

CHAPTER 4

LOCAL KNOWLEDGE ON AQUATIC ANIMALS WITHIN THE RICE FIELD ECOSYSTEM

Local people's knowledge, based on their practices and experiences of their day to day lives, have played an important role in resource management activities. Twarog (2004) stated that traditional knowledge is important in the lives of the majority of the world's population as well as in the conservation of the world's biodiversity. Local knowledge of aquatic animals and food in Houay Yae village had been passed from generation to generation, was linked to the farming practices used and the management of aquatic resources. This chapter will highlight what local knowledge has possessed regarding aquatic resources, how they were classified, and the cooking and processing of foods that are linked to the local people's culture and ritual activities.

4.1 Local Knowledge and Fishing Gears

Fishing tools were not just tools used to collect aquatic animals; they were tools used in local livelihood activities and reflected local people's knowledge of how to make them. This sub-chapter will detail the local knowledge held for the making of tools and the belief behind such knowledge.

4.1.1 Local Knowledge on the Making of Fishing Gears

The Houay Yae community had used traditional fishing gears for a long time. They were made from materials available in the local area and involved the local knowledge that was passed down from generation to generation. Over time, more than eight types of tool gathering have been made from materials found in the local area, such as the *bet* (fishhooks), *xai* (bamboo fish traps), *toum* (rounded bamboo fish traps), *peun laem* and *laem sak pa* (fishing guns), *ving* (dip-nets), *soum*

sak pa (fish coops), *mornng* (fish nets) and *khong* (fish baskets).

- **Bet (fish hooks)**

A *bet* was a kind of fishing gear made from bamboo, which consisted of a *khan bet* (fishing rod), a *saiy bet* (fishing line) and a *mark bet* (fishhook). The fish hooks were normally 0.5 to 0.8 meters long and took the form of *bet khaen* (hanging fishhooks) or *bet teuk* (long fishing rods), which was about 0.8 to one meter long and three to five meters long respectively. The selection of the bamboo was important when making the fishhook; and there was a need for the bamboo to be more than two years-old and should have a red color. Normally, one bamboo stem could be used to make around 100 to 150 *khan* (fishing rod) using only two to three meters from the start of the stem. In addition, to make the small fishing rods, flexibility was important; however, if it was too big and too inflexible, the fish would be lost when they would bite. After being made, the fishing rods were soaked in a river or pond for two weeks or one month in order to protect them against weevils and to make them strong. On this, Phor Saeng, a local villager, said:

The selection of the bamboo stem is important for making a good fish rod. I select only bamboo that is two years-old and is straight with a red wood color (tested by observing inside the bamboo). The fish rod must be small and flexible, and to make it requires meticulous work and an expert eye, particularly the 'bet kob' (frog hooks) – which need to be more flexible otherwise one cannot catch any frogs. Furthermore, I also use a small fishing line (a small nylon from outside) for collecting frogs - the secret of making the right fishhook (January 2013).



Figure 4.1: Fish Hooks used in Houay Yae Village

- ***Xai* (bamboo fish traps)**

A *xai* (bamboo fish trap) was a fish trap made from bamboo and used to catch fish in rice fields, ponds, channels and rivers. The *xai* was a traditional fishing tool based on local knowledge and was used for a long time. Making this tool required the knowledge and experience of all the stages, including the selection of the bamboo, which should be at least two years-old and not be *mai pai kud* (bamboo without a peak). For some kinds of *xai*, including *xai chan*, local people chose bamboo that was strong enough to use as a coil trap. In addition, being able to weave was equally important, especially for the *ngar xai* which should be soft; otherwise no fish would be able to enter the trap. Pho Knor said:

The selection of bamboo is important. It has to be strong enough to coil, and flexible, for the weaving of the 'ngar xai' is more important than the other elements, meaning it must be soft, long and wide enough for the fish and other aquatic animals to enter easily (January 2013).

There were four kinds of *xai* used in Houay Yae village which included the *xai luang*, *xai chan*, *xai maed* and *xai leab*. The *xai luang* and *xai leab* looked like a fresh

water snail with a cape at the bottom, a narrow middle and spread-out into a mouth at the top. The *xai chan* looked like a freshwater snail but had a rounded middle and a trap, while the *xai maed* looked like a basket with the narrow neck and was spread-out at the mouth. According to local beliefs, the *xai* also represented *xai sa na* (winning), *sok dee* (good luck) and *khuam mee sok mee xai* (luck, success and health) as reflected in local life and culture. However, recently most *xai* were kept inside houses, particular at the entrance or on the main pillar for luck.

- ***Toum* (rounded bamboo fish trap)**

A *toum* was a traditional fishing tool which reflected local people's craftsmanship, as it involved selecting the right bamboo, weaving it and using it. Two year-old *mai fai* (bamboo) was used to make the *toum*, and had to be tough and strong. During our interview, Phonekham told me that *tiew mai* (green wood under the bark) was used as *tork sarn* to weave the *toum* but that the *tork sarn*³ was a limiting factor. If the bamboo had enough *tork sarn*, an average of ten *toum* per day could be made. *Toum* were not used immediately after they were made and were placed on a *hing or khaa* (shelf) for a year or, indeed, until they turned black as this protected the wood from weevils. The most important part of the processes when weaving a *toum* was the *ngar toum*, which required not only a big *ngar toum*⁴ but also a wide piece of wood with a soft inside. However, a good *toum* would also have a good lure. There were four kinds of *toum* used in Houay Yae village: the *toum ien* (rounded eel trap), a *toum pa khao* (rounded white fish trap), a *toum pa douk* (rounded catfish trap) and a *toum kob* (rounded frog trap). Phone kham, a villager who is an expert on *toum* in Houay Yae village, told me:

'Mai fai song nong' (two year-old bamboo) is selected to make the 'toum', as it is tough and strong. In order to maintain a strong 'toum' and protect it from weevils, after it is weaved I leave it (yang fai) for at least a year or until it is black in color. Normally, if making a 'tork

³*tork sarn*- thin bamboo-strips that are used to weave the *toum*

⁴*ngar toum*- the opening of the *toum* which allows aquatic animals to swim inside

sarn, I can weave over ten 'toum' per day. The most important part of the technique is the 'ngar toum', which has to have a wide mouth and be soft, wide enough for aquatic animals to enter easily, such as eels, catfish and white fish. The choice of bait is also important; I usually use earthworms (January 2013).



