

PANAY ECO-SOCIAL CONSERVATION PROJECT  
(PanayCon)

**Sixteenth Annual Report**

January 2013

E. Curio (ed.)

PanayCon, Pandan Public Library, Pandan, Antique, Philippines,  
P.O. Box 42, Kalibo, Aklan 5600, Philippines  
Eberhard.Curio@rub.de

Under the umbrella of the NGO PhilinCon

In close cooperation with

Aklan State University (Philippines)  
Department of Environment and Natural Resources (Philippines)  
Frankfurt Zoological Society (Germany)  
Ruhr-University Bochum (Germany)  
GIZ (Germany)



**Front cover clockwise – a plethora of new species**

Upper left: **Freshwater *Sundathelphusa* sp.; Mt. Madja-as, 1,000 m asl.**

Upper right: **Freshwater *Sundathelphusa* sp.; Mt. Nangtud, 1,600 m asl.**

Lower right: **The arboreal, forest-dwelling *Geosesarma* cf. *rathbunae*; Sibaliw.**

Lower left: **Karst-dwelling *Geosesarma* sp., Mun. Nabas.**

Center: **Forest floor-dwelling *Geosesarma* sp.; Mt. Baloy at around 1,400 m asl.**

**See Chap. 3.1 Conservation Research**

All photos courtesy Maren Gaulke, Munich; art work by Helga Schulze, Bochum

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***Impressum:***

The Sixteenth Report of PanayCon builds on contributions from

Curio, Eberhard  
Gaulke, Maren  
Leocadio Dioso  
Sanchez Jr., Enrique  
Santos, Marivene  
Santillan, Rhea

and was edited by E. Curio. -

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Pandan and Bochum, July 2013



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## Sixteenth Report 2013

An update and thorough revision of the 'Fifteenth Report 2009'

### *Title of Project and Time Period:*

Panay Eco-Social Conservation Project (PanayCon), the forerunner had been PESCP that ceased to exist in 2009. The time period covered by the year 2009-2013.

The project's work is formalised under the aegis of a Memorandum of Agreement between the DENR and Ruhr-University Bochum, renewed in 2012, and a collecting permit, covering collecting (blood of birds, plants, ectoparasites), and potential prey of the Marine Toad or Cane Toad (*Rhinella [Bufo] marinus*), locally known also as 'Hawaiian Frog'. An andement with opportunistically obtained specimens (e.g. road kills) that represent new species or new distributional records in the pipeline. - Links with many environmentally concerned agencies/institutions are continuing to thrive and many others are developing: Erwin-Warth-Stiftung, President Hilde Stühlinger, and the CAPE Foundation, President Macrina P. Lovina, absolute vital for the project; the CAPE Foundation has take care of costal development including the instruction of fisher mens and the conservation of marine wildlife. And further befriended supporter of the project is Leocadio F. Dioso, Leocadio Alonsagay Dioso Memorial Public Library, Pandan, Antique, Philippines, and to generous the host office in the compounds of the library. Talks with underway with the University of the Philippines, Campus Iloilo and Mia-agio, in the intent of hiring Prof. Dr. E. Curio as a Visitor Professor to supervising of Filipino Bachelor and Masters Students.

In the 15<sup>th</sup> report detailed the plans of the filinilozation, i. e. the stepping down on foreign personnel to make way that key Filipinos persons then take over. The plans receive a heavy blow when the management found to for responsible for malversation of funds. The ensuing chaos made three quarters of the staff jobless while the segment of the reha and research facilities (8 people) by fund regenerated by Prof. Curio could be remained unto still. The case against going is worn-doers is on-going. The FZS had had completely its budget, had fired to the management staff under suspicion of embezzlement of his fund and started the sue them in a court in Culasi.

In the wake of this upheaval consultation of and old new staff started at the end of which a organization emerged, i. e. namely PhiliCon we with project PanayCon, unfolding a completely new organizational structure (App. 1). Due to the nice-down of the budget staff no working on a voluntarily basis, be the bookkeeper, Mrs. Rhea Santillan, and further 'lent' for only NGO; the CAPE Foundation was on prespicacity to render the job of six FRs who even deplutonized as WEO (Wildlife Environmental Officer). The project management hard work in restoring the previous budget to allowed for extended operational basis of the project.

Sad to say, BioCon, an NGO and earlier outgrowth of PESCP, failed all along with its mandate of strengthening PESCP financially since its erection 12 years ago. Accordingly the founding of a new NGO PhilConserve by concerned citizens in 2005 laid the ground for fostering the hope for effective biodiversity conservation in Panay; preparations toward fund-raising have been promoted by members of the BOD. For further details on within-country

support by governmental bodies on an on-going correspondence with the BOD of BioCon further in always entering in 13. year.

PanayCon gratefully acknowledges again the factual and moral support received from the LGU of Pandan. I take this opportunity to extend my deep-felt gratitude to *Hon. Julius Tan*, Municipal Mayor of Pandan, and the Head of the Pandan Department of Agriculture, *Mr. Ronald S. Sanchez*, for their great understanding and perspicacity of giving leeway to their staff in assisting PanayCon tremendously in its zeal of pushing its and the municipality's environment agenda. Accordingly I am pleased to mention the assistance of *Mr. Arnold Demegillo*, Pandan's MENRO and Agricultural Technologist, who took pains in advising PanayCon in community liaison matters facilitating various technical problems.

As before, Prof. Dr. E. Schneider, President of the German 'Bird Protection Committee' (Göttingen), was circumspectly funding our *ex situ* work focused on the rehabilitation and release of wildlife, specially endangered birds.

To all these people and institutions we are deeply grateful and hope that they will support the cause of both PESCP and its umbrella NGO PhilConserve also in the future.

There were honours to members of project in the reporting period. In recognition of the services delivered to the DENR Dr. Enrique Sanchez, Jr., have the Certificate of Recognition honour on behalf of this office during a Anniversary Celebration and Recognition an Environmental Partners in a ceremony in San Jose on the 10 June 2013.

Furthermore, the American Biographical Institute bestowed the honour of induction of the 2009 Order of International Merit to Prof. Dr. E. Curio for professional achievements in 2010.

### **Editorial**

We are back again! Ever since 2010 an unfortunate phase of inactivity was imposed on our project though corruption of the project management had led to withdrawal of the major funding recourse through the Frankfurt Zoological Society. The shortfall of FZS funding, beginning in 2010, ended a period of carefree project activities lasting the past 15 years. It led to the establishment of the Panay Eco-Social Conservation Project (PanayCon), [www.panaycon.org](http://www.panaycon.org), earlier named PESCP). However, the project activities in this phase concerned only forest protection and rehabilitation of wildlife. Because of lack of funding, all reforestation, livelihood and nest-guarding initiatives have folded down. Due historical reasons, rehabilitation and research did not suffer similarly drawbacks; the activities went on thanks to the insightful behaviour of remaining and new donors turning a blind eye to the libelous bad-mouthing of one of the dismissed managers. He tried to blame the project advisor for the demise to divert attention from his shortcomings. In this way, he attempted to dissuade long-term donors from supporting the rehabilitation and research projects, without having any own benefit from it. After that, the funding was being jeopardized to though allowing to work carries go, namely rehabilitation, research and office work. In spite of such efforts, work continued, also thanks to our devoted local co-workers. - The court cases against the two managers are still on-going.

There were more supporters stepping in after the FZS's withdrawal. First, Mr. Leocadio Dioso, the director of the Pandan Public Library, generously has been helping by sharing his office with of our employees, i. e., the bookkeeper Ms. Rhea Santillan and various friends and

supporters of the project. - Second, the befriended CAPE Foundation stepped in, enabling the carrying on of the forest conservation scheme; six Forest Ranger jobs were maintained thanks to the loyalty of CAPE President Ms. Macrina ‘Macky’ Lovina.

By and by, PanayCon’s previous schemes get going again, and we increasingly get support under the guidance of the new umbrella NGO PhilinCon (Philippine Initiative for Conservation and the People, Inc., [www.philincon.org](http://www.philincon.org), which replaced the old NGO PhilConserve). Ms. Helga Schulze contributed as a volunteer illustrator and web designer, making the appearance of PanayCon of the eyes of the public again well known. Bit by bit PanayCon is rising from the ashes.

Beside recovery of our “old” project, we were pleased about learnt a new event – the Reproductive Health Bill (RHB) by the Philippine government which addresses one of the worst problems in the country: environmental destruction because of overpopulation. This bill passed the congress after a sheer endless debate, ending in a victory of all people advocating family planning. The bill allows a slow-down of population numbers and it probably can save the Filipinos from hungry and famine, if implemented fast. A slow-down of population growth was hailed as a panacea to survival, all other things being equal (Editorial of 2008 and 2009, see up fourteenth and fifteenth, Ann. Report, respectively).

## **Executive Summary**

### **1. Conversation and Rehabilitation**

#### **Combined report for the four-year period 1 January 2009 - 31 December 2012**

In 2009, PhilConserve became victim of financial irregularities, which involved substantial losses in cash and other assets, caused by two PESCP officials. All operations were put to a stop for the time being.

Over the years of 2010-2012 PhilConserve and PESCP ceased to exist in order to be replaced by the newly founded Philippine Initiative for Conservation of the Environment and the People, Inc. (PhilinCon) and PanayCon (Panay Eco-Social Conservation Project), respectively.

Thanks to the efforts of Prof. Dr. E. Curio, a total of 9 jobs have been maintained, although the overall number of employees as well as the total of hired FRs had to be reduced. Activities carried out over the years of 2009 – 2013 were law enforcement for protection and conservation of forest areas, a biodiversity assessment of the Central Panay Mountain Range and operations of wildlife research and rehabilitation facilities. During the reported period an average of 18 forest rangers were hired, trained and used every year to patrol forest areas and confiscate chainsaws and illegally logged timber.

#### **PanayCon’s Protection for the last substantial sized population of the Dulungan Hornbill (*Aceros waldeni*) – Prospects for 2014**

A briefly history is given of the development of the Dulungan population and its protection two guards alongside in expansion in over ever increasing range in the CPMR by to 2008. After part systematic protection of nest holes had stopped due shortage of fund not full no

provided by the FZS. A last census revealed a population of about 1,350 pairs (active nest holes). A beneficial advantage extended to the protection of other wildlife in the area though was not needs to be quantified.

### **Animals under the care of PhilinCon in January 2013**

An account of given of wildlife in the care of project and its veterinary supervisor when latest admission in the three wildlife facilities of Mag-aba, Bulanao and Sibaliw, with date of admission, animal species, sex, ring number when applicable, and annotations.

## **2. Conservation Research: Taxonomy and Biodiversity**

### **Herpetofauna**

The herpetologist Dr. M. Gaulke come brought out of monograph on the taxonomy and distribution of all taxa of reptiles and amphibians any islands of the Philippines. ‘The Herpetofauna auf Panay Island, Philippines’ a complete update an list any discoveries, notably by the author, and their taxonomy, is lavishly illustrated, most all by the her own photographs.

On all update, research Gaulke overviews the morphometric and meristic character form the Mabitang, the congeneric species of the widely distributed, also vegetarian relatives the of the Mabitang from the north of the archipelago, setting it aside from a recent described taxon.

### **Shellfishes – animals without back bones**

#### **Land- and freshwater-crab surveys: Preliminary results**

As results of studies of Gaulke and Santos the land crabs of Panay are highly diverse and they occur from the deep-land green-forest up to Madjas-an and Nangtud in the CPRM. There some are possible five inequitable beautiful *Geosesarma* species (see above the frontispiece of the Ann. Report) that await formal description. – Apart these those species the two *Sundathelphusa* sp., two member of the Gecarcinucidae family. The first which new of the science. The are karst inhabitant or tree-dweller, and have a direct developmental. Are on ca 30 *Sundathelphusa* species in the Philippines the two was parasitized found by *Rhizophala*, from of ca 230 species of spell-fish usually marine origin that have found first two in a terrestrial habitats far them from the sea. – Furthermore, a group of swimming crabs of the family Potamidae was found in Rivers that were under study are well.

#### **More shellfish research: a new species and genus of landhopper**

In 2010 Javier & Coleman described from the litter fauna from Panay a new landhoppers we have been known for a few of years (*Talitrus curioi*), thus describing a terrestrial member of the landhoppers family from the Philippines. (Related froms was known from of the forests South Africa and Australia). Later on, Lowry & Coleman (2012) remaned to species as *Curiotalitrus curioi* by latest morphological detail, thus erecting a new genus the for new species.



