

**E.S.F. Bulletin October 2003**



*Podarcis sicula*

Dear studbookkeeper.

Before you have the new bulletin on the proceedings of the ESF. Since the beginning of this year I accepted the position as contact person between the studbook keepers and the ESF-board. My main task is to be the first point of contact for the studbook keepers, and to keep them informed about de new issues and decisions made by the board. For those who not know me yet, let me starting by introducing myself. My name is Laurens Woldring. I am 25 years of age and I just finished with my bachelor degree in Animal management. At the moment I am working as a teacher in animal maintenance and biology. I became board member of the ESF (then still named OOS) in 2000. My main interest is in tortoises, especially those from temperate regions. Since the beginning of this year I also took over de management of the studbook for the western subspecies of the Hermann's tortoise (*Testudo hermanni hermanni*).

I know that in the past communication between the board and the studbook keepers was considered a point of weakness by both parties. My mission is to try to inform you about ESF topics on a more regular basis in the future. This bulletin is a new concept and I am still working on a definitive format. I would like to remind you that, the same as you, the board works on a voluntary basis. We can only succeed in achieving our goals and maintain healthy captive reptile and amphibian studbook populations by working together.

I hope that this bulletin will live up to your expectations. If you have any comment or question, please let me know.

Best wishes on behalf of the ESF board,

Laurens Woldring

E.S.F. Board member and contact person.

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## **Word from the Chairman Henk Zwartepoorte**

For many years during our OOS period it was a good custom issuing yearbooks of all existing studbook species. In those yearbooks I wrote a foreword and progress report. According the increase of the number of studbooks this became practically impossible because of high costs and labour. After the metamorphoses of OOS into ESF we landed into a period of practical necessary changes such as computer software, the constitution of the society, passing by a notary, contracts with the Laser-bureau of the Ministry of Agriculture, the participants contracts and internal ESF board practical labour. We had to accept the departure of ESF board members Max Bisschops and Jacco van Rossum and Nienke Kluiwstra.

After a period of reorganisation I think we now are in the position of having a complete ESF board with a good division of labour. One vital part in the board is not yet filled in and that is the task of PR and marketing. ESF still lacks a logo and a profile.

Furthermore we have a German secretary who is managing the contact between the German studbook keepers.

One very important goal we reached over the last year is the cooperation and integration into the Turtle Survival Alliance. Together with the European Association of Zoos and Aquariums (EAZA) the European Studbook Foundation now is an equal partner of TSA-Europe. This means that cooperation with European zoos is also officially accepted by the EAZA executive committee. Several ESF-studbooks for the highly endangered Asian turtle species already cooperate with EAZA's European Studbooks (ESB's).

During this period of reorganisation there was a silence from the side of the ESF-board into the direction of studbook keepers and studbook participants. The goals achieved as explained above indicate the reason of this silence, and shows that a lot however happened.

With this newsletter and the new task of Laurens Woldring within the board, also as explained by him above, is a new tool into good communication between the board and the studbook- keepers and participants. The Internet site: [www.studbooks.org](http://www.studbooks.org) will be used more intensively to increase and improve communication.

Studbooks and breeding programmes are vital instruments for the establishment of so called "assurance colonies" for the increasing numbers of endangered reptile and amphibian species and I am still convinced of the feasibility of this. For some species this will be the only chance of survival.

