     Transfer
                                            A25         6 Oct 2001 ______     Loan to
                                            HRF        12 Jun 2004 0612-I     Transfer
                                            A63        17 Apr 2016 ______     Loan to

    38    F       ????        WILD    WILD  SPRINGBOK   3 Oct 2001   NONE     Capture
                                            HRF         6 Oct 2001 ______     Transfer
                                            A25         6 Oct 2001 ______     Loan to
                                            HRF        12 Jun 2004 612-II     Transfer
                                            A63        17 Apr 2016 ______     Loan to

Totals: 1.1.0 (2)
-------------------------------------------------------------------------------------

A65
    72    M    24 Jul 2005   MULT3   MULT4  HRF        24 Jul 2005    ?-1     Hatch
                                            A65        17 Oct 2009 ______     Loan to
Totals: 1.0.0 (1)
-------------------------------------------------------------------------------------

A66
    11    M    10 Nov 1997       1       3  HRF        10 Nov 1997  III-4     Hatch
                                            A06        22 Nov 1998 ______     Loan to
                                            A07         5 Jul 2000 ______     Loan to
                                            A16        16 Sep 2000 ______     Loan to
                                            A83        14 Mar 2015 ______     Loan to
                                            A66        23 Oct 2016 ______     Loan to

   149    F    17 Sep 2015      35      36  A10        17 Sep 2015 ______     Hatch
                                            HRF        17 Sep 2015 ______     Ownership
                                            A66         1 Nov 2017 ______     Loan to
Totals: 1.1.0 (2)
-------------------------------------------------------------------------------------

A68
     9    F    30 Nov 1996       1       2  HRF        30 Nov 1996   II-1     Hatch
                                            A68        15 May 2014 ______     Loan to

    99    M    21 May 2008      37      38  HRF        21 May 2008 ______     Hatch
                                            A68         5 Jun 2010 ______     Loan to

   100    M    24 Jun 2008      37      38  HRF        24 Jun 2008 ______     Hatch
                                            A68         5 Jun 2010 ______     Loan to
Totals: 2.1.0 (3)
-------------------------------------------------------------------------------------

A76
   114    M     4 Jul 2010      37       9  HRF         4 Jul 2010 ______     Hatch
                                            A76       ~27 Jun 2011 ______     Loan to
Totals: 1.0.0 (1)
-------------------------------------------------------------------------------------

A78
    71    M    25 Jun 2005      44       7  A10        25 Jun 2005 ______     Hatch
                                            HRF        25 Jun 2005 ______     Ownership
                                            A58         6 May 2008 ______     Loan to
                                            A10        22 Jan 2012 ______     Loan to
                                            A78        10 Mar 2012 ______     Loan to
Totals: 1.0.0 (1)
-------------------------------------------------------------------------------------
```

```
A79
    10    M    22 Oct 1997       1       2  HRF        22 Oct 1997   II-3     Hatch
                                             A10         4 Aug 2001 ______     Loan to
                                             A31         7 May 2002 ______     Loan to
                                             A33         8 Nov 2002  UHURU     Loan to
                                             A57         6 Apr 2008 ______     Loan to
                                             A79        17 May 2016 ______     Loan to

    79    F     9 Aug 2006      37      38  HRF         9 Aug 2006 ______     Hatch
                                             A57         5 Nov 2009 ______     Loan to
                                             A79        17 May 2016 ______     Loan to

   118    F     1 May 2010      44       7  A10         1 May 2010 ______     Hatch
                                             HRF       ~ 1 May 2010 ______     Ownership
                                             A58        10 Nov 2011 ______     Loan to
                                             A10        22 Jan 2012 ______     Loan to
                                             A79        22 Feb 2012 ______     Loan to
Totals: 1.2.0 (3)
-------------------------------------------------------------------------------------

A80
   106    M    20 May 2009      35      36  A07        20 May 2009 ______     Hatch
                                             HRF        20 May 2009 ______     Ownership
                                             A67        13 Mar 2010 ______     Loan to
                                             A80        19 Jan 2016 ______     Loan to

   121    M    23 Sep 2011      35      36  A07        23 Sep 2011 ______     Hatch
                                             HRF        23 Sep 2011 ______     Ownership
                                             A67        18 Nov 2011 ______     Loan to
                                             A80        19 Jan 2016 ______     Loan to
Totals: 2.0.0 (2)
-------------------------------------------------------------------------------------

A84
    74    M    31 Jul 2005       1       3  A25        31 Jul 2005 ______     Hatch
                                             HRF        31 Jul 2005 ______     Ownership
                                             A55        24 Mar 2007 ______     Loan to
                                             A84        12 Mar 2016 ______     Loan to

    96    F    30 Jul 2007      35      36  A07        30 Jul 2007 ______     Hatch
                                             HRF        30 Jul 2007 ______     Ownership
                                             A61        13 Apr 2008 ______     Loan to
                                             A64        10 May 2009 ______     Loan to
                                             A55        12 Sep 2009 ______     Loan to
                                             A84        12 Mar 2016 ______     Transfer

   119    M   ~20 Apr 2011      44       7  A10       ~20 Apr 2011 ______     Hatch
                                             HRF       ~20 Apr 2011 ______     Ownership
                                             A84         8 Sep 2012 ______     Loan to

   163    ?    10 Aug 2016      74      96  A84        10 Aug 2016 ______     Hatch
                                             HRF        10 Aug 2016 ______     Ownership

   180    ?    14 Jun 2017      74      96  A86        14 Jun 2017 ______     Hatch
                                             HRF        14 Jun 2017 ______     Ownership
Totals: 2.1.2 (5)
-------------------------------------------------------------------------------------

A91
   123    M    24 Jun 2012      37      38  HRF        24 Jun 2012 ______     Hatch
                                             A91        13 Dec 2014 ______     Loan to
Totals: 1.0.0 (1)
-------------------------------------------------------------------------------------

A94
    88    M   ~15 Nov 2005      25      60  A37       ~15 Nov 2005 ______     Hatch
                                             HRF       ~15 Nov 2005 ______     Ownership
                                             A69        30 Aug 2010 ______     Loan to
                                             A39        24 Nov 2011 ______     Loan to
                                             A63        17 Mar 2014 ______     Loan to
                                             A94        11 Mar 2017 ______     Loan to

   120    F   ~19 Sep 2011      44       7  A10       ~19 Sep 2011 ______     Hatch
                                             HRF       ~19 Sep 2011 ______     Ownership
                                             A94         4 Oct 2013 ______     Loan to

   139    F     1 Sep 2014      35      36  A10         1 Sep 2014 ______     Hatch
                                             HRF         1 Sep 2014 ______     Ownership
                                             A63        13 Mar 2016 ______     Loan to
                                             A94        11 Mar 2017 ______     Loan to
Totals: 1.2.0 (3)
-------------------------------------------------------------------------------------

A103
    94    M    27 Aug 2007      44       7  A10        27 Aug 2007 ______     Hatch
                                             HRF       ~27 Aug 2007 ______     Ownership
                                             A82        10 Mar 2012 ______     Loan to
                                             A92        18 Mar 2013 ______     Loan to
                                             A103        8 Mar 2014 ______     Loan to
Totals: 1.0.0 (1)
-------------------------------------------------------------------------------------
```

```
A104
     7    F    24 Dec 1996       1       3  HRF        24 Dec 1996  III-3     Hatch
                                              A06        22 Nov 1998 _______     Loan to
                                              A07         5 Jul 2000 _______     Loan to
                                              A18        14 Dec 2001 _______     Loan to
                                              A31         6 May 2002 _______     Loan to
                                              A10         8 Dec 2002 _______     Loan to
                                              A65        11 Nov 2012 _______     Loan to
                                              A104       12 May 2014 _______     Loan to

    44    M    31 Oct 2002      35      36  A07        31 Oct 2002 _______     Hatch
                                              HRF        31 Oct 2002 _______     Ownership
                                              A10        24 Jul 2004 _______     Loan to
                                              A65        11 Nov 2012 _______     Loan to
                                              A104       12 May 2014 _______     Loan to

Totals: 1.1.0 (2)
-------------------------------------------------------------------------------------