Figure 4.2: *Toum Pa Khao* used in Houy Yae Village

- ***Peun laem* and *laem sak pa* (fishing guns)**

Peun laem and *laem sak pa* were traditional fishing tools that emerged as the ecology of the area had changed and as aquatic resources declined. The *peun laem* was made from hardwood, and was cut into the shape of a gun. It consisted of a *yang ka toun* (catapult), a *louk nar* (a long and small dart) and a *kai peun* (trigger). Local people in Houay Yae village used *peun laem* to shoot fish and frogs in the rice fields, channels, streams and rivers. They were also good for use in deep water. Normally, the *peun laem* were between 0.8 and one meter long, though this varied.

The *laem sak pa* was made from a bamboo stems, shaped like a javelin and was three to five meters long, with fifteen to twenty small rods taken from a bicycle wheel that was tied at the end. This equipment was used to collect fish, frogs and other aquatic animals in the rice fields, streams and rivers. The animals were 'shot' by hand and it was noted that the use of this tool require expertise. The people in Houay

Yae village usually used this tool to catch fish and frogs in the rice fields.



Figure 4.3: A *Laem Sak Pa* in Houay Yae Village

- ***Ving (dip-net)***

A *ving* or *sa ving* was a traditional fishing net weaved by hand by the local people. It was made of a triangle of *mai xang fai* (bamboo) called *khob ving* with the net made from nylon that was used to catch aquatic animals such as fish, small aquatic animals and aquatic insects found in the rice fields, streams, channels and river near the village. The holes that were used in the making of the *sa ving* were also used to bind net with a *khob ving*, and represents meaning from a local knowledge and beliefs perspective. The following is a rhyme which acted as a guide for making the holes:

pong pou, pong pa

ma pao, khao khone

norn chao, aow kin

The meaning of words used in the rhyme are: (1) *pong pou* means a crab, (2) *pong pa* means a fish, (3) *ma pao* means nothing(empty), (4) *norn chao* means that to collect too many fish will lead to the fish rotting, and (5) *aow kin*, which means to collect enough fish for household consumption only. The local people used this saying when making the holes and remained with the hole for the *norn chao* and *aow*

kin. Once this saying was recited it meant that good luck and a large fish catch would follow. There were six kinds of *sa ving* used in Houay Yae village, the *sa ving* (dip-net), *ka tong pa* (another kind of dip-net), a *ving son tae*, *ka tong kob* (used to catch frogs), a *dang kuad pa* and a *ka doung*.



Figure 4.4: *Ka Tong kob* (frog collecting tool) used in Houay Yae Village

- ***Soum sak pa* (fishing coop)**

A *soum sak pa* was a traditional fishing tool or ‘coop trap’ that was used to catch fish and was also made from bamboo. The bamboo was cut and a small rod was made called a *diew*. Many of these *diew* were burned in a fire and then soaked in water for one to two months before they were completed. The *soum sak pa* was weaved together using many *diew*. It was essential that people had the expertise to use this tool and had to be knowledgeable. If one was catching fish with a coop and had still not caught the fish after four or five attempts, it was called *soum see soum har*. The use of the *soum sak pa* was part of the teaching of words at school. The phrase *soum see soum har* was used in teaching as a reflection of the local livelihoods, the local culture and community practices, and was used as a teaching of how to be human, to be truthful and avoid saying *soum see soum har* (‘words without truth’) to deceive people.

- **Morng - hae (fish net)**

A *morng* and *hae* were fishing tools used to collect fish, with most *hae* made from nylon by the local people. The weaving of the *hae* reflected local livelihoods in the community and took a long time, while for the *khae*⁵ the key was to make it as round and wide as possible. Nowadays, most *morng* used in Houay Yae were made in a factory, though it would still be made by some local people including the *morng thien* - a kind of net with a long piece of bamboo two or three meters long attached which was used to catch fish in channels and streams. During my interview with Viengkham, he explained what knowledge was required to weave the fish nets:

I learned how to make the 'hae' (fish net) from my father. The weaving of a 'hae' takes a long time and one needs to be meticulous about it, particular when making a new 'khae', when it is crucial not to forget how to make it as wide and round as possible, for if not it will not be good for catching fish. Normally, it takes between three and five months to make one such net (January 2013).



Figure 4.5: Fishing Net used in Houay Yae Village

⁵A *khae* is used to widen a *hae* (fishnet); the number of *khae* is increased based on the length of fishnet required.

- **Khong (fish basket)**

A *khong* was used to store fish together with the fishing tools and was made from bamboo. There were more than four kinds of *khong*, such as the *khong phangom*, *khaong ngar niew*, *khong loy* and *khong ta taek*. These fish baskets were made based on local knowledge and were used in Houay Yae village for a long time. Making a *khong* required a good knowledge of bamboo weaving techniques, and became a meticulous task, one linked closely to local livelihoods and traditional farming practices. In the past, the *khong* was hung from a farmer's waist when harrowing the rice field, and was used to collect and carry fish and other aquatic animals as he or she walked with the buffaloes. As Phor Kanchanh told me:

In the past, I woke up early in the morning and went to the rice field to harrow, when I would hang a 'khong' from my waist in order to catch fish and other aquatic animals for lunch. I used to walk after the buffaloes and use the 'khong' as I went; collecting aquatic animals (January 2013).



Figure 4.6: *Khong Loy* used in Houay Yae Village

From this point of view, *khong* (fish basket) had a close relationship with local farmers and their farming practices. In addition, *khong* was also referred to the relationship between local people and its use meaning that whenever it was used, the

khong has to be tied with human body.

4.1.2 Local Beliefs regarding the Making of Fishing Tools

Local knowledge and beliefs interact and have a close relationship with local livelihoods, culture and rites, and in particular those related to the selection and making of fishing tools. In Houay Yae village, local people have long had extensive knowledge and strong beliefs regarding the making of fishing tools, such as the piercing of holes in the dip-net and the selection of fishing rods with internodes. These beliefs have involved the use of sayings, both as a selection guide and in order to bring luck. Examples of this are words such as ‘*pong pou, pong pa, ma pao, khao khone, norn chao, aow kin*’ and where (1) *pong pou* meant ‘crab’, (2) *ma pao* meant ‘nothing’, (3) *khao khon* referred to the knees aching from walking a lot, (4) *norn chao* referred to the catching of too many fish, which would then rot, and (5) *aow kin* meant collecting enough fish only for household consumption. Most local people remembered *norn chao* and *aow kin* when making the last hole of their dip-nets and fishing rods. As Mae Nom said:

I select bamboo stems for making the ‘khob ving’ and I pierce holes in it for weaving the net. The number of holes to be made is guided by a saying, so I start to count with the phrase ‘pong pou’, then ‘pong pa’ and so on, up to the last hole for which I use the phrase ‘ma pao, khao khon, norn chao and aow kin’. Following this method is good for making a dip-net, and means that whenever I go to catch fish and other aquatic animals I believe I will catch a lot (January 2013).

