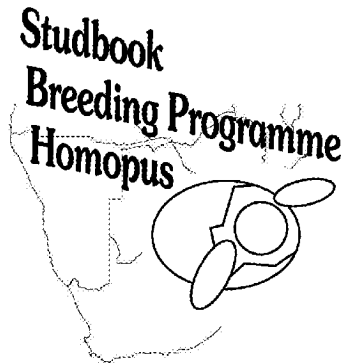


# **Studbook Breeding Programme *Homopus***



**Annual Report  
1999**

*Victor Loehr  
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## CONTENTS

<b>1. INTRODUCTION AND GENERAL ACTIVITIES IN 1999 .....</b>	<b>3</b>
1.1. 1.1. PUBLICATIONS AND PRESENTATIONS STUDBOOK BREEDING PROGRAMME <i>HOMOPUS</i> (SEE ALSO CHAPTER 9) .....	3
1.2. INTERNET SITE .....	3
1.3. JOURNEYS .....	4
1.4. RESEARCH .....	4
1.5. CONTACTS .....	4
1.5. FINANCES .....	4
<b>2. PLANS FOR ACTIVITIES IN 2000 .....</b>	<b>6</b>
2.1. PRESENTATIONS .....	6
2.2. INTERNET SITE .....	6
2.3. JOURNEYS .....	6
2.4. RESEARCH .....	6
2.5. CONTACTS .....	6
<b>PART 1: STUDBOOK <i>HOMOPUS S. SIGNATUS</i></b>	
<b>3. CURRENT LIVING STUDBOOK POPULATION AND TRANSFERS .....</b>	<b>8</b>
<b>4. IMPORTS, BIRTHS AND DEATHS .....</b>	<b>10</b>
<b>5. TOTAL STUDBOOK POPULATION AND FUTURE PERSPECTIVES .....</b>	<b>12</b>
<b>PART 2: STUDBOOK <i>HOMOPUS AREOLATUS</i></b>	
<b>6. CURRENT LIVING STUDBOOK POPULATION AND TRANSFERS .....</b>	<b>14</b>
<b>7. IMPORTS, BIRTHS AND DEATHS .....</b>	<b>16</b>
<b>8. TOTAL STUDBOOK POPULATION AND FUTURE PERSPECTIVES .....</b>	<b>17</b>
<b>9. LITERATURE ABOUT <i>HOMOPUS</i> .....</b>	<b>18</b>
<b>APPENDIX 1 HUSBANDRY CONDITIONS AND ADDITIONAL INFORMATION PER LOCATION <i>HOMOPUS S. SIGNATUS</i></b>	
<b>APPENDIX 2 HUSBANDRY CONDITIONS AND ADDITIONAL INFORMATION PER LOCATION <i>HOMOPUS AREOLATUS</i></b>	

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Since 1992 several Dutch herpetological societies have initiated a total of 60 studbook programmes on reptile and amphibian species. In 1997, all programmes were condensed into an independent foundation known as: 'Stichting Overkoepelend Orgaan Stamboeken' (SOOS). Early in its development, SOOS formulated the very important criteria that no studbook participant would jeopardise their important herpetological contributions and goals with any commercial enterprise from their specimens, either currently or in the future. The Studbook Breeding Programme *Homopus* is one of few studbooks operating world-wide. The aims of the studbook programmes in general are:

- To inform the herpetological community with data and publications generated from captive situations and field studies
- Procuring, maintaining, and reproducing genetically healthy captive individuals for future loans to recognised individuals and institutions

These conservation goals are particularly relevant today as wild populations of many reptiles and amphibians experience increasing survival pressures. Establishing working programs that emphasise captive husbandry in conjunction with fieldwork is crucial in developing sound wildlife management. A significant contribution that captive animals may perform is through the concept of re-introduction of their potential offspring. Although re-introduction of species is at a very early stage and occasionally controversial, there may come a time when the offspring of captive animals are the sole source for re-introducing species into previously suitable habitat where the natural population has become extinct. More importantly re-introduction has the potential of insuring genetic diversity to populations that have become unnaturally isolated due to human interference.



## 1. INTRODUCTION AND GENERAL ACTIVITIES IN 1999

This report is updating the 1998 annual report of the Studbook Breeding Programme *Homopus*, published in December 1998. The Studbook Breeding Programme *Homopus* is aiming to form captive populations and to study these, to carry out research in the field, and to gather and distribute as much information about species of the genus *Homopus* as possible. This report will summarise the activities of the programme in 1999, plans for 2000, and it will give an overview of the current composition and changes in the captive populations: *H. s. signatus* and *H. areolatus*.

Additional information may be obtained from the internet site of the Studbook Breeding Programme *Homopus*, <http://www.homopus.org>, or from the studbook co-ordinator.

In the next paragraphs an overview of the main activities in 1999 is presented.

### 1.1. Publications and presentations Studbook Breeding Programme *Homopus* (see also chapter 9)

A manuscript with detailed information about husbandry, behaviour and captive breeding of *H. s. signatus* that was submitted for publication in *Chelonian Conservation and Biology* in January 1998, still has not been published. However, page proofs have been sent to the author and the report will be published in the next issue, scheduled for 31 December 1999.

In 1999, short articles about dietary requirements of captive hatchling *H. s. signatus*, and the influence of photoperiod and temperature on captive *H. s. signatus* have been published in *African Herp News*. These may be reprinted in 2000 in the South African magazine *The Keeper*. A life history note about the natural diet of *H. s. signatus* and *H. s. cafer* was published in *African Herp News* as well.

A second life history note about autumn activity of *H. s. cafer* is currently in press in *African Herp News*.

As a result of an increased co-operation with a Namibian keeper of *H. s. signatus* (formerly known as *H. bergeri*), a manuscript about husbandry, behaviour and captive breeding of this species has been prepared and submitted for publication in *Chelonian Conservation and Biology*. A manuscript in Dutch, outlining the aims and methods of the Studbook Breeding Programme *Homopus*, has been submitted for publication in a special edition that will be published by the Dutch Turtle/Tortoise Society next year.