### **A new species of whip spider for Panay**

A new species of the Charinidae assemblage of whip spiders were that the second species of *Sarax* thus forming the *S. curioi*. Its other congeneric the Philippines being *S. brachydactylus* are a wider distribution, reaching out to Malaysia and Cambodia. As comparison the typical whip spiders with inward-bent pedipalps serving as the pair of antennas the *Sarax* species, has far less specular name-naming ‘whips’ and exhibiting less formidable forelegs.

### ***Telephonoides panayensis*, a new giant whip scorpion**

The genus and species of wish giant scorpion displayed morphically character warrant a new genus, that different of four *Telyphonus* species (Uropygi, Telyphonidae) in the country. The only other whip scorpion from Panay Island of from of different genus (*Glyptoglutus augustinus*) is of smaller size. The both new species of spider whip (*Sarax curioi*) and new species of whip scorpion (*Telephonoides panayensis*) was found in the NW Peninsula, namely on the forest floor and in a dry lever bed, respectively.

### **Decription six new Philippine species of the Tiger-moths (*Cyana*)**

Among 17 species treated six there from Palawan and Minadao in the South to Luzon in the North, with branching of assemblages with to variously directions (Arctidae, Lithosiinae). The are distinguished by their genitals and are confusingly similar. Variously lines are evidence point that the that assemblages branch to too in islands compassing Panay as well. In the latter described in *Cyana curioi* from Palawan.

## **3. Behavioural Ecology**

### **The avoidance of spider webs by bats**

Birds and bats appear to risking by flying in the spider webs. This rises the question if i.e. bats had locate and avoid the web, for instance of *Nephila* sp. – The question was experimentally tackled was baiting artificially a feeding tree that was one vertical side covered with opaque wall and other three sides by a scaffold of frames. The frames was suspended in the scaffolding and carried in one of the three wall *Nephila* web side and side (Fig. 1). The fruit bats (*Ptenochirus jagori*) flew to the bait tree on any the three sides and avoided web on marginally. However, on departing from the tree the flying used two a free-web wall. They had had the their flight toward the tree that a web-wall is to be avoided, or, way located and subsequently avoided a web after looking at of its from at the advantage point with relaxation. The jury there out the is these possibilities.

I a different approach with freshly caught bat that latter were subjected to the taks of leaving a cage exits which not would cover by the *Nephila* web while is was web free. The escapes of the bats from this dual-choice apparatus war tallied. A was a tendency of a smaller species (*Cynopterus brachyotis*) to leave the apparatus through a web-free exit, also war also the care the smaller species including a microchipteron. If true smaller bat species but aware of the web that the larger species (*Ptenochirus jagori*) were there more endangered by the spider.

### **The of function of bi-coloured fruit displays**

This test the 'foliar flag hypothesis' who which structure of or adjacent to a fruit are often from a time colour and thought to direct attack to frugivores to the fruit in leading to a preferential detection of the fruit and thereby seed dispersal. At a matter of fact, frus removed more efficiently while enjoying such foliar flags but reason for this removal has enigmatic may 30 years the enigmatic. We have experiments with Taractics was shown that to in combinations of red and auxiliary black was earlier discovered in their natural unsouing. At free visible on the plate the combinations or red-red, black-black and res-black colours was not preferred, the earlier discoveries of bi-coloured displays as genuine effect of the bi-colouredness. A second function of bi-colouredness have allowed the genuine to assess the ripeness of the fruit: the colour a green was not preferred over red, and part green of a fruit are indications of ripeness.

### **Colony defence by an ant - and test of Life History theory**

Organisms have been shown to strike a balance multiple needs simultaneously, in other words that said to form 'trade-off' to maximize Darwinian fitness. Are of the 'trade-offs' of to balance future reproduction against current reproduction. The future with dull due his ill health as and its will current bout reproduction in enhanced and vice versa. The simulated with the removing a the hind leg from an ant (*Polyrhachis* sp.) how the future component of reproduction (colony defence) and defence can a powerful *Rhytidoponera* sp ant and compared against intact individuals of the defender. As predicted by Life History theory, the mutilated ants defenced the colony effectively against the intruder, apparently regarding their future bleak.

### **A plant insect mutualism of *Leea manillensis*: An any many ant attendants**

The are of the least 26 species inhabiting the *Leea* (Leeaceae) trees, one at at time per plant, and even taking turning night and day species-specifically. A many *Leea* individuals lack any ant species at all, so the mutualism is qualifying as facultative though food bodies and extrafloral nectaries as apparently a reward to insects attacking herbivores. A measure quantified the damage by herbivores and its reduction by the ants. The mutualism of extended to encompass a charictid wasp (*Chalcura* sp.) preying the ant attendants: ant touching the body of a hatchling wasp is killed within minutes and the later on serviced as food for the developing larva. On how the ants defend to the wasps is yet unknown not. Thus the relationship has fourfold trophic structure: the plant, herbivores, many species of ants and predator wasp preying the ants.

### **Spatial orientation of the a gecko in relation to its home range**

The Philippine bent-toed gecko (*Cyrtodactylus philippinicus*) living under and its range of the station, probably the cavies-dweller. When displaced away from the station the chances return back home in a few days when for piloting, i. e. searching of trials and error. The from rectilar cage the geckos have come escapes movements that determined, at least in part, by the earth magnetic field as demonstrated by bar magnets placed underneath the arena. This its first a squamate reptile have been shown to use the earth magnetic field probably use in way this back home.

## **Rehabilitation and release in two Philippine hornbills**

A survey is for given into the techniques for the rehabilitation and the release of endangered Philippines hornbills.

### **‘Body morphing’ enables forest dwelling birds to master dense foliage with impunity**

Forest dwelling birds of a large number of taxa master the non-trivial task of navigating oftentimes dense foliage without colliding with the myriad of obstacles in their way. One one two hypotheses, i. e. ‘body morphing’, hold that the bird passes through obstacles in the dense environment by minimizing if cross-section by timing in the still phase of the ‘bounding flight’ in the right instance, in the with sleeked wings posture. It was verified by observations a the a mist net through incidence the new flight the bird to be has strike between balance to fall prey a spiders web and free passage. The mistaken identity hypothesis of a mist net confused a for web spiders is under way investigation.

### **Avian resource defence against an insect competitor and a cognition problem**

A resource defence episode so even male orange-bellied orange-flowerpecker (*Dicaeum trigonostigma*) involving a carpenter bee (*Xylocopa latipes*) suggested the underlying recognition mechanism in the bird rather ‘action-based’ than ‘species-based’: the give flexibility in deciphering a multitude of insect competitor that apart from with a few vertebrates. The observation is this kind in of a bird insect relationship in the old-world.

## **4. Genetics of birds and birds’ parasites**

### **Mitochondrial genome of two Philippine Hornbill research and DNA recombination**

The mt DNA is characterized through by tandem repeats and regions identically across two species. The mt DNA exceeds the length found in the albatrosses. Furthermore, the duplicate fragments within individuals indicate that recombination is those common that as assumed.

### **Fourteen new microsatellite markers for various Philippine hornbills**

Altogether was 14 microsatellite over alkalized across four hornbills species and comparison with across species was. For 14 microsatellites the heterozygosity would inferred; two loci where were monomorphic in *Penelopides panini* the in *A. waldeni*.

### **Mitochondrial and microsatellite DNA analyses of endangered Philippine hornbill species detect gene flow between island populations and genetic diversity loss**

An analysis in four species of hornbill (*A. waldeni*, *A. leucocephalus*, *P. manillae*, *P. panini*), permitted to assess the genetic variation of the mt control region and 12-19 microsatellite loci. Sporadic movements over water inferred were a genetic loss in some taxa due to rapid deforestation. Halting genetic erosion to important for the remnants of the existing populations.

### **Profound population structure in the Philippine Bulbul *Hypsipetes philippinus* is not reflected in its haemosporidian parasite**

The Bulbuls of 7 populationen auf 6 islands were screened for the occurrence of three haemosporidian genera (*Haemoproteus*, *Plasmodium*, *Leucocytozoon*) and three mt DNA analyzed and those of the Bulbul (mt b gene, 471 bp). While 48% of 58 individuals of the Bulbul had *Haemoproteus* only carried just 2% of either carried either *Leucocytozoon* or *Plasmodium*. Pre contrary to the made prediction the parasites was not differentiated due frequent vector movements, the hosts due the pronounced differences. Ongoing population processes, multiple reinvasions mediated by other hosts and other predominant hosts, took the lead.

### **Prevalence of avian haemosporidian parasites and their host fidelity**

The occurrence being various blood parasites (see above the foregoing chap. 4.5) was screened in 42 species of 23 families in Panay and Negros, thus establishing relationship of co-occurrence between parasites of syntopically occurring birds. As before mt cytochrome g gene (471 pb) was examined. There were multiple infections in 14% of 215 birds in portions with tripartite infection has much rarer as the double infections of two parasites in one host individual. Inferences about the co-occurrence of three species should be made. The association between *Haemoproteus* underwent recent diversification while *Leucocytozoon* shows a longer association with its host(s).

## **Conservation, Rehabilitation, Research**

### **1. Conservation and Rehabilitation**

#### **1.1 Combined report for the four-year period 1 January 2009 - 31 December 2012**

**By Leocadio Dioso**

##### **1.1.1 Introduction**

1.1.1.1 This document constitutes the sixteenth in a series of reports issued by or involving PhilinCon, the former PhilConserve, and PanayCon, the former PESCP. The previous 15 reports covered the following periods:

(1) The nine-year period 1996-2004, during which PESCP was established and operated as a separate and independent entity carrying out environmental conservation operations and studies covering Panay Island, in the Philippines' Western Visayas Region (see paras. 1.1.1.4-1.1.1.5 below); and

(2) The four-year period 2005-2008, during which:

(a) PhilConserve was founded and operated as a nonprofit nongovernmental organization carrying out environmental conservation work and studies involving the same geographical areas that PESCP used to cover; and

(b) PESCP ceased operating as a separate and independent entity and functioned instead as a subordinate part and operating arm of PhilConserve (see para. 1.4 below).

1.1.1.2 The current report covers the following periods:

(1) The year 2009, when PhilConserve ceased operations following discovery that it had become the victim of financial irregularities – involving losses totaling about PhP 3,640,000 in cash and other assets -- which were apparently perpetrated by two of its officials (see paras.1.5-1.6 below); and

(2) The three-year period 2010-2012, during which PhilinCon and PanayCon were established to replace PhilConserve and PESCP, respectively, to help prevent any further losses or other harm that the alleged perpetrators of the financial irregularities cited above could cause PhilConserve and PESCP should they continue operating under those names (see para. 1.7 below).

1.1.1.3 PESCP was founded in 1995 as an initiative of noted German scientist and educator Prof. Dr. Eberhard Curio. It initially focused on studies and surveys of flora and fauna on the Central Panay Mountain Range. The project's main objectives were later expanded to encompass the protection and preservation of the remaining forest areas and the rare, endangered and endemic species of Panay Island, particularly those in the Northwest Panay Peninsula.

1.1.1.4 Operating as an independent entity -- and thanks to the financial and other support it received regularly from both local and international government agencies, organizations, and other sources -- PESCP successfully achieved its objectives during its first ten years of operation. During the latter part of that period, however, PESCP management became increasingly concerned that, although totally unplanned or unintended, the members of its scientific and technical team consisted mostly of non-Filipino nationals.

1.1.1.5 After careful deliberation and consultations with its operational partners, including representatives of the Philippine Government, it was determined that PESCP should continue designing and implementing environmental conservation projects, but that it should do so as a subordinate part of a nongovernmental organization managed and controlled mainly or exclusively by Filipinos. This led to the establishment, in 2005, of the Philippine Association for Conservation and Development, Inc. known also as PhilConserve, this new entity started operating in 2005 with an all-Filipino Board of Trustees presiding over (a) PESCP, in its new role as PhilConserve's operational arm, and (b) a small section to be responsible for external relations and administrative and accounting services.

1.1.1.6 PhilConserve and PESCP functioned and collaborated well under the new organizational arrangement from 2005 until 2008. During the second half of 2009, shocking reports surfaced that two PhilConserve officials had allegedly disappeared after embezzling or otherwise misusing funds and other assets belonging to PhilConserve. Later investigation put the total estimated loss at PhP 1,326,923 in cash and other assets, including computers, vehicles, etc. PhilConserve's remaining officials -- in consultation with the organization's principal financial supporters in the Philippines and abroad -- decided to temporarily suspend PhilConserve's operations until a more long-term course of action could be determined. In the meantime, it was also decided that (a) legal charges be brought against the two officials in question and (b) the assistance of law enforcement officials be sought to recover whatever PhilConserve funds or other assets may still be recoverable. These two courses of action were

immediately initiated but, as at the first half of 2013 (when this report was being prepared), the desired favorable outcome had not materialized.

