

Bio-Diversity Management in Local Wisdom of Watershed and Coastal Zone of Pattani, Thailand

Vichit Rangpan

Faculty of Sciences Technology and Agriculture, Yala Rajabhat University 95000 Yala Province, Thailand
E-mail: vichit39@gmail.com

ABSTRACT:

Bio-diversity management in local wisdom of watershed and coastal zone of Pattani, Thailand was investigated by a collaboration of people residing in the study areas. The study was aimed to study the natural diversity of the watershed and coastal Pattani, to study the biodiversity of the Pattani watershed and the coastal, to study the diversity of the watershed and the Pattani coastal, to remove the good knowledge already from one local to fill another inferior locality in the watershed and coastal Pattani, to study how to manage biodiversity commemorate the domestic biological resources, to promote people appreciation in biological value and sustainable use, as well as to build awareness on the biological conservation among all stakeholders. Both quantitative and qualitative analysis and participatory action were employed in the study. The sampling methodology was assigned for 36 areas representing 7 different ecosystems. The study revealed that species of living organisms found in the upper, lower of watershed and the coastal zone of Pattani regions were ; 170 : 119 : 130 for vascular plants, 53 : 65 : 115 for fish, 85 : 90 : 50 for mushrooms, 38 : 55 : 85 for algae, 25 : 10 : 43 for wild life and 15 : 10 : 40 for birds; respectively. Eight approaches were suggested for the conservation of their biological resources, sustainable uses, storing and entrapping, repairmen, reconstruction, development, protection, reservation and zoning. And the local wisdom of the plant, food and drug administration knowledge promotion understanding local curriculum on biodiversity management among local wisdom of the watershed and the coastal of Pattani. The performance criteria E1 / E2 were 80/80 and the study of how to manage biodiversity in Pattani and coastal zone to lead the way. To disseminate the knowledge, subjective educations including the basic learning, context searching, pollutant reducing, co-planning, reserving and promoting sustainable development were implemented to the area

Keywords : Conservation, Biological Resources, Watershed, Coastal Zone, Pattani

INTRODUCTION

Biological resources can generally be divided into three levels, of which the genetic biological is a creature's variety in genetic component and turns out to be genetically different either within a single species or between different species. These are the difference which appear to be used in determining the geographical proximity of creature in the evolution of life. Secondly, is species diversity, which measured by the number of each species and population of those species. In this context, the age and sex structure of the population is also considered. Thirdly is ecological biological, within the each system is a source of ecological habitats of the particular creature type with reference to physical and biological factors that are appropriate to each species living in the system. Biological resources is the identity of our world. It helps to maintain the world atmosphere, soil, water and climate last longer as possible. So, it can be said that biological resources is the foundation of life of all livings on the Earth (Narong Seesawad 2005); (Vichit, 2015d). On the other hand, biological resources is important to mankind. As humans are part of the bios, they must live together with other livings. With existence of various living species, humans can use biological resources in all aspects and their uses are more than other living species. As for biological resources conservation and application with regard to watershed and coastal

zone of Pattani. It is very

*Corresponding author : vichit39@gmail.com

important because the central basin area in the part locates the elevated earth with forests lining from the north to the south and originated from Sonkalakhiri mountain ridges in the district of Betong Yala province, and flows into the Pattani bay, Pattani province. With its approximate 3727.87 square kilometers (department of water resources, 2015); (Vichit, 2015c) and its approximate 443,810 population (development of enviromental quality, 2004) their uses in various forms of consumption are normally observed, and hence their activities can be sensibly undertaken to conserve and sustain the biological resources forever.

• MATERIALS AND METHODS

As for Scientific research, the followings were steps in detail. Sampling of vegetation in the survey area was conducted by collecting leaves, flowers and their fruits. Collected samples were then subjected to storage using methods of breeding and preservation. Records of all species were also done during this procedure, and their data included the followings.