Additional life history notes about natural diet of *H. s. signatus* and maximum size of this species are in preparation.

At the symposium of the Austrian *Schildkrötenfreunde Österreich* (Austria), a lecture about captive management and observations in the wild of *H. s. signatus*, *H. s. cafer* and *H. s. signatus* was presented in January 1999. The proposal for a field research project on *H. s. signatus* (see also paragraph 1.4) was presented and discussed at Cape Nature Conservation in Stellenbosch (South Africa) in September 1999.

### 1.2. Internet site

The address of the existing internet site of the Studbook Breeding Programme *Homopus* has changed into <http://www.homopus.org>. The studbook co-ordinator has occupied the domain [www.homopus.org](http://www.homopus.org), in order to make the site better accessible. A banner has also been constructed and is available from <http://home.kabelfoon.nl/~loehr/homopu.gif>. Over 2100 page views have effected since June 1998.

Information about *H. femoralis* has been added to the site. Photographs and (unpublished) measurements of a shell, containing three eggs, have been obtained from Haacke and Branch. Branch has furthermore offered to forward a photograph, showing a female *H. femoralis* during oviposition in the field.

The amount of data regarding captive climatic conditions and growth of captive *H. s. signatus*, presented on the site, increased in 1999. Also several electron microscope photographs of egg shells of *H. s. signatus* were added.

PDF-files containing the annual studbook reports can now be downloaded from the site.

### 1.3. Journeys

Both South Africa and Namibia were visited in 1999. In April, one of the studbook participants visited the natural habitats of *H. areolatus*, *H. s. signatus* and *H. s. cafer*. In September and October, these areas, as well as the habitat of *H.* species in Namibia, were visited by the studbook co-ordinator. A second studbook participant joined the latter visit to the habitats of *H. areolatus* and *H. signatus*. During the September/October trip, 3 of the 4 participants in the 2000 research project on *H. s. signatus* attended the presentation of the research proposal at Cape Nature Conservation. Furthermore, an expedition was organised to collect *H. s. signatus* to consolidate the captive studbook population. Permits were gratefully received from Northern Cape Nature Conservation (South Africa). In Namibia, contacts with a keeper and breeder of *H.* species were re-established.

### 1.4. Research

In 1999 the Studbook Breeding Programme *Homopus* was involved in four research projects:

- *Long term captive study on H. s. signatus*  
*H. s. signatus* is continuously studied in a scientifically controlled captive environment. Publications and presentations resulting from the study are summarised in paragraph 1.1 and chapter 9.
- *Population dynamics, natural diet and behaviour of H. s. signatus*  
A research project on population dynamics, natural diet and behaviour of *H. s. signatus* was prepared within the Studbook Breeding Programme *Homopus*. The field work is scheduled for August/September 2000. The project is carried out by Nicolas Bayoff (USA), Tom Licitra (USA), Tamara Harris-Smith (South Africa) and Victor Loehr (Netherlands). Input by Cape Nature Conservation (South Africa) and the University of the Western Cape (South Africa) is present. A project proposal regarding this study may be obtained from the studbook co-ordinator, or can be downloaded from the internet site of the Studbook Breeding Programme *Homopus*.
- *Tortoise egg shells*  
Declan Nolan from Nijmegen University (Netherlands) is studying shells of tortoise eggs. Experimental electron microscope scans from a small sample of shells of hatched and non-hatched *H. s. signatus* eggs, have revealed what appear to be signs of calcium mobilisation. Furthermore, pores in the egg shells looked 'different' if compared with those in shells of other species. Currently, all *H. s. signatus* egg shells produced in captivity are being collected and sent to Nijmegen University.
- *Microsatellite DNA and parent-offspring relationships*  
Jessica Cunningham from the University of Cape Town (South Africa) is carrying out a project on microsatellite DNA in (African) tortoises. The captive population *H. s. signatus* served as a source of DNA-samples from specimens with known parent-offspring relationships. Blood samples were sent to South Africa and are currently being processed.

### 1.5. Contacts

Since the database of the International Species Information System (ISIS) showed that *H. signatus* was present in three zoos in the USA (Knoxville Zoological Gardens, Wildlife Conservation Society (Bronx) and St. Louis Zoological Park), efforts to contact these zoos were made in 1999 (and before). Aim was to exchange information about the species, and possibly captive-bred specimens in order to prevent inbreeding in the studbook population. Knoxville Zoological Gardens (Bern Tryon) responded and some information about the species was exchanged. Because Knoxville Zoological Gardens is keeping specimens from unknown origin and subspecies (possibly intermediates between *H. s. signatus* and *H. s. cafer*), exchanging specimens did not seem appropriate. The specimens from the Wildlife Conservation Society have recently been transferred to Knoxville Zoological Gardens, and therefore efforts to contact the latter organisation will be stopped. Since Jessica Cunningham is currently carrying out DNA analyses on all species of tortoises in Henry Doorly Zoo (Nebraska, USA), in order to establish relationships and possible cryptic species, she was informed about the existence of Knoxville's possibly intermediate specimens of *H. signatus*. She was also brought into contact with a keeper of *H.* species, as DNA-samples of this species still lacked.

As a result of the internet site of the Studbook Breeding Programme *Homopus*, several USA zoos and students working on tortoise research projects have applied for copies of articles and manuscripts produced within the programme.

The Studbook Breeding Programme *Homopus* has applied for participation in the Consortium of Aquariums, Universities and Zoos (CAUZ), based at the California State University, and co-ordinated by Donna Hardy. The reply was positive and the programme will be listed in the directory.

Also the herpetologists directory of the Centre for North American Amphibians and Reptiles (CNAAR) now contains a reference of the Studbook Breeding Programme *Homopus*.

