



Final Report

of the

Lake Manguao Aquatic Biodiversity Conservation Project

in Palawan, the Philippines.

A project of



Conducted by

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Executive Summary

The project aims

- ≠ to distinguish biodiversity components of the freshwater ecosystems of Palawan
- ≠ to deliver data contributing to the Protected Area Suitability Assessment of the Manguao Catchment, a key area of the freshwater biodiversity in the Philippines
- ≠ to train and to sensitise junior scientists, environmentalists and local communities to conservational problems and their solutions
- ≠ to introduce and to develop sustainable land use practices enabling improvement of the livelihood of local communities at the Manguao Catchment and avoiding further destruction of the natural resources



Training of junior scientists is one concern of the project

Introduction

The Palawan Corridor

Palawan, the Philippine Island and Province of the same name, represents a biodiversity corridor and hotspot within the Southeast Asian archipelago. It belongs to the faunal and floral complex of Greater Sunda. Due to a larger part of remaining forest cover compared to other Philippine islands, Palawan is called the “last frontier”. The entire province was declared a UNESCO biosphere reserve in 1991 and it is subjected to the specific “Strategic Environmental Plan” by the Senate and House of Representatives of the Philippines. However, the ongoing loss of biodiversity as a consequence of increased land use by a growing population urgently requires the protection of key habitats and a switch to sustainable land use practices. This requires knowledge and monitoring of the ecosystems.



The location of Palawan in the Sundaic Region

The Lake Manguao Catchment

Lake Manguao, locally also called Lake Danao, is the only natural freshwater lake on Palawan Island. It is located at the Municipality of Taytay at the north of the island. The lake was created by volcanic activities and covers about 600 ha. Its catchment is about 4500 ha large, drained by few permanent and several temporary streams.



Lake Manguao, the only freshwater Lake in Palawan

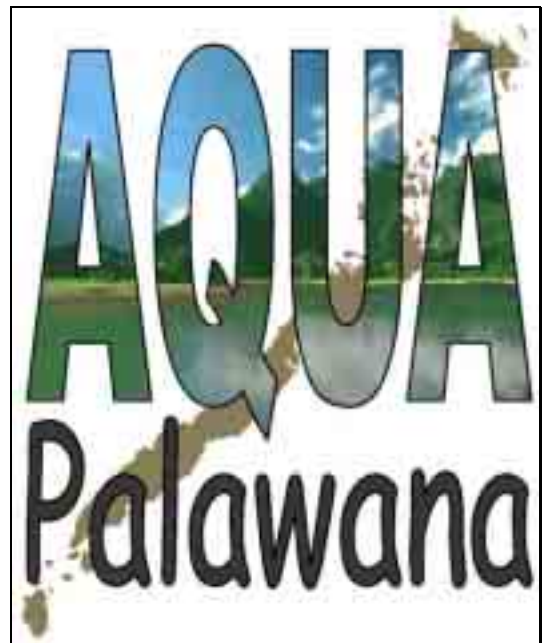
Initial small-scale surveys already discovered a number of species endemic to the lake and its tributaries [e.g. <http://rmbn.nus.edu.sg/rbz/biblio/52/52rbz227-237.pdf>] It can be assumed that it has an outstanding proportion of endemic taxa. This ecosystem is threatened due to land conversion as fire clearance and selective logging is still practiced affecting both, terrestrial and freshwater ecosystems. The executing authorities, the Palawan Council for Sustainable Development (PCSD) and the Provincial Government of Palawan aim at an effective protection of this key area of freshwater biodiversity in the Philippines by a Protected Area Suitability Assessment.



Fire clearance is a main threat for the Manguao area

The AQUA*palawana* Programme

This project is a part of the “Aquatic Biodiversity Research Programme on the Philippine Island of Palawan” (AQUA*palawana*), a joint initiative of the Western Philippines University (WPU) and the International Research Institute of Entomology (IRIE) at the Museum of Natural History Vienna, Austria (NMW). This programme aims to develop and implement strategies and action plans for the scientific research into the freshwater ecosystems of Palawan, their conservation, management and sustainable use. A main focus of its activities is the Manguao Catchment. A freshwater crab endemic to the area was already described in 2004 within the scope of AQUA*palawana* [<http://rmbn.nus.edu.sg/rbz/biblio/52/52rbz227-237.pdf>].