1) Collection sites included province, district, sub-district, locality and so on so forth 2) collection date in referring with the plant budding season 3) local or folk name from the learned individual(s) in the collecting area 4) forest types like of tropical rain forest, dry evergreen forest, or along the stream, the valley as well as the ridge 5) general characteristics of stems, flower, and fruits 6) name of collector (s) sampling of fixed plankton was conducted by collecting samples at various points throughout the coastal zone of Pattani bay for 12 sites. This was done by placing and soaking 3 pieces of PVC materials with 50 cm in length and 10 cm width for the period of 14-21 days in water at the depth of 50 cm. Fish sampling was conducted using active sampling method by using of nets, and the samples were then analyzed. Sampling of mushrooms was performed by exploring the various mushrooms during their fruiting period, which occurred in 1-2 days after rain. Observation data included collection date, nature of their sites, and mushroom photographs. Once collected, those samples were subjected to be dried or preserved in 5% formalin with spore printing of their spores then performed for the purpose of classification. Sampling of wild mammals and birds used sampling of APHA (1992) with modification based on local wisdom and folk knowledge. Population of animals was counted by the road side while journey for observation made along the roads in the area. By this approach, counts of different types of pets were made possible and better in particular with those of grouses, pheasants, peacocks, civets, mongooses and reptiles. Traces of these animals were also used, and these included use of live sound, nest counting, and dung counts and so on so forth. social science research used qualitative research techniques in combination with techniques of participatory action research. Participators included folks and locals. They were interviewed (In-depth Interview). Meanwhile, the leaders of professional OTOP Officers, communities, chiefs of district executives joined the focus group interview. Such qualitative research techniques were conducted in the main villages in the Watershed and the Coastal Zone of Pattani. Researcher teams chose the particular and specific districts, sub-districts, and villages based on availability of convenient transportation as well as problems and the effects of biological resources application. In preparing the study area to be explored, ensuring its natural conditions and studied network with coastal-ecosystem arrangement was emphasized. Coastal ecosystems located 3-7 kilometers from the coastal were represented by lower region. Study areas with those categories were below. (Upper of Pattani Watershed) 1. Chulabhon Pattana profect 10 as agricultural ecosystems 2. Nakor water fall as forest ecosystem 3. Wan Wisa Water fall as forest ecosystem 4. Intason water fall as forest ecosystem 5. La-Ong Rong

Water fall as forest ecosystem 6. Chalem Phra Krel Water fall as forest ecosystem 7. Chulabhon 7, 9 villages as mountain ecosystems 8. Ban Chantharat, Betong district as mountain ecosystems 9. Peyamit 1,2 villages as forest ecosystems. 10. Santinimit 1,2 village as forest ecosystems 11. KokChang market area and Banglang dam as inland water ecosystems 12.Sakai village as forest ecosystem. (lower of Pattani watershed) 1. Market community Tanto district as a mountain ecosystems 2. Talad kao community, Bannagsta district as agricultural ecosystems. 3. Sa-ek sub-district community as agricultural ecosystems. 4. TalingChan sub-district community as agricultural ecosystems. 5. Krong Pinang district community as agricultural ecosystems. 6. PongKayee village as agricultural ecosystems. 7. Satengnok village community as agricultural ecosystems. 7. Muslim Samphan community as agricultural ecosystems. 8. Yala district as urban ecosystems 9. Mae Lan district as agricultural ecosystems 10. Pattani dam community as inland water ecosystems 11. Community of Tasek sub-district, Pattani as agricultural ecosystems. 12.Pattani municipality as urban ecosystems. (coastal zone of Pattani) 1 .Bangkhaw sub - district as agricultural ecosystems. 2. Bangtava sub- district as coastal ecosystems. 3. Toojung sub- district as coastal ecosystems. 4. .Rusmilae sub- district as urban ecosystems. 5. Sabarang sub - district as urban ecosystems. 6. Bana sub – district as agricultural ecosystems. 7. Lampo sub - district as mangroves ecosystems. 8. Tungung Luloa sub – district as mangroves ecosystems. 9. Mangroves forest areas center. as mangroves ecosystems 10. Bangpoo sub - district as brackish ecosystems. 11 .Yamo sub - district as brackish ecosystems. 12. Taloagapo sub- district as coastal ecosystems.

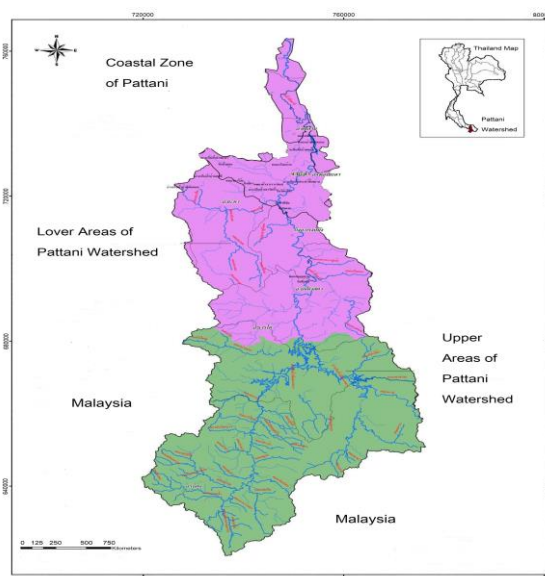


Figure1 : Pattani Watershed, Thailand

Data collecting was conducted on locality and made community network on January 2018 to December 2018. Community networks consist of 36 areas consist of localities were given seminar on the curriculum of physical, and biological data collection. Basic data collection was firstly conducted with discussion, and summarization. It followed by the collection of 2nd, 3rd, and 4th round which conducted by research team who worked on samples along side with leader of peoples in each locality. Summarizing collected data for 2nd, 3rd and 4th round, and enlisting of biological resources, manpower preparation. Community network members were selected by the office of Sub-district administrative organization for each locality. They were given invitation letters, and their representatives then attended our meeting. In such meeting, the understanding of community network was efficiently delivered.