#### 1.6. *Finances*

The Studbook Breeding Programme *Homopus* opened a bank account, coupled to the bank account of the supervising overall studbook foundation, known as 'Stichting Overkoepelend Orgaan Stamboeken' (SOOS). This will allow companies and private persons to donate tax-deductable gifts to the Studbook Breeding Programme *Homopus*. The account number is 8316568, in the name of Stg Overkoepelend Org Stamboeken - Studbook *Homopus*, IJsselstein, Netherlands.

## 2. PLANS FOR ACTIVITIES IN 2000

Much of the available time in 2000 will be consumed by the preparations, field work and data processing in relation to a research project on population dynamics, natural diet and behaviour of *H. s. signatus* in South Africa. Next to that, it will be attempted to pay attention to other activities related to *Homopus*.

### 2.1. Presentations

In March 2000, a lecture about captive management and observations in the wild of *H. s. signatus*, *H. signatus cafer* and *H.* species will be presented at a symposium of the German *Deutsche Gesellschaft für Herpetologie und Terrarienkunde*.

When the biannual symposium of the Herpetological Association of Africa will coincide with the field work for the project on *H. s. signatus*, preliminary results may be presented there.

### 2.2. Internet site

The internet site of the Studbook Breeding Programme *Homopus* will keep growing. All papers published within the Studbook Breeding Programme *Homopus* in 2000 will be posted on the site, and growth and climatic data will be updated recently. Moreover, it will be attempted to post information about *Homopus* from outside of the programme, when available.

A section dealing with husbandry and breeding of *H. areolatus* is still lacking, but will be composed and added in 2000.

### 2.3. Journeys

In order to carry out the field work for the project on *H. s. signatus*, South Africa will be visited in August-September by the research participants.

### 2.4. Research

There is no additional involvement in research projects planned for 2000. Efforts will be put in running projects (paragraph 1.4). However, when the participation of the Studbook Breeding Programme *Homopus* will be requested in 2000, this will most certainly be considered.

### 2.5. Contacts

An increasing number of people and organisations find their way to the internet site of the Studbook Breeding Programme *Homopus*. This will yield an increasing number of contacts with people with an interest in tortoises of the genus *Homopus* in 2000. Additionally, it will be attempted to actively contact others who are involved with *Homopus*.

## **Part 1:**

# **Studbook *Homopus s. signatus***



### 3. CURRENT LIVING STUBBOOK POPULATION AND TRANSFERS

In 1999 the number of locations where live *Homopus s. signatus* specimens are housed, grew to 4. These locations are in the Netherlands (1), Germany (2) and the USA (1). The total number of live specimens in the studbook population grew from 12 to 18: One specimen (0017) was obtained from a keeper outside of the studbook and originates from an unknown wild location. Therefore, at this point it will not be paired with any of the remaining specimens, that originate from a single population in South Africa. Four specimens (0018-0021) were imported by the Studbook Breeding Programme *Homopus* (see also chapter 4) in 1999, and the remaining specimen (0015) was born in captivity. Hatching 0008, that had died in 1997, was transferred from location 2 to the Natural History Museum in Leiden (Netherlands) (registration number RMNH28042). All transfers were in accordance with national and international legislation.

Husbandry conditions and additional information per location are available in appendix 1.

**Table I:** Current living studbook population *Homopus s. signatus* per location as registered in the studbook. M is male, F is female, U is unknown, D is donation, L is loan and B is birth.

STUD ID	SEX	SIRE ID	DAM ID	DATE OF ARRIVAL dd/mm/yy	LOCATION	HOUSE NAME	FCOEF	SUB-SPECIES
LOCATION 1 (3.2.0)								
0017	M	WILD	WILD	? 08/09/99	UNKNOWN LOCATION 1 (D)	-	0.000	unknown <sup>1</sup>
0018	M	WILD	WILD	16/09/99 (?)	LOCATION 1 (D)	Viejo	0.000	<i>signatus</i>
0019	M	WILD	WILD	16/09/99 (?)	LOCATION 1 (D)	Stumpy	0.000	<i>signatus</i>
0020	F	WILD	WILD	16/09/99 (?)	LOCATION 1 (D)	Bertha	0.000	<i>signatus</i>
0021	F	WILD	WILD	16/09/99 (?)	LOCATION 1 (D)	Bertha	0.000	<i>signatus</i>
LOCATION 2 (3.4.1)								
0001	M	WILD	WILD	30/09/95	LOCATION 2 (D)	950930-I	0.000	<i>signatus</i>
0002	F	WILD	WILD	30/09/95	LOCATION 2 (D)	950930-II	0.000	<i>signatus</i>
0003	F	WILD	WILD	30/09/95	LOCATION 2 (D)	950930-III	0.000	<i>signatus</i>
0005	F	WILD	0003	27/02/96	LOCATION 2 (B)	960227-III-1	0.000	<i>signatus</i>
0006	M	0001	0003	08/11/96	LOCATION 2 (B)	961108-III-2	0.000	<i>signatus</i>
0009	F	0001	0002	30/11/96	LOCATION 2 (B)	971130-II-1	0.000	<i>signatus</i>
0010	M	0001	0002	22/10/97	LOCATION 2 (B)	971022-II-3	0.000	<i>signatus</i>
0015	U	0001	0002	20/09/99	LOCATION 2 (B)	990920-II-6	0.000	<i>signatus</i>
LOCATION 3 (1.1.0)								
0007	F	0001	0003	24/12/96 22/11/98	LOCATION 2 (B) LOCATION 3 (L)	961224-III-3 -	0.000	<i>signatus</i>
0011	M	0001	0003	10/11/97 22/11/98	LOCATION 2 (B) LOCATION 3 (L)	971110-III-4 -	0.000	<i>signatus</i>
LOCATION 4 (3.0.0)								
0012	M	0001	0002	21/11/97 22/11/98	LOCATION 2 (B) LOCATION 4 (L)	971121-II-4 -	0.000	<i>signatus</i>
0013	M	0001	0002	26/09/98 22/11/98	LOCATION 2 (B) LOCATION 4 (L)	980926-II-5 -	0.000	<i>signatus</i>
0014	M	0001	0003	22/10/98 22/11/98	LOCATION 2 (B) LOCATION 4 (L)	981022-III-5 -	0.000	<i>signatus</i>

Total population: (10.7.1)

<sup>1</sup> Originating from unknown wild location

All specimens together make the total living studbook population 10 males, 7 females and 1 unknown, housed at 4 locations. No females, but 4 single males fit for breeding purposes are present, at locations 1 (0017) and 4 (0012-0014). Male 0017 is originating from an unknown wild location, and therefore this male will only be paired with females that are from unknown original location, or with surplus females.