The logo of the “Aquatic Biodiversity Research Programme on the Philippine Island of Palawan”

The Project Strategy

The project follows a two-track strategy. A lasting conservation of biodiversity can only be assured if the local communities agree and support this vision. A community-based approach of the project therefore focuses on raising of people's awareness and on knowledge-transfer to the local communities. This particularly aims to introduce sustainable land use practices at the Lake Manguao area, such as “Rainforestation Farming”, an evaluated long-term method to increase both, livelihood standards and habitat conditions.



A meeting with residents of Sitio Danao, Taytay

The second, scientific-driven approach focuses on biodiversity research into the freshwater macroinvertebrate fauna of the Lake Manguao Catchment and Palawan in general. Taxonomic and ecological data were gathered particularly on aquatic beetles, bugs, mayflies and decapod crustaceans to record their distribution and dispersion, endemisms as well as unknown faunal components. The data obtained will support the Protected Area Suitability Assessment. Additionally, junior scientists and conservationists are trained during the project to enable their independent work and forthcoming monitoring activities.

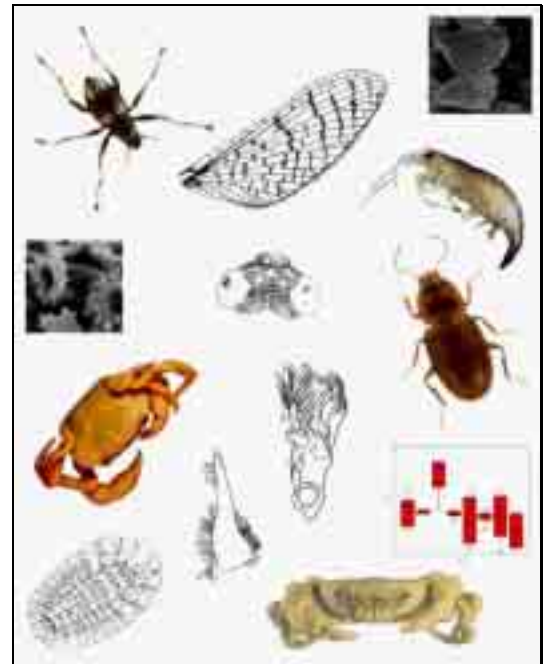
Activities prior to RSG funding

December 2006 – March 2007

This entire period was financed using funds of the Coccinella Programme of the NMW.

Activities focused on:

- ⌘ Biodiversity surveys at the Lake Manguao Catchment and other Palawan sites
- ⌘ Preparatory consultations with local authorities and the WPU
- ⌘ Legal confirmation of a Memorandum of Agreement on the AQUA_{palawana} Programme between WPU and the IRIE
- ⌘ Preliminary study of comparative material of Southeast Asian decapods at Raffles Museum of Biodiversity Research at the National University of Singapore and arrangements for a subsequent working visit [http://rmb.r.nus.edu.sg/news/index.php?entry=/visitors/20061204-hendrik_freitag.txt]
- ⌘ Final studies on Palawan aquatic Minute Moss Beetles (Hydraenidae) at the IRIE and subsequent publication of a taxonomic revision
- ⌘ Scientific studies on Palawan Stream Mayflies (Heptageniidae) at the Phyllodrom Museum of Tropical Ecology Leipzig, Germany, and taxonomic works on Palawan Riffle Beetles (Elmidae) at the IRIE.



The scientific part of the project focuses on freshwater macroinvertebrates



A scientific publication of AQUA_{palawana} including data of the recent project at Lake Manguao

RSG funded Project Phase

April 2007 – December 2007

This period was realised using the Rufford Small Grant, a grant for guest researchers of the National University of Singapore / Raffles Museum of Biodiversity Research, funds of the Kirschenhofer Foundation Vienna, Austria and private contributions.

Public Relations

The success of conservational efforts depends substantially on an objective communication with all groups involved and affected.

During its entire period, the project and its manager have been in discourse with local people, officials of local government units, professional and non-professional conservationists.

First of all, a handout on the projects objectives was prepared in Tagalog language and distributed at potential sites of project activities. At the same time, a meeting was held with the residents of the Lake Manguao area where the proposed activities were discussed and the projects intention was explained. Such meetings have subsequently been repeated several times.