A105
    82    M    26 Dec 2005      25      60  A37        26 Dec 2005 _______     Hatch
                                              HRF        26 Dec 2005 _______     Ownership
                                              A71        30 Aug 2010 _______     Loan to
                                              A85         5 Mar 2014 _______     Loan to
                                              A105        9 Oct 2014 _______     Loan to

   138    F    22 Aug 2014      35      36  A10        22 Aug 2014 _______     Hatch
                                              HRF        22 Aug 2014 _______     Ownership
                                              A105       15 Apr 2016 _______     Loan to
Totals: 1.1.0 (2)
-------------------------------------------------------------------------------------

A106
   128    M    15 Jun 2012      35      36  A07        15 Jun 2012 _______     Hatch
                                              HRF        15 Jun 2012 _______     Ownership
                                              A85        20 Oct 2012 _______     Loan to
                                              A106        5 Oct 2014 _______     Loan to
Totals: 1.0.0 (1)
-------------------------------------------------------------------------------------

A109
   111    M    13 May 2010      37      38  HRF        13 May 2010 _______     Hatch
                                              A39         3 Dec 2011 _______     Loan to
                                              A63        17 Mar 2014 _______     Loan to
                                              A109      ~25 Jan 2015 _______     Loan to
Totals: 1.0.0 (1)
-------------------------------------------------------------------------------------

A110
    14    M    22 Oct 1998       1       3  HRF        22 Oct 1998  III-5     Hatch
                                              A07        22 Nov 1998 _______     Loan to
                                              A16        16 Sep 2000 _______     Loan to
                                              A110       14 Mar 2015 _______     Loan to

   107    F    21 Jul 2009      35      36  A07        21 Jul 2009 _______     Hatch
                                              HRF        21 Jul 2009 _______     Ownership
                                              A67        13 Mar 2010 _______     Loan to
                                              A59         8 Mar 2014 _______     Loan to
                                              A94        12 Mar 2016 _______     Loan to
                                              A110       11 Mar 2017 _______     Loan to

   179    ?    15 Dec 2017      14     107  A110       15 Dec 2017 _______     Hatch
                                              HRF        15 Dec 2017 _______     Ownership
Totals: 1.1.1 (3)
-------------------------------------------------------------------------------------

A111
   110    F    23 Mar 2010      44       7  A10        23 Mar 2010 _______     Hatch
                                              HRF       ~23 Mar 2010 _______     Ownership
                                              A58        10 Nov 2011 _______     Loan to
                                              A10        22 Jan 2012 _______     Loan to
                                              A81        22 Feb 2012 _______     Loan to
                                              A111        3 May 2015 _______     Loan to
Totals: 0.1.0 (1)
-------------------------------------------------------------------------------------

A112
   131    M     4 Oct 2013      35      36  A10         4 Oct 2013 _______     Hatch
                                              HRF         4 Oct 2013 _______     Ownership
                                              A112       12 Sep 2015 _______     Loan to
Totals: 1.0.0 (1)
-------------------------------------------------------------------------------------

A113
   126    M    16 Aug 2012      37       9  HRF        16 Aug 2012 _______     Hatch
                                              A113       13 Jun 2015 _______     Loan to
Totals: 1.0.0 (1)
-------------------------------------------------------------------------------------

A114
   124    M    30 Jun 2012      37       9  HRF        30 Jun 2012 _______     Hatch
                                              A114       12 Sep 2015 _______     Loan to
Totals: 1.0.0 (1)
-------------------------------------------------------------------------------------
```

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A115
    87    M   ~15 Oct 2005      25      60  A37       ~15 Oct 2005 ______     Hatch
                                             A115       21 Nov 2015 ______     Transfer

    89    M    18 Jan 2007      25      60  A37        18 Jan 2007 ______     Hatch
                                             A115      ~21 Nov 2015 ______     Transfer

    92    M    10 Aug 2007      25      60  A37        10 Aug 2007 ______     Hatch
                                             HRF       ~10 Aug 2007 ______     Ownership
                                             A115       21 Nov 2015 ______     Loan to
Totals: 3.0.0 (3)
-------------------------------------------------------------------------------------

A116
    42    F    20 Aug 2002       1       2  HRF        20 Aug 2002  II-11     Hatch
                                             A08        19 Apr 2003 ______     Loan to
                                             A116       31 Jan 2016 ______     Loan to

    73    M     2 Aug 2005      37      38  HRF         2 Aug 2005  HSS73     Hatch
                                             A08        18 Apr 2009 ______     Loan to
                                             A116       31 Jan 2016 ______     Loan to

   125    M     7 Jul 2012      74      96  A55         7 Jul 2012 ______     Hatch
                                             HRF         7 Jul 2012 ______     Ownership
                                             A90         1 Mar 2013 ______     Loan to
                                             A55        25 Aug 2015 ______     Loan to
                                             A116       31 Jan 2016 ______     Loan to

   171    ?     1 Aug 2017      73      42  A116        1 Aug 2017 ______     Hatch
                                             HRF         1 Aug 2017 ______     Ownership

   173    ?    14 Sep 2017      73      42  A116       14 Sep 2017 ______     Hatch
                                             HRF        14 Sep 2017 ______     Ownership
Totals: 2.1.2 (5)
-------------------------------------------------------------------------------------

A117
   137    M    21 Jun 2014      35      36  A10        21 Jun 2014 ______     Hatch
                                             HRF        21 Jun 2014 ______     Ownership
                                             A117        8 Apr 2016 ______     Loan to
Totals: 1.0.0 (1)
-------------------------------------------------------------------------------------

A120
   145    F    20 Jun 2015      35      36  A10        20 Jun 2015 ______     Hatch
                                             HRF        20 Jun 2015 ______     Ownership
                                             A120       10 Sep 2016 ______     Loan to
Totals: 0.1.0 (1)
-------------------------------------------------------------------------------------

A122
   112    M     8 Jun 2010      37       9  HRF         8 Jun 2010 ______     Hatch
                                             A72        29 Oct 2010 ______     Loan to
                                             A83        16 Aug 2012 ______     Loan to
                                             A122       10 Dec 2016 ______     Loan to
Totals: 1.0.0 (1)
-------------------------------------------------------------------------------------

A124
   146    F     6 Jul 2015      35      36  A10         6 Jul 2015 ______     Hatch
                                             HRF         6 Jul 2015 ______     Ownership
                                             A124       10 Sep 2016 ______     Loan to
Totals: 0.1.0 (1)
-------------------------------------------------------------------------------------

AMSTERDAM - Artis Royal Zoo
    77    F    13 Jul 2006      44       7  A10        13 Jul 2006 ______     Hatch
                                             HRF        13 Jul 2006 ______     Ownership
                                             A63        14 Aug 2010 ______     Loan to
                                             AMSTERDAM   2 May 2014 ______     Loan to

   115    M     6 Jul 2011      37       9  HRF         6 Jul 2011 ______     Hatch
                                             AMSTERDAM   6 Nov 2012 R12043     Loan to

   117    M    12 Jun 2011      37       9  HRF        12 Jun 2011 ______     Hatch
                                             AMSTERDAM   6 Nov 2012 R12042     Loan to
Totals: 2.1.0 (3)
-------------------------------------------------------------------------------------

HRF - Homopus Research Foundation
   142    F    15 May 2015      37      38  HRF        15 May 2015 ______     Hatch

   154    M       ????        WILD    WILD  SPRINGBOK  22 Sep 2015   NONE     Capture
                                             HRF        22 Sep 2015 ______     Transfer

   159    F       ????        WILD    WILD  SPRINGBOK  22 Sep 2015   NONE     Capture
                                             HRF        22 Sep 2015 ______     Transfer

   161    F    26 Jan 2016    WILD     159  HRF        26 Jan 2016 ______     Hatch

   162    F    25 Feb 2016    WILD     159  HRF        25 Feb 2016 ______     Hatch
Totals: 1.4.0 (5)
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PLZEN - Zool A Botanicka Zahrada Plzen
   136    F     2 Sep 2014      37       9  HRF         2 Sep 2014 ______     Hatch
                                            PLZEN      27 Sep 2016 725101     Loan to
Totals: 0.1.0 (1)
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=====================================================================================
TOTALS: 48.26.18 (92)
```