Curriculum training on the preparation of local database was set for the purpose of data collection and later delivers to the community. Recruiting peoples and network coordinator was done by selecting 2 leaders of peoples from locality. These students were assigned to coordinate in samplings, and 2 leaders of peoples for each unit worked on the weekend day. Recruiting men for the main coordinator groups who were ready to work with community networks in the next stages of data collection, by these stages, data collecting was worked by researcher team with community network support. The works in this stage included seminar conduction for all localities, followed by enlisting of the routes for observation and study procedures, which were scientific and social related, preparation of natural classroom. This determined the good localities for setting natural classroom within those particular localities. Natural classroom community condition was determined by considering its safety, transportation facility, and convenience in making an understanding, especially in the context of using Thai and local languages among folk scholars. Constructing the local curriculum included the following works. 1) Seminar on the importance of creating a local curriculum was conducted with participation of 10 lectures of Yala Rajabhat Univerdity. These lectures of Yala Rajabhat Univerdity together with local community network synthesized the curriculum. 2) Creating local curriculum was worked out by our research team with groups of local and regional basic education service staffs as well as people from the locality. They drafted the curriculum and determined the natural classroom in the study area. 3) Enhancement of knowledge and understanding on the importance, application values of natural resources and biological resources in coastal zone of Pattani bay was initiated by defining the scope of works and using various media during the research practices. Such works were made uses of charts/knowledge documents/radio broadcasting/community radio. Activities included the group discussion and interviews folk scholars. After the conducting the enhancement of knowledge and understanding the importance and values of natural resources and biodiversity in coastal zone of Pattani bay through exhibition of the knowledge in the area, the seminar for exchanging knowledge among communities and researchers as well as discussing the utilization of valuable biological resources was followed, and finally the action plan for sustainable uses of biological resource for this defined area was resulted.

• RESULT AND DISCUSSION

Results of the conservation of biological resources in the Pattani watershed and coastal zone of Pattani were as follows.

1. General and ecological conditions of the Pattani watershed and the coastal zone of Pattani. The Pattani watershed and the coastal zone of Pattani were the important areas in the Deep South with geography of high wooded terrain and flat. It was a bed of flood water that lined from north to south and some parts lined in the east. Its south border was the watershed of the SankakaKhiri mountaions in Yala with about 300,000 hectares of forest plantations, mainly rainforest. There was a forest reserves, national parks, wildlife Sanctuaries and 957,014.75 – hectare forest reserves. It was about 25.66% of the region shares by Pattani province and the beaches, and this was characterized by ecological areas along the river plains and the mangrove forest with the coastal area of not less than 37 square kilometers. In coastal ecosystems, it included animal populations that were different from other ecosystems areas. It was the social ecology of wetland plants that were influenced by the dynamics of mangrove ecosystems, i.e. the coastal landscape, climate, tidal waves and currents as well as salinity

			Ut on	Pr ation	S usta inab le use
(Dominant Species of the Plant)					
1	Fagraea Roxb.	fragrans	✓	✓	
2	Drynaria Linn.	quercifolia	✓	✓	
3	Streblus Lour.	asper	✓	✓	
4	Alpinia Swartz.	galangal	✓	✓	
5	Melastoma malabathricum		✓	✓	
6	Piper Roxb.	sarmentosum	✓	✓	
7	Cassia Linn.	alata	✓	✓	
8	Cymbopogon Rendle	nardus	✓	✓	
9	Cycas Griff.	pectinata	✓	✓	
0	Andrographis Well.ex Ness.	paniculata (Burm)	✓	✓	
1	Etlingera R.M.Smith	datior (jack)		✓	✓
1	Murdannia (Hassk.) Rolla Rao et Kammathy.	loriformis	✓	✓	
2	Garcinia Dear	cambogia	✓		✓
3	Diplazium esculentum (Retz) Sw.		✓	✓	✓
4	Musa Linn	Sapientum	✓	✓	✓
5	Nasturtium 6	officinale	✓	✓	✓
6	Borassus 7	flabellifer	✓	✓	✓
7	Dominant species of Mushroom				
1	Podostroma (Pat.)Boedijn	cornudamae		✓	✓
2	Teermitomyces fuliginosus Heim			✓	✓
3	Cookeina (Mont.) Kuntze	tricholoma	✓	✓	

4	Termitomyces microcarps (Berk & Broome) R. Heim	✓	✓
5	Entoloma nitidm Quel.	✓	✓
6	Oudemansiella radicata (Relh:Fr.) Sing		
7	Tricholoma crassum (Berk.) Sacc.	✓	✓
8	Ganoderma lucidum (Leys.ex Fr.) Karst.	✓	✓

water stains, soil and nutrients, etc.