## 1. News.

- I would to start by mentioning that our last studbook keepers meeting at Rotterdam of 1-2-2003 was a success. Although unfortunately due the severe weather some of our German colleague's had to cancel at the last minute, most of the studbook keepers were present. For those who missed the meeting, the minutes will follow later on in this publication.
- As you already noticed the text is written in English instead of German or Dutch. Reason for this is that we can welcome our first British Studbook keeper mister Richard J. Berridge who started a studbook for the Malagasy poison frogs of the genus *Mantella*. Mainly because of this and because of the fact that we are getting more and more requests from possible future studbook keeper from for example Scandinavian countries, we have decided on the board meeting of 24 April 2003 to switch over to English as correspondence language. ESF is a European organisation anyway. It takes too much effort to translate every correspondence in each individual language. Of course if there are people willing to translate E.S.F. correspondence into another language we completely endorse this.
- During this board meeting several other decisions were made. Because of the fact that still very few studbookkeepers handed in their annual report, which is one of the compulsory issues they agreed on when becoming a studbook keeper, the board decided to put up a deadline. The deadline is the first of April of the next year and the report should be sent to secretary Gerrit Hofstra. If for what reason or so ever the studbook keeper is not able to hand over the annual report on time he should contact the secretary about this in order to find another solution. Also because of the fact that not every studbook keeper handed over a keeping/breeding advise for the studbook species, as was demanded by the board, we would like the studbook keepers that did not hand over this advise, to hand it over the next year for the first of April together with the annual report. A format for the keeping/ breeding advice can be found further on in this bulletin. A format for the annual report will be send to you soon. Another deadline that was put up is on the first of July and is for the board to have finished an annual report including a small review of all the individual annual reports, which will be published and be available for the stud book keepers. The board is also working on "policies" which will be published later on this year.
- As agreed on at the studbook keepers meeting on 1-2-2003 at Rotterdam zoo, we like to switch from SPARKS to the windows compatible studbook program STUDBOOK, which is developed by R. Buchman. Our software specialist Fred-Jan Kraan has tested the program and there are still some small issues that need to be improved before we can switch over to this program. This is on a voluntary basis. Working with Sparks remains possible if desired.
- Another new feature you probably already noticed is that each studbook keeper received it's own official E.S.F. e-mail address. This E.S.F. address is linked to the studbook keeper's private address. The address is formed by the scientific name of the (sub) species followed by the text: studbooks.org. Between the genus, species and subspecies name a line is put. For example: [clemmys-guttata@studbooks.org](mailto:clemmys-guttata@studbooks.org) and [chrysemys-picta-dorsalis@studbooks.org](mailto:chrysemys-picta-dorsalis@studbooks.org) With these new addresses we want to obtain a more uniform and professional look which should fit into our organization.
- On the April 25 the board signed a contract with the LASER CITES office in order to adopt animals that are confiscated by the state and to place animals via the studbook keepers.

## 2. Minutes studbook keepers meeting 1-February 2003 Rotterdam zoo

Author: C. Winkelman.

Translation: F.J. Kraan

At 15.10 the chairman, Henk Zwartepoorte, opened the meeting.

The secretary, Gerrit Hofstra points out that the studbooks increasingly need to be professionalised. Studbookkeepers should send their year report in the second quarter of the year to Gerrit. Laurens Woldring will be provided with discription and breeding information of each species. Partially this is already done.

Layout

There is an inquiry for the lay-out of the description. Gerrit Hofstra promises to send these out.

Henk Zwartepoorte gives information on the LASER contracts and the conditions LASER requires for keeping the animals.

LASER contract / regulations ESF:

As the ESF regulations are completed by the notary, making the ESF an official society, the LASER contract is expected to be signed soon. The ESF can than place animals via the stud bookkeepers, both internationally as in the Netherlands. Most studbook contracts are already translated into English for usage outside the Netherlands. Some legal finishing touches are needed.

At the moment the priority order of placing by LASER is:

1. Zoos
2. Reception centers
3. ESF
4. Others

The ESF only accepts as much animals as can be placed. This is always happens in consultation with the studbook keeper. Studbook keepers are only obliged to place if and as many animals as was agreed upon. Note however the following points:

- These are often full grown animals
- The sex is unknown
- The size is unknown
- The origin is unknown

If someone is unable support the animals placed under his or her care by the ESF, the ESF will arrange placing of the animals elsewhere.

Costs like chipping, DNA typing are expected to be largely financed by the Ministry of Agriculture, as this is cheapest in the long run. This is a point of discussion for the LASER contract. Small costs are expected to be paid by the studbook participants.