After formal consent to the planned activities, two information boards were set up, one in Sitio Danao (village at Lake Manguao) and one at the College of Fisheries and Aquatic Science of the WPU. The information sheets displayed were changed in regard to recent project activities and concerns.

Cooperations on particular issues of the project were arranged with local experts and NGOs:

- ⌘ WPU Forestry Department, Aborlan Campus: Prof. Romeo R. Lerom; Prof. Lita Bañoc-Sopsop, WPU Aquatic Science Department: Prof. Joie Matillano, and Prof. Roger Dolorosa
- ⌘ KATALA Foundation: Siegfred H. Diaz, Dr. Sabine Schoppe

Several meetings were held with officials to inform about the project and to clear formalities:

- ⌘ Municipal Administration & Council of Taytay
- ⌘ Barangay Administration of Poblacion, Taytay,
- ⌘ Municipality and Barangay officials of Balabac
- ⌘ City Administration & Council of Puerto Princesa
- ⌘ Barangay Administrations of Napsan and Luzviminda, Puerto Princesa City



The information board at Sitio Danao



A discussion with municipal officials of Taytay



Project Presentation at the 5th "Ecology and Fish Conservation Week" of the WPU on October 10, 2007

WPU President and WPU Puerto Princesa Campus Dean Conferences and annual meetings of professional societies were attended where the project was introduced to the audience and first results were presented:

- ## 20th GTOe Meeting “Tropical Diversity in the Anthropocene” (February 21-26, 2007, Museum Koenig Bonn, Germany; poster)
- ## International Convention of the Philippine Society for the Study of Nature (May 2-5, 2007, PSU, Puerto Princesa, Philippines; poster)
- ## Conference on “Biodiversity Crisis on Tropical Islands” (June 10-13, 2007, UBD, Banda Seri Begawan, Brunei Darussalam; oral presentation & poster [<http://www.ubd.edu.bn/news/conferences/bcti1206/programme.html>])
- ## Biodiversity and Ecology Journal Club Meeting (July 3, 2007, NUS, Singapore; oral presentation [<http://www.dbs.nus.edu.sg/eventlist/seminars/poster/2007/hendrik.pdf>])
- ## 5th “Ecology and Fish Conservation Week” (October 8-12, 2007, WPU Puerto Princesa, Philippines; oral presentation)



An exchange of information with locals of Sitio Danao



The project presentation at the Taytay Municipal Council session on September 3rd 2007

Workshop on “Rainforestation Farming”

Slash-and-burn is a common land-use practice in rural Palawan and a main threat for the indigenous biodiversity. Promoting the switch to sustainable agricultural techniques is a main challenge for the conservation of natural resources.

Introducing a sustainable land-use practice was a main concern of the project. “Rainforestation Farming” is such a method. It was initially developed and practised by indigenous Tagbanua communities in Palawan and later on adopted and improved by a long-term Philippine-German project of the Institute of Tropical Ecology at the Leyte State University (LSU), Visayas. The concept is also promoted by the Department of Environment and Natural Resources (DENR) [<http://forestry.denr.gov.ph/DMC2004-06.pdf>]. The attendance of a seminar workshop at the LSU, which is now the most experienced and advanced institution on this field in the Philippines, provided a practical training useful for planned forthcoming activities in Palawan. The “rainforestation” demonstration site in Aborlan, Palawan was additionally visited.



KATALA member Siegfried Diaz records potential “mother-trees” at Maranlatan Forest



Participants of the Rainforestation Workshop in Taytay

A four-day excursion to the forests around Lake Manguao was under-taken with the experienced local “rainforestation” expert Siegfred H. Diaz (KATALA Foundation). His support was very helpful to detect and to record potential mother-trees for the collection of seedlings for the project nursery. This survey revealed that Dipterocarp hardwoods are already very rare although the original vegetation was Dipterocarp Lowland Forest. The actual “Rainforestation Workshop” was held on September 25-28, 2007 at Sitio Danao, the village at Lake Manguao. 21 members of the community around Lake Manguao, one representatives of each, the Municipal Administration and the Municipal DENR as well as teachers and students of the WPU followed the invitation. Due to the large fraction of non-academic participants, the workshop was held in Tagalog language. All participants received a kit consisting of a Tagalog guide on “rainforestation farming” and fruit crop seeds. For 1-½ days, the workshop was held at the conference place in the town proper of Taytay. Lectures were given on

- ≠ Vertebrate wildlife of the Lake Manguao Catchment and their conservation necessities (Prof. Joie Matillano, WPU)
- ≠ Conservation and use of indigenous plant genetic resources in Palawan (Prof. Romeo R. Lerom, WPU) Ecosystem functioning, value and conservation of forest streams (Dr. Hendrik Freitag)
- ≠ Detailed introduction to the “Rainforestation Farming” concept (Siegfred H. Diaz, KATALA Foundation).