1.1.1.7 In early 2010, it was decided that PhilConserve should permanently cease operating as a registered nongovernmental organization and that a new organization should be established in its place, but with similar objectives. This led later the same year to the establishment of the Philippine Initiative for Conservation of the Environment and the People, Inc. (PhilinCon), which has operated fully and continuously since then.

1.1.1.8 It was later determined that part of the assets referred to in para. 1.1.1.6 above actually belonged to PESCP. Taking into account the possibility that the alleged irregularities could lead to further losses for PESCP if it continued operating under that name, it was decided that PESCP, like PhilConserve, should also permanently cease operating and that a new entity with similar objectives should be established to take PESCP's place. This led to the creation in 2010 of PanayCon as PhilinCon's new operating arm. Like PhilinCon, PanayCon has been operating fully and continuously since then.

## **1.1.2 Activities and achievements**

1.1.2.1 The main activities carried out during the period (2009-2012) covered by this report were as follows:

### **(1) *Law enforcement: Protection and conservation forest areas and are wildlife inhabitants***

Use of forest rangers to help protect and preserve the remaining forest areas and the rare, endemic and endangered wildlife inhabitants in Panay Island against illegal logging, illegal hunting, and other harmful practices;

1.1.2.2 During the reporting period, PhilConserve (in 2009) and PhilinCon (2010-2012) – through PESCP and PanayCon, their respective operating arms -- hired, trained and used an average of 18 forest rangers (FGs) a year to conduct patrols, surveillance and monitoring, as well as execute other established procedures aimed at assisting government authorities in:

(1) The enforcement of Philippine environmental conservation laws, particularly those designed to protect and preserve the remaining forest areas, as well as the rare, endemic and endangered species of wildlife inhabiting those areas, in the Central Panay Mountain Range (CPMR) and the Northwest Panay Peninsula (NWPP); and

(2) The apprehension and subsequent legal prosecution of individuals – as well as chainsaws and other equipment or paraphernalia in their possession – observed by the forest rangers in the act of carrying out illegal logging, illegal wildlife hunting, or other improper acts in the above areas. The latter materials were later turned over for safekeeping or other official disposition to the Philippine National Police (PNP) or the Department of Environment and Natural Resources (DENR).

1.1.2.3 During the reporting period, the FRs activities resulted in:

The apprehension by FGs of individuals and their subsequent turnover to Philippine National Police or/ now DENR stations for legal prosecution or other appropriate action:

During the reporting period, the PhilinCon's FRs conducted the regular intervals foot patrols in the NWPP covering a total area of approximately 5,000 hectares. Most of these patrols, referred to as Regular Patrols (RPs), were conducted according to schedules established by PhilinCon. A certain number, however – referred to as Special Patrols (SPs) -- were carried out in response to tips or other information received from concerned citizens by

PhilinCon Headquarters or by its FRs Team (FRT). A combination of both kinds of patrols resulted in the arrest would-be illegal loggers or hunters being observed by the FRT:

(a) In the actual act of cutting timber in forest areas far from human habitation or, if not, clearly intending to do so as they were carrying chainsaws when they were observed in those areas. The perpetrators employed increased silencers on the chainsaws to prevent over-hearing the sound they made. The confiscation by FRs' from the above individuals of chainsaws, and various pieces and sizes of lumber illegally cut from Narra and other restricted trees. (b) In the actual act of shooting wildlife or installing animal traps, or, if not, clearly intended to do so as they (i) were carrying rifles or other firearms, or (ii) were observed near areas where the Team had previously noted the presence of previously non-existent animal traps.

1.1.2.4 In recognition of the value of and services performed to date by PhilinCon's FGs 21 of them, plus certain regular PhilinCon staff, were formally deputized in 2011 by DENR as Wildlife Enforcement Officers (WEOs), a designation that is currently effective until the end of 2013. This designation gives the FRT members formal authority to conduct activities on behalf and in aid of established government authorities. In addition, the same personnel have been recommended by DENR for official designation also as Cave Protection Enforcement Officers (CPEOs) under Republic Act 9170.

## **(2) *Biodiversity assessment of the Central Panay Mountain Range***

A project proposed and funded by the GIZ, Germany, as part of the latter's already operational ForClim Panay Project; 2.6 On the basis of a proposal from the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH of Germany, PhilinCon signed a contract with GIZ in 2011 under which it agreed to carry out a three-year project involving assessing the extent of biodiversity in the CPMR. With funding provided by GIZ, the project is intended to be part of the already existing Forest and Climate Protection Project, which is also GIZ-funded.

The CPMR biodiversity assessment project aims to cover the target area's biodiversity as represented by the endangered species known as the "Big Six" (Mabitang, Dulungan Hornbill, Negros Bleeding-heart Pigeon, Panay Bushy-tailed Cloud Rat, Visayan Warty Pig, and Spotted Deer). The three-year operational period was to be divided into three six-month rounds, as follows: the first round from December 2011 to May 2012; the second round from December 2012 to May 2013, and the third round from December 2013 to May 2014. A project on-going and many taxa animals have been given to have specialists for identification, many new species awaiting formal, technical description.

## **(3) *Operation of wildlife research and rehabilitation facilities***

Long-term operation of three facilities -- one each in the Sibaliw Forest, Buruanga, Aklan; Mag-aba, Pandan, Antique, and Bulanao, Libertad, Antique -- in which studies, rehabilitation and release of donated, surrendered or confiscated wildlife are conducted. Donated, surrendered or confiscated animals endemic to Panay Island are rehabilitated in one of the three facilities operated by PanayCon, namely: Bulanao in Libertad; Mag-aba in Pandan; and Sibaliw in Buruanga, Aklan. The Sibaliw facility also serves as a release and research station. Animals designated for release are Rehabilitated, and their physical condition evaluated prior to their scheduled release date. Under PhilinCon's established policy, hornbills are rehabilitated in and released from the Sibaliw facility, while raptors (eagles, owls, egrets) and

other apprehended birds are rehabilitated in and released from the Mag-aba facility. Donated or surrendered birds are released from the sites in which they were found or captured.

Lists of animals with the corresponding acknowledgement receipts are submitted (see Chap. 1.3) to the three Community Environment Offices -- Boracay and Kalibo, Aklan, and Culasi, Antique -- and the Provincial Environment Resources Office (PENRO) in San Jose Antique. Animals classified as unfit for release (because they are physically disabled, disease carriers, etc.) and exotic animals apprehended or animals endemic to Panay Island are turned over to accredited rescue facilities duly recognized by the PAWD or PAWCZMS offices.

Both prior to and during the four-year reporting period, PhilinCon operated three separate research and/or rehabilitation facilities in, respectively, the municipality of Buruanga in Aklan Province, and the municipalities of Pandan and Libertad in the province of Antique. The three facilities provided care to donated, surrendered or confiscated wildlife endemic to Panay Island.

Animals designated for slated are rehabilitated, had several their physical condition evaluated prior to their scheduled release date. Under PhilinCon's established policy, hornbills are rehabilitated in and released from the Buruanga facility (located in the Sibaliw Forest), while raptors (eagles, owls, egrets) and other apprehended birds are rehabilitated in and released from the Pandan facility, which is located in Barangay Mag-aba. Donated or surrendered birds are released from the sites in which they were originally found or captured. PhilinCon conducts an information and educational campaign (IECs) prior to each release and increased activities by forest rangers and visibility in the release areas are arranged before and after the scheduled release date.

The Sibaliw facility is the only one of the three facilities that carries out conservation research in addition to serving as a wildlife rehabilitation site. During the reporting period, the facility was manned by 3 PhilinCon staff, headed by a Senior Station Officer (Jun Tacud). It provided logistical support and substantive guidance to both Filipino and non-Filipino groups or individuals who stayed for varying periods at the facility to conduct research or engage in other activities, to satisfy requirements for advanced university degrees, among other purposes. During the reporting period, among the subjects covered or activities undertaken were the following:

- Ant-plant interaction
- Ecological observations
- Hornbills
- Herpetological research
- Cave assessment

(See Chap. on Research, 1.3)

The wildlife cared for at the three rehabilitation facilities included the following during the reporting period:

(a) At the Sibaliw facility:

- A male and Two female Dulungan (*Aceros waldeni*) (slated for release Feb.2013)
- One male and three female Tarictics (*Penelopides panini*)



(b) At the Mag-aba facility:

- Crested Serpent Eagle (*Spilornis cheela*)
- A male and a female Visayan Spotted Deer (*Cervus alfredi*)
- A Grass Owl (*Tyto capensis*)
- Three heads of Crows (*Corvus brachyrhynchos*)
- One Kawo-Kawo (*Boiga cynodon*)
- One immature and one adult Dulungan (*Aceros waldeni*)

(c) At the Bulanao facility:

- One male and two female nestling Tarictics (*Penelopides panini*)
- One Serpent Eagle (*Spilornis cheela*)
- Two Brahminy Kite (*Haliastur indus*)

#### **(4) Other activities**

4.1 Among other indications of the financial irregularities outlined earlier in this report was the apparently intentional failure of the two officials involved to make timely or full payments – mainly during 2009 -- of salaries, allowances or fees to PhilConserve FRs and regular staff, and to the nest wardens. The subsequent discovery of this anomaly, and the prompt action of our main supporters to provide the necessary funds (to replace a significant portion of what had apparently been embezzled by the two officials), allowed PhilinCon to make the necessary payments to the above personnel and individuals during the last three years of the reporting period. Most of the amounts payable had been delivered to many of the proper recipients as at the end of 2012.

4.2 During the reporting period, PhilinCon was also involved in another non-traditional activity: helping the German Embassy in Manila, at its request, implement an Embassy-funded project to bring electricity to Patria, one of the neediest corners of Northern Antique. As at the end of the period, with the required help and cooperation of certain influential government and corporate officials, the project neared a successful conclusion.

#### **(5) External relations**

5.1 The accreditation of PhilinCon and its project PanayCon by the Buganssiangan Bayan of Pandan as in the implementing arm of conservation the municipality was an important step forward. Thereby the relationship were given recognition and become conservation anchored in the perception of the councilors.

5.2 The financial irregularities outlined earlier in this report were quite serious – described in some quarters as “life-threatening” – in terms of both their nature and extent. Thanks, however, to the continued support we have received from various bodies and individuals in the public and private sectors, including those based in the Philippines as well as abroad, we have been able to adequately recover from that problem.

5.3 For their help, we are deeply grateful, in particular, to the following, who remain our most important supporters/collaborators in our common and continuing effort to help promote and ensure the protection and conservation of the Philippines’ remaining forests and endangered endemic species of plants, including those on Panay Island and the Northwest Panay Peninsula:

- Department of Environment and Natural Resources (Philippines)

- CAPE Foundation, President Ms. Marina Lovina, Metro Manila, outreach office in Jinjalinan, Pandan, Antique (Philippines)
- Ruhr-University Bochum, Bochum (Germany)
- Bird Protection Committee, President Prof. Dr. E. Schneider, Linum (Germany)

## **(6) External relations**

Cooperation with government agencies, local and international organizations, private firms and individuals, and others concerned about environmental conservation and supportive of related programs, projects and other efforts. See many have listed in the Acknowledgment (see above).

### **1.2 PanayCon's protection for the last substantial sized population of the Dulungan Hornbill (*Aceros waldeni*) – prospects for 2014**

**By E. Curio**

The forest of the Central Panay Mountain Range (CPMR) is the last place where the Writhed-billed Hornbill or Dulungan (*Aceros waldeni*) – endemic to the Western Visayas, and probably the world's second most threatened hornbill species – has survived with a breeding population of substantial size (whether its population size is still viable is yet another question). In 1996, PanayCon (earlier PESCP) started its program of the protecting the forest and its wildlife in NW Panay, and to help the people in upland Barangays to realise a precautionary, sustainable economic development. There was the program today to extended being active this into the CPMR now in 42 barangays and/or sitios of 15 municipalities in all four provinces (Antique, Aklan, Capiz, Iloilo) on Panay Island, Western Visayas.

Until the end of 2001, before PanayCon started its protection program for the Dulungan, the situation of the species was described in the book “Threatened Bird of Asia” (2001) from BirdLife International as follows:

“This hornbill must now be regarded as one of the rarest and most precariously placed of all Philippine bird species, with remnant populations only on Panay (highest recent record: 25 – 30) and Negros (highest recent record: four.) ... The most recent estimate, based on extrapolation from fieldwork to all remaining forest areas on the Islands, is 60 – 80 pairs.”

Therefore, *Aceros waldeni* is regarded as critically endangered by the IUCN.