In case of an deceased animal, an section report of an Vet is expected. The reasons are:

- Finding the death cause.
- Getting an overview of the circumstances of the animals in the long run.

Under certain circumstances, the board can give dispensation for the section report. Merijn Kerlen provided an valid example for the recent lot of *Cuora amboinenis*. A dispensation must be requested by the board in all cases.

The financial situation of the ESF:

The treasurer will be asked to make a summary.

ESF public relations

H. Zwartepoorte previously announced the external policy will be studied by students. The board will study the results and inform the studbook keepers.

The studbookregistration program Studbook.

H. Zwartepoorte will contact Rainard Buchmann of Sebag in Germany on this. The ESF will buy the program and distribute it to the studbook keepers. Support will be coordinated by the ESF. It will be possible to use Sparks and Studbook in combination on the same studbook data.

Questions:

- What will be the policy if someone wants to be studbook keeper with commercial interests?

*The board will formulate a response in the studbook guidelines.*

- What should be the policy when animals are offered without the proper documentation?

*The board assumes only legal animals can participate in the studbook. But sometimes this poses difficult questions, like a studbook with only females, and a illegal male is offered.*

- Victor Loehr wants to know what happened to the actions discussed in the previous meeting; "format" and "folder".

-

*The "format" is an action for Gerrit Hofstra and Laurens Woldring.*

*According to Henk Zwartepoorte the "folder" is delayed by the departure of Nienke Kluiwstra who should have created the folder with help of Ron de Bruin.*

E-mail:

Gerrit Hofstra proposes to supply all studbook keepers with an uniform email address. Consultation of Fred Jan Kraan resulted in the possibility to create email addresses of the form: species@studbooks.org. The studbook keepers will be informed on the possibilities.

Deliberation of ESF-board and studbook keepers

The board wants to organize each year a studbook keepers day. In addition to this a booklet will be produced containing articles and reports on animals in the studbooks. For clarity: these are not inventories of studbooks and studbook participants.

Deletion of studbooks?

The board announces that a number of disfunctional studbooks were deleted. In the future the other studbook keepers will be informed of similar actions. Gerrit Hofstra wants to add that these studbooks can be taken over or restarted if good reasons are present.

### 3. Species categories

Already several years ago H. Zwartepoorte mentioned the necessity to split up the studbooks in several categories. This because of the fact that some studbooks were considered of higher priority than others for which a different kind of management is required. Often studbooks for species that are very abundant in captivity appeared to be less successful as the studbooks became overfull and relations between animals were becoming unclear. The management of this kind of studbooks should therefore be quite different in contrast with studbooks with low numbers of animals and with a threatened status in the wild. In order to give proper attention to each studbook the board split up the studbooks into several categories, which are presented below.

If you don't agree with the category your studbook is placed in please contact our secretary: Gerrit Hofstra. More information about this topic will follow soon.

#### Status.

- A High protection. This status means that the species is threatened in the wild or is expected to become threatened in the near future and that keeping a genetically healthy population in captivity could be essential for the survival of the species.
- B Moderate protection. This status means that there is no direct danger of extinction for the species in the wild but close monitoring of the population stays important. This status will also be given to species of which the captive population is very small and or consists of a very limited number of bloodlines so careful breeding stays necessary.
- C Low protection. This status is given to species with safe populations in the wild and in captivity.

The status of a studbook is evaluated yearly by the ESF-Board. Studbook keepers and advisory boards can and will be asked to advice on the status.