The belief behind the making of fishing tools was part of a cultural belief system. There was a view that their tools have a supernatural being inside them. The being led to good luck in the fish catching process. The belief also reflected the relationship between the natural resources and the local people that the respect paid to them.

4.2 Local Knowledge and Beliefs on Catching Aquatic Foods

The making and use of fishing tools reflected the local knowledge with respect to the catching of aquatic animals. Local people in Houay Yae village have had their own knowledge system used to catch aquatic animals, a system they have used for a long time and was based on the knowledge passed-down from generation to generation. The knowledge that was based on observation over time and space, and belief.

4.2.1 Observed Knowledge used to Catch Aquatic Animals

Local knowledge consisted of adaptive, situated and practiced knowledge, and was based on experience and learning within local livelihoods. Beckford and Barker (2007) stated that the characteristics of local knowledge were its value and adaptability when dealing with risk and uncertainty and its ability to meet food security needs. Local people in Houay Yae village have accumulated an observed knowledge in terms of catching aquatic animals based on their experiences and through learning by practice. In my interview with Viengkeo, I was told that he was able to tell where there were fish or no fish in the rice fields by observing the color of the water – whether it was clear or a little turbid; by observing the presence of dead crabs; small fish; fish excrement in and around the rice fields, and the excrement of snakehead fish. In addition, Viengkeo also said one could throw a small stone or small amount of soil into a river in order to check where the fish were. Moreover, the sky could be used to check for the time when fish and other aquatic animals venture out, particular on *deun dub* (no moon) or *pa orr* days (fish meeting days), by looking at the clouds that look like the fish's scale and where they were located (North, South, East or West). Viengkeo added:

I catch aquatic animals in the rice fields based on my experience and knowledge. I observe the dead crabs and dead fish from the fish's excrement, as well as look at the water color – whether it is turbid or clean. In addition, I observe the clouds that look like fish's scale, as they tell me where can go and catch fish at night, and in particular on 'deun dub' (no moon) days, or when the fish were together - called 'pa

orr' (January 2013).

The local people's knowledge system was also based on time and space. They would have a mental map in their minds, and this meant that they knew when and where to catch aquatic animals. Jy, a villager in Houay Yae village, he said:

Each year, when the first rains come in May or June, I go to catch fish, frogs and other aquatic animals in 'na pha pouk', after which I go to 'na houay yae' and 'na hee', as well as 'na houay noy'- respectively, for that is where I can catch a lot of frogs and fish. I usually catch these animals at night (January 2013).



Figure 4.7: Collecting Frogs in Houay Yae Village

The knowledge of how to observe the catching of aquatic food represented the knowledge of the local people in the Houay Yae community. This knowledge was situated and was based on their experiences and practices of observing dead crabs, dead small fish from the fish's excrement, the color of the water and the location of the clouds in the sky.

4.2.2 Local Beliefs and Practices related to the Catching of Aquatic

Animals

The fishing methods used in the Houay Yae village included the use of fishing tools, as well as the application of time and space concepts. The catching of aquatic animals also had a close link with local livelihoods, culture and beliefs, as could be observed in the practices, procedures and taboos associated with such activities such as those practiced for a long time ago in Houay Yae village. People in the local community believed that every location had a *chao* or supernatural being who protected the natural resources, such as the water, forests, rice fields and land. These procedures and taboos were as follows:

- ***Phee chao nam vang pa* (supernatural beings)**

The Lao term *phee chao nam vang pa* referred to a ghost or supernatural being which lived in the river and protected and took care of the fish and other aquatic animals. This was a local belief related to the catching of fish. The villagers paid their respects to this spirit, so whenever they caught fish and other aquatic animals they would pay their respects to the spirit by saying good words and avoided the collection of aquatic animals on Buddhist day called *van sin* days (no moon and full moon days). If someone did not pay their respect, he or she would fall sick with a headache; a nosebleed or worse. During my interview, Phor Saeng told me that he usually paid his respects to the spirit before fishing; otherwise he would not catch any fish at all. He told me:

I say “chao buak nam vang pa ery, pou khar khor pou khor pa pai yuu pai kin dae der, ya dai tae tong der lae ya tak ya tuang dai”, and after saying these words I throw a stone into the river basin, as this will allow me to catch plenty of fish. One day I went to catch fish in the Nam Song River for two-and-half hours and did not catch anything, then suddenly realized I had forgotten to pay my respects to the spirit before fishing. I then said a few words and after that caught fish. This is why I believe there are ghosts or supernatural beings that protect the fish and provides them for us (January 2013).

These belief systems supported local resource management practices in terms of preservation of the fish stocks, and reflected local perspectives on the ecological system. The relationship between the local community and local resources was not only linked to food security and income generation, but was also reflected in local cultural and ritual activities, as well as the traditional beliefs system.

- ***Kham sok dee***

The use of incantations and spells were practiced for a long time, and reflected the relationships and interactions that took place between local people, their livelihoods and the supernatural world, and particularly in relation to the local resource use. Local people in Houay Yae village have had their own spells and incantations that they used in conjunction with their fishing equipment, and these were called *kham sok dee* or *kham sok kham marn*. When using fishhooks, the incantation was called *sok khan bet*, and its words were as follows:

*Khao tem hia mia tem souam ka bor ao, ja ao pa khing yuu houa hard
pa chard yuu houa vang*

These words were uttered before people went to fish and they would put rice on the fishing rod, recite the verse, and would throw away the rice. As Phor Chanthavong said:

Before leaving my home to gather food, particularly when going to catch fish and other aquatic animals, I say a spell that I learned from my father - in order to ensure I have a successful and safe trip. Because I do this, every time I go to catch fish, it seems to me I get lucky (January 2013).

The above reflected local people's confidence in their local beliefs and the relationship that existed between these beliefs and the natural resources.

- **The Procedure Used to Collect Ant's Eggs**

The catching of aquatic animals in the Houay Yae community was closely linked to traditional beliefs, practices, procedures and taboos, all of which were related to local the livelihoods and culture. In the Houay Yae community, ant's eggs were used in *toum pa* (rounded bamboo fish traps) and as a bait to catch fish in the rivers. As a result, the collection of ant eggs was important. There were, however, taboos and beliefs linked to this. When collecting the eggs of ants in particular '*mod thieb*' (a kind of ant), it was believed that a person should not jump or try to brush the ants off his legs or arms and should not leave a knife on the ground as this would scare the fish away. Phor Viengthong said:

The technique used to collect ants' eggs as bait is important, if one wishes to catch lots of fish. I have to avoid jumping up and do not take the ants out of my arms and legs, plus I avoid leaving my knife on the ground, because if I do so, the fish will swim away and will not catch any fish at all (January 2013).