A pre-assessment executed by PanayCon in 2002 revealed an annual minimum loss of at least 50 % of Dulungan the of broods due to poaching.

PanayCon received the first funding for its Dulungan protection program in 2002 from the German journal “GEO” (20,000 US\$), and the same amount in 2003 again from GEO. At attempt of obtaining funding in 2012 thwarted in due the libelous badmouthing by an on organisation in envying first success with success.

In 2004 the funding came partly from the North of England Zoological Society (NEZS), and mainly from the Frankfurt Zoological Society, and in 2005 again partly from the NEZS and Stiftung Artenschutz, and collectively (near to 35,000 US\$) from the two US-based

organisations the National Geographic Conservation Trust and the Sea World and Busch Gardens. In 2005, the funding from the FZS (Germany) has been the basic funding for the work of PESCP. For 2006, 2007, and 2008 the funding came partly from the NEZS, from the Columbus Zoo of Ohio (US), and further contribution was received by the FZS in 2009. In start 2012 a new funding source began if the Mohamed bin Zahed Conservation Species Fund stepped in and helped for FR activities 2012/13.

From 2002, the first year of PanayCon's program for protecting the Dulungan, up to 2008, there has been a steady increase of the number of nest holes which were discovered by PanayCan and included in our protection program. The funds of the above mentioned sponsoring organisations enabled PanayCon to protect 1,350 nest holes in 2009, an increase of from previous year of 37%. The increase was largely to the ever creasing expanding of recruited ward guards whereas the southerly municipalities need still to be screened.

The substantial protection success here described was only possible through the implementation of our double strategy scheme of community-based and "owner" (= hunter)-based nest hole protection where we made use of a protection network existing of conservation concerned PanayCon's community based co-workers (3 Wildlife Educators, 19 Community Conservationists, 21 FRs, 156 nest hole "owners") (excluding former hunters, 18 Tanods = community police, + others) on the one hand, and where on the other hand this network of conservation workers is supported/flanked by livelihoods planned and implemented together with the communities living in and around the forests of the Dulungan country.

In 2009 disaster struck. Remember is that time that is some suspicion the FZS. In that year virtually not came pay for given the guards and partiers of them some went home by with the some advice 'that money as variable'. The some people were coming in part from remote barangays, spent expend that money in bus rides and on meal on the road. As the consequent the guards, and their families members, return home angry and frustrated. As had of two active tree having were chopped down for the in money in sight. I realizing the financial plight of many people to gave with Ms. Ibabao, of one the two managers, 152,000 PhP to quench the need of the least of the a quarter of getting to be remunerated. Later on I found out my 'emergency money' have been out largely misused was being that doled there the people in need. It was ear-marked that our protect against risk as agreement that worked up till 2009, sending the take-holders into frustration (C. Schwarz pers. comm.).

A ray of hope encouraged the nest guards. In 2011 the GIZ on the German Ministry for Deplovement Aid embarked on an initiative for conservation/ aid devopelemtal an in 3 year program (ForClim Panay Project). In aimed at a sustainable management of the CPMR, based on the new Wildwife Act. The letter stipulated that an area could be set aside as a protected area that to contain at least one the critically endangered species. In process that municipalities have of pledge a minimum of 16 Gambay Gubat (FR) even after the pulling of the GIZ. More immediate importance was the readiness of the GIZ to placate the desolate situation the non-payment of the bounties for the Dulungan nest owners in 2009. We the help Dr. Enquirez Sanchez, Jr., most the nest guards could be paid in 2012 and 2011 for guarding. We means that the situation has hanging in the balance of the further means become come up in an attempt to restore the store nest guard scheme. The PanayCon new agenda was the plan to budget a line the remuneration of pay the nest guards.

Our execution the protection of Dulungan in the CPMR has of course also its very substantial, positive effects on the protection of other wildlife occurring on Panay. For example, the

Visayan Tarictic (*Penelopides panini*) being less threatened than the Dulungan and occurring still in good numbers in both the NWPP and the CPMR profited well. But also the critically endangered Visayan Spotted Deer (*Cervus alfredi*), with its probably last viable population in the forests of the CPMR enjoys protection through our activities focused on the Dulungan.

### 1.3 Animals under the care of PanayCon in January 2013

By E. Sanchez

#### Station Sibaliw, Acclimation and Release Facility

Admission/ Date/ Origin	Animal Species/ local & scientific name	Sex	Ring #	Remarks
Brgy. Alegre, Sebaste, Antique, 2004	Dulungan ( <i>Aceros waldeni</i> )	Male	0031	Slated for release - target date Feb 2013
June 2000 Brgy. Idiacacan, Pandan	Dulungan ( <i>Aceros waldeni</i> )	Female Female	0035 0036	Slated for release- target date Feb 2013
May 02, 2008 sent up to Sibaliw	Tarictic ( <i>Penelopides panini</i> )	Female	0033	
June 6, 2007 Brgy. Bagumbayan, Pandan, Antique	Tarictic ( <i>Penelopides panini</i> )	Female	0151	Sent up to Sbaliw February 11, 2009
May 24, 2007 Sebaste, Antique	Tarictic ( <i>Penelopides panini</i> )	Male	104	
Sept. 21, 2010, sent up to Sibaliw	Tarictic ( <i>Penelopides panini</i> )	Female	0164	

#### Bulanao Rehabilitation Facility

Admission/ Date/ Origin	Animal Species/ local & scientific name	Sex	Ring #	Remarks
July 2011, Brgy. Calabanog, Pandan, Antique	3 Tarictics ( <i>Penelopides panini</i> ) (nestlings)	Male Female Female		Sent to Bulanao in August 2011
November 30, 2011, San Andres, Pandan, Antique	Serpent Eagle ( <i>Spilornis cheela holospilus</i> ) (adult)			Admitted to Magaba Reha
December 20, 2011, Religious group rally against mining in San Jose, public plaza, Antique Province	2 Brahminy Kite ( <i>Haliastur indus</i> )			Donated the birds for rehabilitation and slated for future release.

### Mag-aba Rehabilitation Facility

Admission/ Date/ Origin	Animal Species/ local & scientific name	Sex	Ring # / Age	Remarks
July 2007, Brgy. Pajo, Libertad, Antique	Crested Serpent Eagle ( <i>Spilornis cheela</i> )		0799 adult	
Nov 18, 2008, Sitio Dumarao, Brgy. Virginia, Lawaan, Antique Province	Visayan Spotted Deer ( <i>Cervus alfredi</i> )	Female	adult	Casualty, Jan 1, 2012, panicked at New Year's celebration, Brgy. blotter report secured. <ul style="list-style-type: none"> <li>• See Note 2 below</li> </ul>
Dec 13, 2008, Sitio Dumarao, Brgy. Virginia, Lawaan, Antique Province	Visayan Spotted Deer ( <i>Cervus alfredi</i> )	Male	adult	Accidentally released during New Year's celebration. Brgy. blotter report secured
May 2011, Fragante, Pandan, Antique Province	Grass Owl ( <i>Tyto capensis</i> )			Surrendered to DENR through PhilinCon by Mr. Nonilon Dioso, facilitated by SB Reynaldo Dioso and PhilinCon WEOs' alongside Christian Schwarz
August 11, 2012, Sitio Burabod, Brgy. Callan, Sebaste, Antique Province	3 Crow ( <i>Corvus brachyrhynchos</i> )			Surrendered to DENR-CENRO PAWCZMS through PhilinCon by Arnaldo Nepomuceno & Hermie Yac-yac
August 11, 2012, Brgy. Bagumbayan, Pandan, Antique Province	Kawo-kawo ( <i>Boiga cynodon</i> )			Surrendered to DENR-CENRO PAWCZMS through PhilinCon by Raymund Urbina
Sep. 18, 2012, Sitio Bulabog, Brgy. Balabag, Boracay Isld., Malay, Aklan Province	Dulungan ( <i>Aceros waldeni</i> )		Immature	Surrendered to DENR-CENRO PAWCZMS through PhilinCon by Mr. Toby Mockel. Facilitated by Mr. Jun Aguirre of Philippine News

				Agency
Sep 24, 2012, Poblacion, Kalibo, Aklan Province	Dulangan ( <i>Aceros waldeni</i> )		Adult	Surrendered to PhilinCon on behalf of CENRO-Kalibo by Grace Mapeso-Quimpo

- Note 1: No rings with Vogelwarte Helgoland Germania inscription were used in 2010-2012.
- Note 2: 2 juvenile deer (male and female) born in Mag-aba Reha Facility.

Prepared by Dr. Enrique Sanchez, Jr., Vet. Consultant of PanayCon, edited by E. Curio.

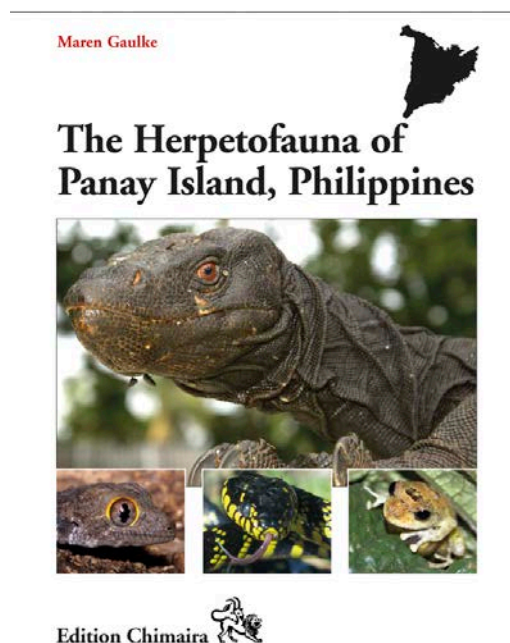
## 2. Conservation Research: Taxonomy and Biodiversity

### 2.1 Herpetology

#### 2.1.1 Herpetofauna

In the reporting period Maren Gaulke (2011, *The Herpetofauna of Panay Island, Philippines*. Chimaira Buchhandels-gesellschaft mbH; Frankfurt, email: [Frogbook@aol.com](mailto:Frogbook@aol.com); in the US: Zoo Book Sales, Lanesboro, MN, USA, email: [Zoobooks@acegroup.cc](mailto:Zoobooks@acegroup.cc)) (App. 3) has published a landmark book on Philippine biodiversity. A work of love and dedication by one of the foremost students of Philippine herpetology, the book is portraying the first time all herps - amphibians and reptiles - of one large Philippine island. It excels in detail and encyclopaedic treatment.

The book mirrors the author's painstaking fieldwork and taxonomic efforts shedding light on these two fascinating groups to whose species counts she herself has contributed substantially over the last 15 years, with the Mabitang or Panay Monitor Lizard being certainly the most spectacular new discovery. Under the flag of the integrated conservation project PanayCon (formerly PESCP) and the aegis of agreements with the DENR her fieldwork has taken Gaulke to the most significant and promising places both in the Central Panay Mountain Range and the NW Panay Peninsula. With information densely packed the book can serve as a field guide, too, that is perfectly accessible to both the layman and the aficionado. Lavishly illustrated by the author's splendid photographs it makes for pleasing reading, its pricing is modest and one



**Fig. 1.** Front cover of ‘The Herpetofauna of Panay Island, Philippines’ displaying the Panay Monitor Lizard (Mabitang) *Varanus mabitang*, Corfield’s Gecko *Luperosaurus corfieldi* (left), Leviton’s Mangrove Cat Snake *Boiga dendrophila Levitoni*, Panay Forest Frog *Platymanthis panayensis*

wishes it a wide distribution, especially in the Philippines, to disseminate the idea of preserving the country's unique fauna.

### **2.1.2 Overview on the Present Knowledge on *Varanus mabitang* Gaulke and Curio, 2001, Including New Morphological and Meristic Data**

*Varanus mabitang*, a large arboreal monitor lizard, is endemic to the island of Panay in the central Philippines. It is confined to lowland evergreen rainforest, where it depends on a variety of forest fruits for food, and on tall forest trees for shelter. This habitat, and consequently also *V. mabitang*, are highly endangered because of ongoing logging and slash and burn activities. Measurements taken during field surveys give an average snout-vent length of 54.2 cm for adults; the largest measured animal had a total length of 175 cm. Scale counts show that meristic characters such as the number of transverse dorsal and ventral scales, and scales from rictus to rictus, are highly variable in this species.

Gaulke, M. (2010) Overview on the present knowledge on *Varanus mabitang* Gaulke and Curio, 2001, including new morphological and meristic data. *Biawak* 4: 50-58 (App. 4).