Two captive-bred couples kept at locations 2 (0006 and 0009) and 3 (0007 and 0011) concerns related specimens, and breeding will be avoided. The specimens eventually will be paired with unrelated future captive-bred specimens from location 1 (0018-0021) or 2 (0005 and 0010). Only when possibilities to acquire unrelated specimens in the future will be futile, related specimens may be paired. In that case, inbred F2-specimens will be marked as such in the studbook registration, and re-pairing of related breeding specimens with unrelated specimens, will always have priority.

**Table II:** Current living studbook population *Homopus s. signatus* as registered in the studbook.

LOCATION	MALES	FEMALES	UNKNOWN
LOCATION 1	3	4	1
LOCATION 2	3	2	0
LOCATION 3	1	1	0
LOCATION 4	3	0	0
TOTAL	10	7	1

## 4. IMPORTS, BIRTHS AND DEATHS

Northern Cape Nature Conservation (South Africa) granted a permit in 1999, to collect and export 2.2 *H. s. signatus* to the USA, in order to consolidate the studbook population. These specimens (0018-0021) were collected and exported in September from the same population, from which the captive population already present results (0001-0004 collected in 1995). It is considered of importance not to mix specimens from different geographic localities (genetic pollution).

**Table III:** Imports of *Homopus s. signatus* in 1999. M is male, F is Female and D is donation.

STUD ID	SEX	DATE OF CAPTURE dd/mm/yy	FIRST CAPTIVE LOCATION	DATE OF ARRIVAL dd/mm/yy	ORIGIN
YEAR 1999					
0018	M	15/09/99 (?)	LOCATION 1 (D)	16/09/99 (?)	Springbok, Namaqualand (South Africa)
0019	M	15/09/99 (?)	LOCATION 1 (D)	16/09/99 (?)	Springbok, Namaqualand (South Africa)
0020	F	15/09/99 (?)	LOCATION 1 (D)	16/09/99 (?)	Springbok, Namaqualand (South Africa)
0021	F	15/09/99 (?)	LOCATION 1 (D)	16/09/99 (?)	Springbok, Namaqualand (South Africa)

Total number of imports: (2.2.0)

The studbook population *H. s. signatus* produced eggs at two locations in 1999. At location 2, female 0003 produced 1 egg and female 0002 produced 3 eggs. The first and the last egg of the latter female were not fully calcified when laid, and broke during oviposition. The shells were examined by Declan Nolan (Nijmegen University, Netherlands), by means of electron microscopy. It is suspected that a recent rebuilding of the enclosure, imposing stress on the tortoises, has caused the female to produce eggs that were in an early stage of development. The normal egg, however, developed normally and yielded a healthy hatchling (0015). In 2000, the enclosure will remain undisturbed during the breeding season.

In the egg of female 0003, a dead fully developed embryo was found. It is not clear what has caused the death of the embryo, but since it has not been encountered previously, the incubation technique will remain unchanged. The egg shell and embryo have been sent to Nijmegen University for examination of the egg shell.

Since both females at location 2 produced fertile eggs in 1999, there does not seem to be a reason to suspect that the 1995-1998 tendency to a decreasing number of fertile eggs (relatively to unfertile eggs, as suggested in the 1998 annual studbook report) will hold.

At location 1, females 0020 and 0021 appeared to be gravid when imported, and each produced one egg. These eggs still are being incubated at this moment.

**Table IV:** Births of *Homopus s. signatus* in 1999. U is unknown.

STUD ID	SEX	SIRE ID	DAM ID	DATE OF ARRIVAL dd/mm/yy	LOCATION	HOUSE NAME	FCOEF	DATE OF DEATH dd/mm/yy
YEAR 1998								
0015	U	0001	0002	20/09/99	LOCATION 2 (B)	990920-III-6	0.000	
0016	U	0001	0003	04/10/99	LOCATION 2 (B)	991004-III-6	0.000	04/10/99

Total number of births: (0.0.2)

Except from the embryo that was found dead in the egg, no specimens of *H. s. signatus* have died in 1999.

**Table V:** Deaths of *Homopus s. signatus* in 1999. U is unknown and B is birth.

STUD ID	SEX	SIRE ID	DAM ID	DATE OF ARRIVAL dd/mm/yy	LOCATION	DATE OF DEATH dd/mm/yy	AGE AT DEATH yy/mm	PRIMARY CAUSE
0016	U	0001	0003	04/10/99	LOCATION 2 (B)	04/01/99	0 d	Fully developed embryo died in egg

Total number of deaths: (0.0.1)

## 5. TOTAL STUDBOOK POPULATION AND FUTURE PERSPECTIVES

The current total studbook population of the studbook *H. s. signatus* consists of 21 specimens. From these, 9 are wild-caught specimens (8 collected and imported by the Studbook Breeding Programme *Homopus*) and 12 are captive-bred. Eighteen tortoises are currently alive, housed at 4 locations. The import of 4 wild-caught *H. s. signatus* in 1999 hopefully will allow to pair future captive-bred specimens, with specimens resulting from the previously imported specimens, in order to prevent inbreeding. Furthermore, couple 0004+0010 at location 2 may produce offspring, without inbreeding. The future of the studbook *H. s. signatus* will depend greatly on the results obtained at these locations.

