Aquatic ecology and biodiversity around Khao Pra Wiharn National Park, Thailand

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Abstracts

The area 4.6 km^2 in the Pra Wiharn National Park is the area along the border line between Thailand and Cambodia. This area is still maintaining the problem in overlaps claming between this two countries.

If the Pra Wiharn Temple, in which is locating in the area 4.6 km^2, was nominated as the world heritage site then the area 4.6 km^2 will be basically sensitively in the ecology system.

The ecology system of Sra Trao pond ,in which only one water source above the Pa Mo I Daeng Cliff and the other running water sources, on the open area near the Temple, as the temporary pools should be studied and collected data for planning as the sustainable ecological area.

Key Words: Pra Wiharn Temple/ Management Zone/ Aquatic Ecosystem/ Phyto Plankton/ Zoo Plankton

1. Introduction

1.1 Background of Khao Pra Wiharn National Park

Khao Pra Wiharn National Park is located in zone 48 N, at UTM 464422 E – 499252 E (Latitude 14 Degree 22 Lipda 44 Philipda and 14 Degree 28 Lipda 5 Philipda North) and 1589558 N – 1599393 N (Lontitude 104 Degree 40 Lipda 12Philipda and 104 Degree 59 Lipda 3 Philipda East). That UTM refer to base WGS 84 .It covers 130 km^2 of area as shown in Figure 1.

Tambon Sao Thong Chai and Tumbon Phu Pha Mok subdistrict in Kantharalak district, Srisaket province. It covers 59 km^2

Tambon Song in Nam Yeun district, Ubon Ratchathani province. It covers 36 km^2

Tambon Kok Sa-ard in Nam Khun district, Ubon Ratchathani province. It covers 35 km^2 The part is connected to:

North Cultivation area
South Cambodia
East Yod Dome Wildlife Sanctuary
West Phanom Dong Rak Wildlife Sanctuary

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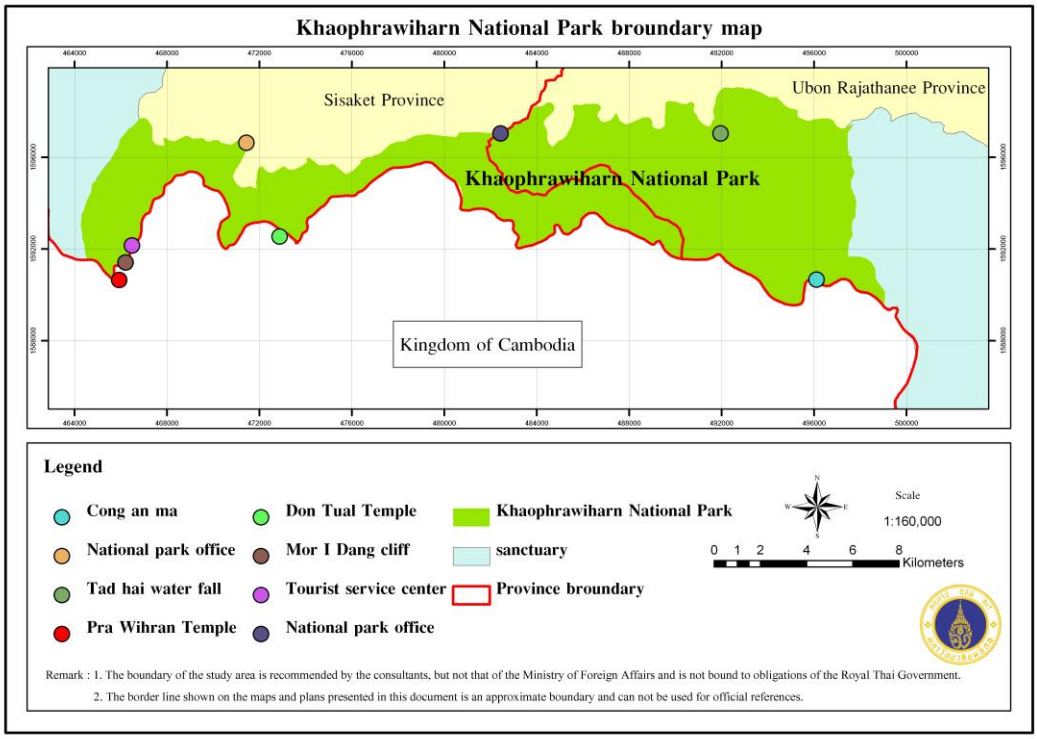