<i>Acantochelys (Platemys) spixii</i>	-
<i>Testudo (Agrionemys) horsfieldi</i>	B
<i>Pogona henrylawsonyi (Amphibolurus rankini)</i>	C
<i>Anolis bicaorum</i>	A/B
<i>Chelodina longicollis</i>	C
<i>Chelodina mccordi (was: C. novaeguineae)</i>	A
<i>Chersina angulata</i>	B
<i>Chinemys megaloccephala</i>	A
<i>Chinemys nigricans</i>	A
<i>Chinemys reevesi</i>	A/B
<i>Chrysemys picta belli</i>	C
<i>Chrysemys picta dorsalis</i>	C
<i>Cistoclemmys (Cuora) flavomarginata</i>	B
<i>Clemmys guttata</i>	C
<i>Cordylus cataphractus</i>	A
<i>Cordylus giganteus</i>	A
<i>Cordylus tropidosternum jonesi</i>	A/B
<i>Cordylus tropidosternum tropidosternum</i>	C
<i>Ctenosaura bakeri</i>	C
<i>Ctenosaura melanosterna</i>	B
<i>Cuora amboinensis</i>	A/B
<i>Cuora aurocapitata</i>	A
<i>Cuora galbinifrons</i>	A
<i>Cuora mccordi</i>	A
<i>Cuora pani</i>	A
<i>Cuora trifasciata</i>	A
<i>Cuora zhoui</i>	A
<i>Cyclemys dentata</i>	A/B
<i>Cyclemys tchepouensis</i>	A/B
<i>Geochelone carbonaria</i>	C
<i>Geochelone denticulata</i>	C

<i>Geochelone elegans</i>	B
<i>Geochelone pardalis</i>	C
<i>Geochelone travancorica</i>	A/B
<i>Geoclemmys hamiltoni</i>	A
<i>Geoemyda spengleri</i>	A
<i>Heosemys spinosa</i>	A
<i>Homopus spp.</i>	B
<i>Hydromedusa tectifera</i>	-
<i>Hyla savignyi</i>	C
<i>Indotestudo elongata</i>	B
<i>Indotestudo forsteni</i>	B
<i>Kinixys belliana belliana</i>	B
<i>Kinixys belliana nogueyi</i>	B
<i>Kinixys homeana</i>	B
<i>Kinixys speki</i>	B
<i>Malacochersus tornieri</i>	A
<i>Manouria impressa</i>	A
<i>Mantella spec.</i>	B
<i>Mauremys annamensis</i>	A
<i>Mauremys iversoni</i>	A
<i>Mauremys mutica</i>	A
<i>Mauremys pritchardi</i>	A
<i>Ocadia sinensis</i>	A
<i>Oplurus spec.</i>	C
<i>Pelomedusa subrufa</i>	C
<i>Platemys platycephala</i>	C
<i>Platysternon megacephalum</i>	A
<i>Podarcis lilfordi</i>	B
<i>Pyxidea mouhotii</i>	A
<i>Pyxis arachnoides</i>	A
<i>Sacalia bealei</i>	A
<i>Sacalia quadriocellata</i>	A
<i>Sauromalus obesus</i>	C
<i>Siebenrockiella crassicollis</i>	A
<i>Sternotherus minor</i>	C
<i>Terrapene carolina bauri</i>	A
<i>Terrapene carolina carolina</i>	C
<i>Terrapene carolina major</i>	C
<i>Terrapene carolina mexicana</i>	A
<i>Terrapene carolina triunguis</i>	C
<i>Terrapene ornata</i>	B
<i>Testudo graeca graeca</i>	B
<i>Testudo graeca iberica</i>	B
<i>Testudo hermanni boettgeri</i>	C
<i>Testudo hermanni hermanni</i>	B
<i>Testudo kleinmanni and T. weneri</i>	A
<i>Testudo marginata</i>	C
<i>Tiliqua scincoides</i>	C
<i>Uromastyx acanthinura</i>	B
<i>Uromastyx aegyptia</i>	B
<i>Uromastyx hardwickii</i>	B
<i>Uromastyx maliensis</i>	B
<i>Uromastyx ocellata ornata</i>	B
<i>Varanus acanthurus</i>	C
<i>Varanus exanthematicus</i>	C
<i>Varanus niloticus</i>	B