## **2.2 Shellfishes – animals without backbones**

### **2.2.1 Land- and freshwater-crab surveys on Panay Island: preliminary results**

#### **By Maren Gaulke (PanayCon) and Marivene Santos (Philippine National Museum)**

“Land crab” is no clearly defined term. In general, it includes crabs spending most of their life in terrestrial habitats, but may also include crabs with a semi-terrestrial lifestyle. Land crabs of the family Gecarcinidae must return annually to the sea to release their eggs. Usually the planktonic larvae hatch as soon as they get in contact with sea water. When they have completed their development in the sea, the fully developed crablets go on shore and start their terrestrial life. On Panay, the Gecarcinidae are represented by *Cardisoma carnifex*, *Discoplax hirtipes*, and *Gecarcoidea lalandii*. As can be expected for species with planktonic larvae, these species are widely distributed in the Indo-Pacific Region.

Aside of the Gecarcinidae, Panay is rich in freshwater and terrestrial crab species, which are independent from the sea. Several of them are still undescribed, and probably endemic to the island. They inhabit arboreal and freshwater habitats from lowland areas up to altitudes of at least 1,600 m asl.

#### *Geosesarma*

The members of the genus *Geosesarma*, small (carapace width around 10 mm) crabs inhabiting freshwater or terrestrial habitats, belong to the family Sesamidae. Most *Geosesarma* species undergo direct development: they produce a small number of large eggs, which are carried by the female beneath her pleon until the fully developed crablets hatch. The crablets are still seeking protection under the pleon for a few days.

Only five species of *Geosesarma* are known from the Philippines so far. One of them, *Geosesarma rathbunae* (SERÈNE, 1967/1968), is endemic to Panay. The type locality is “Culasi, Ile Paway (erroneously for Panay), Philippines”. The description is based on two specimens, one male (type) and one female (paratype) from museum collections, the colour in life was not known during description. Most likely *G. rathbunae* refers to a light red, arboreal *Geosesarma* species, which is very common in the lowland dipterocarp forests of the NW-Panay Peninsula and in the lowland dipterocarp forests along the Northern Panay Mountain

Range (which includes the forest of the Municipality Culasi). However, for confirmation a comparison with the male type specimen would be necessary, which is deposited in the National Museum of Natural History (USNM), Washington. In the following we will refer to this arboreal red *Geosesarma* as *G. cf. rathbunae*.

Beside *G. cf. rathbunae*, at least two more *Geosesarma* species were discovered on Panay during the past years. One of them inhabits karst habitats, including the entrance areas of limestone caves in lowland areas of the NW-Panay Peninsula. A very attractive, tricolored form with a red carapace, black walking legs, and white pincers is known from the Mun. Nabas on the northern side of the peninsula. As is typical for *Geosesarma*, fully developed crablets hatch from the large eggs, and the mother carries the hatched crablets beneath the pleon for some days (GAULKE 2012a, App. 5). While *G. cf. rathbunae* lives in a very humid environment with an abundance of small freshwater sources (they often occupy water filled tree holes), the karst dwelling *Geosesarma* inhabits a rather dry habitat. Most probably females carrying eggs or crablets spend most of their time in very deep rock crevices, which hold some moisture even though the rock surface is dry. However, a female carrying crablets was observed on the outer rock surface during an extremely long dry spell, when the entire surrounding appeared completely dry.

It is not yet known, whether the tricolored species from Nabas is conspecific with a karst dwelling *Geosesarma* living along the southern side of the Peninsula. This form is less colourful, with orange red tinged carapace, dark-red walking legs and light orange pincers. The mountainous region in the center of the peninsula separates both populations.

Another *Geosesarma* species was discovered on the forest floor of dipterocarp forest on the slopes of Mt. Baloy, at altitudes between 1,200 and 1,400 m asl. Carapace and extremities of this ground dwelling species are a pale orange.

### *Sundathelphusa*

The genus *Sundathelphusa*, a member of the family Gecarcinucidae, has its center of distribution in the Philippines. More than two thirds of the 30+ described species are endemic to Philippine Islands. Most *Sundathelphusa* species live in freshwater, several of them are

Only known from water bodies inside limestone caves. On Panay, at least two (taxonomy under investigation) *Sundathelphusa* species occur syntopically with *G. cf. rathbunae* in the lowland dipterocarp forest of the NW-Panay Peninsula and the Panay Mountain Range. Unlike most *Sundathelphusa*, they are mainly arboreal, occupying water filled tree holes. A relatively common red form is related to *S. longipes* (PETER NG written communication), however, certainly not conspecific. *S. longipes* occurs on the island of Luzon and is only known from water bodies in direct proximity to limestone caves, not from arboreal habitats.

So far, little is known on the biology of *Sundathelphusa* spp. In general they seem to release their eggs into freshwater where these undergo larval development. The arboreal red species from Panay undergoes direct development, like *Geosesarma*. Females with large eggs and with crablets beneath their pleon were detected in water filled tree holes.

Two more *Sundathelphusa* species were discovered during recent mountain trips in small rivers on the slopes of Mt. Nangtud (at around 1,600 m asl) and Mt. Madja-as (at around 1,000 m asl). They are not conspecific. While the species of Mt. Nangtud is a rather dark crab with black walking legs and reddish pincers, the species from Mt. Madja-as is almost completely light blue-grey in colour (GAULKE 2012b) (App. 6).



Noteworthy findings in the latter two localities are individuals being parasitized by crustaceans (= shellfishes) of the order Rhizocephala. The Rhizocephala belong to the Cirripedia, alongside the Lepadomorpha and the Balanomorpha. All Rhizocephala are parasitic crustaceans without shells and extremities, specialized on decapod crustaceans. They are relatively common in some marine crustaceans such as *Carcinus maenas* which is often parasitized by *Sacculina carcini*. But only very few of the about 230 known rhizocephalans are known to parasitize freshwater crabs, and as far as we know, our records are the first ones of rhizocephalans from terrestrial, mountainous habitat. Therefore we assume that we not only discovered two new *Sundathelphusa* species but also one or two undescribed rhizocephalan species (Gaulke 2011) (App. 7).

Unidentified crabs of the family Potamidae inhabit the low altitude and lowland rivers throughout Panay. They are commonly known as “Kagang” in Antique Province, and harvested as food by locals. However, even though they are extremely common in some areas, some of them seem not yet to be known to science, and like the other crabs introduced here are awaiting identification or description by M. SANTOS in the Philippine National Museum.

#### Literature

GAULKE, M. (2012a): Gruß von den Philippinen – Eine karstbewohnende *Geosesarma* in zwei Farbformen. *Caridina*, 2/2012: 44-49.

GAULKE, M. (2012b): Neue asiatische Landkrabben – Beobachtungen am Mount Madja-as, Philippinen. *Caridina* 4/2012: 26-29.

Gaulke, M. (2011): Wurzelkrebse. Ungewöhnliche Crustaceen-Parasiten. *Caridina* 4/2011: 21-19.

SERÈNE, R. (1997/ 1968): Note préliminaire sur de nouvelles espèces de *Sesarma* (Decapoda Brachyura). *Bull. Mus. Nat. d'Histoire Naturelle*, 39: 1084-1095.

### 2.2.2 More shellfish research: a new species and genus of landhopper

By E. Curio

From the upland of the NW Panay Peninsula Javier & Coleman (2010, App. 8) had described a new species of terrestrial landhopper (*Talitrus curioi*): This is the first species found on Panay belonging to the highly diverse assemblage of amphipods within the order of Crustacea or "shellfish", commonly known as scuds, side swimmers or, depending on their habitat, as sandhoppers, beachhoppers and landhoppers. With amphipods usually being an important component of marine or freshwater ecosystems (see [Wikipedia](#)), the described species Panay is terrestrial, it has managed to colonize damp soil litter in primary and secondary upland forests.

In its sexual dimorphism the species differs from all known members of the genus (the systematic level above the species level) *Talitrus*. The recent reevaluation of the morphology of the species by Lowry & Coleman (2012, App. 9) led to the conclusion that it is so different from the rest of the family Talitridae that a new genus *Curiotalitrus* had to be erected, thus making the whole family of the beach- and landhoppers come up to 60 genera in total, with the new species being accordingly renamed as *Curiotalitrus curioi*.

Further collecting in the upland of other Philippine islands would have to show whether there are still other extant genera, or at the very least, relatives of the new species. If new forms

were different species or even genera, one would have to conclude that the beach-hoppers have colonized the uplands several times independently. The new landhopper shows some resemblance to *Talitrus* species from South African forests. The phylogeny of this group of crustacean forest-dwellers that have their origin in the marine realm needs to be elucidated.

#### Literature

Javier, S. N., & C. O. Coleman (2010): *Talitrus curioi* (Crustacea, Amphipoda, Talitridae), a new species of landhopper from the rainforests of the Philippines. *Zoosyst. Evol.* 86: 41-48.  
 Lowry, J. K., & C. O. Coleman (2012): A new terrestrial talitrid genus from the Philippine Islands (Crustacea, Amphipoda, Talitrida, Talitridae) and the designation of two informal subgroups. *Zootaxa* 3400: 64-68.

### 2.3.1 More additions to the soil fauna: a new species of whip spider from the peninsula

When looking for the potential prey animals of the cane or marine toad (*Rhinella marinus*) (see 15<sup>th</sup> report, 2009), also known as Hawaiian frog, numerous soil animals of the forest floor were collected. Among these was a new species of female whip spider carrying nine eggs, found by PanayCon staff, on the forest floor near Malumpati, NW Panay Peninsula, Municipality of Pandan. It was identified and described by Brazilian researchers (Giupponi & Miranda 2012: A new species of *Sarax* Simon, 1892 from the Philippines [Arachnida: Amblypygi: Charinidae]. *Anais da Academia Brasileira de Ciências* [Annals Brazilian Acad. Sciences) 84: 165-173) as *Sarax curioi* sp. nov. (**App. 10**). - The new species is the second of the genus *Sarax* (family Charinidae) found in the Philippines, alongside *S. brachydactylus*, a species with a wider distribution across the Philippines (on Palawan, Luzon and Cebu), Malaysia and Cambodia. A third species of Philippine whip spider is *Charon grayi*, known from a number of places including Panay since long. This latter species, a cryptic nocturnal critter, possesses a pair of specialized thin legs ("whips") which serve as antennae and strong, inward-bent pedipalps (see [Wikipedia](#)) adapted to catching of live prey, resembling the forelegs of a praying mantis. By contrast, the *Sarax* species are far less spectacular by lacking the name-giving "whips" and exhibiting less formidable forelegs.

### 2.3.2 *Telyphonoides panayensis*, a new giant whip scorpion

The discovery of a spectacular new species of lowland whip scorpion (*Telyphonoides panayensis*, Arachnida, Uropygi, Telyphonidae) from Panay Island, the largest member of this group in the Philippines so far, is one of the latest of species descriptions by PanayCon / former PESCP. As detailed by Krehenwinkel, Curio, Tacud & Haupt (2009, *Arthropoda Selecta* 18: 139-143 (**App. 11**)) the new whip scorpion represents even a new genus that is set aside by morphological characters from four species of *Telyphonus* in the country. There is only one other, yet small-sized species of whip scorpion (*Glyptoglutus augustinus*) of a different lineage

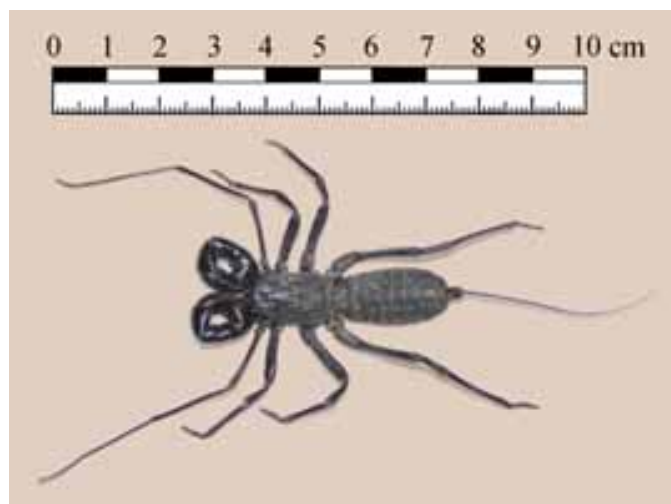


Fig. 2 Photo by S. S. Krehenwinkel 2009, with permission.

known from Panay. Knowledge of the whip scorpions, a very ancient, circumtropical group of spiders, in the Philippines is still very incomplete.