From Viengthong point of view was a reflection of the belief system of that local community with its rules of collecting ant's egg and represented the close relationship between the local community and the natural resources as well as the high respect it had for it.

4.3 Local Classification of Aquatic Animals

Aquatic animals played an important role in the livelihoods and cultural activities of local people in the Houay Yae community. These aquatic resources had been consumed for a long time, and local people had a significant level of knowledge and experience in using them and knew the characteristics of each animal very well. The local people's classification of aquatic animals was based on local names and perspectives, including the use and characteristics. Selxas and Begossi (2001) had studied the fish ethno-taxonomy used within folk and scientific systems, and argued that local knowledge regarding fish biodiversity played an important role in helping

the study population develop the information needed to create appropriate fishery management strategies for areas adjacent to Adventureiro and Proveta , particularly in the Marine Park of Adventureiro. In the Houay Yae community, aquatic animals were classified based on their species and physical characteristics, their size and purpose, as well as their habitats. This is described in more detail in the following sections.

4.3.1 Physical Characteristics

Local people in Houay Yae village have classified aquatic animals into 88 species and six types, namely, fish, frogs, mollusks, crabs, shrimps and insects.

- **Fish Types**

Pa (fish) were classified as a food used for household consumption and income generation. Fish such as white fish, snakehead fish and catfish were also treated as a supernatural food, one that was linked closely to Buddhist and cultural activities in rural areas. The fish consumed in Houay Yae village were classified into 48 species based on their physical characteristic (see Table 4.1). For example, *pa tong dao* was classified based on a local perspective, with the word *tong* meaning a banana leaf and the word *dao* referring to a star in the sky. Therefore, *pa tong dao* had a body that looked like a banana leaf and had a star shape on its body and the local people called it *pa tong dao*. Phor Bounthan, an elder in Houay Yae village, told me:

I don't know, how did we get the name of each fish? When I was young I heard my parents say: 'One day a long time ago, people saw a man hanging fish in his home and they asked him: "what kind of fish are you collecting? To which he replied 'a pa khao (white fish)', as all the fish in his hand were white. Since then, 'white fish' has been the classification of the 'pa khao' (January 2013).

Using physical characteristic, local people in Houay Yae village also classified the fish into two groups; scaly (32 species) and soft-skinned fish (sixteen species).

Table 4.1: Fish Species in Houay Yae Village

No.	Lao Name	Lao Language	English Name	Scientific Name
	Scaly Fish			
1	<i>Pa xiew khao</i>	ບາຊິວເຂົ້າ		<i>Rasbora septemtrionalis</i>
2	<i>Pa kheng</i>	ບາເຂັງ		<i>Anabas testudineus</i>
3	<i>Pa xiew aow</i>	ບາຊິວອ້າວ		<i>Luciosoma spilopeura</i>
4	<i>Pa xiew nuad yao</i>	ບາຊິວນວດຍາວ		<i>Esomas metallicas</i>
5	<i>Pa tong lard</i>	ບາຕອງລາດ		<i>Notopterus notopterus</i>
6	<i>Pa tong dao</i>	ບາຕອງດາວ		<i>Chitala ornate</i>
7	<i>Pa khor</i>	ບາຄໍ່	Snakehead Fish	<i>Channa striata</i>
8	<i>Pa khor kang</i>	ບາຄໍ່ກັງ		<i>Channa gachua</i>
9	<i>Pa nin</i>	ບານິນ	Tilapia	<i>Oriochromis niloticus</i>
10	<i>Pa mun</i>	ບາມັນ		<i>Gylinocheilus pennocki</i>
11	<i>Pa chard</i>	ບາຈາດ		<i>Poropuntius laoensis</i>
12	<i>Pa khao</i>	ບາຂາວ	White Fish	<i>puntius aurotaeniatus</i>
13	<i>Pa ket khaeng</i>	ບາເກັດແຂງ		<i>Systemus spp.</i>
14	<i>Pa bu</i>	ບາບູ່	Sleepy Goby	<i>Oxyeleotris marmorata</i>
15	<i>Pa kang lieng</i>	ບາກັງລຽງ		
16	<i>Pa khee tid</i>	ບາຄືຕິດ		
17	<i>Pa ket laeb</i>	ບາເກັດແລບ		
18	<i>Pa porm</i>	ບາບອມ		
19	<i>Pa morm</i>	ບາມ້ອມ		<i>Scaphiodonichthys Acanthopterus</i>
20	<i>Pa hang daeng</i>	ບາຫາງແດງ		
21	<i>Pa nai kham</i>	ບາໄນຄຳ	Carp	<i>Cyprinus carpi</i>
22	<i>Pa ee thai</i>	ບາອີໄທ		
23	<i>Pa khing</i>	ບາຂິ່ງ		<i>Onychostoma gerlachi</i>
24	<i>Pa mud</i>	ບາມຸດ		
25	<i>Pa khee mouk</i>	ບາຂີ້ມຸກ		
26	<i>Pa dork thong</i>	ບາດອກທອງ		
27	<i>Pa karn sok</i>	ບາກ່ານໂຊກ		
28	<i>Pa nai lard</i>	ບາໄນລາດ	Carp	<i>Cyprinus carpio</i>

Table 4.1: (Continued)

No.	Lao Name	Lao Language	English Name	Scientific Name
29	<i>Pa daeng</i>	ປາແດງ	Red fish	<i>Tor tambroides spp.</i>
30	<i>Pa song</i>	ປາສອງ		
31	<i>Pa ka derd</i>	ປາກະເດີດ	Three-spotted Gourami	<i>Trichogaster trichopterus</i>
32	<i>Pa mard</i>	ປາມັດ		<i>Trichopsis spp.</i>
	<i>Soft-Skinned Fish</i>			
33	<i>Pa pao</i>	ປາປ້າ		<i>Mototrete turgidus</i>
34	<i>Pa kod leung</i>	ປາກົດເຫຼືອງ	Yellow Catfish	<i>Himibagrus filamentus</i>
35	<i>Pa kod khao</i>	ປາກົດຂາວ	White Catfish	<i>Himibagrus sp.</i>
36	<i>Pa kha yaeng</i>	ປາຂະແຍງ		<i>Mystus singaringan</i>
37	<i>Pa hark kouy</i>	ປາຮາກກ້ວຍ		<i>Acantopsis spp.</i>
38	<i>Pa lard lai</i>	ປາຫຼາດລາຍ		<i>Mestacembelas armatas</i>
39	<i>Pa ci thong</i>	ປາຊີທົງ		<i>Xenentodon cancella</i>
40	<i>Pa khae</i>	ປາແຂ້		<i>Glyptotherax lamprits</i>
41	<i>Pa lord</i>	ປາຫຼົດ		<i>Macragnathus semiocellatus</i>
42	<i>Pa kheo kai</i>	ປາແຂ້ວໄກ່		<i>Yasuhitokakia lecontei</i>
43	<i>Pa duk en</i>	ປາດຸກເອັນ	Walking Catfish	<i>Clarias gariepinus</i>
44	<i>Pa xeum</i>	ປາເຊີອມ		<i>Ompok krattensis</i>
45	<i>Pa kee ka deun</i>	ປາຂີ້ກະເດືອນ		
46	<i>Pa phun</i>	ປາພັນ		<i>Schistura spp.</i>
47	<i>Pa duk born</i>	ປາດຸກບອນ	Walking Catfish	<i>Clarias gariepinus</i>
48	<i>Ien</i>	ອຸ່ງນ	Eel	<i>Monopterus albus</i>



