

Identification of indicator species on the basis of inventories on the insect, reptile, fish and bird fauna of the biosphere-reserve Pendjari in Benin (West Africa).

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Introduction

In February 2002 a **scientific investigation** of the small fauna took place in the Pendjari National Park under the lead of Dipl. Biol. O. Grell. Team members were Dr. K. Voss, Dr. Chr. Zöckler, Dipl. Biol. H. Grell and Dipl. Biol. J. Schwahn. The team stayed during the investigation in a camp near Arli at the border to Burkina Faso and had an off-road car available. The investigation occurred of the 6.2 to 25.2. during the **dry season**. The main aim was to increase the general knowledge of the **species spectrum** and the **distribution** of birds, fish, reptiles and insects in the Pendjari National Park and provide **recommendations for the management plan**. A follow-up expedition is planned for October 2003 in order to complete the investigation with the rainy season aspect.

Each species group required very different means of survey techniques. In the following report the groups are treated separately. Also the recommendations for the management plan occurred in each case for every animal species group separately.

The species recording of the **birds** in February 2002 is seasonal and the shortness of the stay determines an incomplete list. Bird species only occurring during the rainy season in the Pendjari are missing. In addition a great number of Palaeartic migrants, such as the White Stork, was not present in February. A complete list of all known bird records incl. new observations has been compiled with notes on the threatened status.

The **fish** survey can also not be considered as complete at this stage. Particularly the fact that up to the last sampling new species were identified let us think more species may be found. The beginning of the hot dry season proved as favorable for the fish survey. Numerous fish species were caught. The knowledge of the fish fauna in Pendjari has been significantly broadened. An up to date list of all known fish species for the Pendjari National Park has been compiled.

For **reptiles** and also **amphibians** the dry season was less suitable for any survey. The dry season was unfavorable also with respect to most **insects**. In spite of high number of species recorded and it became obvious that the current knowledge regarding locusts is low. Evaluating the results different ecological aspects of the findings are highlighted.

About 700 **photographs** were created and digitalized. The photographs were arranged in a database, labelled and put on a separate CD. In addition digital sound recordings were compiled.

Abstracts of the individual animal groups

Birds

203 species of birds were recorded in the investigation period. Together with all available knowledge a total of 362 bird species can be listed for Pendjari NP. For the first time the complete list of all recorded bird species for the Pendjari National Park is compiled in the appendix systematically in three languages (English, French, German). Some ten new bird species were recorded for the Pendjari NP and possibly for Benin. Further species are expected to be recorded and may justify another inventory at a different season. The bird species were also tagged with respect to their habitat requirements, with about 25 % water bound, about 30 % in forest habitats, about 40 % favoring open country species. Only few species have been recognised as generalists or bound to rocky habitats. Two thirds of all

species were residents; the others are migrants largely from the Palaearktis. No endemic species were found, most bird species are widespread in western Africa. Five species are considered globally as endangered and protected by prosecution. In Pendjari they appear not to be threatened at present. The most predominant threat occurs in a variety of habitat losses for forest birds through frequent bush fires that destroy the forest vegetation for the benefit of the open savannah. Some species benefit from the fire, others not, as listed in the appendix. Recommendations for the management of the park were given. The Pendjari National Park holds a large potential for an ornitho-tourism, which has been explored very little and is worth considering further.

Fish

In the dry season selected water bodies in the Pendjari NP were examined for fish species. In addition characteristic chemical-physical parameters were measured. The Pendjari river was examined at two characteristic points: quiet water (pool) and running (riffle). Furthermore six different water bodies with stagnant water (=Mare) of different size and depth, have been included.

The chemical-physical features characterize the waters as aquatic habitats with small conductivity and low degrees of hardness. The pH-values are in the neutral to slightly sour range. Nitrite and nitrate content are very low. The transparency (Secchi-depth) in the Pendjari river comes to approx. 50 cm. In the Mares it is by far smaller due to the activity of hippopotami and crocodiles, except for Mare Bori (>80 cm), where at least no hippopotami occur.

In total 381 individuals of 40 fish species have been caught during the survey, originating from 17 families. 32 species have been measured and documented photographically. Together with the other preliminary investigations the total species number is 67 species for the fish fauna in the Pendjari NP. The species spectrum consists of typical representatives of the biogeographic region "sahelo-soudanian" comprising the river systems of the Niger and Volta. The highest species number of fish was found in the river, which is connected with the whole Volta-Bassin above the Lac Volta during the rainy season, when the water level is high. During the rainy season the river inundates and floods up to 60 % of the surface of the Pendjari national park. In this time it replaces the fish fauna of its upper reaches and of the Mares. An exception is Mare Bori, which is fed by the small clear Yamata spring creek out of the Atacora mountain range and shows an entirely independent fish fauna of predominantly small species. With sinking water level the connection between the river and the Mares is interrupted. In the dry season the number of the fish species in the Mares consists of only half of the those in the river, and the size of the individuals of same species seems to be generally smaller in the Mares than in the river. The species composition of the several Mares is more or less clearly different from each other. The determining factor for the species composition seems to be the depth of water. It also prevails above other parameters, e.g. the persistence in the waters, but also above the abundance of submersed macrophytes (aquatic plants). At present the results allow recommendations for the management plan of the national park as far as the protection and the development of the water bodies and its fish fauna - also with regard to attract more tourism.