The remaining days consisted of a practical training:

- ≠ Potential mother-trees were visited with the participants and marked by sign boards
- ≠ Suitable seeds and wildlings were collected
- ≠ A nursery for tree seedlings, fruit and cash crops was established providing optimal soil, light and humidity conditions
- ≠ Pioneering trees were planted at an area near the Sitio hall

A people’s organisation (SAMAHAN ng mag MANGGUGUBAT at MAGSASAKA sa SITIO DANAOS) was founded, which will be responsible for the future management of the “rainforestation” activities.



Taytay Municipal Administrator Sermeno holds the welcoming speech of the Rainforestation Workshop



Workshop participants mark “mother-trees”



Sorting of the seedling collections



Dipterocarp seedlings are prepared for the nursery

Local individuals elected during the workshop took respective honorary positions: Rogelio Bendinsen (President), Edna Palanun (Vice President), Beverly Comahig (Secretary), Jolito Latube (Treasurer), M. DelaTorre (Auditor), B. Sabroso (Rapporteur), M. Rodriguez (Business Manager), R. Caaba (Mediator), Chito Edep & Kapitan Nonoy Dalamon (Advisors).

Finally, all participants received a certificate of participation during a closing ceremony.

Further day meetings with the members of the new people's organisation were held in October and November 2007 to continue the "rainforestation" activities, to maintain and to monitor the nursery and the plantations.



This nursery was established during the workshop

Biodiversity Surveys

Obtaining knowledge about an ecosystem and its lifeforms is the first step to evaluate its importance for the conservation of biodiversity.

Regular field surveys were undertaken at the Manguao Catchment. Aquatic macroinvertebrates were sampled in all accessible lake tributaries (13 streams, 22 sites).

Many sites were only accessible by long walks or by boat. Collections were obtained by hand-net sampling, by manual pick up from stones, leaves, and other coarse particulate organic matter, by digging in littoral fringe and by using emergence traps. The latter allow the sampling of adult terrestrial stages of larvae which inhabit the aquatic habitat in focus. Thus species/genus level identification is possible for those organisms which cannot yet be identified in larval stage.

Traps specifically modified for usage under tropical field conditions [<http://www3.interscience.wiley.com/cgi-bin/abstract/109604832/ABSTRACT>] were applied in all permanent lake tributaries.

Distributional data of representatives of the systematic groups studied are rare. Most species are not even known yet. Therefore, it is essential to sample as many potential habitats as possible if one wants to know about their status of distribution, endemism and possible threats. 43 days were additionally spent for the sampling of 82 comparative sites in the province of Palawan.

All macroinvertebrate specimens that could not be identified in the field were preserved in alcohol for subsequent determination.



The sampling sites at Manguao Catchment



WPU graduate Geoffrey Aludia installs an emergence trap



BS student Archie Espinosa searches for aquatic insects

WPU students and graduates, teachers, professional and non-professional conservationists as well as officials of local government units and locals joined most of these field surveys. Thus the excursions served as a training and field lesson (freshwater fauna, scientific sampling methods, habitat types) at the same time.

Identification / formal description of species

Macroinvertebrate taxa of which populations are not lastingly disturbed by field sampling have high value as indicators for the monitoring of ecosystems.

The identification of the macroinvertebrates collected at the sampling sites of the Manguao Catchment and at the comparative sites in Palawan is still ongoing. As many specimens belong to undescribed taxa, this working step needs the most time.

The project parts realised at scientific reference collections & libraries focused on comparative studies of taxa related to those collected in Palawan.

Freshwater Decapods (crabs, shrimps & prawns) of the genera *Atyoida*, *Atyopsis*, *Caridina*, *Geosesarma*, *Insulamom*, *Labuanium*, *Parathelphusa* were studied at the Raffles Museum of Biodiversity Research (RMBR). The regarding publications are being prepared with Singaporean, Japanese and Chinese co-authors of appropriate specialisation. The stay at the RMBR was kindly co-financed by a per diem fund of this institution.