#### 4. Ten years studbook *Chelodina longicollis* and *Chelodina mccordi*.

Author Wim Fontijne

In 1992 a start was made with studbooks for reptiles and amphibians within the Nederlandse Schildpadden Vereniging (Dutch Turtle/Tortoise Society). At a certain point it proved necessary to establish a separate administration and management for studbooks. In 1994 the Overkoepelend Orgaan Stamboeken was established, which became a foundation in 1997. In 2001 its name was changed into European Studbook Foundation, in which not only Dutch studbook holders participated but also German, Austrian and English ones. When I received a request from my colleague Henk Zwartepoorte, at that time secretary and chairman of the N.S.V., to manage these studbooks, he already realized that zoos would be foremost in the conservation of a reptile species, but that cooperation with private keepers would be very important. Rotterdam Zoo supported this initiative wholeheartedly from the start. After managing the studbooks for *Chelodina longicollis* and *Chellodina. mccordi* for ten years and after three computer programs, I come to the conclusion that it was an excellent decision in 1992 to start a studbook for these species. In 1992 there were only a handful of Dutch hobbyists who presented their animals for both studbooks. The goal of both studbooks was to establish a safe population in captivity, so there would be no need any more to capture animals in the wild. By now, well-established zoos participate in the studbooks, like Rotterdam and London Zoo. After a visit to Thomas Vinke, in those days chairman of AG Schildkröten of the DGHT, it appeared that there were people in Germany who had these species in their private collection. After contacting German keepers of these species and visiting congresses and workshops, both studbooks are well established in Germany. After the seizure of Asian turtles in Hong Kong, the studbook for *Chelodina mccordi* gained a participant in the U.S.A., because at that moment there was no studbook holder on the other side of the Ocean.

##### Studbook *Chelodina longicollis*

Breeding the Australian Snake-necked turtles in Holland has stopped. The breeding animals had the respectable age of 23 years. The average age of the animals in captivity up to now is about 20 years. It remains to be seen what their offspring will do. The first reports are positive. A breeder in Germany saw 10 animals hatch. These young animals found a new destination. Their new owners were contacted in 2003, whether they would be willing to participate in the studbook. No transfers took place the past year. The studbook population remained fairly stable, which is shown by the studbook printout. On December 31, 2002 the studbook population consisted out of 7 males, 10 females and 10 animals of yet unknown gender (7.10.10).

##### Studbook *Chelodina mccordi*

Breeding these animals in Germany has started well with 55 young animals born in 1 location. All animals found a new destination and the new owners were contacted in 2003 with the request to participate in the studbook. No transfers took place in 2002. The studbook population remained fairly stable, which is shown by the studbook printout. On December 31, 2002 the studbook population consisted out of 8 males, 20 females and 15 animals of yet unknown gender (8.20.15). The studbook population has grown in comparison to 2001 with more females. The first reports of a Dutch breeder for the year 2003 are positive: when all eggs that are produced will hatch, the number of animals without known gender would be doubled.

I would like to thank Pieter Harreman for the translation into English.

Wim Fontijne

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*Chelodina longicollis*

*Chelodina mccordi*

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## 5. Genetics in theory and practice

Author: Laurens Woldring

An earlier version of this article has been sent to studbook keepers in 2001

In this article I will try to explain a few topics regarding the maintenance of genetic variability in small animal populations. I also made some notes on practical use of genetics in studbook keeping and terraristics.

### Introduction

No population survives forever. Due to: changes in climate, succession, epidemics and all sorts of occasional rare events like earthquakes, floods etc. all populations are doomed to become extinct. Unfortunately due to the activity of man, this evolutionary process proceeds nowadays even a thousand times faster than the natural extinction.

Many populations and even entire species have been brought to the edge of extinction in the last century, and for some it's even to late. To prevent the extinction of the most endangered species, we try to maintain the current populations and even try to increase their numbers by breeding them in captivity. The exact objectives of captive breeding can be different for each species, and those objectives should be properly defined.