2. Results of the biological study were as below.

Table 1 : The Species of Biological Resources in the Pattani Watershed and Coastal Zone of Pattani

Table 1 : The Species of Biological Resources in the Pattani Watershed and Coastal Zone of Pattani (continuous)

Nu mb ers	Name	Management		
		Uti liza tio n	Pre ser vat ion	Sus tain able use
Dominant species of algae				
1	Chroococcus minutus (Kutzing) Naegeli	✓		
2	Oscillatoria tenuis C.A.Agardh	✓		
3	Achnanthes biporoma (Hohn & Hellermann) Lange - Bertalot	✓		
4	Fragilaria capucina Desmaz	✓		
5	Gomphonema auritum A.Braun	✓		
6	Synedra ulna (Nitzsch) Ehrenberg	✓		
7	Gracilaris fisheri (Xia et Abbott) Abbott, Zhang et Xia		✓	✓
Dominant species of Aquatic Animals				
1	Notopterus notopterus	✓		
2	C l u p e i c h t h y s perakensis	✓		
3	Parachela maculicauda	✓		

4	Parachela siamensis	✓		
5	Parachela oxygastroides	✓		
6	Oxygaster anomalura	✓		
7	Danio tweedei	✓		
8	Esomus metallicus	✓		
9	Polymesoda (Beloina) erosa Solander	✓	✓	✓
10	Pangasiaanodon gigas	✓	✓	✓
	Dominant species of wild life			
1	Nycticebus coucang Boddart	✓	✓	
2	Cervus unicolor Kerr	✓	✓	
3	Muntiacus muntjak	✓	✓	
4	Hulobateslor Linneus	✓	✓	
5	Traqlus javanicus Osbeck	✓	✓	
6	Hylobates pileatusn Gray	✓	✓	
7	Elephas maximus		✓	✓
8	Sus scrofa		✓	✓
9	Athenebrama Temminck		✓	
10	Streptopelia tranquebarica Harmann			
11	Thaumantis klugius lucipor (Westwood)	✓	✓	
12	Euthalia evelina compta (Fruhstorfer)	✓	✓	

Table 1 : The Species of Biological Resources in the Pattani Watershed and Coastal Zone of Pattani (continuous)

N u m b e r s	Name	Management		
		Utilization	Preservation	Sustainable use
1 3	Paduca fasciata (C.&R.Relder)	✓	✓	
1 4	Ancistroides armatus H.Druce	✓	✓	
1 5	Cirrochroa orissa C.&Felder	✓	✓	
1 6	Graphium agetes Westwood	✓	✓	

1	Danaus chrysippus	✓	✓	
7	chrysippus(L.)			
1	Parantica asparia	✓	✓	
8	asparia (Fabricius)			
1	Parantica melaneus	✓	✓	
9	plataniston (Fruhstorfer)			
2	Euploea mulciber	✓	✓	
0	mulciber (Gramer)			
Dominant species of pants and animals in mangrove forest				
1	Rhizophora apiculata	✓	✓	
2	Rhizophora mucronata	✓	✓	
3	Xylocarpus granatum	✓	✓	
4	Xylocarpus moluccensis	✓	✓	
5	Excoecaria agalocha	✓	✓	
6	Bouguera cylindrica	✓	✓	
7	Derris trifoliata	✓	✓	
8	Acrostichum aureum	✓	✓	
9	Nypa frutican	✓	✓	✓
1	Scylla serrata	✓	✓	✓
0				

B1 – 11 Showed the threatened species of threatened species of Biological Resources Noted ; B 6 (Green earth, 2016); B 11 (Office biodiversity, 2016)

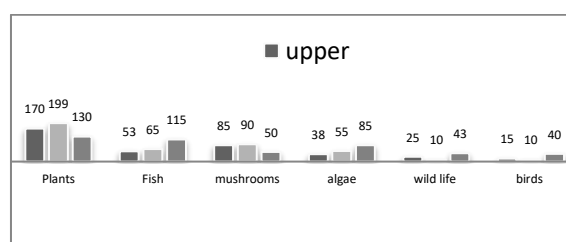


Figure 2 : The number of Biological Resources in this areas

3. Local wisdom for the bio-diversity application in the Pattani watershed and coastal zoad. Local wisdom of folk on the application in routine activities was observed in aquatic animal practices of fresh water genetic resource. It was observed that there was fish catching during September to December by majority of people using fishing hooks like flag dipping in the still water from water sources of pond during limited water. However, they used nets in flood season. Others that had used included harpoon bow, stabber and shooter as well as trap and special net for special fish. Pongpang was used in the fish trap at low tide the water flow. Wildlife utilization was of 4 major types, and those were bird catching using bird cage with a particular cage specialized for Red-whiskered bulbul, which was adapted into breeding and competitive culture. Wild pig capturing was very frequent causing its short supply in the markets. The catch of bees was observed operating in the night to prepared for herbal medicine. Bee catchers used to nail the tree making them ease in climbing. They also recited