**Table VI:** Total studbook population *Homopus s. signatus*. M is male, F is female, U is unknown, D is donation, L is loan and B is birth.

STUD ID	SEX	SIRE ID	DAM ID	DATE OF ARRIVAL dd/mm/yy	LOCATION	HOUSE NAME	FCOEF	DATE OF DEATH
0001	M	WILD	WILD	30/09/95	LOCATION 2 (D)	950930-I	0.000	
0002	F	WILD	WILD	30/09/95	LOCATION 2 (D)	950930-II	0.000	
0003	F	WILD	WILD	30/09/95	LOCATION 2 (D)	950930-III	0.000	
0004	M	WILD	WILD	30/09/95	LOCATION 2 (D)	950930-IV	0.000	24/12/95
				02/09/96	NNM (D)	RMNH27497		
0005	F	WILD	0003	27/02/96	LOCATION 2 (B)	960227-III-1	0.000	
0006	M	0001	0003	08/11/96	LOCATION 2 (B)	961108-III-2	0.000	
0007	F	0001	0003	24/12/96	LOCATION 2 (B)	961224-III-3	0.000	
				22/11/98	LOCATION 3 (L)	-		
0008	U	0001	0002	26/01/97	LOCATION 2 (B)	970126-II-2	0.000	02/02/97
				24/03/99	NNM (D)	RMNH28042		
0009	F	0001	0002	30/11/96	LOCATION 2 (B)	971130-II-1	0.000	
0010	M	0001	0002	22/10/97	LOCATION 2 (B)	971022-II-3	0.000	
0011	M	0001	0003	10/11/97	LOCATION 2 (B)	971110-III-4	0.000	
				22/11/98	LOCATION 3 (L)	-		
0012	M	0001	0002	21/11/97	LOCATION 2 (B)	971121-II-4	0.000	
				22/11/98	LOCATION 4 (L)	-		
0013	M	0001	0002	26/09/98	LOCATION 2 (B)	980926-II-5	0.000	
				22/11/98	LOCATION 4 (L)	-		
0014	M	0001	0003	22/10/98	LOCATION 2 (B)	981022-III-5	0.000	
				22/11/98	LOCATION 4 (L)	-		
0015	U	0001	0002	20/09/99	LOCATION 2 (B)	990920-II-6	0.000	
0016	U	0001	0003	04/10/99	LOCATION 2 (B)	991004-III-6	0.000	04/10/99
				16/10/99	NU (D)	-		
0017	M	WILD	WILD	?	UNKOWN	-	0.000	
				08/09/99	LOCATION 1 (D)	-		
0018	M	WILD	WILD	16/09/99 (?)	LOCATION 1 (D)	Viejo	0.000	
0019	M	WILD	WILD	16/09/99 (?)	LOCATION 1 (D)	Stumpy	0.000	
0020	F	WILD	0003	16/09/99 (?)	LOCATION 1 (D)	Midge	0.000	
0021	F	WILD	WILD	16/09/99 (?)	LOCATION 1 (D)	Bertha	0.000	

Total studbook population: (11.7.3)

NNM = Natural History Museum, Leiden (Netherlands)  
 NU = Nijmegen University, Nijmegen (Netherlands)

## **Part 2:**

# **Studbook *Homopus areolatus***

## 6. CURRENT LIVING STUDBOOK POPULATION AND TRANSFERS

Live *Homopus areolatus* in the studbook are located at two locations; location 1 and location 2 (Netherlands and USA). Location 5 hosted 1 specimen in 1999 (0002), but this specimen has died (see also chapter 7). Locations 6 and KRAAIFTN-ZOO have transferred several specimens, but do not have their collections registered in the studbook registration. The total number of live specimens grew from 5 to 11 in 1999. Five captive adult specimens (0008 and 0011-0014) were transferred from Tygerberg Zoopark (Kraaifontein, South Africa), 3 from location 6 (009, 0010 and 0015) (both outside of the studbook), and 2 specimens (0002 and 0003) died (see also chapter 7). All transfers were in accordance with national and international legislation.

Husbandry conditions and additional information of location 2 are available in appendix 2.

**Table I:** Current living studbook population *Homopus areolatus* as registered in the studbook. F is female, M is male, U is unknown, B is birth and D is donation.

STUD ID	SEX	SIRE ID	DAM ID	DATE OF ARRIVAL dd/mm/yy	LOCATION	HOUSE NAME	FCOEF	SUB-SPECIES
LOCATION 1 (2.5.1)								
0008	F	WILD	WILD	? 16/09/99 (?)	KRAAIFTN-ZOO (D) LOCATION 1 (D)	- A6	0.000	-
0009	F	WILD	WILD	? 16/09/99 (?)	LOCATION 6 (D) LOCATION 1 (D)	- Blacky (A2)	0.000	-
0010	M	WILD	WILD	? 16/09/99 (?)	LOCATION 6 (D) LOCATION 1 (D)	- Ernst (A3)	0.000	-
0011	F	WILD	WILD	? 16/09/99 (?)	KRAAIFTN-ZOO (D) LOCATION 1 (D)	- A5	0.000	-
0012	F	WILD	WILD	? 16/09/99 (?)	KRAAIFTN-ZOO (D) LOCATION 1 (D)	- A6	0.000	-
0013	M	WILD	WILD	? 16/09/99 (?)	KRAAIFTN-ZOO (D) LOCATION 1 (D)	- A7	0.000	-
0014	U	WILD	WILD	? 16/09/99 (?)	KRAAIFTN-ZOO (D) LOCATION 1 (D)	- Baby	0.000	-
0015	F	WILD	WILD	? 16/09/99 (?)	LOCATION 6 (D) LOCATION 1 (D)	- A4	0.000	-
LOCATION 2 (1.2.0)								
0004	F	UNKN	UNKN	? 21/11/97	KRAAIFTN-ZOO (B) LOCATION 2 (D)	- 971121-IV	0.000	-
0005	M	UNKN	UNKN	? 21/11/97	KRAAIFTN-ZOO (B) LOCATION 2 (D)	- 971121-V	0.000	-
0006	F	UNKN	UNKN	? 21/11/97	KRAAIFTN-ZOO (B) LOCATION 2 (D)	- 971121-VI	0.000	-
LOCATION 5 (0.0.0)								
Total population: (3.7.1)								

All specimens together make the total living studbook population 11 specimens, housed in breeding groups at two locations. No single specimens fit for breeding purposes are present. A table that shows this summarised information can be found on the next page.