Homopus areolatus: live and available studbook population. MULTX are groups of unregistered specimens at locations outside of the studbook, except MULT4 consists of studbook numbers 59 and 60, and MULT7 consists of studbook numbers 190 and 191. UNKX are specimens at locations outside of the studbook. UNK6 and UNK7 probably originate from bloodline 58 x MULT4, consequently, studbook number 235 should be considered an inbred individual.

```
=====================================================================================
Stud # | Sex | Hatch Date | Sire  | Dam   | Location | Date      | Local ID | Event    |
=====================================================================================

A10
    62    F   ~25 Nov 2007       5       4  A10       ~25 Nov 2007 ______     Hatch
                                            HRF       ~25 Nov 2007 ______     Ownership
                                            A44        27 Mar 2011 ______     Loan to
                                            A10        25 Jul 2014 ______     Transfer

    94    M     7 Jul 2009      16      17  A16         7 Jul 2009 ______     Hatch
                                            A44         5 Jun 2010 AUGUST     Transfer
                                            A10       ~25 Jul 2014 ______     Transfer

   186    ?    15 Sep 2015      94      62  A10        15 Sep 2015 ______     Hatch

   201    ?    16 Aug 2016      94      62  A10        16 Aug 2016 ______     Hatch

   223    F         ~ 2010    WILD    WILD  WILD      ~10 Oct 2017   NONE     Capture
                                            A10       ~11 Oct 2017 ______     Loan to
                                            HRF       ~11 Oct 2017 ______     Ownership

   224    ?    29 Apr 2017      94      62  A10        29 Apr 2017 ______     Hatch
                                            HRF        29 Apr 2017 ______     Ownership

   225    ?     4 May 2017      94      62  A10         4 May 2017 ______     Hatch
                                            HRF         4 May 2017 ______     Ownership

   226    ?    11 May 2017      94      62  A10        11 May 2017 ______     Hatch

   228    ?    13 Jul 2017      94      62  A10        13 Jul 2017 ______     Hatch

   229    ?    15 Jul 2017      94      62  A10        15 Jul 2017 ______     Hatch

   230    ?    30 Jul 2017      94      62  A10        30 Jul 2017 ______     Hatch
                                            HRF        30 Jul 2017 ______     Ownership

   232    ?    19 Sep 2017      94      62  A10        19 Sep 2017 ______     Hatch
                                            HRF        19 Sep 2017 ______     Ownership

   233    ?    21 Sep 2017      94      62  A10        21 Sep 2017 ______     Hatch
Totals: 1.2.10 (13)
-------------------------------------------------------------------------------------

A16
    17    F       ????        WILD    WILD  A16        30 Aug 1994 ______     Transfer

    39    M     9 Apr 2003      16      17  A16         9 Apr 2003 ______     Hatch

    48    M    23 Mar 2004      16      17  A16        23 Mar 2004 ______     Hatch

    49    F    25 Mar 2004      16      17  A16        25 Mar 2004 ______     Hatch

    50    F     8 Aug 2004      16      17  A16         8 Aug 2004 ______     Hatch

    51    M    19 Aug 2004      16      17  A16        19 Aug 2004 ______     Hatch

    52    F    25 Aug 2004      16      17  A16        25 Aug 2004 ______     Hatch

    54    M    10 Jun 2005      16      17  A16        10 Jun 2005 ______     Hatch

    55    M    27 Jun 2005      16      17  A16        27 Jun 2005 ______     Hatch

    56    F     6 Oct 2005      16      17  A16         6 Oct 2005 ______     Hatch

    57    F     3 Nov 2005      16      17  A16         3 Nov 2005 ______     Hatch

   108    M     8 Mar 2010      47      37  A44         8 Mar 2010 ______     Hatch
                                            A16         4 Jun 2010 ______     Transfer

   109    F     8 Mar 2010      47      37  A44         8 Mar 2010 ______     Hatch
                                            A16         4 Jun 2010 ______     Transfer

   115    ?    30 May 2010      16      17  A16        30 May 2010 ______     Hatch
```

116	?	31 May 2010	16	17	A16	31 May 2010	_____	Hatch
122	?	2 Jul 2011	16	17	A16	2 Jul 2011	_____	Hatch
134	?	27 Apr 2012	16	17	A16	27 Apr 2012	_____	Hatch
135	?	25 Aug 2012	16	17	A16	25 Aug 2012	_____	Hatch
146	?	9 Apr 2013	16	17	A16	9 Apr 2013	_____	Hatch
147	?	9 Apr 2013	16	17	A16	9 Apr 2013	_____	Hatch
152	?	11 Jun 2014	16	17	A16	11 Jun 2014	_____	Hatch
153	?	11 Jun 2014	16	17	A16	11 Jun 2014	_____	Hatch
157	?	6 Sep 2014	55	109	A16	6 Sep 2014	_____	Hatch
182	?	26 Jul 2015	108	56	A16	26 Jul 2015	_____	Hatch
184	?	18 Aug 2015	108	56	A16	18 Aug 2015	_____	Hatch
188	?	17 Aug 2016	MULT 6	17	A16	17 Aug 2016	_____	Hatch
189	?	18 Aug 2016	MULT 6	17	A16	18 Aug 2016	_____	Hatch
217	?	8 May 2017	108	56	A16	8 May 2017	_____	Hatch
218	?	18 May 2017	108	56	A16	18 May 2017	_____	Hatch
219	?	24 Jun 2017	108	17	A16	24 Jun 2017	_____	Hatch
227	?	22 Aug 2017	108	56	A16	22 Aug 2017	_____	Hatch

Totals: 6.7.18 (31)

A37

22	M	????	WILD	WILD	UNKNOWN	????	NONE	Capture
					A20	????	_____	Transfer
					A21	17 Oct 2000	_____	Transfer
					A37	15 Sep 2002	1	Transfer
23	F	????	WILD	WILD	UNKNOWN	????	NONE	Capture
					A20	????	_____	Transfer
					A21	17 Oct 2000	_____	Transfer
					A37	15 Sep 2002	2	Transfer
24	F	~ 1993	UNK1	UNK2	A20	~ 1993	_____	Hatch
					A21	17 Oct 2000	_____	Transfer
					A37	15 Sep 2002	3	Transfer
46	M	30 Sep 2004	22	24	A37	30 Sep 2004	_____	Hatch
107	F	8 Mar 2010	47	37	A44	8 Mar 2010	_____	Hatch
					A37	5 May 2010	_____	Transfer
111	F	29 Mar 2010	47	37	A44	29 Mar 2010	_____	Hatch
					A37	7 Jun 2010	_____	Transfer
172	M	5 Jan 2014	22	24	A37	5 Jan 2014	_____	Hatch
173	M	12 Jan 2014	22	24	A37	12 Jan 2014	_____	Hatch
174	F	15 Aug 2014	22	24	A37	15 Aug 2014	_____	Hatch
175	F	15 Jan 2015	22	24	A37	15 Jan 2015	_____	Hatch
177	M	15 Feb 2012	22	24	A37	15 Feb 2012	_____	Hatch
178	F	15 Feb 2009	22	24	A37	15 Feb 2009	_____	Hatch
179	F	15 Feb 2005	22	24	A37	15 Feb 2005	_____	Hatch
180	F	15 Feb 2004	22	24	A37	15 Feb 2004	_____	Hatch
183	F	11 Aug 2015	22	24	A37	11 Aug 2015	_____	Hatch
211	?	8 Feb 2016	22	24	A37	8 Feb 2016	_____	Hatch
212	?	17 Mar 2016	22	24	A37	17 Mar 2016	_____	Hatch
213	?	18 Mar 2016	22	24	A37	18 Mar 2016	_____	Hatch

Totals: 5.10.3 (18)

A42

35	M	9 Jul 2002	16	17	A16	9 Jul 2002	_____	Hatch
					A42	~30 Sep 2005	_____	Loan to

Totals: 1.0.0 (1)