Some objectives we can think of are:

- **Species survival in captivity for the terrarium hobby.**  
These species do not necessarily have to be currently threatened in the wild, but it's important that the terrarium hobby becomes independent of the imports of wild animals, and so prevent further decline of those populations.
- **Gain knowledge on the ecology of species.**  
The knowledge gained from captive animals can be used to understand and protect the wild populations. This knowledge can also be used to inform the public and to raise awareness.
- **Conservation.**  
For the most endangered species, captive-bred animals can become very important for the species survival. These animals can be used for conservation programs and, if necessary, even for reintroduction to the wild.

Although it's evident that these objectives have some overlap, it's very important to define the primary goal of these objectives.

To maintain populations in captivity for generations we have to consider 3 factors that can influence the survival of those populations.

1. Environmental factors. These include: climatic factors, predation, natural catastrophes etc. Fortunately we can regulate most of these factors in captivity. Once the optimal conditions are found, no real problems are expected from these factors.
2. Demographic factors. These are the variation in birth and mortality, as well the fluctuation in sex ratio due to statistical chance. Reptile breeders have a certain advantage compared to breeders of other animal groups. This is because of the fact that to some extent, we can influence the sex ratio of many species, during the embryonic stage.
3. Genetic factors. I would like to explain these in detail.

## The principles of genetics.

In this section I will try to explain some basic genetic principles.

Every individual is different. Those differences are caused by the differences in alleles that are situated on the genes. These alleles are the codes for a certain feature and are always present twice. These alleles are inherited by the laws of dominance. Dominant alleles are represented by a capital letter (A) and recessive alleles by a small letter (a). Genes can be heterozygous (Aa) or homozygous (AA) or (aa).

I will try to explain the theory using the following examples:

1. We take a gene. On this gene is situated the allele A, which stands for eye-colour. The father has brown eyes and is homozygous dominant (**AA**). The mother has blue eyes and is homozygous recessive (**aa**). The eye-color brown is dominant over blue  $A \leftrightarrow a$ . All offspring will have the alleles **Aa** (heterozygous).  
The probability that the offspring (F1) will have brown eyes is thus 100%. These percentages can be easily found by using a simple crossing-table. (see figure 1)
2. We take the same allele. The father has brown eyes, but this time he is heterozygous (**Aa**). The mother still has blue eyes and is still homozygous (**aa**). The offspring will have the allele combination **Aa** or **aa**. The probability that the offspring will have brown eyes is 50% (**Aa**). So the probability for blue eyes is of course also 50% (**aa**). (see figure 2) You obtain the same percentages if you cross homozygous dominant (**AA**) with heterozygous (**Aa**).
3. We take the same allele again. The father stays brown-eyed heterozygous (**Aa**), but this time the mother is also brown-eyed heterozygous (**Aa**).  
Result: (see figure 3)  
The probability for **AA** = 25% gives brown eyes.  
The probability for **Aa** = 50% gives brown eyes.  
The probability for **aa** = 25% gives blue eyes.  
The probability for brown eyes is thus:  $25 + 50 = 75\%$   
The probability for blue eyes is than: 25%

Not only morphological features are represented by allele combinations. Features such as the vulnerability to diseases, for example, can be determined by the alleles.

	<b>A</b>	<b>A</b>
<b>a</b>	Aa	Aa
<b>a</b>	Aa	Aa

**Figure 1**

	<b>A</b>	<b>a</b>
<b>a</b>	Aa	aa
<b>a</b>	Aa	aa

**Figure 2**

	<b>A</b>	<b>a</b>
<b>A</b>	AA	Aa
<b>a</b>	Aa	aa

**Figure 3**

### Loss of Genetic variation

The amount of heterozygosity on the different alleles is called genetic variability. This genetic variability is responsible for the fact that a species can adapt to the changing circumstances; the evolutionary process, and so can survive. This means that the best-adapted individuals will

reproduce, and will pass on their “positive” genes to the next generation. This is why it’s very important to maintain a high level of genetic variability. The main factor of loss of genetic variability in small populations is inbreeding.