Scientific works at the IRIE and the Museum of Zoology Dresden, Germany focused on aquatic beetles where a revision on the genus *Ancyronyx* (spider water beetles) was made. During the biodiversity workshop in Palawan (see below), large parts of the collection of aquatic bugs (Heteroptera) were identified.

Two papers including data collected during this project have been published recently. They include identification keys enabling forthcoming applied studies:

FREITAG, H. & JÄCH, M. A. 2007: The genus *Ancyronyx* Erichson, 1847 (Coleoptera, Elmidae) in Palawan and Busuanga, (Philippines) with descriptions of six new species. *Zootaxa* 1590: 37–59. [<http://www.mapress.com/zootaxa/2007f/z01590p059f.pdf>]

FREITAG, H. & JÄCH, M. A. 2007: Revision of the species of *Hydraena* Kugelann (Coleoptera: Hydraenidae) from Palawan and Busuanga, with descriptions of eleven new species, and redescription of *Hydraena* (*Hydraenopsis*) *scabra* d'Orchymont, 1925. *Zootaxa* 1590: 37–59. [<http://www.mapress.com/zootaxa/2007f/z01431p044f.pdf>]



WPU graduates Diverlie Acosta & Jona Miguel check samples of aquatic macroinvertebrates



Dr. Herbert Zettel (Natural History Museum Vienna) demonstrates the identification of Water Bugs



Checking of comparative material at the Raffles Museum of Biodiversity Research in Singapore



Identification of freshwater Decapods

Another paper has been accepted for publication:

BRAASCH, D. & FREITAG, H. 2008: *Palawaneuria*, a new subgenus of *Compsoeuria* and new species of *Compsoeuria* and *Afronurus* (Ephemeroptera: Heptageniidae) from Palawan, Philippines. (in press: Deutsche Entomologische Zeitschrift)

More scientific results obtained during the project will be published in the near future. This will finally allow the identification of priority zones for the conservation of biodiversity at the Lake Manguao Catchment. These data are not presented here.

Workshop on Biodiversity

The establishment and the training of an indigenous community of natural scientists and conservationists is essential for a sustainable success of conservational efforts.

A course on Philippine "Freshwater Invertebrates: Their Taxonomy, Diversity and Ecology" was held on November 26-29, 2007 at the WPU.

Dr. Herbert Zettel from the IRIE, expert on Philippine Heteroptera, kindly offered his expertise to facilitate this workshop. All students of the Aquatic Biology Bachelor Course of the WPU College of Fisheries and Aquatic Science participated in the entire workshop. Other classes, teachers and interested individuals joined the general introduction to the Philippine aquatic biodiversity.

The following lessons and practical trainings were given during the workshop:

- ⌘ "Introduction to the tropical Asian freshwater macroinvertebrates" (Dr. Hendrik Freitag,)
- ⌘ "Sampling design and collection methods for the study of freshwater macroinvertebrates" (Dr. Hendrik Freitag)
- ⌘ Field excursion (Fidel Bandanillo, Curator of the Entomological Collection, USC; Dr. Herbert Zettel; Dr. Hendrik Freitag)
- ⌘ "Introduction to the water bugs of the Philippines" (Dr. Herbert Zettel) "Nepomorpha (True Water Bugs) of the Philippines" (Dr. Herbert Zettel) "Gerromorpha (Water Striders) of the Philippines" (Dr. Herbert Zettel)
- ⌘ "Introduction to the Water Beetles of the Philippines" (Dr. Hendrik Freitag)

The project results obtained so far already document the outstanding proportion of endemic taxa in Palawan:

| | Species Philippines | Species Palawan | Palawan Endemics | New species |
|----------------------|------------------------|--------------------|---------------------|----------------|
| Coleoptera | | | | |
| Elmidae | | | | |
| <i>Ancyronyx</i> | 15 ¹ | 6 | 6 | 6 |
| Hydraenidae | | | | |
| <i>Hydraena</i> | 16 ² | 15 | 13 | 14 |
| Psephenidae | 15 | 7 | 4 | 3 |
| Ephemeroptera | | | | |
| Heptageniidae | 14 | 4 | 4 | 4 ³ |
| Decapoda | | | | |
| Parathelphusidae | 10 | 9 | 9 | 2 |
| Atyidae | 23 | 13 | 2 | 1 ³ |

¹ partly with undescribed, but clearly distinguishable species

² very incomplete as fauna very insufficiently recorded

³ recently under description



Students of aquatic science during a workshop lesson



The handouts provided are a helpful teaching material

The seminar topics were illustrated by practical examples and allowed an active contribution of the participants. An identical workshop planned to be held at the University of San Carlos (USC), Cebu was unfortunately cancelled by the faculty due to an overlap with important field projects.