Figure 4.8: *Pa khao (puntius aurotaeniatus)* in Houay Yae Village

- **Frog Types**

Kob (frog) was an amphibian commonly found in the rice fields of the Houay Yae village in the wet season, where it was collected for household consumption. Based on my interviews and observations, frogs in Houay Yae village were classified into thirteen species based on their local name and characteristics (see Table 4.2). This classification reflected local people's knowledge in terms of the use of aquatic resources and their livelihoods.

Table 4.2: Frog Species in Houay Yae Village

No.	Lao Name	Lao Language	English Name	Scientific Name
1	<i>Khied mo</i>	ຂຽດອີໄມ້	Field Frog	<i>Fejervarya limnocharis</i>
2	<i>Khied leung</i>	ຂຽດເຫຼືອງ	Yellow-backed Frog	<i>Pelophylax lateralis</i>
3	<i>Khied khang dum</i>	ຂຽດຂ້າງດໍາ	Dark-sided Frog	<i>Hylarana nigrovittata</i>
4	<i>Ta pard</i>	ຕາປາດ	Common Tree Frog	<i>Polypedates leucomystax</i>
5	<i>Orn</i>	ໂອນ		
6	<i>Khied lang khiey</i>	ຂຽດຫຼັງຂຽວ	Green Paddy Frog	<i>Hylarana erythraea</i>
7	<i>Eung</i>	ອື່ງ	Asiatic Burrowing Frog	<i>Kaloula pulchra</i>
8	<i>Khied ja na</i>	ຂຽດຈະນາ	Common Puddle Frog	<i>Occidozyga lima</i>

Table 4.2: (Continued)

No.	Lao Name	Lao Language	English Name	Scientific Name
9	<i>Khied edum</i>	ຂຽດອີດໍາ	Ornate Chorus Frog	<i>Microhyla fissipes</i>
10	<i>Khied kaen mak eu</i>	ຂຽດແກ່ນໝາກອື່	Dark Side Chorus Frog	<i>Microhyla heymonsi</i>
11	<i>Khied xaiy</i>	ຂຽດຊາຍ	Common Puddle Frog	<i>Common puddle frog</i>
12	<i>Kob</i>	ກົບ	Frog	<i>Hoplobatrachus rugulosus</i>
13	<i>Khun khark</i>	ຄັນຄາກ	Toad	<i>Duttaphrynus melanostictus</i>



Figure 4.9: Frogs in Houay Yae Village

- **Mollusk Types**

Snails were included in the phylum of invertebrate animals. The snails consumed in Houay Yae were all freshwater snails and could be classified into six species based on their use and characteristics (see Table 4.3). The classification of the snails based on their physical characteristics reflected local knowledge in terms of local livelihoods and the local people's reliance on such natural resources. *Hoy choub* was the local name used for a snail and, when people ate it, they would kiss the bottom and head (*choub means 'kiss'*). The name *hoy kin khao* (apple snail) was given because this snail liked to eat rice seedlings (*kin khao means 'eat rice'*).

Table 4.3: Mollusk Species in Houay Yae Village

No	Lao Name	Lao Language	English Name	Scientific Name
1	<i>Hoy pang</i>	ຫອຍປັງ	Apple Snail	<i>Pila ampullacea</i>
2	<i>Hoy phao</i>	ຫອຍພ້າວ		<i>Angiostrongylus cantonensis</i>
3	<i>Hoy choub</i>	ຫອຍຈູບ	Pond Snail	<i>Filopaludina sumatrensis Dunker</i>
4	<i>Hoy khom</i>	ຫອຍຂົມ		<i>Brotia (Brotia) sp.</i>
5	<i>Hoy lek chan</i>	ຫອຍເຫຼັກຈານ	River Snail	<i>Brotia baccata</i>
6	<i>Hoy kin khao</i>	ຫອຍກິນເຂົ້າ	Apple Snail	<i>Pomacea sp.</i>

Figure 4.10: *Hoy Lek Charn* (snail) in Houay Yae Village

- **Crab Types**

Crabs were crustaceans eaten in the households of the Houay Yae village and were classified into four species based on their physical characteristics. These properties were *puu na* (field crab) which had yellow legs and carapaces; *puu houay* (river crab) which had dark legs and carapaces; and the smaller field crab (see Table 4.4). As above, this classification reflected local knowledge and revealed the different characteristics of the species.

Table 4.4: Crab Species in Houay Yae Village

No	Lao Name	Lao Language	English Name	Scientific Name
1	<i>Ka puu na</i>	ກະປູນາ	Field Crab	<i>Esanthelphusa spp</i>
2	<i>Ka puu houay</i>	ກະປູຫ້ວຍ	River Crab	<i>Esanthelphusa spp</i>
3	<i>Ka puu paeng</i>	ກະປູແປງ		
4	<i>Ka puu hin</i>	ກະປູຫີນ		

- **Shrimp Types**

Shrimps were also used for household consumption and were found in the local rice fields in the wet season in streams and rivers. The shrimp caught in Houay Yae village were classified into three types; *kouang kam yai* (big muscular shrimp), *kouang phoi* and *kouang keo* (see Table 4.5). The *kouang kam yai* is a big muscular species – the biggest shrimp in the community. The *kouang keo*, on the other hand, had a white and transparent body, like glass, hence its name.

Table 4.5: Shrimp Species in Houay Yae Village

No	Lao Name	Lao Language	English Name	Scientific Name
1	<i>Kouang kam yai</i>	ກຸ້ງກ້າມໃຫຍ່	Big Muscular Shrimp	<i>Macrobrachium rosenbergi</i>
2	<i>Kouang phoi</i>	ກຸ້ງຝອຍ		
3	<i>Kouang keo</i>	ກຸ້ງແກ້ວ	Freshwater Shrimp	<i>Macrobrachium spp.</i>

- **Insects and Other Small Aquatic Animals**

Insects represented an important and popular source of food, and the name of each insect normally began with the word *meang*, such as *maeng da* (Giant Water Bug), *meang ta loua* (Water Scorpion) and *meang nam muak* (Predaceous Diving Beetle). The insects collected in Houay Yae village could be classified into fourteen species (see Table 4.6) based on their characteristics and on the local livelihoods. The *maeng nam muak* was a group of beetles which, when touched, produced a white colored water - like *nam muak*, hence the name. The *maeng ta lua*; looked like a kind of farming tool called a *lua*, which was used to make ridges in the earth.