Because of the fact that the captive populations we deal with are relatively small, it’s of great importance to avoid inbreeding as much as possible.

In the next section I will try to explain some negative side effects caused by the lack of genetic variability.

- **Genetic bottleneck**

Within a population there exists for example a 100 different variations of a certain gene-area. Let’s say that a catastrophe occurs, and 80% of the population dies. The remaining 20% will start reproducing again. But after this catastrophe the genetic diversity has drastically declined. Let’s say that now only 20 variations of the gene area are left. If, in this case, the particular gene-area coded for the resistance to a deadly disease it can be possible that due to statistical chance, all resistant animals have died. In case of an outbreak of the disease, no animal will survive and the population will become extinct. In a small population the changes of losing important alleles are much greater than in a large population. (statistical fact). This is also the case in the next phenomenon.

- **Genetic drift.**

By this we mean that in small populations rare alleles are much more likely to disappear than in relatively large populations. For example, take a very specific allele that is present in only 1% of the population. In the case of a large population (let’s say a 1000 individuals) this means that there are 10 animals that carry this allele, and so it’s very likely that this allele is passed true to the next generation. In a smaller population of let’s say a 100 individuals for example, only 1 animal is carrier of this rare allele. If this animal does not reproduce, this particular allele will become extinct in this population. And even if this animal does reproduce, and produces 2 offspring, there is still a 25% chance that the allele is not passed on. This is why rare alleles disappear much faster from a small population than from a large population. If in this example the allele was necessary to make antibodies to survive a rare lethal disease, the changes of extinction for this population are relatively high.

Although the loss of important genes in a population is in real life a slow process, it should not be underestimated.

- **Inbreeding depression**

It has been proven that some diseases are hereditary. In most of these cases the allele combinations that code for these diseases are homozygous recessive. This means that this disease only comes to expression if the allelic combination is (aa). Usually the disease doesn’t come into expression because against the recessive “negative” allele (a) from the carrier, there comes a “positive” dominant allele (A) from the non-carrying partner.

There is a 50% probability that the offspring is carrier of the disease, but the disease doesn’t come to expression. If the carrier reproduces with a family member (inbreeding), who is likely to be a carrier of the recessive allele (a) also, there is a 25% probability (heterozygous x heterozygous) that the offspring will have the disease. This is the reason that inbreeding can lead to diseases and can even cause death. A famous example is haemophilia in the closely related European royal families.

The maintenance of high genetic variability and the prevention of inbreeding is of major concern. The exact numbers of animals that are needed to maintain a small population healthy in the long run differs with species and is often not known. In the zoo-world a minimum amount of 50 but much better 500 breeding pairs are considered necessary.

Another parameter that is often used is that over a period of 100 years, the genetic variability may not have been declined with more than 5 to 10 % of the original variability. Another parameter that is used is to spread the loss of genetic variability over a x-amount of generations. For example: Within 10 generations the genetic variability may not have been declined with more than 2%. Of course this is species specific. There are different mathematical equations for calculating subjects

as: genetic variability, inbreeding depression and the level of congeniality, but I will not go further in on this material. More about this you can find in: Princée, (1998.)

## **In Practice**

Avoiding inbreeding is very important. An argument used by breeders that do cross related animals is, that they breed healthy looking animals for generations. Inbreeding doesn't necessarily lead directly to (visible) complications. We know that some species seem to do very well in captivity even after being inbred for many generations. The Malagasy Gecko's of the genus *Phelsuma* for example. (Borg ter, 2000) From other species we know that within a few generations of inbreeding, problems do occur and weak, dead or even no of juveniles are born. For example some species of European lizards of the genus *Podarcis* and some species of North-American Gartersnakes of the genus *Thamnophis*. (Borg ter, 2000) (Hallmen, 2000) (Uneken, pers.com) Some breeders relate these complications to incorrect husbandry rather than to inbreeding.