**Table II:** Current living studbook population *Homopus areolatus* as registered in the studbook.

LOCATION	MALES	FEMALES	UNKNOWN
LOCATION 1	2	5	1
LOCATION 2	1	2	0
TOTAL	3	7	1



## 7. IMPORTS, BIRTHS AND DEATHS

In 1999 no wild *H. areolatus* were imported. However, 11 specimens were transferred from Tygerberg Zoopark (Kraaifontein, South Africa) and location 6 (South Africa), to location 1.

Specimens 0004-0006 at location 2 are still too young to breed. Females 0008 and 0011 at location 1 appeared to be gravid when transferred to this location, and produced 2 and 3 eggs. These should hatch in the next year.

Shortly after transferring specimen 0003 from Tygerberg Zoopark (where it had been bred) to location 2 in 1998, it was found to be diseased (fluid retention, weak limbs, extreme skin sloughing) and was taken to the Birds and Exotic Animal Specialist Group of the Veterinary Department of Utrecht University in the Netherlands. X-raying revealed that approximately 1/3 of the internal volume was taken by air, at the site where the lungs should be present. The cause of this phenomenon was unknown, as was the cure. This specimen died in 1999. It will be examined by Utrecht University. The single adult female present at location 5 died from unknown causes in 1999. The carcass was found too late to allow for dissection.

**Table III:** Deaths of *Homopus areolatus* in 1999. U is unknown, F is female and D is donation.

STUD ID	SEX	SIRE ID	DAM ID	DATE OF ARRIVAL dd/mm/yy	LOCATION	DATE OF DEATH dd/mm/yy	AGE AT DEATH yy/mm	PRIMARY CAUSE
0002	F	WILD	WILD	14/12/97	LOCATION 5 (D)	13/08/99	?	?
0003	U	UNKN	UNKN	21/11/97	LOCATION 2 (D)	29/10/99	?	Under investigation

Total number of deaths: (0.1.1)

## 8. TOTAL STUDBOOK POPULATION AND FUTURE PERSPECTIVES

The current studbook population of the studbook *H. areolatus* consists of 15 specimens. From these, 11 are wild-caught (7 handed to Tygerberg Zoopark by visitors, 1 had been in captivity in the Netherlands for about 15 years, and 3 originate from unknown locations) and four are captive-bred. Eleven tortoises are alive, housed at two locations.

As the total studbook population of *H. areolatus* is limited, it is desirable to add specimens in order to provide chances for the survival of the studbook on the long run. Preferably, specimens should be added by participation of additional keepers of the species. Location 5 would still be interested to set up a breeding group, consisting of specimens that are already in captivity. Current breeding groups at locations 1 and 2 offer possibilities for growth of the population by captive breeding.

**Table IV:** Total studbook population *Homopus areolatus*. M is male, F is female, U is unknown, D is donation, B is birth and L is loan.

STUD ID	SEX	SIRE ID	DAM ID	DATE OF ARRIVAL dd/mm/yy	LOCATION	HOUSE NAME	FCOEF	DATE OF DEATH
0001	F	WILD	WILD	?	KRAAIFTN-ZOO (D)	-	0.000	
				14/12/97	LOCATION 5 (D)	HZ0525		09/11/98
0002	F	WILD	WILD	?	KRAAIFTN-ZOO (D)	-	0.000	
				14/12/97	LOCATION 5 (D)	-		13/08/99
0003	U	UNKN	UNKN	?	KRAAIFTN-ZOO (B)	-	0.000	
				21/11/97	LOCATION 2 (D)	971121-III		29/10/99
				15/12/99	UU (D)	-		
0004	F	UNKN	UNKN	?	KRAAIFTN-ZOO (B)	-	0.000	
				21/11/97	LOCATION 2 (D)	971121-IV		
0005	M	UNKN	UNKN	?	KRAAIFTN-ZOO (B)	-	0.000	
				21/11/97	LOCATION 2 (D)	971121-V		
0006	F	UNKN	UNKN	?	KRAAIFTN-ZOO (B)	-	0.000	
				21/11/97	LOCATION 2 (D)	971121-VI		
0007	M	WILD	WILD	?	ROTTERD-ZOO (?)	-	0.000	
					LOCATION 5 (L)	HZ0457		05/07/98
0008	F	WILD	WILD	?	KRAAIFTN-ZOO (D)	-	0.000	
				16/09/99 (?)	LOCATION 1 (D)	A6		
0009	F	WILD	WILD	?	LOCATION 6 (D)	-	0.000	
				16/09/99 (?)	LOCATION 1 (D)	Blacky (A2)		
0010	M	WILD	WILD	?	LOCATION 6 (D)	-	0.000	
				16/09/99 (?)	LOCATION 1 (D)	Ernst (A3)		
0011	F	WILD	WILD	?	KRAAIFTN-ZOO (D)	-	0.000	
				16/09/99 (?)	LOCATION 1 (D)	A5		
0012	F	WILD	WILD	?	KRAAIFTN-ZOO (D)	-	0.000	
				16/09/99 (?)	LOCATION 1 (D)	A6		
0013	M	WILD	WILD	?	KRAAIFTN-ZOO (D)	-	0.000	
				16/09/99 (?)	LOCATION 1 (D)	A7		
0014	U	WILD	WILD	?	KRAAIFTN-ZOO (D)	-	0.000	
				16/09/99 (?)	LOCATION 1 (D)	Baby		
0015	F	WILD	WILD	?	LOCATION 6 (D)	-	0.000	
				16/09/99 (?)	LOCATION 1 (D)	A4		