verses from the Quran as they believed the action brought them safety in handling bees. Pickled fish processing used Nile Tilapia, and this became popular export product. Plants were usually used as herbs, foods, and for making home such as *Fagraea fragrans* Roxb.), *Hopea ferrea* Laness, Share), and *Intsia palembanica* Miq. Vegetables were used as food for both humans and pets. They were, for instances, dipping sauce, and popular vegetables like star gooseberry (*Sauropus androgynus*), *Stenochlaena palustris* (Burm.), *Colocasia esculenta* (L), *Diplazium esculatum*, *Streptocarpus asper* Lour. for goat feed, *Metroxylon rumphii* Mart. for poultry cow and buffalo feed. Those were used for medicine included *Senna siamea* (Lam.), *Jatropha curcas* L., and *Cassia alata* (L.)

Table 2 : The Method of Bio-Diversity Management in Local Wisdom of watershed and Coastal Zone of Pattani, Thailand

N u m b e r s	Zone	Bio-Diversity Management in Local Wisdom of watershed and Coastal Zone of Pattani, Thailand	
The Upper of Pattani Watershed			
1.	Chulabhon Development Project 10	Protection	
2.	Nakor Water fall	Storing	and entrapping
3.	Wan Wisa Water fall	Storing	and entrapping
4.	Intason Water fall	Storing	and entrapping
5.	La-Ong Rong Water fall	Storing	and entrapping
6.	Chalem Phra Krel Water fall	Storing	and entrapping
7.	Chulabhon 7, 9 villages	Protection	/ Sustionable uses
8.	Ban Chantharat, Betong District	Protection	/ Sustionable uses
9.	Peyamit 1, 2 villages	Protection	/ Sustionable uses
10.	Santinimit 1, 2 village	Protection	/ Reservation
11.	KokChang market area and Banglang Dam	Sustainable uses	/ Reservation
12.	Sakai village	Reservation	
The Lower of Pattani Watershed			

1.	Market Community Tanto District		Repairment Development	/
2.	Sa-ek District community	Sub-	Repairment Development	/
3.	TalingChan District community	Sub-	Repairment Development	/
4.	Krong District community	Pinang	Repairment Development	/
5.	PongKayee village		Repairment Development	/
6.	Satengnok community	village	Repairment Development	/
7.	MuslimSamphan community		Zoning	
8.	Yala District		Zoning	
9.	Mae Lan District		Zoning	
10.	Pattani Community	Dam	Sustainable uses	
11.	Community of Tasek District, Pattani	Sub-	Zoning Repairment	/
12.	Pattani Municipality		Zoning Reconstruction	/
The Coastal Zone of Pattani Bay				
1.	Bangkhaw District	Sub -	Development	
2.	Bangtava District	Sub-	Repairment Development	/
3.	Toojung District	Sub-	Zoning Repairment	/
4.	Rusmilae District	Sub-	Zoning Repairment	/
5.	Sabarang District	Sub -	Zoning Repairment	/
6.	Bana District.	Sub -	Zoning Sustionable uses	/
7.	Lampo District	Sub -	Sustionable uses / Storing	
8.	Tungung Sub - District	Luloa	Zoning and entrapping Sustionable uses / Protection	/
9.	Mangroves areas center	Forest	Protection Sustionable uses	/

1	Bangpoo	Sub	-	Zoning	/
0.	District			Reservation	
1	Yamo	Sub-		Zoning / Straing	
1.	District			and entrapping	
1	Taloagapo	Sub-		Reconstruction	/
2.	District			Zoning	/
				Repairment	

4. Threats of biodiversity and their causes. In general, biological resources that were threatened included fish species using electric fishing and hand catching in rice field, etc. The first threat in the Pattani watershed and coastal zone encompassed wildlife and forest commercialization. As seen in in the upper area, the commercial trade of wild pigs and forest products that occurred along the Thailand-Malaysia Border. Second threat was change of the land use, in particular, the rubber field to the housing, and dam construction resulting in population evacuation. The third was of projects and developments including the settlement and housing, the tourism development as in Piyamitra village. The tourist trade of wild species of was observed in KokChang market. The final issue was the development of the rubber industry and establishment of industries in the area. Study results showed that species threatened in the Pattani watershed included *Elephas maximus*, *Sus scrofa*, *Polymesoda (Beloina) erosa* Solander, *Osteochilus hasselto*, *Ganoderma lucidum* (Leys.ex Fr.) Karst., *Pristotepis fasciatus*, *Nasturtium officinale*, *Teermitomyces fuliginosus* Heim. And the coastal area in clouded, *Nypa frutican*, *Gracilaris fisheri* (Xia et) Abbott, Zhang et Xia and *Halophila* spp.