Figure 1: Khao Pra Wiharn Naitonal Park Boundary Map

1.2 Prawiharn Temple and it setting

Pra Wiharn Temple was built in King Suryavarman I - King Suryavarman II (B.E. 1569-1665) approximately for present to Lord Shiva. The temple is located on the top of Sand Stone of Phanom Dong Rak Mountain Range which is border line between the Kingdom of Thailand and the Kingdom of Cambodia. The Pra Wiharn Temple's characteristic is outstanding of Architecture with Bapuan style which is the style of art in 15^{th}-17^{th} Buddhist Era. Area at the north direction of temple is corridor connecting to Khao Pra Wiharn National Park of Thailand . The mountain is sand stone and they are presumed that is the key construction material source for Pra Wiharn Temple construction.

Cambodia has proposed Pra Wiharn Temple being a World Heritage Site and created management plans including the area around the temple 4.6 km^2 with ignorance Thailand protestation. This 4.6 km^2 was also claimed by Thailand in which they are Thailand territory, while Cambodia has claimed that land belong to them according to the map 1:200,000 in B.E 2505 judged by the International World Court (This area keeps confliction between this two counties until now) .According to the world heritage criteria, the area around the Temple was classified into three zones as following:

1) The Core Zone
2) The Development Zone and
3) The Buffer Zone

(figure 2 the zoning map for the area management)

1.3 Detail classification

1.3.1 The Core Zone

The Core Zone means the area close to the Pra Wiharn Temple. It is the conservation Zone located in Khao Pra Wiharn National Park (Soa Thong chai Sub-district, Kantharalak District, Sisaket Province) . Some places are rock outcrops while some are covered by shrub forest and some are dry-evergreen forest. .

It was determined that they are the area covered 4.6 km^2. around the Temple.

The important conservative zone is archeological sites and settling. They boundaries are determined in accordance with the Fine Art Department notice on registration of archeological site list at the top of Pra Wiharn mountain. Moreover, Thailand has plan for nomination of Pra Wiharn Temple settling and components located in Thailand side to be world cultural heritage in future. Therefore, an area that is connected to Pra Wiharn Temple becomes Core Zone. While Khao Pra Wiharn National Park has to settle measures for each archeological site protection complying with Ancient Monuments, Antiques & National Museums Act B.E.2477 and the Fine Art Department Regulation on Archeological Site Conservation B.E.2528.

1.3.2 The Development Zone

The development Zone means the area closed to the Core Zone and mostly used to support the Core Zone. The policy on land use in this area is to support tourism activities together with temporary resident area of local people who come to service tourism activities. The building pattern must be controlled and the Infrastructures and public utilities location are specified.

An area of Phumisarol village, Non Sawang pattana village, and other village surrounding Pra Wiharn Temple within 10 Kilometer are outside of conservation zone

1.3.3 The Buffer Zone

The Buffer Zone or the Conservation zone means the area covered by the watershed that may be impacted if the Temple is being nominated as the World Heritage Site. This watershed names Huai Takob (figure 2), is 30 km^2 approximately. It is closed to Phumisarol Village

The Buffer Zone or the conservation Zone has to plan for prevention problems might be occurred. The total area of 30 km^2 is classified to be Buffer Zone which is the same area as Conservation forest of Khao Pra Wiharn National Park. This area is an important conservation zone. At present, Khao Pra Wiharn National Park has a good conservation plan, such as establishment of forest ranger, performing reconnaissance, and forest invasion protection etc.