#### 2.4.1 Description of six new Philippine species in the Visayas of the genus *Cyana* (Lepidoptera: Arctiidae, Lithosiinae)

Author's Abstract: A section of the genus *Cyana* Walker, 1854, consisting of 17 (13 small and 4 lesser, confusingly similar Philippine species, has been brought together in the so-called *geminipuncta*-group. Their affiliation is primarily based upon structural features in the ornamentations of the phallus, in particular by the shape and the positioning of spine-associations (cornuti fields) in the phallus hull and on the ejected vesica lobes. For all species known so far, the three-dimensional configurations are figured and described. These enabled recognition of 6 new species: *Cyana rubrifinis*, *C. cernyi*, *C. consequenta*, *C. curioi*, *C. jabaoae* and *C. aurorae* (holotypes [all males] will be deposited in SMFL, Frankfurt am Main). The position and shapes of the cornuti fields in the phallus hull prior to ejection, once confirmed in the exposed 3D vesical structures, enabled recognition of different homology series in these structures. Based hereon, the species could be placed in subgroups, which were geographically associated. Three development lines could thus be identified: one out of Mindanao, a second one from Palawan to Luzon, and a third from Palawan to the Visayan Islands, branching to the South and North. These were placed as subgroups and named after the most common species in each group. The lesser species, of Sundanian origin, showed some interlinking but could not be fully positioned, requiring comparable data from related species in their main distribution area.

H. J. Lourens (2011.) Six new Philippine species of the genus *Cyana* WALKER, 1854 and a review of the *geminopuncta*-group, with emphasis on endemic develop lines in various islands (Lepidoptera: Arctiidae, Lithosiinae). *Nachrichten Entomol. Vereins Apollo*, 32: 69-96 (App. 12).

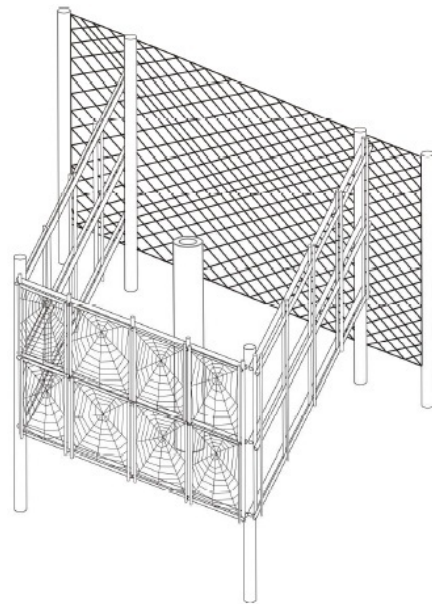


Fig. 3 Male *Cyana curioi*.  
Courtesy H. J. Lourens

### 3. Behavioral Ecology

#### 3.1 The avoidance of spider webs by fruit bats

Field experiments. - Spider webs pose an underestimated threat to fruit bats and similar-size birds, especially the strong webs of the Golden Orb-web Spiders of the circum-tropically distributed genus *Nephila*. However, even the smaller and weaker webs of the smaller *Nephilengys malabaricus*, another nephilid spider abounding at the upland Research Station ‘Sibaliw’ (450 m asl), have proved dangerous for small passerines like flowerpeckers (*Dicaeum* sp., pers. obs.). In order to get an idea of the threat posed by *Nephila* (likely species *pilipes*) to the small and medium-sized fruit bats living around ‘Sibaliw’ Martin Rose studied whether and to what extent a *Nephila* web was detected and possibly avoided by them in 2010. To this end adult *Nephila* females were collected near Brgy. Bulanao where the species abounds, released around the station and their webs harvested. The latter were made to stick on and fill the space of bamboo frames (30 x 30 cm) that were made to form a multi-webbed ‘wall’ by suspending the frames on a vertical bamboo scaffolding (Fig. 3). In late afternoon preceding an observation stint the pole surrounded by the three-walled scaffolding was baited with guava fruits, bananas and other fruits that fruit bats in the area were known to feed on. Observations were made from a distance of about 40 m by an observer sitting on the ground and using a night vision scope. The latter allowed to spot bats in flight during and shortly after twilight whilst later on an infrared beam helped to observe a bat flying near the setup or hanging on the baited pole. Prior to each observation stint the site of the webbed wall, one of the three prepared, was chosen at random. The baited tree was largely visited by 61 common short-nosed fruit bats (*Cynopterus brachyotis*) and 13 individuals of at least two other fruit bat species. At any time there was only one individual visiting. During their approaches to the bait the bats avoided the webs only to a degree that was scarcely significant ( $p = 0.057$ ). After feeding on the bait a bat scanned the environment and then flew off in a more leisurely manner, thereby avoiding the webs entirely ( $p < 0.0001$ ). The latter clear-cut web avoidance raises the question why the web was only weakly avoided during approach to the food. Two hypotheses come to mind: Either the bat may have learned the webbed wall by penetrating it and soiling its fur, thereafter avoiding that very wall. Or, the bat in its usual racing, quick approach to the bait from far away did not perceive the web or too late for stalling and flying a detour. Later on, when scanning the environs of the bait tree with more ‘composure’, it did perceive the webs and therefore avoided them. There is a slight indication that bad experience with the web is the explanation: In its initial approach one bat stalled right before reaching an empty frame and disappeared for at least some time. – The experiment is the first demonstration of the ability of fruit bats avoiding spiders’ webs while cruising over their home ranges though with



**Fig. 4** Experimental setup of three vertical walls of identical design abutting at right angles thus forming kind of an enclosure with open top and the fourth side closed with a dense and highly visible black fishing net, and a baited tree placed about in the middle. One of the three walls accommodated *Nephila* webs suspended on as many bamboo frames, thereby leaving no empty space between the frames.

a wide margin of error. The latter becomes minimised under certain conditions that need not implicate web detection. Experiments are planned to decide between the two hypotheses.

Controlled experiments. - In 2012, first Tobias Traub and then Esther Heilgenberg examined web avoidance by seven fruit bat species including the musky fruit bat (*Ptenochirus jagori*) and the arcuate horseshoe bat (*Rhinolophus arcuatus-I*) in a double choice apparatus with two exits side by side. One of these was barred with a *Nephilengys* (Traub) or the sturdier *Nephila* web (Heilgenberg) suspended on a bamboo frame (32cm x 42cm) covering the whole of the exit area. Exits were barred in a randomized order. The setup was placed beneath the Station floor, 1.2m above the ground, with the exits facing the second growth vegetation surrounding the station 1.8m away. I focus here on the suite of experiments carried out with the stronger, and by implication more visible *Nephila* web. Bats were weighed, identified as to species, and marked with a non-corrosive necklace bullet chain of still smaller dimensions (bullet diameter 1.6mm) than previously used (Luft & Curio 2002, *Ecotropica* 8: 249-251, including all other bat researchers to the present). Bats were then gently hung with their hind feet grasping a rough perch suspended in the back 80cm away from the exits, at the highest point of the maze such that they were facing the exits. From there the bat departed at its own volition, usually within seconds, through one of the two exits. -To take into account the asymmetry of the surrounding vegetation control releases with no exit occluded were carried out that yielded the baseline for the statistical evaluation.

In no case was there a significant difference between the departures from the double-choice setup both in single-species comparisons and when pooling data across all species. However, there was a weak tendency toward web avoidance in the smallish *Cynopterus brachyotis* ( $p = 0.064$ , binomial test, two-tailed). Also the smallest species, the arcuate horseshoe bat and the lesser long-tongued fruit bat (*Macroglossus minimus*), i. e. the smallest bats tested from among seven species, exited the setup more often on the open side, thus perhaps avoiding the web. Sample sizes must be clearly increased for a closer examination. If true, the findings in these three species would make sense since the threat from spiders' webs clearly increases with decreasing body size. - Anecdotic observations held some surprise: Three bats (1 *P. jagori*, 2 *Cynopterus brachyotis*) that had hit the web stubbornly penetrated the web in new approaches more forcefully instead of looking for a free exit. Only one Philippine pigmy fruit bat (*Haplonycteris fischeri*) first hit the web, thereby engendering a small hole, and then smartly exited the setup through the open end.

In a similar double-choice apparatus a number of bird species have been tested by Christian Theissen in 2011. Possibly due to as yet small sample sizes no significant differences have been found between the two exits. As with the bats, experiments must be continued to increase sample sizes.

### **3.2 The function of bi-coloured fruit displays – a bird plant interaction?**

Thirty years ago Willson & Thompson (1982, *Can. J. Bot.* 60: 701-713) and Stiles (1982, *Am Nat.* 120: 500-509) proposed the bi-coloured fruit display hypothesis and the more specific 'foliar flag hypothesis', respectively. Essentially, both hypotheses were suggested to functionally explain the remarkable fact that bi-coloured fruit displays occur in no less than 26 plant families, yet with their function (= adaptive significance) remaining unexplained till today. Bi-colouredness may arise from different-coloured unripe fruit of the same infructescence, different-coloured auxiliary parts adjacent or close to a ripe fruit like bracts (= conspicuously coloured leaves surrounding flower[s]), pedicels, or aged leaves ('foliar flags')

having changed colour. The two hypotheses assumed that the bi-colouredness would enhance the removal of fruits through frugivores, mainly birds, thereby contributing to seed dispersal that in the meantime had become recognized as vital for both forest regeneration and tree species diversity in forests and well-known under the term ‘Janzen-Connell-Effect’. Whilst many authors have subsequently shown bi-colouredness to enhance fruit removal by frugivores the mechanism underlying this enhancement remained largely unexplored (Curio, in prep.). In a study with six captive Tropic Hornbills (*Penelopides panini panini*) housed in large aviaries in Station ‘Sibaliw’ we examined the question on whether fruit attractiveness or fruit detectability could explain bi-colouredness of certain Philippine forest trees (Christine Schmidt, pers. comm.). Separation of these two aspects is vital for any conclusion on improved detectability; to draw any such conclusion attractiveness per se, e. g., via a sensory bias, has to be excluded as a confounding factor.

The study, running from April to August 2010, focused on the question of whether bi-coloured fruit displays are detected faster by frugivores than mono-coloured fruits due to some increased contrast. To investigate contrasts both within bi-coloured fruit displays and against their backgrounds, the reflectance spectra of fruits, pedicels and leaves of *Dehaasia* sp. (Lauraceae) with its red and black display were recorded. Furthermore, fruits from three forest tree species *Dehaasia* included as well as artificially fabricated fruit displays were presented to the Tropic Hornbills. The latter consisted of mono-coloured black or red as well as bi-coloured red-black food items of equal size. Experiments were designed to distinguish between detectability of fruits as a function of their colouration and preference for (= attractiveness of) certain colourations geared to fruit quality. This study highlights that bi-coloured fruit displays fulfill two basic functions in the communication channel between plants and a frugivorous bird species: first, they facilitate early detection of fruits, and second, they aid birds in evaluating fruit quality and ripeness (see also Schaefer & Braun 2009, Ecology. 90: 1564-1573). Thereby, the birds’ foraging becomes more efficient and plant reproduction improved by the selective dispersal of ripe fruits only. Mutualistic relationships such as between fruit trees and dispersers are not just required for growth, reproduction and survival of both partners but they also maintain the natural dynamics of the forest.

### **3.3 Colony defence by artificially senescent ants against an ant predator – a test of Life History theory**

Organisms have to balance multiple needs against each other since the resources to cope with all demands of life are limited. In other words, ‘trade-offs’ need to be achieved that are thought to maximize Darwinian fitness. This insight has become the central explanatory tenet of ‘life history theory’ (Stearns 1992, The evolution of life histories, Oxford Univ. Press; Roff 2002, Life history evolution. Sinauer Associates, Inc.). Among others it predicts that an animal that, as a consequence of old age, has few offspring to expect in the future should invest more resources into its current offspring and/ or relatives. (The latter have in common with the individual under scrutiny a predictable percentage of its genes and should therefore be assisted in order to maximize representation of the said individual’s genes in subsequent generations – as predicted by ‘kin selection theory’. This representation is one accepted measure of Darwinian fitness.) To test this idea one has to show that a higher investment into one’s relatives does not merely follow from old age per se but from senescence, i. e. the age-related decline of physical and behavioural functions of an organism. Because of the loose relationship between age and senescence one has to manipulate the latter if one wants to test the prediction of higher investment with declining prospects of reproduction.