Volunteers

Two volunteers (Niels Hagge, student at the University of Hamburg; Jojo Orcullo, non-professional environmentalist, Puerto Princesa) joined the project to receive a practical training on conservation for the entire period October 01-20, 2007. The volunteers joined the regular schedule, which included field sampling and "rainforestation" activities. Additional excursions to the WWF Irawadi-Dolphin-Conservation Project (Malampaya Sound, Taytay), the Philippine Cockatoo Conservation Project of the KATALA Foundation (Rasa Island, Narra) and an ornithological excursion at Lake Manguao were included in the schedule.

Outlook

The "rainforestation" activities will be continued as high-value hardwoods presently reared in the nursery shall later be planted under pioneer trees set during previous activities. More species of indigenous fruit trees should be included.

As the dipterocarp abundance was found to be significantly decreased in the remaining forest around Sitio Danao, it appears advisable to enrich them by selective reforestation. The WPU applied for a grant of the Philippine Tropical Forest Conservation Foundation (PTFCF) to continue the "rainforestation" efforts and to implement the concept on a larger scale in the area. The expansion of the "rainforestation" activities to other municipalities is taken into consideration.

As a result of the biodiversity workshop some students of the Aquatic Biology Course plan to focus on macroinvertebrates as indicator organisms in their Bachelor thesis. This offers further opportunities for cooperations with AQUA *palawana*.

The taxonomic works and inventories on the Palawan freshwater macroinvertebrates will be continued. After a sufficient part of systematic groups collected at the Manguao Catchment has been identified, potential priority zones for conservation will be distinguished.



Joie Matillano receives his certificate of appreciation



The volunteers Jojo Orcullo and Niels Hagge



More efforts are needed for a lasting conservation and a sustainable use of the Lake Manguao Catchment



A huge "mother-tree" at Maranlatan Forest

Acknowledgements

First of all, thanks to the Rufford Maurice Laing Foundation for providing AQUA_{palawana} with a Rufford Small Grant that made this project possible.

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The project manager wishes to express his deep gratitude to the International Research Institute of Entomology (IRIE) at the NMW, the Raffles Museum of Biodiversity Research at the National University of Singapore, and the Zoological Museum (Museum für Tierkunde) Dresden, which provided excellent working facilities and copious collections of comparative material. Sincere thanks to Dr. Herbert Zettel (IRIE) for his excellent support during the Biodiversity Workshop and Dr. Manfred A. Jäch, Dr. Peter K.L. Ng, Dr. Yixiong Cai, Dr. Darren C. J. Yeo, Dr. Tohru Naruse for professional advice. Curator Hironori Komatsu kindly provided access to specimens of the National Museum of Nature and Science Tokyo by means of a loan of comparative material.

Thanks are to Siegfred H. Diaz (KATALA Foundation) who facilitated the rainforestation workshop and its preparation very professionally, just like Roldan D. Kuan did by formal communication with political officials.

Many thanks also to the Taytay Municipal Government and authorities, especially Administrator Sermeno, for providing facilities to support the Rainforestation Workshop. The use of the provisional Manguao field station was kindly made possible by the municipal representative in the area, Mr. Chito Edep.

Field sampling in Palawan was made possible by a gratuitous permit of the Palawan Council for Sustainable Development Staff (PCSDS). The underlying permission was obtained by resolutions of the local government units of the Municipality of Taytay; the City of Puerto Princesa; Barangays Poblacion (Taytay) and Napsan (Puerto Princesa) and the consent of the local community of Sitio Danao (Poblacion, Taytay), the indigenous people community of Napsan (Puerto Princesa) and the private land owner Dr. Nestor A. Reyes (Poblacion, Taytay).