A44

130	F	16 Mar 2012	94	62	A44	16 Mar 2012	_____	Hatch
132	M	18 Jul 2012	94	62	A44	18 Jul 2012	_____	Hatch

```
   133    F    13 Aug 2012      94      62  A44        13 Aug 2012 ______     Hatch
                                            HRF        13 Aug 2012 ______     Ownership

   149    M    27 Apr 2013      94      62  A44        27 Apr 2013 ______     Hatch
                                            HRF        27 Apr 2013 ______     Ownership

Totals: 2.2.0 (4)
--------------------------------------------------------------------------------

A46
    58    M       ????        WILD    WILD  A46         9 Sep 1997     03     Transfer

    59    F       ????        WILD    WILD  A46         9 Sep 1997     01     Transfer

    60    F       ????        WILD    WILD  A46        25 Mar 1999     02     Transfer

   162    ?    29 Jan 2014      58   MULT4  A46        29 Jan 2014 ______     Hatch

   164    ?    20 Feb 2014      58   MULT4  A46        20 Feb 2014 ______     Hatch

   165    ?    20 Feb 2014      58   MULT4  A46        20 Feb 2014 ______     Hatch

   167    ?    27 Feb 2014      58   MULT4  A46        27 Feb 2014 ______     Hatch

   169    ?    13 Feb 2015      58   MULT4  A46        13 Feb 2015 ______     Hatch

   170    ?    20 Feb 2015      58   MULT4  A46        20 Feb 2015 ______     Hatch

   171    ?    20 Mar 2015      58   MULT4  A46        20 Mar 2015 ______     Hatch

   197    ?     4 Feb 2016      58   MULT4  A46         4 Feb 2016 ______     Hatch

   198    ?     4 Feb 2016      58   MULT4  A46         4 Feb 2016 ______     Hatch

   199    ?     4 Feb 2016      58   MULT4  A46         4 Feb 2016 ______     Hatch

   200    ?     6 Feb 2016      58   MULT4  A46         6 Feb 2016 ______     Hatch

   202    ?    20 Feb 2016      58   MULT4  A46        20 Feb 2016 ______     Hatch

   203    ?    21 Feb 2016      58   MULT4  A46        21 Feb 2016 ______     Hatch

   204    ?    22 Feb 2016      58   MULT4  A46        22 Feb 2016 ______     Hatch

   205    ?     3 Mar 2016      58   MULT4  A46         3 Mar 2016 ______     Hatch

   206    ?     4 Mar 2016      58   MULT4  A46         4 Mar 2016 ______     Hatch

   220    ?     1 Feb 2017      58   MULT4  A46        18 Oct 2017 ______     Hatch

   221    ?     2 Feb 2017      58   MULT4  A46         2 Feb 2017 ______     Hatch

   222    ?     4 Mar 2017      58   MULT4  A46         4 Mar 2017 ______     Hatch
Totals: 1.2.19 (22)
--------------------------------------------------------------------------------

A48
    93    M     7 Jul 2009      16      17  A16         7 Jul 2009 ______     Hatch
                                            A44         5 Jun 2010 ______     Transfer
                                            A48        13 Jun 2010 ______     Transfer
                                            HRF        15 May 2017 ______     Ownership

Totals: 1.0.0 (1)
--------------------------------------------------------------------------------

A59
   187    F    17 Sep 2015      94      62  A10        17 Sep 2015 ______     Hatch
                                            HRF        17 Sep 2015 ______     Ownership
                                            A59        12 Sep 2016 ______     Loan to
Totals: 0.1.0 (1)
--------------------------------------------------------------------------------

A66
    79    M   ~15 Mar 2007      58   MULT4  A46       ~15 Mar 2007 ______     Hatch
                                            A54       ~15 Jun 2008 ______     Loan to
                                            HRF       ~15 Jun 2008 ______     Ownership
                                            A66        11 Apr 2015 ______     Loan to

    81    F   ~15 Mar 2007      58   MULT4  A46       ~15 Mar 2007 ______     Hatch
                                            A54       ~15 Jun 2008 ______     Loan to
                                            HRF       ~15 Jun 2008 ______     Ownership
                                            A66       ~11 Apr 2015 ______     Loan to
Totals: 1.1.0 (2)
--------------------------------------------------------------------------------

A73
    69    M   ~22 Apr 2004      58   MULT4  A46       ~22 Apr 2004 ______     Hatch
                                            A56       ~21 May 2006 ______     Loan to
                                            A73        19 Jun 2010 ______     Transfer

    71    F   ~ 6 Mar 2004      58   MULT4  A46       ~ 6 Mar 2004 ______     Hatch
                                            A56       ~21 May 2006 ______     Loan to
                                            A73        19 Jun 2010 ______     Transfer
Totals: 1.1.0 (2)
```

```
A77
    84    M   ~ 7 Feb 2008      58   MULT4  A46       ~ 7 Feb 2008 ______     Hatch
                                           A77         2 Jun 2011 ______     Transfer

    85    M   ~ 7 Feb 2008      58   MULT4  A46       ~ 7 Feb 2008 ______     Hatch
                                           A77         2 Jun 2011 ______     Transfer
Totals: 2.0.0 (2)
-------------------------------------------------------------------------------

A94
   185    ?    12 Sep 2015      94      62  A10        12 Sep 2015 ______     Hatch
                                           HRF        12 Sep 2015 ______     Ownership
                                           A94        12 Sep 2016 ______     Loan to
Totals: 0.0.1 (1)
-------------------------------------------------------------------------------

A99
   123    F    23 Jan 2012      58   MULT4  A46        23 Jan 2012 ______     Hatch
                                           A99         1 Sep 2016 ______     Transfer

   124    M    24 Jan 2012      58   MULT4  A46        24 Jan 2012 ______     Hatch
                                           A99         1 Sep 2016 ______     Transfer

   125    M    31 Jan 2012      58   MULT4  A46        31 Jan 2012 ______     Hatch
                                           A99         1 Sep 2016 ______     Transfer

   126    M     1 Feb 2012      58   MULT4  A46         1 Feb 2012 ______     Hatch
                                           A99         1 Sep 2016 ______     Transfer

   128    F     3 Feb 2012      58   MULT4  A46         3 Feb 2012 ______     Hatch
                                           A99         1 Sep 2016 ______     Transfer

   129    F     4 Feb 2012      58   MULT4  A46         4 Feb 2012 ______     Hatch
                                           A99         1 Sep 2016 ______     Transfer

   137    M   ~25 Jan 2013      58   MULT4  A46       ~25 Jan 2013 ______     Hatch
                                           A99       ~ 1 Sep 2016 ______     Transfer

   166    M    21 Feb 2014      58   MULT4  A46        21 Feb 2014 ______     Hatch
                                           A99         1 Sep 2016 ______     Transfer

   234    M       ????        UNK6    UNK7  A86       ~ 1 Nov 2012 ______     Hatch
                                           A99       ~ 1 May 2014 ______     Transfer

   235    ?     5 Sep 2017     234     129  A99         5 Sep 2017 ______     Hatch
Totals: 6.3.1 (10)
-------------------------------------------------------------------------------

A100
    96    M   ~18 Jan 2010      58   MULT4  A46       ~18 Jan 2010 ______     Hatch
                                           A56       ~ 1 Jun 2012 ______     Loan to
                                           A89       ~ 1 Jun 2012 ______     Loan to
                                           A100      ~13 Jul 2013 ______     Transfer

   138    M   ~27 Jan 2013      58   MULT4  A46       ~27 Jan 2013 ______     Hatch
                                           A99       ~ 1 Sep 2016 ______     Loan to
                                           A100       19 Mar 2017 ______     Transfer

   141    M   ~17 Feb 2013      58   MULT4  A46       ~17 Feb 2013 ______     Hatch
                                           A99       ~ 1 Sep 2016 ______     Loan to
                                           A100      ~19 Mar 2017 ______     Transfer

   145    F   ~26 Mar 2013      58   MULT4  A46       ~26 Mar 2013 ______     Hatch
                                           A99       ~ 1 Sep 2016 ______     Loan to
                                           A100       14 Nov 2017 ______     Transfer
Totals: 3.1.0 (4)
-------------------------------------------------------------------------------

A121
   190    F       ????        WILD    WILD  A121        8 Apr 2016 ______     Transfer

   191    F       ????        WILD    WILD  A121        8 Apr 2016 ______     Transfer

   192    M       ????        WILD    WILD  A121        8 Apr 2016 ______     Transfer

   194    F   ~ 8 Apr 2016     192   MULT7  A121        8 Apr 2016 ______     Hatch

   195    ?   ~ 8 Apr 2016     192   MULT7  A121        8 Apr 2016 ______     Hatch

   196    ?   ~ 8 Apr 2016     192   MULT7  A121        8 Apr 2016 ______     Hatch

   210    F         ~ 2006     WILD    WILD  A121        1 Dec 2016 ______     Transfer

   214    ?    21 Mar 2017     192  MULT 7  A121       21 Mar 2017 ______     Hatch

   215    ?    21 Mar 2017     192  MULT 7  A121       21 Mar 2017 ______     Hatch


   216    ?    21 Mar 2017     192  MULT 7  A121       21 Mar 2017 ______     Hatch
Totals: 1.4.5 (10)
-------------------------------------------------------------------------------
```

```
A125
   127    M     2 Feb 2012      58   MULT4  A46         2 Feb 2012 ______     Hatch
                                           A99         1 Sep 2016 ______     Loan to
                                           A125        1 Oct 2017 ______     Transfer

   136    F   ~18 Jan 2013      58   MULT4  A46       ~18 Jan 2013 ______     Hatch
                                           A99         1 Sep 2016 ______     Loan to
                                           A125        1 Oct 2017 ______     Transfer

   140    ?   ~17 Feb 2013      58   MULT4  A46       ~17 Feb 2013 ______     Hatch
                                           A99       ~ 1 Sep 2016 ______     Loan to
                                           A125      ~19 Mar 2017 ______     Transfer

   143    M   ~10 Mar 2013      58   MULT4  A46       ~10 Mar 2013 ______     Hatch
                                           A99       ~ 1 Sep 2016 ______     Loan to
                                           A125      ~ 1 Oct 2017 ______     Transfer
Totals: 2.1.1 (4)
-------------------------------------------------------------------------------------

A126
   139    ?   ~ 6 Feb 2013      58   MULT4  A46       ~ 6 Feb 2013 ______     Hatch
                                           A99       ~ 1 Sep 2016 ______     Loan to
                                           A126      ~13 Mar 2017 ______     Transfer

   144    ?   ~26 Mar 2013      58   MULT4  A46       ~26 Mar 2013 ______     Hatch
                                           A99       ~ 1 Sep 2016 ______     Loan to
                                           A126      ~13 Mar 2017 ______     Transfer

   163    ?    29 Jan 2014      58   MULT4  A46        29 Jan 2014 ______     Hatch
                                           A99         1 Sep 2016 ______     Loan to
                                           A126       13 Mar 2017 ______     Transfer

   168    ?    10 Mar 2014      58   MULT4  A46        10 Mar 2014 ______     Hatch
                                           A99         1 Sep 2016 ______     Loan to
                                           A126       13 Mar 2017 ______     Transfer
Totals: 0.0.4 (4)
-------------------------------------------------------------------------------------

A127
   142    M   ~ 4 Mar 2013      58   MULT4  A46       ~ 4 Mar 2013 ______     Hatch
                                           A99       ~ 1 Sep 2016 ______     Transfer
                                           A127        9 Sep 2017 ______     Transfer
Totals: 1.0.0 (1)
-------------------------------------------------------------------------------------

TCBCC - Turtle Conservancy Behler Chelonian Center
   207    ?    11 Apr 2016      10      11  TCBCC      11 Apr 2016 AREO10     Hatch

   208    ?    11 Apr 2016      10      11  TCBCC      11 Apr 2016 AREO11     Hatch

   209    ?    15 May 2016      10      11  TCBCC      15 May 2016 AREO09     Hatch

   236    ?     4 Apr 2017      10      11  TCBCC       4 Apr 2017 AREO12     Hatch

   237    ?    17 Apr 2017      10      11  TCBCC      17 Apr 2017 AREO13     Hatch

   238    ?    12 Aug 2017      10      11  TCBCC      12 Aug 2017 AREO14     Hatch
Totals: 0.0.6 (6)
-------------------------------------------------------------------------------------

WUPPERTAL - Wuppertal Zoological Garten
     4    F       ????       MULT1   MULT2  KRAAIFONT     ????      ______     Hatch
                                           HRF        21 Nov 1997      IV     Transfer
                                           A10        27 Oct 2004 ______     Loan to
                                           WUPPERTAL  13 Sep 2014 R14018     Loan to

    40    M       ????        WILD    WILD  WUPPERTAL  28 Mar 1991 91586B     Transfer

Totals: 1.1.0 (2)
-------------------------------------------------------------------------------------
=====================================================================================
TOTALS: 35.36.68 (139)
```