Total studbook population: (4.10.1)

UU = Utrecht University, Utrecht (Netherlands)

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## Appendix 1

### Husbandry conditions and additional information per location *Homopus s. signatus*

#### LOCATION 1

The tortoises are being kept in a wooden enclosure 183 x 61 x 61 cm. Overhead lighting is provided via 2 122 cm Vitalite Power twists. At this point the lights are left on for 12 hours per day. This will be changed annually to provide a seasonal light cycle. I am using a coarse sand substrate similar in texture to that found in their natural environment, but different in color (brown/grey not reddish). Five shelters/hides are located throughout the habitat. They are constructed by stacking flat rocks. All are used at one point or another, often communally.

Heat is provided via basking lights only. There is a primary 25 W red basking light that goes on 1 hour prior to overhead lighting, and goes off one hour prior to the end of the photoperiod. A second basking light in the tank kicks on for 3 hours per day at mid day (this will also be changed to provide seasonal variation). The temperature on this end of the tank during those hours reaches above 37°C. This is being done to simulate mid day high temperatures experienced in their natural environment. The tortoises have been observed basking at this time. Using this method, the tortoises are provided with a night time gradient of 24-25°C degrees at night, and 31-39°C during the day.

Water is left in the tank at all times and is changed (at least) daily. They have been observed drinking from it. My animals are fed every other day. Their diet consists of fresh and dried greens (Dandelion, kale, romaine, etcetera with chopped timothy hay for the dry portion) and some type of vegetable. All meals are supplemented with Miner-all brand calcium. This calcium has no vitamins in it, so Nekton Rep Color vitamins are provided once a week (sprinkled over food stuffs). They show a fondness for green beans, seedless cucumber, grated carrot, yellow and green squash, bean sprouts and the occasional piece of fruit (strawberry or grated apple) I have also fed them rose, dandelion and Rose of Sharon blossoms on occasion.

I also have a long term captive male *Homopus signatus* that I am housing individually in a glass aquarium under the same conditions. I am hoping to find a female of unknown origin over the next year that this individual could be paired to.

Both of my females have laid eggs this year that are currently incubating. I observed one being laid on October 27. The female moistened the ground with urine and began excavating a hole. She was backed into one of the hides. When she was ready to lay she began moving her head in and out of her shell. After the egg was laid she buried it almost completely. I unearthed the egg and moved it to a Hovibator styrofoam incubator. The egg was placed in a plastic deli dish on top of vermiculite moistened at a 1:3 ratio.

I checked the rest of the hides at this point as both females had been pacing anxiously in the days prior. I found a second egg, uncovered, under another one of the hides. By comparing original capture weights to post egg laying weights I was able to determine that each female laid one egg. I moved it to the same incubator. Both eggs are now being incubated for twelve hours at 31°C with a night drop to 25°C. With any luck, these should hatch in 2000.

I have not taken steps to test for or de-parasitize any of these animals at this point. All are doing well.

#### LOCATION 2

Husbandry conditions have been described in detail and have been published in several articles by Loehr (see chapter 9). It is attempted to change the conditions as little as possible. Currently, climatic conditions in the adult enclosure are maintained as shown on the following page.

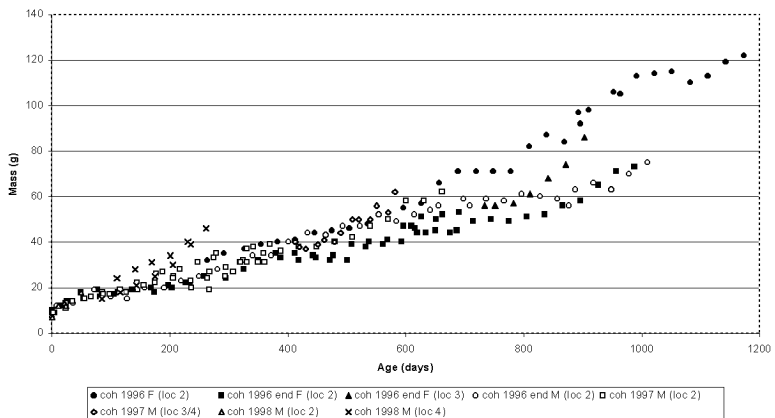
Temperatures and humidity of hatchling enclosures are maintained at a higher level for the first year. Photoperiod is the same as in the enclosure of the adult tortoises. Adults are fed 4 times weekly, hatchlings 6 times weekly, until they reach an age of one year. A water bowl is available in all enclosures at all times.

In order to monitor temperature more detailed in the enclosure of the adult *H. s. signatus*, an electronic device has been constructed to monitor and log temperature by means of a personal computer. It is planned to write a description of this method in 2000.

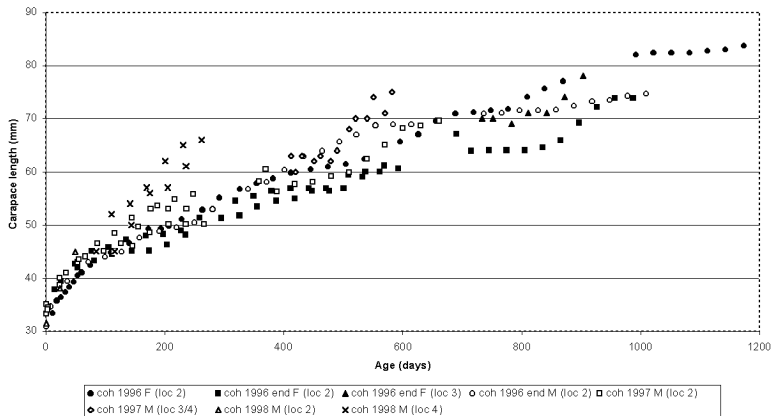
Growth results are shown below the table on the next page.