1.4 The Study Area

The study area is the 4.6 km^2 around the Temple. The water ecology of Sra Trao pond and the temporary water source on the rock outcrop will be described. This 4.6 km^2 is mostly near the Core Zone, they are in the Development Zone.(Figure 2)

1.5 Objective of the study

To study and describe some characteristics and aquatic diversities of the ecology in the water source on the setting area around the Pra Wiharn Temple.

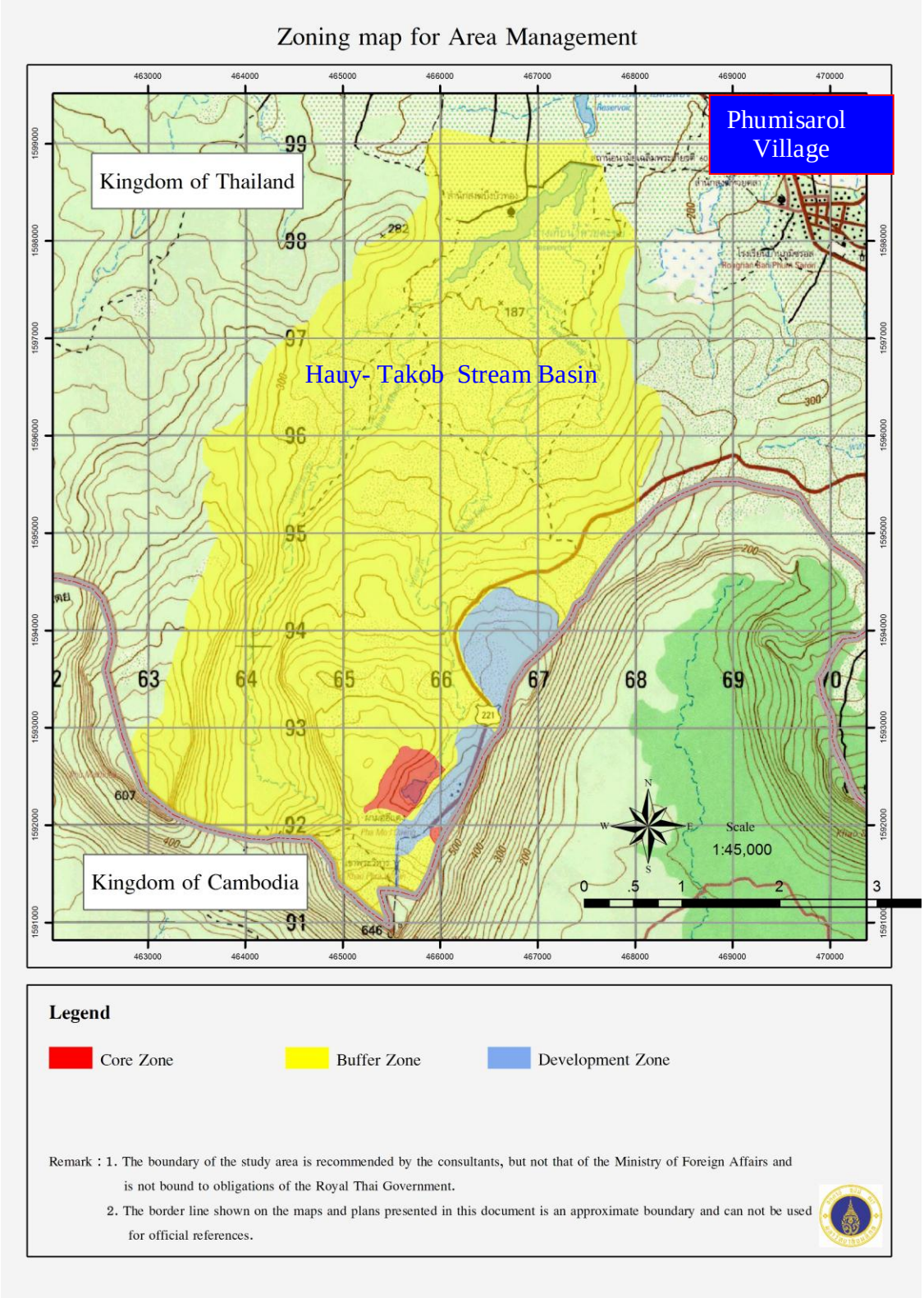

Figure 2: . Huay- Takob Stream along the Border line and Pra Wiharn Zoning Management

1.5 Data Information

The environmental data were collected from the study area in order to provide information that will be applied to preparing environmental management plans of the Settling Boundaries of the Pra Wiharn Temple. The Information were obtained by reviewing reports and some from field study as following;.