5. Results of the bio-diversity management in local wisdom. As for management of the upper area where the origins of water sources were located, enforcement of the untouched management should be considered practicing. The so-called sustainable conservation could be controlled and well operated in the upper area of the villages of Chulabhorn 7 and 9, Jantarat, and KokChang market. For the lower area like villages of Pakaharang, Paknaam, and Yaring sub-district of Pattani, the restoration and repair should be practiced, and possibly by the aid of modern technology so that prevention of its bad consequence. In the central area of the Pattani watershed where the utilization of bio -resources was very intensive, especially for the purpose of housing, approaches of improvement and development should be emphasized. Those said area encompassed sub-districts of Tasek, Pakaharang, Paknaam, and Yaring of Pattani Province. Whereas local wisdom conservation was seen applicable by using database technology, creating lesson instruction for local wisdom, disseminating knowledge in schools such as those that were affiliated with regional or zoning offices, or segmenting/grouping. As such, there should be 3 zones ; the upper for agriculture and forestry, the lower zones for housing and developing as well as considering the impact of such utilization to come, the coastal zones for conservation and fishing areas.

6. Promoting knowledge, understanding of local instruction on bio-diversity management in local widom of watershed and coastal zone of Pattani, Thailand Cognitive study on conservation the Pattani watershed and coastal zone of Pattani bay from local wisdom were collected for construction of curriculum content that suited the particular general levels and with title on the biological resources conservation and sustainable utilization in the Pattani watershed and coastal zone of Pattani. There was 1 level of general education, as well as public education currently operated. For each of these, 5 units were taught, and score of efficiency was 80/80.

• Discussion

Discussion of bio-diversity management in local wisdom of watershed and costal zone of pattani Thailand were as follows.

1. General and ecological conditions of the Pattani watershed and the coastal zone of Pattani. The Pattani watershed and the coastal zone of Pattani were the important areas in the Deep South with geography of high wooded terrain and flat. It was a bed of flood water that lined from north to south and some parts lined in the east. Its south border was the watershed of the SankakaKhiri mountains in Yala with about 300,000 hectares of forest plantations, mainly rainforest. There was a forest reserves, national parks, wildlife Sanctuaries and 957,014.75 – hectare forest reserves. It was about 25.66% of the region shares by Pattani province and the beaches, and this was characterized by ecological areas along the river plains and the mangrove forest with the coastal area of not less than 37 square kilometers. In coastal ecosystems, it included animal populations that were different from other ecosystems areas. It was the social ecology of wetland plants that were influenced by the dynamics of mangrove ecosystems, i.e. the coastal landscape, climate, tidal waves and currents as well as salinity water stains, soil and nutrients, etc. The finding was in agreement with Komiyama A, et al (2008). In addition development of Quality Promotion on the Environment (2003); Vichit (2015b). reported the Pattani watershed and coastal zone of Pattani are in a part of an important ecological system in which there are many ecological system like, The Hala-Bala forest, a tropical forest mangrove forest, rainforest, freshwater ecological system, Pattani River, Brackish water ecological system, mudflat, recent tidal flat, former tidal, flat, sand ridge and alluvial Plain. These ecological system, are the large habitat to the diversity life's include plants and animals that may not be found in other locations in other parts of by in Thailand. The finding was in agreement with (Development of Forestry, 1999); (Vichit, 2015a).

2. Results of the biological study were as below.

The species of biological resources in the Pattani watershed and coastal zone of Pattani had the first group was dominant species of the plant Consisting of the most is the management among the local wisdom in the use and storage of 16 species in the area. The appropriate management of 6 types of plants that are used among the local wisdom, most was economic plants which were used in consumption and distribution. This was because the use in the area should be careful to increase the resources that can be replaced without causing any problems with the resources. In accordance with Kasem (2000) theory of management, which states that the use and preservation of natural resources and the environment in the watershed area should maintain the balance of resources by using and keeping each other's balance.

In the second group, the dominant species of mushroom, which was found that the most prominent local wisdom by having to be managed in a storage manner to decompose in the area as well as the use of herbs in particular *Ganoderma lucidum* (Leys.ex Fr.) Karst. People in the village Piyamit which was the area in the valley has been used for medicinal purposes for a long time. In accordance with the opinions of Abdulahali (2019) presided over the position of the president of the association for the sale of Pattani watershed people, commenting on the use of various types of mushrooms for a long time and the original drug distribution and treatment of illnesses continuously.