Date	Week	Photoperiod (+/- 15 minutes, max/min = 14/10 hrs)	Temperature in hiding place (°C)	Sprayings (day of week)
10/10	41	switch on later	28	thu
17/10	42	switch off earlier	28	thu
24/10	43	switch on later	28	thu
31/10	44	switch off earlier	28	thu
07/11	45	switch on later	26	thu
14/11	46	switch off earlier	26	thu
21/11	47	switch on later	26	thu
28/11	48	switch off earlier	26	thu
05/12	49	switch on later	24	thu
12/12	50	switch off earlier	24	thu
19/12	51	switch on later	24	thu
26/12	52	switch off earlier	24	thu
02/01	1	switch on later	22	thu, sun
09/01	2	switch off earlier	22	thu, sun
16/01	3	switch on later	22	thu, sun
23/01	4	switch off earlier	22	thu, sun
period		constant	20	thu, sun
27/02	9	switch off later	22	thu, sun
05/03	10	switch on earlier	22	thu, sun
12/03	11	switch off later	22	thu, sun
19/03	12	switch on earlier	22	thu, sun
26/03	13	switch off later	24	tue, thu, sun
02/04	14	switch on earlier	24	tue, thu, sun
09/04	15	switch off later	24	tue, thu, sun
16/04	16	switch on earlier	24	tue, thu, sun
23/04	17	switch off later	26	thu, sun
30/04	18	switch on earlier	26	thu, sun
07/05	19	switch off later	26	thu, sun
14/05	20	switch on earlier	26	thu, sun
21/05	21	switch off later	28	thu
28/05	22	switch on earlier	28	thu
04/06	23	switch off later	28	thu
11/06	24	switch on earlier	28	thu
period		constant	30	-

Growth of four cohorts *Homopus s. signatus*, at locations 1, 2 and 3  
M is male, F is female



Growth of four cohorts *Homopus s. signatus*, at locations 2, 3 and 4  
M is male, F is female



LOCATION 3 and LOCATION 4

*Terrarium studbook numbers 0007 and 0011*

- Size: 120 x 70 cm
- Decoration: Back constructed from artificial rocks, and additional rocks with several hiding places
- Soil: Sand with calcium gravel, approximately 3 cm deep; rock plate as feeding site and water bowl
- Illumination: 1x 36 W tube light + 2 x 23 W energy-saving lamps + 1 x 40 W spot light
- Photoperiod: Summer (July-September): 13,5 hrs; winter (October-June): 9 hrs (gradual increase/decrease)
- Heating: The total soil surface is heated up to a day temperature of approximately 29°C by the illumination of the enclosure under the one with *H. s. signatus*
- Temperature: Summer: 20-24°C (night) and 34°C (day); winter: 16-18°C (night) and 29°C (day); locally up to 45°C
- Rel. humidity: Night: 75-85%; day: 55%

*Terrarium studbook numbers 0012-0014*

Same as enclosure described above, but illuminated by 1 x 36 W tube light and 1 x 50 W halogen lamp. Temperatures up to 30°C and 36°C under halogen lamp. The photoperiod is automatically decreased (9 hrs) and increased (13 hrs) in autumn and spring, by means of an 'Astrotimer'.

*Feeding*

The tortoises are fed daily on fresh green leaves collected outside (*Taraxacum*, *Trifolium*, grasses, etcetera), andive, roman lettuce, cut fruits (apple, pear, melon, berries) and legumes (cucumber, zucchini, paprika). A small amount (0.5-1 g) of a calcium/vitamin supplement (Vitakalk, Vitakraft) is always added.

*Water*

The tortoises receive (plain) water, three times weekly in a water bowl. During the dry (summer) season, the tortoises receive water once weekly, and feeding is decreased (studbook numbers 0007, 0012 and 0013 did not receive this treatment in 1999).

*Climatic cycles*

May-July: Start of dry season, decreasing amounts of water and food offered, increasing photoperiod

July-October: Warm and dry (aestivation conditions)

November-May: Decreasing photoperiod and temperature. Enclosures sprayed, and water and food offered.

*Behaviour*

Specimen 0007 (female) feeds daily and produces faeces every 2 days. Despite of the aestivation conditions, the tortoise fed infrequently.

Specimen 0011 (male) appeared to be in a state of aestivation between July-October, and did not take any food.

Specima 0012 and 0013 were not presented an aestivation period and were active daily.

Specimen 0014 appeared to be in a state of aestivation between August-September. It became active in the end of August.

On 5 July the first mating attempt of specimen 0013 with 0012 was observed. In August these specimens made mating attempts to eachother.



## Appendix 2

### Husbandry conditions and additional information per location *Homopus areolatus*

#### LOCATION 2

One subadult male and two subadult females are housed in a 150 x 60 x 40 cm (l x w x h) chipboard enclosure. Front pane is glass. It is illuminated using a 36 W tube light. Heating occurs by means of 2 40 W spot lights and heating mats under the enclosure, all switched via dimmers. Climatic conditions are as described for *H. s. signatus* on location 2 (appendix 1), but winter temperatures are maintained at a higher level and humidity is higher due to longer sprayings throughout the year. It is planned to provide lower winter temperatures as soon as the tortoises have grown older.

Soil consists of a 4 cm layer of fine gravel and sand. The enclosure is furthermore decorated with wood, dried and artificial plants and some stones.

Tortoises are fed 4 times weekly, on green leaves (collected outside in summer, in winter andive and chicory). Twice per week cucumber and carrot is added, once per week also tomato or orange and apple is provided. In all cases a calcium/vitamin (Gistocal) supplement is added. A water bowl is available permanently.

The tortoises typically spend mornings basking under the spot lights, after which they become very active and start searching for food. They are being fed in the afternoon. After feeding they tend to retreat. No specific interactions between the (not fully grown) tortoises has been observed until now.