1) Master Plan of Khao Pra Wiharn National Park (B.E.2548) ,Department of Nation Parks ,Wildlife and plant Conservation , Ministry of Natural Resources and Environment

2) Field surveying for primary data

2. Aquatic Ecosystem

In order to describe some aquatic ecosystem in the study area , one sample point of Hauy Takob stream basin ,which lies along the border of the Kingdom of Thailand and Cambodia, steep, mountainous and hilly , is superscripted to be studied as the co-example investigation.

While two sample points of the aquatic ecosystem in the water source area around the Temple, in Sra Trao pond and in temporary water source during May 2008, are collected. Phytoplankton and zooplankton samples are qualitatively collected with 20 and 60 µm mesh net and then preserved in 2 and 5% formalin, respectively.

Some ecology of the study area could be described as following:

2.1 Huai Takhob aquatic ecosystem

2.1.1 Aquatic plants

Only grass-like plants can be found at the edge of the pond.

2.1.2 Plankton

Sixty-two species of phytoplankton were found. It is found that Phytoplankton, the division of Chlorophyta, *Cosmarium spp*. and the division of Chrysophyta, *Dinobryon sp*. Were the dominant species (Table 4). While zooplankton, 36 species were found and no obviously dominant species was presented (Table 5). To find phytoplankton *Cosmarium sp.* and *Dinobryon sp.* as dominant species means that water quality in Huai Ta Khob can be evaluated as fair to good (Yuwadee, 2005). They state of having no dominant species of zooplankton might have been caused by the high flow rate of water and the sparse presence of aquatic plants. The flow affects plankton and usually flushes it away**.**

2.2 Sra Trao Pond Aquatic Ecosystem

Sra Trao is the only water source in the Core Zone area. In summer or dry season, water is little or dried up. There is a waterfall nearby called “Nam Tok Khun Sri”, receiving water from Huai Ta Ni Creek and Huai Ta Maria Creek from Peay Ta Di ridge. Eventually water flows into Sra Trao pond. This becomes the sole water source of the area, covering 30-50 Rais depending on water volume. The depth of Sra Trao is 1.5-2 meter. It contains 60,000-90,000 cu.m. of water for different activities in Mor E Daeng Cliff area (The core Zone).

2.2.1 Aquatic plants

Half of the surface area of Sra Trao reservoir is covered by plants, the plants found both at the edge and at the middle of the pond. Most of them were Water Lilies, green algae, grass, and weeds. Over-population of plants has caused a lack of sunlight and has reduced the photosynthesis of phytoplankton. Water circulation is also limited. Dead plants have caused water quality to degrade and the water has become shallow, leading to degradation of the ecosystem.

2.2.2 Plankton

Fifty-three species of phytoplankton were found in Sra Trao reservoir as follows: the division of Cyanophyta, *Chroococcidiopsis sp,* the division of Chlorophyta, *Spirogyra sp., Cosmarium contractum, Micrasterias alata* and *Gonatozygon sp*.; and the division of Bacillariophyta; *Encyonema sp., Frustula sp.* and *Nitzschia sp*. were the abundant species (Table 2). Zooplankton, 38 species were found: *Epheroporus barroisi* (Cladocera) and *Lecane bulla* (Rotifer) are the abundant species (Table 3).

Finding phytoplankton called *Spirogyra sp*. and *Cosmarium sp.* as the abundant species meant that the water quality in Sra Trao is evaluated as fair to good (Yuwadee, 2005).