Starting from this insight R. Cordts (1997, Reproduktiver Aufwand, Fortpflanzungswert und Juvenilhormon beim Heimchen (*Acheta domestica*). Dissertation, Ruhr-Universität Bochum, Conservation Biology Unit, Bochum, Germany) verified, in pioneering experiments, with domestic crickets that animals behaved as predicted when their subjective age was manipulated: By deceiving crickets about their true age through manipulating their level of juvenile hormone, animals rendered ‘old’ or ‘young’ displayed a level of mate choice and of fighting against rivals as would be expected from their simulated prospects of future reproduction independent of their chronological age. This was the first demonstration of a hormone being implicated in the self-assessment of an animal’s senescence. Till today it also remained the only experiment where manipulation was made to work in both directions. Later on ants (*Myrmica scabrinodes*) were made to only overestimate their true age by anaesthetizing them with carbon dioxide and, in a second experiment, by removing their propodeal spines, both of which manipulations made them to care for their colony earlier in life but also made them to die earlier (Moroń et al. 2008, Anim Behav, 75: 345-350, with the authors overlooking the pioneering paper of Cordts).



Fig. 5 A *Polyrhachis* sp. ant worker complete with its armament of spines on its back, the species used for testing colony defence along with nest mates against a powerful *Rhytidoponera* ant. Photo courtesy Thomas Bochynek (2009).

Similar to this latter work, Thomas B o c h y n e k manipulated the well-being of worker ants (*Polyrhachis* sp.) caring for their colony with dependent relatives (sisters of various degrees of relatedness) right beside Station ‘Sibaliw’ in 2009. To this end he cut off one hind-leg distal of the coxa (= base of leg to which the femur is hinged on) of an experimental group of 250 ants capitalizing on the idea that injuries would tend to increase as an animal ages, and that this kind of ageing would be perceived as senescence. Accordingly the injured ants were expected to defend their colony more fiercely. A same sized group of colony mates was left unharmed as a control. Following this, predation on the colony was simulated by placing in their trail a large, common predatory ant (*Rhytidoponera* sp.) whose members are known to forage on other insects including ants. In the experiment the predator was leashed to a thin thread allowing it to stand its ground on the trail against the defenders. Aggression against the predator was measured along a scale from mere threat to sustainably clamping the predator with the mandibles. It turned out that the injured ants attacked – with significantly greater vigour and stamina as compared to the uninjured controls. The experiment therefore falls in line with the previous results obtained with two other insect species as mentioned: As senescence increases so does investment into the next generation genes. The outcome of the experiment is even underscored by the fact that it runs counter to the naïve expectation that an injured defender would do less and thus corroborates forcefully a central prediction of life history theory.

### 3.4 Complexity and dynamics of a facultative plant insect mutualism: the case of *Leea manillensis* and its many ant attendants

There is a large body of knowledge on the mutualistic relationships between plants and insects shedding light and raising even more questions on the coevolution of these huge groups of organisms. The impact on plants of the myriad of herbivores has led to a much studied arms race between plants and their animal consumers. Spanning two trophic levels in the forest ecosystem, for example, these relationships may be obligatory where one party cannot exist without the other, or facultative, allowing for flexibility in the choice of a partner. This dyadic relationship is oftentimes complicated by animal protectors benefiting the plant by killing or moving on the herbivores, thus making the relationship to span three trophic levels.

Following observations of this report's editor, Christoph S c h w i t z k e has studied in his diploma thesis (2012) an ant plant mutualism that by virtue of its fluidity in space and time is facultative in nature. From among nearly 60 species of ants 26 (!) around Station Sibaliw, in a mosaic of secondary and primary forest, attending the smallish trees of *Leea manillensis* (Leeaceae), are present, on average, on only 36% of 223 trees studied. At any one time there is only one species in attendance, indicating some degree of interspecific competition. This is underscored by a day-night turnover of the attending ant species in one case. The ants cluster usually motionless on a fresh shoot of *Leea* at the tree's tip and move almost only when feeding on the nutritious 'food bodies', i. e. small whitish scales protruding from the epidermis, and 'extrafloral nectaries' (EFNs), common to many ant plant mutualisms. Both these foods form a reward for the ant's services to the plant attended. The EFNs themselves exhibit some fluidity in time and seem to produce more nectar in sun-lit places and after being attacked by herbivores, apparently to attract their ant defenders. Also the ants themselves seemed to trigger the secretion of nectar. This indicates that there must be some benefit to the plant through ant attendance. The protective effect of the ant is best documented by the fate of shoots dependent on herbivorous insects, that for reasons of their avoiding attack from predators, are largely foraging on *Leea* at night and where therefore scarcely identified. Whole-sale loss of shoots was forestalled when ants were present but a close relationship between the number of ants and leaf damage could not be established.

This tritrophic relationship is further complicated by the deleterious impact of a tiny parasitoid wasp (Chalcidoidea, Eucharitidae: *Chalcura* sp.) that lays its eggs into young, still unfolded leaves near the cluster of attending ants. Upon hatching the larvae ambush and then attach to an ant when it passes by and somehow kills it within about 20 min, apparently through some deadly chemical. The ant victim serves as food for the wasp larva. In this way the wasp inflicts damage on the tree by depriving it of its defenders. However, the wasp-ant-relationship is dynamic: When attendance by the ants is high the wasp is somehow prevented from laying its deadly clutch of eggs. To this relationship spanning already four trophic levels is to be added yet another level. Anecdotic observations showed that a jumping spider (Salticidae) lying in ambush on part of the *Leea* shoots is catching and feeding on the wasp when the latter is about to lay its eggs. Though the occurrence of the spider is too sporadic to assess its impact on the wasp's predation on the ants it nonetheless demonstrates that a fifth trophic level of an apex predator renders this multi-faceted mutualistic system even more complicated. Schwitzke's study beautifully shows how a detailed look at a seemingly simple system of ants on a plant is making us understand part of the rainforest as a hugely complicated network of species at many trophic levels.



### 3.5 Spatial orientation of the Philippine bent-toed gecko in relation to its home range

Some years ago Anke Siegert, in a field practical at Station Sibaliw, had shown that upon displacement the Philippine bent-toed gecko (*Cyrtodactylus philippinicus*) is capable to find its way home to the place of capture (12<sup>th</sup> Ann. Report of PESCP (now PanayCon), 2006). Animals that had been captured, marked and transferred to a tree 100m and 150m north of the Station came back to their home range within a couple of days or few weeks. By displacing animals 60° West of those earlier release sites (14<sup>th</sup> Ann. Report of PESCP (now PanayCon), 2008) Claudia Kruse could do away with the idea of a site-biased homing orientation in 2007. By implication, this also excluded the idea that homing capitalized on familiarity with an animal's home range, with the area involved exceeding any reasonable size. The large proportion of returnees excluded the possibility ( $p < 0.01$ , 2-tailed binomial test) that the geckos had found home through random search ('piloting'). Starting from this finding Marek, Bissantz, Curio, Siegert, Tacud & Ziggel (1910, Salamandra 46: 93-97, **App. 13**) looked into the possibility of the animal making use of the earth's magnetic field; a magnetic sense had been found previously in various animal groups including crocodiles but not yet in a squamate reptile such as this gecko. Consequently freshly caught animals were placed in a circular arena of aluminum covered with a wire mesh lid and their attempts to exit the cage were tallied in regard of the compass direction. The resulting distribution of compass directions was found to differ from one obtained with a magnetic field changed by magnets attached to the cage from below ( $p < 0.05$ , bootstrap test). Hence, sensing of the earth's magnetic field may be a component of the homeward orientation mechanism. Our results represent the first indication that squamate reptiles can perceive changes in the earth's magnetic field, and may be able to extract from it cues for orientation.

### 3.6 A survey of methods of rehabilitation and release of hornbills in Panay, Philippines

A brief survey on hornbill and conservation problem has given this emphasis on the conservation problem impinging the Philippine hornbills. The account delineates problem of rehabilitation and release with on the two Panay species a while credit has given to the Brehm Fund for Internat. Bird Conservation, e. V., were main supporters of PanayCon (**App. 14**). Curio, E. (2010) Projektbilanz: Erfahrungen mit der Aufzucht und Auswilderung von Hornvögeln auf Panay, Philippinen. Zum Fliegen geboren – Flying Free, Neue Folge 28: 3-5.

### 3.7 'Body morphing' enables forest dwelling birds to master dense foliage with impunity: a novel avian flight performance

Forest dwelling birds of a large number of taxa master the non-trivial task of navigating oftentimes dense foliage without colliding with the myriad of obstacles in their way. This hitherto unexplained feat of bird flight can be basically accounted for by two mechanistic hypotheses. The 'body morphing' hypothesis holds that the bird minimizes the cross-section of its body when facing an obstacle or an opening too small to pass through with flapping wings. The 'planned trajectory' hypothesis suggests that the bird compromises the shortest distance to a goal by navigating the foliage with more detours than would be economically optimal in terms of distance flown. The posture minimizing the cross-section of the body in flight is the passive phase of 'bounding flight' during which phases of wing flapping alternate with phases of sleeking the wings to the body. Observations of passerines negotiating the defined geometry of a net in a Philippine upland forest demonstrate that they can adjust the length of the passive phase such that 'body morphing' at the right time permits them to slip

unharmful through commensurate openings and, by implication, also the foliage of their environment. The considerable individual variation of this performance is functionally discussed along the accumulating evidence of spider webs (*Nephila* sp., *Nephilengys* sp.) forming an as yet unappreciated source of mortality in the tropics (**App. 15**).

Curio, E. & J. Tacud (2009) 'Body morphing' enables forest dwelling birds to master dense foliage with impunity: a novel avian flight performance. *Ecology of Birds* 31: 1-12.

### 3.8 Avian resource defence against an insect competitor and a cognition problem

An account is given on the defence of a food resource by a male of the partially nectar-feeding orange-bellied flowerpecker (*Dicaeum trigonostigma australe*) against the globally biggest carpenter bee (*Xylocopa latipes*) on Panay Isld., Philippines. In the process the passerine attacked the bee physically while it was feeding on the ball-shaped (globose) inflorescences of the tree *Nauclea orientalis* (Rubiaceae) also exploited by the defending male and a nearby female. In addition, the defender chased the bee in flight, thus preventing it from landing on the flowers for feeding. The female remained indifferent to the bee, even feeding beside it on the same flower. By contrast, in five years of field work, widely cruising carpenter bees, *X. cuernosensis* included, have never been seen attacked by any bird so that the aggression reported is regarded as food resource defence. The underlying cognitive achievement is best understood by assuming an intruder 'action-based' threat recognition rather than an intruder, 'identity-based' threat recognition. Birds, and also fish, are endowed with highly sophisticated 'identity-based' powers of identification of syntopic species have been shown to recall the community around them. However, it is only through an 'action-based' model of cognition that birds and fish are thought to utilize the knowledge underlying a species-specific resource defence. An innate 'identity-based' object recognition for select community members including predators is known to exist in many cases, but it would probably not accrue the necessary flexibility to resource defence tailored to hundreds species-specifically of species arthropod nectarivores included: as such defence to be cutting even across animal phyla and thus exacerbating the cognitive problem for the defender if based on an intruder 'identity-based' recognition. – Arguments are presented in support of the idea that the observed resource defence is adaptive, thereby rejecting the 'mistaken identity' hypothesis of interspecific territoriality.

Curio, E. (2013) Avian resource defence against an insect competitor and a cognition problem. *Ecol. Birds in the press* 35: ....

## 4. Genetics of Birds

The present report first gives findings on the genetic structure and its depauperate state in some Philippine hornbills of the W Visayas, then elaborates on the genetic co-evolution of haemosporidian blood parasites of the Philippine Bulbul on various islands, and finally presents an account of recent taxonomic findings on new invertebrate species of Panay Island.

### 4.1 Full mitochondrial genome sequences of two endemic Philippine hornbill species (Aves: Bucerotidae) provide evidence for pervasive mitochondrial DNA recombination

As shown by the population genetic group of Potsdam University (Germany), capitalizing on blood samples provided by PanayCon (formerly PESCP), a major discovery in regard of avian mt genome structure and replication has been achieved. Although nowadays it is widely accepted that mitochondrial mtDNA may undergo recombination, the frequency of such

recombination remains controversial. Here we present the first complete mt genome of the avian family Bucerotidae, i.e., that of two Philippine hornbills, *Aceros waldeni* and *Penelopides panini*. The mt genomes are characterized by a tandemly duplicated region encompassing part of *cytochrome b*, 3 tRNAs, *NADH6*, and the control region. The duplicated fragments are identical to each other except for a short section in domain I and for the length of repeat motifs in domain III of the control region. Due to the heteroplasmy with regard to the number of these repeat motifs, there is some size variation in both genomes; with around 21,657 bp (*A. waldeni*) and 22,737 bp (*P. panini*), they significantly exceed the hitherto longest known avian mt genomes, that of the albatrosses. Sammler et al. (2011) thus discovered concerted evolution between the duplicated fragments within individuals. The existence of differences between individuals in coding genes as well as in the control region, which are maintained between duplicates, indicates that recombination apparently occurs frequently, i.e., in every generation.