If you consider the fact that all captive golden hamsters kept all over the world are descendants of 4 to 8 wild animals, you do question yourself if inbreeding is really that harmful. You have to realize though that the captive tame hamsters have become very different from their wild cousins and don't look very natural any more. It's very unlikely that our captive hamsters would still survive, if released back to the Syrian planes.

I am of the opinion that we should maintain our animals as natural as possible. So when needed, our animals could be used for conservation programs. It is possible that due to inbreeding, a lot of characteristics that could be useful, if not vital, for survival in the wild are lost.

Although we want to keep the genetic variability as high as possible, we also have to try to maintain subspecies or even geographical varieties as "pure" as possible. It is off course of great advantage if the exact origin of imported animals is known. Nowadays it is possible to reveal this origin, as well the level of congeniality of an individual, with the help of DNA-research. But these techniques are very expensive, time consuming and not always 100% accurate. It is very important that we don't let animals, of which we know the origin, interbreed randomly with "unknown" animals or with hybrids. It would be a shame to lose the genes of those "known" animals.

By using the studbook we should try to find the best matching individuals and try to form breeding pairs. The amount of selectiveness we should consider when forming those breeding pairs is depending on the size of the captive population and on the objective that was defined for the breeding of this particular species. These objectives should be related to the category A,B or C each studbook is placed in. Often subspecies and geographical varieties can be recognized by morphological features, in case they are known. This is not always the case!

We can limit the amount of inbreeding by coordinate breeding. To let a breeding program work successfully, we should know what the exact parents of the offspring are. The easiest way to realize this is by keeping our animals in pairs, or otherwise in small breeding units. Off course this is only possible when dealing with species that doesn't live in complex social structures. Another advantage of keeping animals in pairs is that animals can be housed more easily. Instead that e few people keep many animals of one species, many people can keep a few animals of different species. In this way we can breed more animals in a coordinated way on more locations. In this way also the amount of inbreeding will be reduced. For example: If I keep 16 animals in 8 pairs, by rotating them, I can breed 4 generations without inbreeding. If instead I keep these 16 animals in 4 groups of 4 animals, I can only breed 2 generations being sure that no inbreeding occurs. Another negative side issue of keeping animals in groups is, that an entire group should be registered in the studbook as one pair. In this way a lot of animals are lost for the studbook, witch is a shame considering the fact that the wild populations will continue to decline in the near future and captive bred animals might become of great importance for the survival of the species.

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## Literature

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- Princée, F.P.G., *Genetic management of small animal populations in zoos and wildlife reserves*, stadsdrukkerij Amsterdam, 1998.

## 6. Format keeping/ breeding advice

1. Common name (*Scientific name*)

Enclosure:

Temperature/lighting:

Food:

Supplements:

Situation in the wild and in captivity:

Additional information:

Literature:

## 7. Word from our software manager.

Author Fred Jan Kraan

Progress made with Studbook

Studbook is developed to make life easier for studbook keepers using Windows. The SPARKS program can work with all current Windows versions, but its user interface is hard to use for novices and the printing capabilities are outdated.

Studbook solves both problems. The user interface shows more relevant data on screen, giving the user more insight on what to fill in. The printing of reports is done via a web browser, making almost all printers usable. An important feature of Sparks, the checking of the consistency of the data, will also be present in Studbook. This will help the novice user in creating and maintaining a useful studbook.

Another feature of Studbook is the complete compatibility with Sparks. Both programs can be used to create and edit the studbook data. This guarantees that data is interchangeable between Studbook and Sparks installations.

Studbook will soon be available to all ESF studbook keepers.

## **Announcements:**

- We are looking for a **Public Relation officer**.  
Since some time we have a vacancy for this function and we are really looking for someone who is willing to fill this position. Tasks concern the development of PR material like posters and brochures and some fundraising.  
The position is on a voluntary basis. Boardmeetings are generally few times a year.  
For more information please contact me at:  
[groovertje@yahoo.com](mailto:groovertje@yahoo.com)
- For next editions of this bulletin I am looking for pictures of studbook species. Also articles concerning a studbook or studbook species are more than welcome.