Homopus femoralis: live and available studbook population.

```
=====================================================================================
Stud # | Sex | Hatch Date | Sire  | Dam   | Location | Date      | Local ID | Event    |
=====================================================================================

A10
     2    M       ????        WILD    WILD  A28         ~ Jan 2001 ______     Transfer
                                           A08        23 Dec 2001 ______     Loan to
                                           A10        30 Jul 2006 ______     Loan to

     7    M     7 Jun 2008       3       4  HRF         7 Jun 2008 ______     Hatch
                                           A10        22 Oct 2014 ______     Loan to
Totals: 2.0.0 (2)
-------------------------------------------------------------------------------------
```

```
A50
    16    F    26 Jun 2015       3       4  HRF        26 Jun 2015 ______     Hatch
                                             A50         9 Sep 2017 ______     Loan to
Totals: 0.1.0 (1)
-------------------------------------------------------------------------------------

A55
     8    M    30 Jun 2010       3       4  HRF        30 Jun 2010 ______     Hatch
                                             A55        26 Jun 2014 ______     Loan to

    10    F    28 May 2011       3       4  HRF        28 May 2011 ______     Hatch
                                             A55        27 Jun 2015 ______     Loan to
Totals: 1.1.0 (2)
-------------------------------------------------------------------------------------

A59
    12    M    12 Jul 2013       3       4  HRF        12 Jul 2013 ______     Hatch
                                             A59         2 Aug 2015 ______     Loan to

    13    F    15 Jun 2014       3       4  HRF        15 Jun 2014 ______     Hatch
                                             A59        10 Sep 2016 ______     Loan to
Totals: 1.1.0 (2)
-------------------------------------------------------------------------------------

A84
    14    F    18 Jun 2014       3       4  HRF        18 Jun 2014 ______     Hatch
                                             A84        10 Sep 2016 ______     Loan to

    15    F    19 Jun 2014       3       4  HRF        19 Jun 2014 ______     Hatch
                                             A84        10 Sep 2016 ______     Loan to
Totals: 0.2.0 (2)
-------------------------------------------------------------------------------------

HRF - Homopus Research Foundation
     3    M       ????        WILD    WILD  A28         ~ Jan 2001 ______     Transfer
                                             HRF        23 Dec 2001    III     Loan to

     4    F       ????        WILD    WILD  BEAUF W    16 Mar 2006   NONE     Capture
                                             HRF        19 Mar 2006 ______     Transfer

    17    ?    26 Jun 2017       3       4  HRF        26 Jun 2017 ______     Hatch

    18    ?     8 Jul 2017       3       4  HRF         8 Jul 2017 ______     Hatch
Totals: 1.1.2 (4)
-------------------------------------------------------------------------------------
=====================================================================================
TOTALS: 5.6.2 (13)
```

5. SPECIFIC INFORMATION FROM STUDBOOK PARTICIPANTS

On 25 November 2017, participants in the studbook on *H. areolatus* met at Wuppertal Zoo (Germany). A large amount of husbandry and breeding information was exchanged, during lectures and informally. After the meeting, all presentations were distributed to all participants in the *H. areolatus* studbook. The most important general topics were:

- Water and humidity: The natural habitat of *H. areolatus* is quite humid and it appears that replicating these conditions in captivity improves husbandry and breeding results. Several keepers struggle with lack of mating activity or lack of egg production.