Table 4.6: Insect Species in Houay Yae Village

No	Lao Name	Lao Language	English Name	Scientific Name
1	<i>Meang sorn</i>	ແມງຊອນ	Mole Cricket	<i>Gryllotalpa Africana</i>
2	<i>Meang ei niew hang yao</i>	ແມງອີໜັງວຫາງຍາວ	Dragonfly Larvae	<i>Ododata spp.</i>
3	<i>Meang ei niew nar ngorm</i>	ແມງອີໜັງວໜ້າງ່າ	Dragonfly Larvae	<i>Ododata spp.</i>
4	<i>Meang ei niew lang tao</i>	ແມງອີໜັງວຫຼັງເຕົ້າ	Larva of Dragonfly	<i>Ododata spp.</i>
5	<i>Meang ei niew kha yao</i>	ແມງອີໜັງວຂາຍາວ	Dragonfly Larvae	<i>Ododata spp.</i>
6	<i>Meang kard ter</i>	ແມງກາດເຕີ	Hellgrammite Larva	<i>Corydalus</i>
7	<i>Meang ngao nam</i>	ແມງເງົານ້ຳ	Mayfly and Stonefly	<i>Acroneuria californica</i>
8	<i>Meang da</i>	ແມງດາ	Giant Water Bug	<i>Lethocerus indicus</i>
9	<i>Meang pe khai</i>	ແມງເປໄຂ່	Ferocious Water Bug	<i>Diplorchus sp.</i>
10	<i>Meang ta loua</i>	ແມງທະລົ້ວ	Water Scorpion	<i>Laccotrephes ruber Linnaeus</i>
11	<i>Meang nam muak</i>	ແມງນ້ຳມວກ	Predaceous Diving Beetle	<i>Cybister trictatus asiaticus</i>
12	<i>Meang khaem</i>	ແມງເຂັມ	Water Scavenger Beetle	<i>Hydrophilus affinis</i>
13	<i>E - huak</i>	ອີຮວກ		
14	<i>Meang chid</i>	ແມງຈິດ	Water Scavenger Beetle Larvae	

4.3.2 Size and Purpose/Use Characteristics

Local people classified aquatic animals based on their characteristics and the species but also classified them based on their size, purpose or use. The size of the biodiversity of most aquatic animal food was determined by their purpose and could be observed by the name of foods in Houay Yae village. They cooked a species of aquatic animals based on its size such as kaeng som pa khor (snakehead fish soup) made from large sized snakehead fish. On the other hand, most small aquatic animals were made from *pa daek* (fermented fish) and insects and other aquatic animals that are called “*khuang son*” were used for cooking aow and mok – mork.

- **Large Aquatic Animals**

Many foods were made from different types of aquatic animal. In Houay Yae village, large aquatic animals were classified and cooked within different food types and was based on their purpose, such as *kaeng* (soup), *larb pa* (fish salad), *ping* (grilled fish) and *poon* – all of which were made from large aquatic animals. Some foods used in the community, such as *kaeng som pa khor* (snakehead fish soup) and *kaeng som ien* (eel soup) were made using large snakehead fish and eels. The larger sized aquatic animals included fish, frogs and eels.

- **Small-Sized Aquatic Animals**

Smaller aquatic animals were normally cooked in foods called *mok*, *mork* and *aow*, as well as processed food such as *pa daek* (fermented fish). In Houay Yae village, small aquatic animals included insects, shrimps and small fish, plus other small aquatic animals such as *pa xiew nuad yao* (*Esomas metallicas*). This classification based on size, reflected the food culture in Houay Yae village. Most large fish were cooked for household consumption immediately after being caught, while small fish such as *pa daek* were processed for consumption later. Phor Kaenchanh said:

Whenever a big fish is caught, such as a large snakehead fish, we make 'tom som pa khor' (snakehead fish soup) – a part of our local food culture, as only the largest fish and aquatic animals are prepared and cooked in 'tom som' (soup) – as they have a very good taste. On the other hand, mostly small aquatic animals are used in 'pa daek' (fermented fish), while other small aquatic animals such as insects and shrimps are used in 'mok', 'mork' and 'aow' (January 2013).

4.3.3 Habitat Characteristics

In Houay Yae village, mostly aquatic animals were collected from the rice fields, ponds, *houay* (small streams) and the Nam Song River, depending on the season. The collection of aquatic animals depended very much on local knowledge in terms of the animals' habitats. From my interviews and observations, these habitats

could be classified into two types: rice fields and ponds, and small streams and rivers.

- **Rice Fields and Ponds**

In the wet season many aquatic animals could be caught in the rice fields and natural ponds, such as frogs, fish, mollusks, insects and eels. Most frogs were collected in the rice fields, and were made up of more than fifteen species of fish, including eels, *pa xiew* (*Esomas metallicas*), *pa khao* (*puntius aurotaeniatus*) and snakehead fish, plus five species of mollusks, nine species of aquatic insect and one species of shrimp. In total, more than 44 species of aquatic animal could be found in the rice fields and natural ponds around the study village (see Table 4.7).

Table 4.7: Aquatic Animals Found in the Rice Fields and Natural Ponds around Houay Yae Village