Finding zooplankton called *Epheroporus barroisi* as abundant species meant that the density of plants is quite high, because Cladocera prefers to attach to aquatic plants. When there are more plants, there are more habitats, food sources, and hiding places. Moreover, the larvae of the commonly found prawn *Macrobrachium lanchesteri* were found in Sra Trao, and increasing more at their full grown stage at the spillway. This kind of prawn cannot live in poor water quality conditions, therefore the water quality in Sra Trao was suitable for aquatic animals. The abundance of the prawn relates to the availability of zooplankton and organic matter.

However, to find phytoplankton *Nitzschia sp*. and zooplankton *Lecane bulla* as the dominant species and second population respectively meant that some parts of the pond were becoming degraded. It is possible that the high density of aquatic plants blocked water circulation within the pond, or dead plants accumulated in some place such that the area became high in organic matter.

Normally, high organic matter water bodies, we can find few types of plankton, but each type is high number. In Sra Trao we found 53 phytoplankton species in 4 divisions and 27 families, and we found 38 zooplankton species including protozoa, rotifer, cladocera, copepod, ostacod, and decapod. This reflects some degree of plankton biodiversity.

Phytoplankton and zooplankton play subtantial roles in the lower levels of the food chain. They are food for small animals. Zooplankton links the chain and transfers energy to the upper level through feeding because higher animals feed on phytoplankton. The diversity of aquatic animals and plankton in Sra Trao indicates a high diversity of aquatic animals at the higher levels of the food chain.

Figure 3: Sra Trao water pond and sampling point

2.2.3 Temporary Water Source Ecosystems

In the area adjacent to the temple, most temporary water sources are puddles on the rocky ground surface, caused by run-off, and they are scattered extensively. Some small rivulets can be seen. These water sources accommodate tiny ecosystems and are important as the spawning grounds for amphibians such as frogs.

The water source used as the sampling site (Figure 4) is a shallow pit in the quarry, measuring 1x2x0.5 meters near the National Park office building and the meeting hall of Mor E Daeng Cliff. The water depth is 30-40 cm. There is water flowing in and out all the time during rainy season . However ,this system were incident during the flood in rainy season.

Figure 4: Temporary water sampling point

1) Aquatic Plants

Mostly reeds

2) Plankton

At the temporary pool, 8 species of phytoplankton were found. There are the division of Chlorophyta, *Spirogyra* sp., and *Dictyosphaerium tetrachotomum*. as the abundant species. There are 10 species of zooplankton . There are *Lecane curvicornis*, a kind of Rotifer, and *Ilyocryptus spinifer*, a Cladocera, as the abundant species.

3) Conclusion

The presence of phytoplankton *Spirogyra* sp. and *Dictyosphaerium tetraomum* as the dominant species indicates that the water quality in Sra Trao pond is in moderate to good condition . The presence of zooplankton *Lecane curvicornis* and *Ilyocryptus spinife* as the abundant species indicates that the density of aquatic plants in Sra Trao pond is high. This due to the water source is small so sunlight can able to penetrate through water , while that water is flowing and not stagnant of poor quality. (Yuwadee, 2005) . The ecosystem in the temporary water pool is rather abundant.

3. Acknowledgement

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Appendix

Table 1: Phytoplankton in Sra Trao Pond
Abudance: A = abundant, C = common, R = rare