- Incubation conditions: Many eggs produced in captivity are lost because they fail to develop or die during incubation. High (especially air) humidity and relatively low incubation temperatures (e.g., 1.5 °C lower than for *C. signatus*) appear key factors for successful incubation.

- UV radiation and food: Both provision of UV radiation and provision of vitamin D through the food can result in successful husbandry and breeding results. More tests are required to derive optimal conditions.

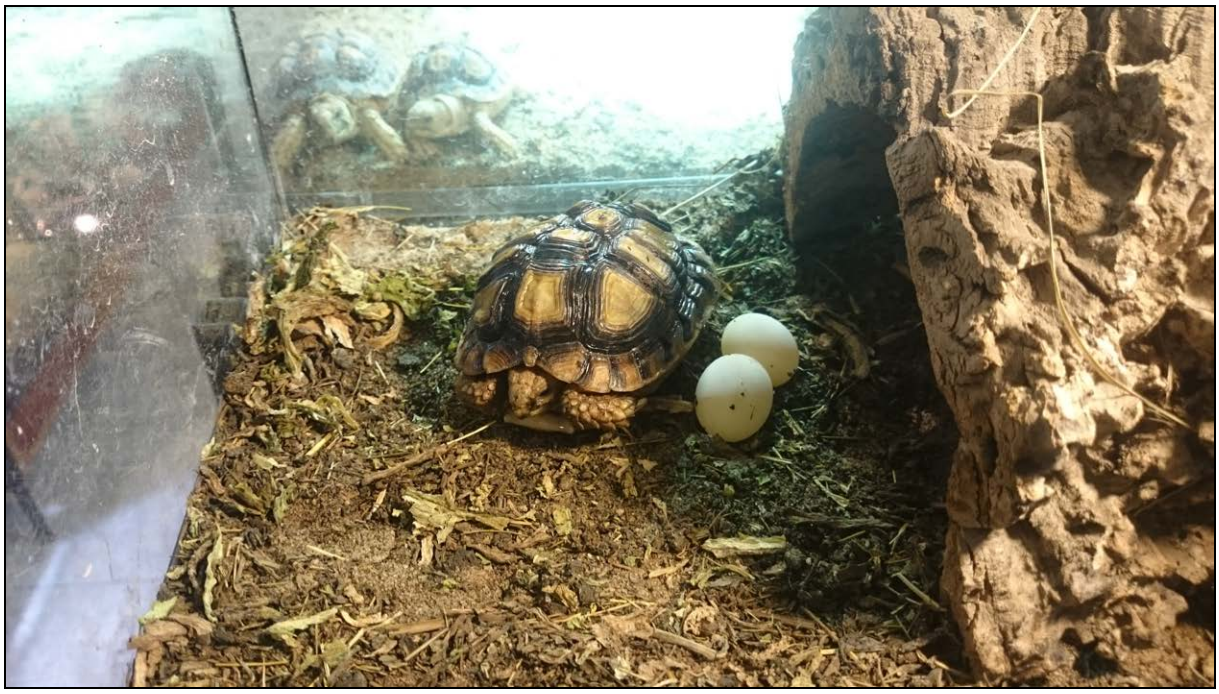
Moreover, the Homopus Research Foundation communicated to all participants in the studbook on *C. signatus* that the most frequent cause of death for *C. signatus* in the studbook is compaction of the intestinal tract as a result of ingesting soil. This should be avoided by providing a compact, firm substrate (e.g., loam) and by providing food in a feeding dish or on a flat rock instead of directly on the substrate. Husbandry guidelines were adjusted accordingly.

Location A10

For the first time in captivity, a female *C. signatus* produced a clutch containing two eggs. This was reported in a manuscript (see Chapter 6). Both eggs developed well, but died prior to incubation.

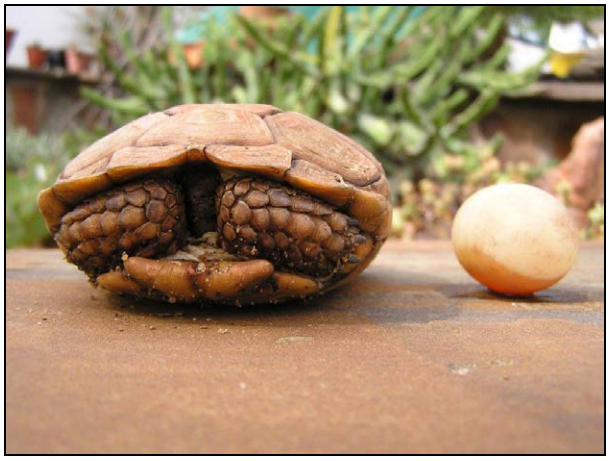
Location A16

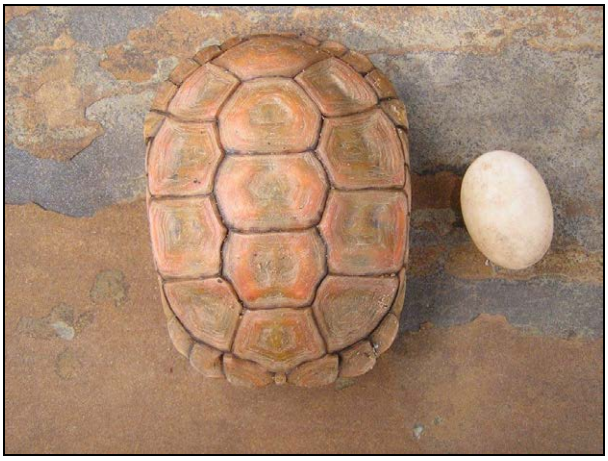
Female *H. areolatus* number 109 produced a clutch of two eggs on 21 March 2017.



Location A46

A female *Chersobius solus* produced an unburied egg that was found on 3 March 2017. *Chersobius solus* eggs are, relatively to female body size, intermediate between *C. signatus* and *Homopus* spp. eggs. The *C. solus* female was housed in an outdoor enclosure in Namibia.





Location A51

One male *C. signatus* was kept in an enclosure measuring 150 x 80 cm. The tortoise was periodically kept outside in summer where it ate part of a *Euphorbia* sp., after it had climbed to a section of the enclosure where it was not supposed to get. Although *Euphorbia* sp. are known to be poisonous, the tortoise did not appear to suffer from any negative effects. Outdoor husbandry was terminated because of the generally bad experiences with outdoor husbandry of *C. signatus* in the studbook.

Location A57

On 26 August 2017, *C. signatus* female number 155 had problems moving its hind limbs. The female was radiographed to exclude egg retention as a cause. An egg had been produced previously, in May 2017. The radiograph verified that the female was not gravid.

The female died on 11 September 2017. Dissection showed a high-grade inflammation of the ovaries, oviducts and large intestine, presumably bacterial. The enteritis caused an intestinal atony, which congested the large intestine.