No.	Lao Name	Lao Language	English Name	Scientific Name
1	<i>Pa xiew khao</i>	ປາຊິວເຂົ້າ		<i>Rasbora septemtrionalis</i>
2	<i>Pa kheng</i>	ປາເຂັງ		<i>Anabas testudineus</i>
3	<i>Pa xiew aow</i>	ປາຊິວອ້າວ		<i>Luciosoma spilopeura</i>
4	<i>Pa xiew nuad yao</i>	ປາຊິວນວດຍາວ		<i>Esomas metallicas</i>
5	<i>Pa tong lard</i>	ປາຕອງລາດ		<i>Notopterus notopterus</i>
6	<i>Pa tong dao</i>	ປາຕອງດາວ		<i>Chitala ornate</i>
7	<i>Pa khor</i>	ປາຄໍ່	Snakehead Fish	<i>Channa striata</i>
8	<i>Pa khao</i>	ປາຂາວ	White Fish	<i>puntius aurotaeniatus</i>
9	<i>Pa ket khaeng</i>	ປາເກັດແຂງ		<i>Systemus spp.</i>
10	<i>Pa ka derd</i>	ປາກະເດີດ	Three-spotted Gourami	<i>Trichogaster trichopterus</i>
11	<i>Pa mard</i>	ປາມັດ		<i>Trichopsis spp.</i>
12	<i>Pa duk en</i>	ປາດຸກເອັນ	Walking Catfish	<i>Clarias gariepinus</i>
13	<i>Pa xeum</i>	ປາເຊືອມ		<i>Ompok krattensis</i>
14	<i>Pa duk born</i>	ປາດຸກບອນ	Walking Catfish	<i>Clarias gariepinus</i>
15	<i>Pa ien</i>	ອຽນ	Eel	<i>Monopterus albus</i>
16	<i>Kouang keo</i>	ກຸ້ງແກ້ວ	Freshwater Prawn	<i>Macrobrachium spp.</i>
17	<i>Meang sorn</i>	ແມງຊອນ	Mole Cricket	<i>Gryllotalpa africana</i>
18	<i>Niewnar ngorm</i>	ແມງອີໜັງວໜັງຈຳ	Dragonfly Larvae	<i>Ododata spp.</i>
19	<i>Meang da</i>	ແມງດາ	Giant Water Bug	<i>Lethocerus indicus</i>
20	<i>Meang pe khai</i>	ແມງເປໄຂ່	Ferocious Water Bug	<i>Diplorchus sp.</i>

Table 4.7: (Continued)

No.	Lao Name	Lao Language	English Name	Scientific Name
21	<i>Meang ta loua</i>	ແມງທະລົ້ວ	Water Scorpion	<i>Laccotrephes ruber</i> <i>Linnaeus</i>
22	<i>Meang nam muak</i>	ແມງນ້ຳມອກ	Predaceous Diving Beetle	<i>Cybister trictatus</i> <i>asiaticus</i>
23	<i>Meang khaem</i>	ແມງຂ້າມ	Water Scavenger Beetle	<i>Hydrophilus affinis</i>
24	<i>Meang chid</i>	ແມງລິດ	Water Scavenger Beetle Larvae	
25	<i>E- huak</i>	ອີຮວກ		
26	<i>Khied mo</i>	ຂຽດອີໄມ້	Field Frog	<i>Fejervarya</i> <i>limnocharis</i>
27	<i>Khied leung</i>	ຂຽດເຫຼືອງ	Yellow-backed Frog	<i>Pelophylax lateralis</i>
28	<i>Khied khang dum</i>	ຂຽດຂ້າງດຳ	Dark-sided Frog	<i>Hylarana nigrovittata</i>
29	<i>Ta pard</i>	ຕາປາດ	Common Tree Frog	<i>Polypedates</i> <i>leucomystax</i>
30	<i>Orn</i>	ໂອນ		
31	<i>Khied lang khiey</i>	ຂຽດຫຼັງຂຽວ	Green Paddy Frog	<i>Hylarana erythraea</i>
32	<i>Eung</i>	ອື່ງ	Asiatic Burrowing Frog	<i>Kaloula pulchra</i>
33	<i>Khied ja na</i>	ຂຽດຈະນາ	Common Puddle Frog	<i>Occidozyga lima</i>
34	<i>Khied e-dum</i>	ຂຽດອິດຳ	Ornate Chorus Frog	<i>Microhyla fissipes</i>
35	<i>Khied kaen mak eu</i>	ຂຽດແກ່ນ ໝາກອື່	Dark-sided Chorus Frog	<i>Microhyla heymonsi</i>
36	<i>Khied xaiy</i>	ຂຽດຊາຍ	Common Puddle Frog	<i>Common puddle frog</i>
37	<i>Kob</i>	ກົບ	Frog	<i>Hoplobatrachus</i> <i>rugulosus</i>
38	<i>Khun khark</i>	ຄັນຄາກ	Toad	<i>Duttaphrynus</i> <i>melanostictus</i>
39	<i>Hoy pang</i>	ຫອຍປັງ	Apple Snail	<i>Pila ampullacea</i>
40	<i>Hoy phao</i>	ຫອຍຟ້າວ		<i>Angiostrongylus</i> <i>cantonensis</i>
41	<i>Hoy choub</i>	ຫອຍຈູບ	Pond Snail	<i>Filopaludina</i> <i>sumatrensis</i> Dunker
42	<i>Hoy khom</i>	ຫອຍຂົມ		<i>Brotia (Brotia) sp.</i>
43	<i>Hoy kin khao</i>	ຫອຍກິນເຂົ້າ	Apple Snail	<i>Pomacea sp.</i>
44	<i>Ka puu na</i>	ກະປຸນາ	Field Crab	<i>Esanthelephusa spp</i>

- **Collection from Small Streams and Rivers**

Apart from the aquatic animals collected from rice fields and natural ponds, more than 44 species of aquatic animals could be collected from streams and rivers, especially in the dry season (see Table 4.8). This included more than 33 species of fish, seven species of insect, two species of shrimps, one species of mollusk and three species of crab.

Table 4.8: Aquatic Animals Collected in Streams and Rivers around Houay Yae Village

No.	Lao Name	Lao Language	English Name	Scientific Name
1	<i>Pa khor kang</i>	ປາຄໍ້ກັງ		<i>Channa gachua</i>
2	<i>Pa nin</i>	ປານິນ		<i>Oriochromis niloticus</i>
3	<i>Pa mun</i>	ປາມັນ		<i>Gylinocheilus pennocki</i>
4	<i>Pa chard</i>	ປາຈາດ		<i>Poropuntius laoensis</i>
5	<i>Pa bu</i>	ປາບູ່	Sleepy Goby	<i>Oxyeleotris marmorata</i>
6	<i>Pa kang lieng</i>	ປາກັງລຽງ		
7	<i>Pa khee tid</i>	ປາຄືຕິດ		
8	<i>Pa ket laeb</i>	ປາເກັດແລບ		
9	<i>Pa porm</i>	ປາປອມ		
10	<i>Pa morm</i>	ປາມ້ອມ		<i>Scaphiodonichthys Acanthopterus</i>
11	<i>Pa hang daeng</i>	ປາຫາງແດງ		
12	<i>Pa nai kham</i>	ປາໄນຄໍາ	Carp	<i>Cyprinus carpi</i>
13	<i>Pa ee thai</i>	ປາອີໄທ		
14	<i>Pa khing</i>	ປາຂິ່ງ		<i>Onychostoma gerlachi</i>
15	<i>Pa mud</i>	ປາມຸດ		
16	<i>Pa khee mouk</i>	ປາຂຶ້ມຸກ		
17	<i>Pa dork thong</i>	ປາດອກທອງ		
18	<i>Pa karn sok</i>	ປາກ່ານໂຊກ		
19	<i>Pa nai lard</i>	ປາໄນລາດ	Carp	<i>Cyprinus carpio</i>
20	<i>Pa daeng</i>	ປາແດງ	Red Fish	<i>Tor tambroides spp.</i>
21	<i>Pa song</i>	ປາສອງ		
22	<i>Pa pao</i>	ປາປໍ້າ		<i>Mototrete turgidus</i>
23	<i>Pa kod leung</i>	ປາກົດເຫຼືອງ	Yellow Catfish	<i>Himibagrus filamentus</i>