In the third group, dominant species of algae, which were managed among local wisdom, were utilized especially the food of aquatic animals Naturally in water sources, especially in the lower areas of the Pattani basin, aquaculture throughout the river is consistent with vichit (2008), which studies effects of water quality on periphyton in the Pattani river, Yala municipality, Thailand. It found the number of periphytic alge attached on the glass slides consisted of 43 species of Bacillariophyta (Diatom), 5 species of Cyannopyta, 6 species of Chlorophyta and 2 of Euglenophyta which was important in the food of aquatic animals in

the young age, which will make the aquaculture process can continue.

In the fourth group was dominant species of aquatic animals, found to be managed among local wisdom to be used, that was, food of the people in the area, especially people who receive food from water sources mainly for a long time. Which was corresponds to the findings of Vichit (2015a) who study of the development of water quality and sustainable management in Pattani watershed south Thailand that water came aquaculture for household consumption.

The fifth group was dominant species of wild life management among local wisdom was proposed to be preserved in the area as a cost of natural resources in the upper area of the Pattani watershed and Pattani coastal zone. Consistent with Vichit (2015d) a research study on conservation of environment and natural resources on Pattani watershed South Thailand, found that wildlife was the cost of society in the upper area, especially in areas with abundant forestry and continue to maintain the race.

In the sixth group the dominant species of plants and animals in the mangrove forest consisted of management of local wisdom in the form of utilization and storage. In which the mangrove forest in Pattani bay area has been continuously utilized, storage space or periodically to restore the natural resources of the environment. It were consistent with the concept of Kasem (2000) who the recovery was necessary to occur in the forest area and try to use parts that grow from the original forest, causing the natural resources and the environment to not run out.

3. Bio-diversity management in local wisdom of watershed and coastal zone of pattani Thailand. Local Wi-do of folk on the application in routine activities was observed in aquatic animal practices of fresh water genetic resource. It was observed that there was fish catching during September to December by majority of people using fishing hooks like flag dipping in the still water from water sources of pond during limited water. However, they used nets in flood season. Others that had been used for included harpoon bow, stabber and shooter as well as trap and special net for special fish. Pongpang was used in the fish trap at low tide the water flow. Wildlife utilization was of 4 major types, and those were bird catching using bird cage with a particular cage specialized for Red-whiskered bulbul, which was adapted into breeding and competitive culture. The finding is in agreement with Vichit (2015) who studied conservation of environment and natural resources on Pattani watershed south Thailand fond that co-relation of conservation and biodiversity utilization and people life style in Pattani watershed was positive in the occupation and daily life. Which was important in life of society in the Pattani watershed, especially the life of the ancestors in the past that harvested products from nature by various methods will continue to maintain the race forever. Wild pig capturing was very frequent causing its short supply in the markets. The catch of bees was observed operating in the night to prepare for herbal medicine. Bee catchers used to nail the tree making them ease in climbing. They also recited verses from the quran as they believed the action brought them safety in handling bees. Pickled fish processing used Nile Tilapia, and this became popular export product. Plants were usually used as herbs, foods, and for making home such as *Fagraea fragrans* Roxb.), *Hopea ferrea* Laness, Share), and *Intsia palembanica* Miq. Vegetables were used as food for both humans and pets. They were, for instances, dipping sauce, and popular vegetables like star gooseberry (*Sauropus androgynus*), *Stenochlaena palustris* (Burm.), *Colocasia esculenta* (L), *Diplazium esculentum*, *Streptulobos asper* Lour. for goat feed, *Metroxylon rumphii* Mart. for poultry cow and buffalo feed. Those were used for medicine included *Senna siamea* (Lam.), *Jatropha curcas* L., and *Cassia alata* (L.)

4. Threats of biodiversity and their causes, in general, biological resources that were threatened included fish species using electric fishing and hand catching in rice field, etc. The first threat in the Pattani watershed encompassed wildlife and forest commercialization.