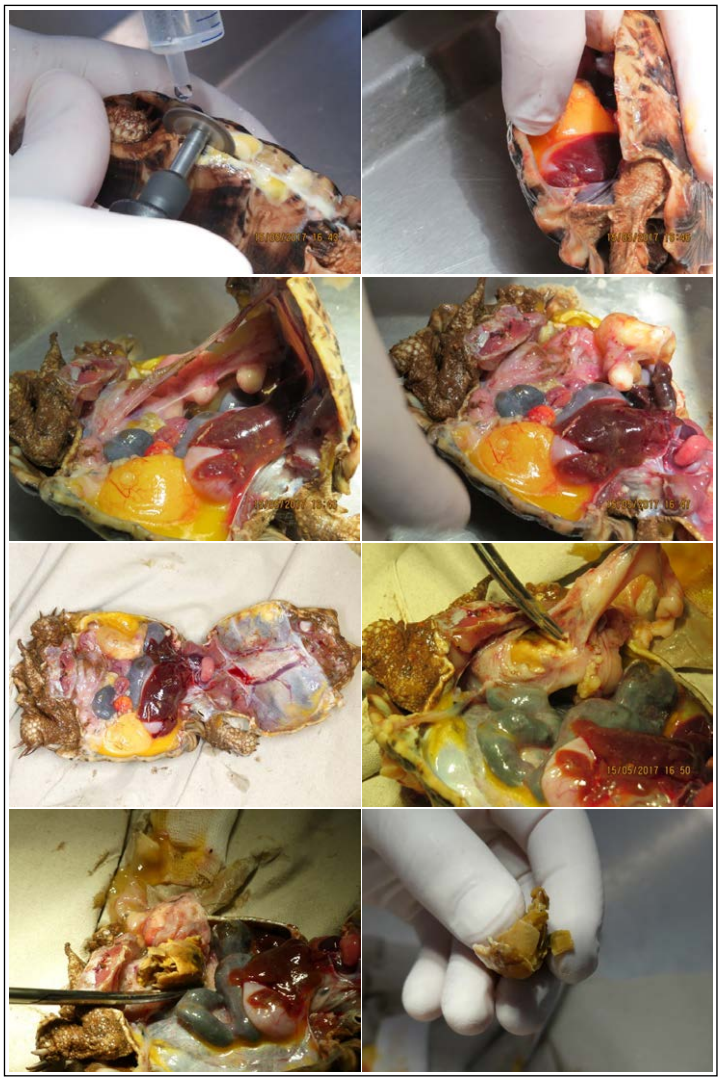
Location A59

For the first time at this location, a hatchling *C. signatus* hatched. The hatchling was born from a wild-caught couple. When the hatchling was placed in a container with compressed loam, it was seen eating small pieces of the damp loam near the water dish. It started feeding regular food 2–3 days later. Possibly the hatchling needed the loam (which was fresh) to build up bacteria in its digestive system.

Location A66

When *C. signatus* female number 130 (born 7 September 2013) unexpectedly died on 14 May 2017, the carcass was dissected to determine the cause of death (i.e., egg retention with bacterial salpingitis). A new captive-bred female was received on 24 November 2017 (see Appendix 1).

The new female has adapted well and started to feed as quickly as two days after the transfer. The male and female C. signatus are kept solitarily until the female will weigh at least 140 g. We expect that this will be the case in June 2018.



Location A68

To test if *C. signatus* female number 9 would be able to produce fertile eggs after separating it from a male with which it annually reproduced, it was separated at a new location in May 2014. Males were regularly introduced, but were allowed to court and not to mate. The result of the test was that female 9 did not produce any eggs in 2015–2017. It will be combined with a male to resume reproduction in 2018.

Location A79

Chersobius signatus female number 79 produced two single-egg clutches, one on 25 January 2017 and one on 12 December 2017. Both eggs were unburied. The first egg failed to hatch, the second is still in the incubator. It is not clear why the eggs were not buried, as the female did bury eggs at the previous location.

Female 118 is housed solitarily. This single female behaves much quieter than the female in the couple, and sometimes hides for days. Nevertheless, it is healthy and eating well.

Location A84

Two *C. signatus* eggs were produced; both eggs cracked during incubation, but one successfully hatched nevertheless. The hatchling was very small (less than 30 mm) and weak in comparison to a hatchling born in 2016. It appears that the 2017 hatchling had problems absorbing calcium, as its shell remained soft. The hatchling was housed solitarily, with a MH UVB-lamp and ample calcium supplementation. On 15 December 2017, the female produced another egg. The two *H. femoralis* at this location are growing nicely.

Location A94

A new enclosure for a couple *C. signatus* was set up. The feeding area was expanded with a larger flat stone to avoid ingestion of substrate.

Location A105

The activity of a male and female *C. signatus* was very similar to that in *Kinixys lobatsiana*: the tortoises were active in intervals of 2−3 months. For comparison: the activity in *Kinixys spekii* (wild-caught and captive-bred) was very different with extended inactive periods from the end of October until March.

Location A110

One egg was produced by a female *C. signatus* at the end of Summer. It is unlikely that eggs produced at this time of the year would successfully develop in the wild, unless *C. signatus* eggs are capable of diapausing. The captive egg hatched after 115 days on 15 December 2017 and the hatchling (mass 9 g) was oriented longitudinally in the egg. Upon hatching, the hatchling was moved to a box with a 35 Watt HQI bulb, and a dry and humid hide. It drank shortly after hatching. Temperatures in the box were 22°C in the hides and coolest corners and circa 32°C under the spot.

Location A111

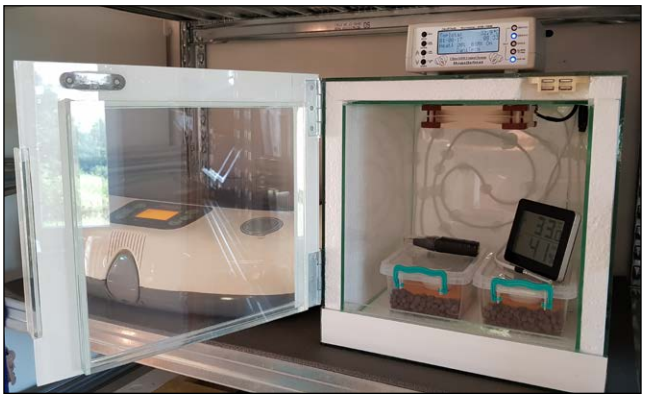
The female *Chersobius signatus* (born on 23 March 2010) produced an egg (38 x 25 mm) for the first time on 7 February 2017. Since the female has always been housed solitarily, the egg was not fertile.

Location A116

The year 2017 was my second season of keeping *C. signatus*. In 2016, an egg was produced but failed to develop. The egg may have been infertile, but to be on the safe side I completely changed the incubation method for 2017.

In 2017, two single egg clutches were produced on 21 March (the female lost 22 g) and on 26 April. The new incubator was placed on a soft pad to reduce vibrations and had the following features:

- Heating cable as heating device;
- PC fan for optimal temperature distribution;
- day/night temperatures adjustable;
- power of heating is automatically decreasing with approaching final temperature;
- GSM alarm – sends messages in case of power failure, low or high temperature;
- certified thermometer was used for calibration.



I followed the instructions specified in the guidelines for husbandry of *C. signatus* by the Homopus Research Foundation. Furthermore, the incubation method followed that used by Victor Loehr – the eggs

were placed on pads instead of substrate in closed boxes and there was no water in the incubator. Two millilitres of water were added to the boxes once a week. After 133 and 136 days, two babies hatched.

Location A121

The outdoor *H. areolatus* enclosure in the natural distribution range of the species produced a hatchling on 5 March 2017.

Location HRF

Chersobius signatus female 159 produced two fertile eggs immediately after its transfer from the wild to captivity in 2015. However, since the transfer, the female has behaved dominantly towards the male that is housed in the same enclosure. The female regularly chased and mounted the male, which has not shown any courtship behaviour itself (verified by permanent webcam supervision). No further eggs have been produced and a radiograph in November showed that the female was not gravid. It appears that conditions in the enclosure are suitable for breeding, because previously two wild-caught and one captive-bred females have regularly reproduced in the same enclosure. In 2018, the male will be exchanged for another male to test if this might alter the behaviour of the female.

6. NEW PUBLICATIONS

The following overview summarises all manuscripts and articles that were submitted, accepted, published, or under review in 2017.

Subject	Submitted	Accepted	Published	Journal
Unexpected decline in a population of speckled tortoises.	2016	2016	2017	Journal of Wildlife Management (English)
Thermoregulatory challenges in the habitat of the world's smallest tortoise, *Chersobius signatus*.	2017	2017	2017	Journal of Thermal Biology (English)
Testudinidae, *Homopus boulengeri*, Duerden 1906, Karoo Padloper. Reproduction.	2017	2017	2017	African Herp News (English)
Testudinidae, *Homopus signatus*, Gmelin 1789, Speckled Padloper. Two-egg clutching.	2017	2017	2017	African Herp News (English)

7. FINANCIAL REPORT

The preparation of a new field study on *C. boulengeri* (see Paragraph 1.5) led to increased expenses compared to 2016. Expenses in 2017 were offset by substantial funding by the Turtle Conservation Fund/Conservation International, the British Chelonia Group and 14 private individuals (see Paragraph 1.5). Although the Homopus Research Foundation maintains relatively large reservations for 2018, the expenses for radiotransmitters, radiography, plant identifications and field materials are expected to exceed reservations. Therefore, the study will require additional funding. Several organisations have already allocated additional funds to the study (see Paragraph 1.5).