Division	Family	Taxa	Abundance
Cyanophyta	Chroococcaceae	*Aphanocapsa* sp.	C
		Aphanothece sp.	C
		*Chroococcus s*p.	C
		Microcystis sp.	C
	Coelastraceae	*Coelastrum microporum*	C
	Merismopediaceae	*Merismopedia punctata*	C
	Microcystaceae	*Merismopedia punctata*	C
	Nostocaceae	*Anabaena* sp.	C
	Oscillatoriaceae	*Lyngbya* sp.	C
		Oscillatoria sp.	C
		Planktolyngbya sp.	C
		Raphidiopsis sp.	C
	Psuedanabaenaceae	*Psuedanabaena* sp.	C
	Rivulariaceae	*Calothrix* sp.	R
		Anacystis sp.	C
		Gloeocapsa sp.	C
	Synchococcaceae	*Cyanobacterium* sp.	R
	Xenococcaceae	*Chroococcidiopsis* sp.	A
Chlorophyta	Chlamydomonadaceae	*Chlamydomonas* sp.	C
	Volvocaceae	*Volvox tertius* sp.	C
		Eudorina sp.	C
	Chlorococcaceae	*Tretaedron* sp.	C
	Palmelaceae	*Sphaerocystis* sp.	C
	Oocystacea	*Ankistodesmus falcatus*	C
		A. spiralis	C
		Chlorella sp.	C
		Golenkinia sp.	C
		Kirchneriella lunaris	C
		Monaraphidium contortum	C
		M. tortile	C
		Oocytis sp.	C
			C
Chlorophyta(ต่อ)	Dictyosphaeriaceae	*Dictyosphaerium* sp.	C
	Scenedesmaceae	*Crucigeniella crucifera*	C
		Crucigeniella sp.	C
		Scenedesmus sp.	C
	Hydrodictyaceae	*Pediastrum obtusum*	C
		P. simplex	C
	Microsporaceae	*Microspora* sp.	C
	Oedogoniaceae	*Oedogonium* sp.	C
	Zygnemataceae	*Mougeotia* sp.	C
		Sirogonium sp.	C
		Spirogyra sp.	A
		Zygnema sp.	C
	Elakatothricaceae	*Elakatothrix* sp.	C
	Mesotaeniaceae	*Cylindrocystis* sp.	R
	Desmidiaceae	*Closterium* sp.1	C
		Closterium sp.2	C
		Cosmarium contractum	A
		C. lundellii	C
		C. obsoletum	C
		C. magnificum	C
		Cosmocladium contrictum	C
		Euastrum turneri	C

		E. turgidum	C
		Euastrum sp.	C
		Gonatozygon sp.	A
		Hyalotheca sp.	C
Chlorophyta (ต่อ)	Desmidiaceae	*Micrasterias alata*	A
		M. folicea	C
		M. lux	A
		M. mahabuleshwarensis	C
		M. pinnatitida	C
		Micrasterias sp.	C
		Pleurotaenium sp.1	C
		Pleurotaenium sp.2	C
		Spondylosium nitens	R
		S. planum	R
		Staurastrum sexangulare	C
		Xanthidium antilopaeum	C
		Xanthidium sp.	C
Euglenophyta	Euglenaceae	*Phacus pleuronectes*	C
		Trachelomonas hispoida	C
		T. volvocina	C
Bacillariophyta	Coscinodiscaceae	*Anomoeneis* sp.	C
		Cyclotella sp.	C
	Cymbellaceae	*Encyonema* sp.	A
	Epithemiaceae	*Epithemia* sp.	C
	Fragilariaceae	*Fragilaria* sp.	C
		Synedra sp.	C
	Gomphonemaceae	*Gomphonema* sp.1	C
		Gomphonema sp.2	C
	Nitzschiaceae	*Nitzschia* sp.	A
	Naviculaceae	*Frustula* sp.	A
		Navicula sp.	C
		Cymbella sp.	C

Table 2: Zooplankton in Sra Trao Pond
Abudance: A = abundant, C = common, R = rare

Group	Family	Taxa	Abundance
Protozoa		*Arcella* sp.	C
		Centropyxis aculeata	C
Rotifer	Asplanchnidae	*Asplanchna sieboldi*	C
	Brachionidae	*Platyias quadricornis*	C
	Euchanidae	*Dipleuchanis propatala*	C
	Epiphanidae	*Epiphanes clavatula*	R
	Lecanidae	*Lecane bulla*	C
		L. curvicornis	C
		L. papuana	C
		L. quadridentata	R
		L. unguitala	R
		Lecane sp.1	R
		Lecane sp.2	R
	Mytilinidae	*Mytilina macrocerca*	R
		Mytilina sp.	R
	Notommatidae	*Monomata* sp.	R
	Scaridiidae	*Scaridium longicaudum*	C
	Synchaetidae	*Polyarthra vulgaris*	C
	Testudinellidae	*Testunella patina*	C
	Trichocercidae	*Trichocerca* sp.1	R
		Trichocerca sp.2	R
	Unidentified species	Species 1	C
	(Bdelloid group)	Species 2	C