As seen in in the upper area, the commercial trade of wild pigs and forest products that occurred along the Thailand-Malaysia Border. Second threat was change of the land use, in particular, the rubber field to the housing, and dam construction resulting in population evacuation. The third was of projects and developments including the settlement and housing, the tourism development as in Piyamitra village. The tourist trade of wild species of was observed in KokChang market. The final issue was the development of the rubber industry and establishment of industries in the area. Heartened the finding is in agreement with Vichit (2015d) in the title of research was conservation of environment and natural resources on Pattani watershed south Thailand, found that the people had a strong conservation of natural resources and the environment in the upper areas. Because it was a conservation area according to the laws of Thailand together with a forest area with high terrain access to the area was difficult, resulting in the conservation of natural resources and the environment and together with the ongoing unrest situation causing outsiders to not enter such areas. Which reduces the destruction of natural resources and the environment which corresponds to the results of this study, namely study results showed that species threatened in the Pattani watershed included *Elephas maximus*, *Sus scrofa*, *Polymesoda (Beloina) erosa* Solander, *Osteochilus hasselto*, *Ganoderma lucidum* (Leys.ex Fr.) Karst., *Pristotepis fasciatus*, *Nasturtium officinale*, *Teermitomyces fuliginosus* Heim. And the coastal area included, *Nypa frutican*, *Gracilaris fisheri* (Xia et) Abbott, Zhang et Xia and *Halophila* spp.

5. Results bio-diversity management in local wisdom of watershed and coastal zone of pattani, Thailand. As for conversation of the upper area where the origins of water sources were located, enforcement of the untouched conversation should be considered practicing. The so-called sustainable conservation could be controlled and well operated in the upper area of the villages of Chulabhorn 7 and 9, Jantararat, and KokChang market. For the lower area like villages of Pakaharang, Paknaam, and Yaring sub-district of Pattani, the restoration and repair should be practised, and possibly by the aid of modern technology so that prevention of its bad consequence. In the central area of the Pattani watershed where the utilization of bio-resources was very intensive, especially for the purpose of housing, approaches of improvement and development should be emphasized. Those said area encompassed sub-districts of Tasek, Pakaharang, Paknaam, and Yaring of Pattani province. Whereas local wisdom conservation was seen applicable by using database technology, creating lesson instruction for local wisdom, disseminating knowledge in schools such as those that were affiliated with regional or zoning offices, or segmenting/grouping. As such, there should be 3 zones ; the upper for agriculture and forestry, the lower zones for housing and developing as well as considering the impact of such utilization to come, the coastal zones for conservation and fishing areas. The finding is in agreement with Vichit., Nitaya., Duangporn. (2015) who studied the local scientific lessons for conservation and utilizing biological diversity in the Pattani watershed south Thailand, found that local scientific lessons suggest the use of natural resources and the environment according to the capacity of land use in the Pattani watershed area to manage the area and conservation methods, packed in local courses. For the youth was to conduct and studies which created awareness of natural resource and environmental conservation. In addition it was also consistent with the performance of the 5 land use competencies, ie, the performance 1. was a reserved area, do not do various activities. Performance 2. the area can carry out activities, but must use the correct conservation principles. Performance 3. was farmland and agriculture. Performance 4. was the residence of the population, And performance 5. was the lowland area Suitable for living and culturing coastal areas (Kasem, 2000).

6. Promoting knowledge, understanding of local instruction on bio-diversity management in local wisdom of watershed and coastal zone of Pattani, Thailand. Cognitive study on bio-diversity management in local wisdom of watershed and coastal zone of Pattani, Thailand.

from local wisdom were collected for construction of curriculum content that suited the particular general levels and with title on the biological resources conservation and sustainable utilization in the Pattani watershed and coastal zone of Pattani. There was 1 levels of general education, as well as public education currently operated. For each of these, 5 units were taught, and score of efficiency was 80/80. The finding is in agreement with Suthi, & Benchawan, (2004) who studied on collection and analyze of information related to local wisdom in Pattani watershed to uphold the tradition of local wisdoms in building house and things related to house, and in working both are very important to maintain as long as possible and they impact a lot on the conservation of biodiversity if both wisdoms can be preserved.

• **CONCLUSION**

Research on bio-diversity management in local wisdom of watershed and coastal zone of Pattani, Thailand was aimed of exploring the biological resources and being participated by all sectors of the public, of enhancing the understanding of the biological resources value and sustainable utilization, of raising the public all and stakeholders' awareness on the biodiversity conservation was conducted. And using both quantitative and qualitative research techniques combined with participatory action research and the use of specific methods in collecting biological samples and specific types of biological resources, the samples in 36 areas, and of up to 6 ecological types was successfully studied. Results showed that upper area of the Pattani watershed found 170 : 119 : 130 species of vascular plants, 53 : 65 : 115 species of fish, 85 : 90 : 50 species of mushrooms, 38 : 55 : 85 species of algae, and 25 : 10 : 43 species of wild life and 15 : 10 : 40 for birds respectively. Results of biological resource conservation and local wisdom for its utilization in this study presented 8 methods of actions, i.e. the sustainable user, storing and encapsulating, repairing, reconstructing, developing, protecting, conserving and zoning. With aspect of promoting knowledge and lesson using pronounced learning instruction, it was found basic learning, context searching, and reducing pollutant, as well as joined planning, treating, and enhancing sustainable development were among the choices.

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