Reptiles

The search for reptiles mainly focussed along the gallery forest and at the Maren, but also in the open Savanne. Eleven species were found. Characteristic for the Pendjari National Parks and widespread are tree lizards (*Agama* spp.). The actual species number is much higher considering other habitats and the knowledge available from neighbouring areas (Roedel et al. 1995 & 1996) and might be not less than 100 species. Little activity was observed among reptiles in the Pendjari National Park. This has not only been observed in the dry season and reason for considerable concern. The extensive absence of turtles is striking. The Monitor Lizard is characterised by shy behavior and rarity. The absence of reptile species is explained partly by frequent bush fires and human prosecution. The observations indicate that reptiles in the Pendjari NP are prosecuted at present. The situation for reptiles gives

reason for concern for the survival of many species. Continuing studies are necessary. In addition to improved park management the introduction of some reptile species appears reasonable to be taken into account. Particularly turtles, but also Monitor Lizards and big snakes are suitable for this purpose. Conservation measures for reptiles appear with high priority. To be threatened particularly many reptiles through frequent and large-area bush fires. Large-area fire protection fields can create relief. The pursuit of the reptiles at the Pendjari is at the present time without control, the protection concept should be expanded onto the field.

Amphibians

Despite the dry season still four species of amphibians were registered. These were Western African species. Active amphibians in the dry season were found near the Mares as well as at the Pendjari river. The actual number of amphibian species in the Pendjari NP is estimated to be considerably higher (see Mission 2003). However it already becomes apparent that with respect to the management plan the protection of the existing Mares, including the flat alluvial plains are crucial for the survival of amphibian species. The planned excavations and taking out of water plants in the lakes as planned for example in the Mare Bori does not only have a negative impact of amphibians but also on a lot of predators, such as storks, herons etc.

Grasshoppers

At 18 transects and 9 different sites grasshoppers were systematically searched for and determined. This way the species diversity and population density of the locusts and grasshoppers active in the dry season could be determined. Different habitats and different fire stages have been compared with each other. In total 31 locust species were verified deriving from 11 families. Three species are considered as rare in West Africa. The Pendjari NP also fulfils the status of protecting invertebrate species. Moist, but open habitats appear especially valuable. The actual species number for the Pendjari NP is estimated to be at least twice as high. In total it is stated that field locusts fulfill a very high ecological function in the Pendjari National Park through the conversion of plants to proteins. The high biomass has a supporting biological function for bird species and other predators of locusts. The highest individual densities occurred on fire sites with fresh grass shooting in the dry season. Up to 1800 individuals were recorded per ha. Large-scale bush fires lead to an impoverishment of the species diversity. For the conservation of the most invertebrates, such as locusts core zones without burning are vital. The wetlands appeared to be especially sensitive.

Butterflies

The dry season is characterized by a low flight activity in butterflies. Nevertheless 37 species were recorded. They are mainly widespread in West Africa, but also one rare species was found. The gallery forest proved to be more species-rich than the open Savannah. It is accepted that the actual species number is considerably higher as records from neighboring, well examined areas demonstrate. An extrapolation of the investigation in the rainy season and/or at the end of the rainy season appears reasonable (see Mission 2003!). The potentially high importance of butterflies for tourism is demonstrated. It is possible to further attract butterflies purposefully through planting special flowers and by providing water sites in the dry season.

Dragonflies

Only a few dragonflies have been recorded through the dry season and it is recommended to carry out a survey of dragonflies in a follow-up expedition at the end of the rainy season

(October 2003). This is particularly important to base the necessary detailed management recommendations on the presumably significant importance of rare and endangered dragonflies in the Pendjari NP.

Outlook

For the first time small animals have been studied in the Pendjari NP. Previous surveys only covered a small proportion and did not aim to provide an overview of the park's biodiversity. This has been considerably expanded and the current knowledge of the park extended. Although only in the dry season a small fraction of the species have been captured the biggest part of the birds and the fish might be known. However, there are still many questions, especially related to reptiles and amphibians. The insect fauna has been recorded for the first time and has to overcome initial difficulties in methods and the right period of investigation. In comparison with the Comoé NP for example the knowledge of invertebrates in the Pendjari NP is still modest. The benefit of the investigations of the small animals is not always obvious at first, big mammals will remain in the center of the interest and attention of the conservation efforts in the national park. Small animals have less chances of being observed and of being regarded as important as they deserve. However, farsighted planning recognises that in the "savannah ecological system" all organisms have their function and play their role in balancing, even though we not always know those in detail. In the long-term conservation and investment in the ecological system benefits over the one-sided protection of species as the experience in conservation projects world-wide demonstrates. A well-founded knowledge of the entire ecological system including the small animals can be used for improving the status and image beyond the national park. Ignoring these values can in the long-term destabilise the system and jeopardise the touristic development as well as the international recognition. The combination of both threatens further protection and the financial support through sponsors.