Group	Family	Taxa	Abundance
		Species 3	C
Cladocera	Bosminidae	*Bosmina longirostis*	C
		Bosminopsis deitersi	C
	Chydoridae	*Alona monacantha*	C
		Epheroporus barroisi	A
		Kuzia longirostis	A
	Daphnidae	*Ceriodaphnia cornuta*	C
	Macrothricidae	*Macrotyrix triceralis*	R
	Ilyocryptidae	*Ilyocryptus spinifer*	R
	Sisidae	*Diaphanosoma sarsi*	C
Copepod	Order Calanoida	*Neodiaptomus laii*	C
	Order Cyclopoida	Species1	C
		Species2	C
Ostracod		Species 1	C
		Species 2	C
Decapod		*Macrobrachium lanchesteri*	C
		Caridina sp.	R

Table 3: Phytoplankton in Huai Ta Khob Creek
Abudance: A = abundant, C = common, R = rare

Division	Family	Taxa	Abundance
Cyanophyta	Chroococcaceae	*Chroococidiopsis* sp.	C
	Oscillatoriaceae	*Lyngbya* sp.	C
		Oscillatoria sp.	C
	Mastigocladaceae	*Mastigocladus* sp.	C
	Microcystaceae	*Merismopedia punctata*	C
	Psuedanabaenaceae	*Psuedanabaena* sp.	C
	Rivulariaceae	*Calothrix* sp.	R
		Scytonema sp.	C
	Synchococcaceae	*Cyanobacterium* sp.	R
Chlorophyta	Chlamydomonadaceae	*Chlamydomonas* sp.	C
	Volvocaceae	*Eudorina* sp.	C
		Pandorina sp.	C
	Palmelaceae	*Sphaerocystis* sp.	C
	Oocystaceae	*Ankistodesmus falcatus*	C
		Chlorella sp.	C
		Golenkinia sp.	C
		Kirchneriella lunaris	C
		Lagerheimia sp.	C
	Dictyosphaeriaceae	*Dictyosphaerium* sp.	C
	Scenedesmaceae	*Actinostrum* sp.	C
		Crucigeniella sp.	C
		Scenedesmus sp.1	C
		Scenedesmus sp.2	C
		Scenedesmus sp.3	C
	Ulothrichaceae	*Ulothrix* sp.	C
	Oedogoniaceae	*Oedogonium* sp.	C
	Zygnemataceae	*Mougeotia* sp.	C
		Spirogyra sp.	C
		Zygnema sp.	C
	Desmidiaceae	*Centritractus belonophorus*	C
		Closterium sp.1	A
		Closterium sp.2	A
		Cosmarium contractum	A

Division	Family	Taxa	Abundance
Chlorophyta		*C. moniliforme*	C
(ต่อ)		*C. magnificum*	C
		Euastrum turneri	C
		Gonatozygon sp.	C
		Hyalotheca sp.	C
	Desmidiaceae	*Micrasterias mahabuleshwarensis*	C
		Spondylosium nitens	C
		S. planum	C
		Staurastrum freemanii	C
		S. tohopekaligense	C
		Staurastrum sp.	C
		Xanthidium superbum	C
Euglenophyta	Euglenaceae	*Phacus tortus*	C
		Trachelomonas hispoida	C
		T. volvocina	C
Chrysophyta	Dinobryaceae	*Dinobryon* sp.	A
	Eunotiaceae	*Eunotia* sp.	C
Bacillariophyta	Coscinodiscaceae	*Cyclotella* sp.	C
	Cymbellaceae	*Encyonema* sp.	C
	Fragilariaceae	*Fragilaria* sp.	C
		Synedra sp.	C
	Gomphonemaceae	*Gomphonema* sp.1	C
	Melosiraceae	*Aulacoseira* sp.	C
	Nitzschiaceae	*Nitzschia* sp.	C
	Naviculaceae	*Amphora* sp.	C
		Frustulia sp.	C
		Navicula sp.	C
		Cymbella sp.	C
	Surirellaceae	*Cymatopleura elliptica*	C