Sammler, S., C. Bleidorn & R. Tiedemann (2011) Full mitochondrial genome sequences of two endemic Philippine hornbill species (Aves: Bucerotidae) provide evidence for pervasive mitochondrial DNA recombination. *BMC Genomics*, 12:35 (**App. 16**).

doi:10.1186/1471-2164-12-35.

The electronic version of this article is the complete one and can be found online at:

<http://www.biomedcentral.com/1471-2164/12/35>

#### **4.2 Fourteen new microsatellite markers for the Visayan tarictic hornbill (*Penelopides panini*) and their cross-species applicability among other endangered Philippine hornbills**

The present study by Sammler et al. (2011) of the University of Potsdam laid the foundation for further genetic studies of Visayan endangered hornbills elucidating their history and genetic pauperism due to shrinking population numbers (see below Sammler et al. 2012). Fourteen microsatellite markers were isolated and characterized for the endangered Visayan tarictic hornbill (*Penelopides panini*, Aves: Bucerotidae). In an analysis of 76 individuals, the number of alleles per locus varied from one to 12. Expected and observed heterozygosity ranged from 0.00 to 0.87 and from 0.00 to 0.89, respectively. All primers also amplify microsatellite loci in other Philippine hornbills, e. g. the critically endangered Walden's hornbill (*Aceros waldeni*). Two loci which are monomorphic in *P. panini* were found polymorphic in at least one of the other species. These 14 new microsatellite markers specifically developed for two genera of Philippine hornbills, in combination with those already available for the hornbill genera *Buceros* and *Bucorvus*, comprise a reasonable number of loci to genetically analyse wild and captive populations of these and probably other related, often endangered hornbills.

Sammler, S., K. Havenstein & R. Tiedemann (2011) Fourteen new microsatellite markers for the Visayan tarictic hornbill (*Penelopides panini*) and their cross-species applicability among other endangered Philippine hornbills. *Conservation Genet Resour.* (**App. 17**).

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#### **4.3 Mitochondrial control region I and microsatellite analyses of endangered Philippine hornbill species (Aves; Bucerotidae) detect gene flow between island populations and genetic diversity loss**

In order to evaluate the genetic diversity in two (critically) endangered Visayan hornbill species Visayan Tarictic Hornbill (*Penelopides panini*) and Walden's Hornbill (*Aceros*

*waldeni*), and to support efforts toward their conservation, we analysed genetic variation in ~ 650 base pairs (bp) of the mitochondrial control region I and at 12-19 microsatellite loci. The sampling covered populations of substantial size, still occurring only on Panay and Negros, and were augmented with museum specimens of extinct populations from neighboring islands. For comparisons, their non- or less endangered sister taxa Luzon Tarictic Hornbill (*P. manillae*) on Luzon and the Polillo islands and Wreathed-billed Hornbill (*A. leucocephalus*) on Mindanao are included in the study. Thus the population history of the two *Penelopides* species was reconstructed and the genetic population structure of the remaining wild populations in all four species was assessed.

Both, the nuclear as well as the mitochondrial datasets, show a genetic separation between islands, but simultaneously, detect sporadic over-water movements. It is hypothesized that deforestation in the last century influenced these migrations.

Furthermore, both markers reveal a genetic diversity loss in both Visayan hornbill species. This may be caused by the dramatic decline in the abundance of the extant populations coupled with the local extinction of genetically slightly differentiated and geographically intervening populations. It is therefore emphasized that conservation of the surviving wild birds of virtually extinct populations are particularly important, as well as the preservation of their genetic potential in captivity.

Sammler, S., V. Ketmaier, K. Havenstein, U. Krause, E. Curio & R. Tiedemann (2012) Mitochondrial control region I and microsatellite analyses of endangered Philippine hornbill species (Aves; Bucerotidae) detect gene flow between island populations and genetic diversity loss. *BMC Evolutionary Biology* 12: 203-216 (**App. 18**).

#### **4.4 Structure of the mitochondrial genomes of two Philippine hornbill species**

The mitochondrial DNA was investigated in terms the specific marker into maintain at the maximum in variation the both endangered hornbill species (*Aceros waldeni*, *Penelopides panini*). In both incurred in the past duplication of the control region, apart from two tandem repeats. The feature the mitochondrial DNA leaves behind both those of the Domestic Fowl (*Gallus gallus*) that of certain albatrosses who considered the have the maximum length of the mitochondrial DNA length of all birds. Furthermore, was it shown that spatial extensive regions underwent recombination more this more common than assumed to far.

Sammler, S., & R. Tiedemann (2009) Struktur des mitochondrialen Genoms zweier philippinischer Hornvogelarten. *Vogelwarte* 47: 336-337 (**App. 19**).

#### **4.5 Profound population structure in the Philippine Bulbul *Hypsipetes philippinus* (Pycnonotidae, Aves) is not reflected in its *Haemoproteus* haemosporidian parasite**

In this study by Silva-Iturriza et al. (2012) of Potsdam University and PanayCon (formerly PESCP) we used molecular markers to screen for the occurrence and prevalence of the three most common haemosporidian genera (*Haemoproteus*, *Plasmodium*, and *Leucocytozoon*) in blood samples of the Philippine Bulbul (*Hypsipetes philippinus*), a thrush-sized passerine bird endemic to the Philippine Archipelago. We then used molecular data to ask whether the phylogeographic patterns in this insular host–parasite system might follow similar evolutionary trajectories or not. We took advantage of a previous study ((Silva-Iturriza et al. 2010 and references therein). describing the pattern of genetic structuring in the Philippine Bulbul across the Central Philippine Archipelago (6 islands, 7 populations and 58 individuals;

three mitochondrial DNA genes). The very same birds were here screened for the occurrence of parasites by species-specific PCR assays of the mitochondrial cytochrome b gene (471 base pairs). Twenty-eight out of the 58 analysed birds had *Haemoproteus* (48%) infections while just 2% of the birds were infected with either *Leucocytozoon* or *Plasmodium*. Sixteen of the 28 birds carrying *Haemoproteus* had multiple infections. The phylogeography of the Philippine Bulbul mostly reflects the geographical origin of samples and it is consistent with the occurrence of two different subspecies on (1) Semirara and (2) Carabao, Boracay, North Gigante, Panay, and Negros, respectively. *Haemoproteus* phylogeography shows very little geographical structure, suggesting extensive gene flow among locations. While movements of birds among islands seem very sporadic, we found co-occurring evolutionary divergent parasite lineages. We conclude that historical processes have played a major role in shaping the host phylogeography, while they have left no signature in that of the parasites. Here ongoing population processes, possibly multiple reinvasions mediated by other hosts, are predominant.

Silva-Iturriza A., V. Ketmaier & R. Tiedemann (2012) Profound population structure in the Philippine Bulbul *Hypsipetes philippinus* (Pycnonotidae, Aves) is not reflected in its *Haemoproteus* haemosporidian parasite. *Infection, Genetics and Evolution* 12: 127–136 (App. 20).

#### 4.6 Prevalence of avian haemosporidian parasites and their host fidelity in the central Philippine islands

In a joint undertaking of Potsdam University and PanayCon Silva-Iturriza et al. (2012) examined the prevalence and host fidelity of avian haemosporidian parasites belonging to the genera *Haemoproteus*, *Leucocytozoon* and *Plasmodium* in the central Philippine islands by sampling 23 bird families (42 species). Using species-specific PCR assays of the mitochondrial cytochrome b gene (471 base pairs, bp), infections were detected in 91 of the 215 screened individuals (42%). Single and multiple infections could be discriminated, too. Thirty-one infected individuals harbored a single *Haemoproteus* lineage (14%), 18 a single *Leucocytozoon* lineage (8%) and 12 a single *Plasmodium* lineage (6%). Of the 215 screened birds, 30 (14%) presented different types of multiple infections. Intrageneric mixed infections were generally more common (18 *Haemoproteus/ Haemoproteus*, 3 *Leucocytozoon/ Leucocytozoon*, and 1 *Plasmodium/Plasmodium*) than intergeneric mixed infections (7 *Haemoproteus/ Leucocytozoon* and 1 *Haemoproteus/ Leucocytozoon/Plasmodium*). We recovered 81 unique haemosporidian mitochondrial haplotypes. These clustered in three strongly supported monophyletic clades that correspond to the three haemosporidian genera. Related lineages of *Haemoproteus* and *Leucocytozoon* were more likely to derive from the same host family than predicted by chance; however, this was not the case for *Plasmodium*. These results indicate that switches between host families are more likely to occur in *Plasmodium*.

One has to conclude that *Haemoproteus* has undergone a recent diversification across well-supported host-family specific clades, while *Leucocytozoon* shows a longer association with its host(s). This study supports previous evidence of a higher prevalence and stronger host-family specificity of *Haemoproteus* and *Leucocytozoon* compared to *Plasmodium*.

Silva-Iturriza, A., V. Ketmaier & R. Tiedemann (2012) Prevalence of avian haemosporidian parasites and their host fidelity in the central Philippine islands. *Parasitology International* 61: 650–657 (App. 21).

### Appendices 1-21: Overview

App. 1	Staff of PanayCon	PanayCon – Organizational Structure and Staff
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App. 7	Gaulke (2011)	Wurzelkrebse. Ungewöhnliche Crustaceen-Parasiten. Caridina 4/2011: 21-19.
App. 8	Javier, S. N. & C. O. Coleman (2010)	<i>Talitrus curioi</i> (Crustacea, Amphipoda, Talitridae), a new species of landhopper from the rainforests of the Philippines. Zoosyst. Evol. 86: 41-48.
App. 9	Lowry, J. K., & C. O. Coleman (2012)	A new terrestrial talitrid genus from the Philippine Islands (Crustacea, Amphipoda, Talitrida, Talitridae) and the designation of two informal subgroups. Zootaxa 3400: 64-68
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App. 11	Krehenwinkel, H., E. Curio, J. Tacud & J. Haupt (2009)	On <i>Thelyphonoides paynansis</i> gen. et sp. n. (Arachnida: Uropygi: Thelephonidae), a new genus and a new species of whip scorpions from Panay Island (Philippines). Arthropoda Selecta 18: 139-143
App. 12	H. J. Lourens (2011)	Six new Philippine species of the genus <i>Cyana</i> WALKER, 1854 and a review of the <i>geminopuncta</i> -group, with emphasis on endemic develop lines in various islands (Lepidoptera: Arctiidae, Lithosiinae). Nachrichten Entomol. Vereins Apollo 32: 69-96
App. 13	Marek, C., N. Bissantz, E. Curio, A. Siegert, J. Tacud & D. Ziggel (1910)	Spatial orientation oft he Philippine bent-toed gecko ( <i>Cyrtodactylus philippinicus</i> ) in relation its home range. Salamandra 46: 93-97
App. 14	Curio, E. (2010)	Projektbilanz: Erfahrungen mit der Aufzucht und Auswilderung von Hornvögeln auf Panay, Philippinen. Zum Fliegen geboren – Flying Free, Neue Folge 28: 3-5
App. 15	Curio, E., & J. Tacud (2009)	‘Body morphing’ enables forest dwelling birds to master dense foliage with impunity: a novel avian flight performance. Ecology of Birds (Ökol. Vögel) 31: 1-12

- App. 16 Sammler, S., C. Bleidorn & R. Tiedemann (2011) Full mitochondrial genome sequences of two endemic Philippine hornbill species (Aves: Bucerotidae) provide evidence for pervasive mitochondrial DNA recombination. *BMC Genomics*, 12: 35
- App. 17 Sammler, S., K. Havenstein & R. Tiedemann (2011) Fourteen new microsatellite for the Visayan tarictic hornbill (*Pelenopides panini*) and their cross-species applicabilities among other endangered Philippine hornbills. *Conservation Genetics Resources*
- App. 18 Sammler, S., V. Ketmaier, K. Havenstein, U. Krause, E. Curio & R. Tiedemann (2012) Mitochondrial control region I and microsatellite analyses of endangered Philippine hornbill species (Aves; Bucerotidae) detect gene flow between island populations and genetic diversity loss. *BMC Evolutionary Biology* 12: 203-216
- App. 19 Sammler, S., & R. Tiedemann (2009) Struktur des mitochondrialen Genoms zweier philippinischer Hornvogelarten. *Vogelwarte* 47: 336-337
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- App. 21 Silva-Iturriza, A., V. Ketmaier & R. Thiedemann (2012) Profound population structure in the Philippine Bulbul *Hypsipetes philippinus* (Pycnonotidae, Aves) is not reflected in its *Haemoproteus* haemosproidian parasite. *Infection, Genetics and Evolution* 12: 127-136.