Revenues		***Expenses***	
Net amount €	**Item**	**Amount €**	**Item**
Projects		*Projects*	*Field ecology of* Chersobius boulengeri
419	Remaining funds 2016	761	Rainfall, temperature and relative humidity loggers
3,422	Donation Turtle Conservation Fund/CI	489	GIS aerial photo for microhabitat and home range mapping
1,115	Donation British Chelonia Group	365	Infrared thermometers and calibration
1,583	Donations (14) private individuals	248	Flashlights for examination of rock crevices
		199	Batteries and chargers
		90	Garmin eTrex GPS
		81	Balance and calibration
		46	Book for plant identifications
		27	Digital calipers
		66	Small materials
		3,000	Reservation transmitters 2018
		1,168	Reservation remaining expenses 2018
6,539	Subtotal	6,539	Subtotal
Other		*Other*	
113	Donation private individual to cover overhead costs	103	Annual costs bank account
		10	International bank transfer costs
113	Subtotal	113	Subtotal
6,652	Total	6,652	Total

8. PERMIT OVERVIEW

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

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)

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)

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)

Field study and surveys on C. boulengeri

- Research permits 755/05, 43/2005 and 35/2005 (Northern Cape Nature Conservation, South Africa)
- Research permit 245/2/2015 (Northern Cape Department of Environment and Nature Conservation, South Africa)
- Research permit FAUNA 0950/2017 (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)

Field study on H. femoralis

- Research permit AAA-004-000185-0035
- Research permit AAA-004-00020-0028
- Research permit AAA-004-000392-0035
- Research permit AAA-004-00027-0028

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 and 153/2012, 460/2013 and 052/2015 (Northern Cape Department of Environment and Nature Conservation, South Africa)

Appendix 1

Report transport and keeping of *C. signatus* at location A66.

Haltebericht *Chersobius signatus*

November 2017 von Location A66

Am 24. November 2017 flogen wir an eine Tagung der Homopus Research Foundation über *Homopus areolatus* nach Düsseldorf, dann nach Wuppertal mit dem weiteren Ziel ein Weibchen *Chersobius signatus* Nr. 149 von Location A10 zu importieren. Die Export- und Speditionspapiere organisierte uns Location A10 mit viel Geduld und Ausdauer, den Import wir. Am Samstag, den 25. November nach einigen sehr interessanten Vorträgen übergab Location A10 uns das Tier, das bereits 104 g wiegt.

Unser bewährter Transportbehälter, Isoliert, beheizbar


Etwas nervös begaben wir uns am 26. November Richtung Flughafen Düsseldorf zu der dortigen Zollbehörde, bei der wir uns bei unserer Ankunft am Freitag angemeldet hatten. Es dauerte dort einige Zeit bis alles Nötige abgewickelt war. Da diese Art Verzollung selten vorkommt, wie die Zöllner uns sagten, beschäftigen wir zwei Beamte und die Warteschlange wuchs.
Bei der Flugkontrolle musste das Tier nicht durch den Röntgenapparat, aber es wurde durch einen Polizisten mit den Papieren nochmals kontrolliert. Das Tier wollten etliche Flughafenpersonen auch sehen, zum Glück standen wir dort alleine an und verursachten dadurch keinen Menschenauflauf. Nach einer Stunde Pause und Verpflegung konnte der Flug nach Zürich starten und das nächste Abenteuer begann.

Nachkontrolle der Papiere

Nach 45 Minuten Flug wuchs unsere Nervosität wieder, der Zollschalter bei der Landung im Gate 1 war geschlossen, also mussten wir zum Gate 2 gehen. Dort angekommen konnten wir sofort mit dem Tier und den Papieren vorstellig werden. Der Zöllner lobte uns, endlich jemand der vollständige Papiere vorweisen kann. Ach waren wir Stolz! Es ging schnell und wir hatten die nötigen Stempel. Nun stand noch unsere letzte Etappe an, nach einem Fussmarsch von 15 Minuten erreichten wir das Büro des Grenztierarztes, das am Sonntag nur CITES Abfertigung tätigt wenn man mit dem Flugzeug reist. Auch diesen Stempel bekamen wir ohne Probleme.
Glücklich und zufrieden konnten wir nun die Heimreise antreten und das schöne Tier in sein neues Gehege setzen.

Wir möchten uns auf diese Weise noch bei Location A10 für das schöne Zuchttier bedanken, Homopus Research Foundation für die Vermittlung. Location A73, der den ganzen Stress mit uns mitmachte und uns mit dem Auto überall hin chauffierte.

Hier das vorbereitete Terrarium für den Neuzugang

Das ganze Gehege, in der Mitte getrennt

hier linke Seite für female

Das *Chersobius signatus* female Nr. 149 wurde am Sonntagabend, den 26. November 2017 in sein neues zu Hause platziert.

Da das Licht im Terrarium um 19.40 Uhr bereits nicht mehr brannte, wurde das *Chersobius* erst am Montag, den 27. November gebadet und kontrolliert.

Montag 27.11.2017 baden

In den ersten zwei Tagen hielt es sich nur im Unterschlupf links (Legeplatz) auf.
Am Mittwoch über Mittag, am 29. November wagte es sich das erste Mal aus seinem Versteck und frass Löwenzahn und eine Nachtkerzenknospe. Leider keine Fotos.

Dienstag und Mittwoch 28 / 29.11.2017 Donnertag 30.11.2017

Boden ganz trocken Boden feucht

Langsam wurde es immer mutiger und erkundete sein neues Revier.

Donnerstag, 30. November 2017

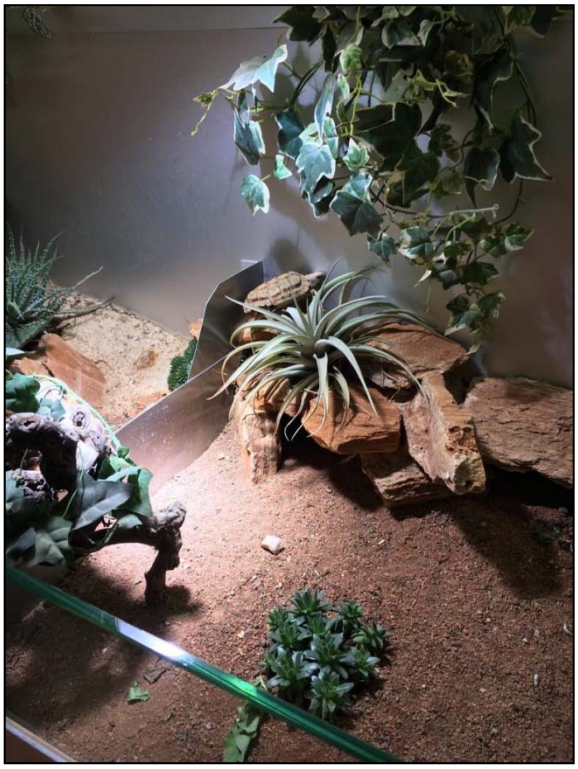
Vielleicht brauchte es doch nach drei Tagen eine feuchtere Bodenbeschaffenheit.

Nun zum male Nr. 11 auf der getrennten, rechten Hälfte des Terrariums, da konnte man folgendes Beobachten.

Montag, 27.11.2017

Am Mittwoch, 29. November wollte das male endlich sehen, was nun mit dieser Abtrennung los ist. Hatte er schon das female gewittert?

Mittwoch 29. November 2017




Die Trennung der beiden Tiere ist in der Mitte der X-Reptile 150 Watt, damit beide Tiere nach Bedarf genügend Licht und UV geniessen können.

Dies ist ein Haltebericht, den wir so schnell nicht vergessen und uns ewig in Erinnerung bleibt.