Table 4: Zooplankton in Huai Ta Khob Creek
Abudance: A = abundant, C = common, R = rare

Group	Family	Taxa	Abundance
Protozoa		*Arcella* sp.	C
		Centropyxis sp.	C
		Difflugia sp.	C
		Vorticella sp.	C
Rotifer	Asplanchnidae	*Asplanchna herrickii*	C
	Brachionidae	*Platyias quadricornis*	C
	Gastropodidae	*Ascomorpha* sp.	R
		Gastropus sp.	R
	Filiniidae	*Filinia opoliensis*	C
		F. terminalis	R
	Hexarthridae	*Hexarthra mira*	C
	Lecanidae	*Lecane bulla*	C
		L. curvicornis	C
		L. closterocerca	R
		L. luna	C
	Mytilinidae	*Mytilina* sp.	R
	Scaridiidae	*Scaridium longicaudum*	R
	Testudinellidae	*Testunella* sp.	R
	Trichocercidae	*Trichocerca* sp.1	C
	Unidentified species	Species 1	C
	(Bdelloid group)	Species 2	C
Cladocera	Bosminidae	*Bosminopsis deitersi*	C
	Chydoridae	*Alona monacantha*	C
		A. cf. *sarasinosum*	A
		Epheroporus barroisi	A

Group	Family	Taxa	Abundance
		Kuzia longirostis	C
	Daphnidae	*Ceriodaphnia cornuta*	C
		Simocephalus serrulatus	C
	Macrothricidae	*Macrotyrix triceralis*	R
		M. spinosa	R
	Moinide	*Moina micrura*	C
	Ilyocryptidae	*Ilyocryptus spinifer*	R
	Sisidae	*Diaphanosoma sarsi*	C
		Psuedosida bidentata	C
Copepod	Order Cyclopoida	Species1	C
		Species2	C
Ostracod		Species 1	C
		Species 2	C
Decapod		*Macrobrachium lanchesteri*	C
		Caridina sp.	R

Table 5: Phytoplankton in temporary pool at Rock Yard
Abudance: A = abundant, C = common, R = rare

Division	Family	Taxa	Abundance
Cyanophyta	Chroococcaceae	*Chroococcus* sp.	C
		Microcystis sp.	C
	Oscillatoriaceae	*Planktolyngbya sp.*	C
	Scytonemaceae	*Scytonema* sp.	C
Chlorophyta	Volvocaceae	*Volvox tertius* sp.	C
	Oocystacea	*Chlorella* sp.	C
	Dictyosphaeriaceae	*Dictyosphaerium* sp.	C
	Scenedesmaceae	*Scenedesmus* sp.	C
	Zygnemataceae	*Spirogyra* sp.	C
	Elakatothricaceae	*Elakatothrix* sp.	C
	Mesotaeniaceae	*Cylindrocystis* sp.	C
	Desmidiaceae	*Euastrum* sp.	C
		Micrasterias sp.	C
		Staurastrum sp.	C
		Xanthidium sp.	C
	Unidentified species	Species 1	C
		Species 2	R
Bacillariophyta	Naviculaceae	*Frustula* sp.	C
		Navicula sp.	C
	Nitzschiaceae	*Nitzschia* sp.	C

Table 6: Zooplankton in temporary pool at Rock Yard
Abudance: A = abundant, C = common, R = rare

Group	Family	Taxa	Abundance
Rotifer	Lecanidae	*Lecane curvicornis*	A
	Notommatidae	*Monomata* sp.	R
	Trichocercidae	*Trichocerca* sp.	C
		Euchanis sp.	R
Cladocera	Chydoridae	*Alona verculosa*	C
		Kalualona cf. karua	C
	Ilyocryptidae	*Ilyocryptus spinifer*	A
Copepod		Cyclopoid copepod	C
Ostracod		Species 1	C
		Species 2	C