Table 4.8: (Continued)

No.	Lao Name	Lao Language	English Name	Scientific Name
24	<i>Pa kod khao</i>	ບາກົດຂາວ	Wite Catfish	<i>Himibagrus sp.</i>
25	<i>Pa kha yaeng</i>	ບາຂະແຍງ		<i>Mystus singaringan</i>
26	<i>Pa hark kouy</i>	ບາຮາກກ້ວຍ		<i>Acantopsis spp.</i>
27	<i>Pa lard lai</i>	ບາຫຼາດລາຍ		<i>Mestacembelas armatas</i>
28	<i>Pa ci thong</i>	ບາຊີທົງ		<i>Xenentodon cancella</i>
29	<i>Pa khae</i>	ບາແຂ້		<i>Glyptotherax lamprits</i>
30	<i>Pa lord</i>	ບາຫຼິດ		<i>Macragnathus semiocellatus</i>
31	<i>Pa kheo kai</i>	ບາແຂ້ວໄກ້		<i>Yasuhitokakia lecontei</i>
32	<i>Pa khee ka deun</i>	ບາຂີ້ກະເດືອນ		
33	<i>Pa phun</i>	ບາພັນ		<i>Schistura spp.</i>
34	<i>Kouang kam yai</i>	ກຸ້ງກ້າມໃຫຍ່	Big Muscular Shrimp	<i>Macrobachium rosenbergi</i>
35	<i>Kouang phoi</i>	ກຸ້ງຝອຍ		
36	<i>Meang ei niew hang yao</i>	ແມງອີໜ້ຽວ ຫາງຍາວ	Dragonfly Larvae	<i>Ododata spp.</i>
37	<i>Meang ei niew lang tao</i>	ແມງອີໜ້ຽວຫຼັງ ເຕົ້າ	Dragonfly Larvae	<i>Ododata spp.</i>
38	<i>Meang ei niew kha yao</i>	ແມງອີໜ້ຽວຂາ ຍາວ	Dragonfly Larvae	<i>Ododata spp.</i>
39	<i>Meang kard ter</i>	ແມງກາດເຕີ	Hellgrammite Larvae	<i>Corydalus</i>
40	<i>Meang ngao nam</i>	ແມງເງົານ້ຳ	Mayfly and Stonefly	<i>Acroneuria californica</i>
41	<i>Hoy lek chan</i>	ຫອຍເຫຼັກຈານ	River Snail	<i>Brotia baccata</i>
42	<i>Ka puu houay</i>	ກະບູຫ້ວຍ	River Crab	<i>Esanthelphusa spp</i>
43	<i>Ka puu paeng</i>	ກະບູແປງ		
44	<i>Ka puu hin</i>	ກະບູຫີນ		

4.4 Local Knowledge on Cooking and Processing Foods

Aquatic foods found within the rice fields played an important role in the local livelihoods of the Houay Yae community, particularly in terms of food security. Many foods and processed foods were made from aquatic animals, including *pa daek* (fermented fish), *mork kheung son* (a mixed of small aquatic animals steamed in banana leaves) and *larb pa* (fish salad). Local knowledge was used to cook and

process these foods, and this had been taking place a long time ago and was an important facet of the local community. This sub-chapter illustrates the local knowledge held on cooking and processing food, as practiced in the community.

4.4.1 Local Knowledge and Cooking Foods

The diverse range of aquatic animals found within the local rice fields were an important source of food in the Houay Yae village, and the knowledge held on how to prepare such foods were passed from generation to generation. Nowadays, the aquatic animals used to create local and traditional food were part of the local identity. As part of my field work in Houay Yae village I held interviews with the local people that were considered to be experts and knowledgeable on the local food culture. I also observed the knowledge people had on the cooking of food as many kinds of local and traditional foods were prepared and cooked in the community. This is described in the following section.

- ***Tom - kaeng (soups)***

Tom - kaeng was a kind of soup that had a sour taste and contained more water than solid food. This soup was normally served at lunch time after people had been working hard during the morning, and its sour taste was meant to help people recover from their spending working and to continue working in the afternoon. *Tom - kaeng* was a popular, traditional food in Houay Yae village, as was *tom som pa khor* (snakehead fish soup), *tom som ien* (eel soup), and *tom som ien ka ti* (coconut milk–eel soup). These foods were closely linked to the local livelihood and the local farming practices such as the growing and harvesting of rice and other crop production activities. The aquatic species normally used in *tom - kaeng* included fish, frogs, snails and eels. When preparing this soup, the aquatic animals were scaled (fish), gutted and chopped, then put into boiling water, after which herbs and spices were added such as garlic; chilli; onion; lemon grass; kaffir lime leaves; roselle leaves, *som poy*⁶ leaves; *som kOUNG* leaves; and as *pa daek*, which could not be forgotten if one wanted a delicious taste. After adding all the ingredients and

⁶ *som poy* is a kind of wild plant that has a sour taste and is use in soups

simmering for twenty or 30 minutes, the soup could be served. I was told in my interviews, that the added roselle leaves, *som poy* leaves and *som koung*⁷ leaves were herbs which helped to reduce fatigue and encouraged the blood to circulate. In addition, *tom kaeng* was a part of the local livelihoods, was linked closely to farming practices and reflected the local knowledge held on foods in the community. The most important technique when making *tom som pa khor* was to put the fish into boiling water, as the water had to boil before the fish could be added, then left for only 20 minutes before serving. Mae Mone said:

‘Tom som pa khor’ is a delicious soup, and the key is to use a snakehead fish which is as fresh and large as possible, as well fresh ingredients. Also, the water has to be boiling before the fish is added; then simmer for twenty minutes (January 2013).

- **Aow**

Aow contained very little water in proportion to the food and had a spicy and a slightly salty taste. From my interviews and observations, it appeared that there were two types of *aow* that were cooked in Houay Yae village: *aow* and *aow larm*. *Aow larm* was normally made from dried fish and dried frogs, while *aow* was made from fresh aquatic animals, such as *aow pa*, *aow khuang son* (insects and small aquatic animals) as well as *aow kob–khied* (frogs). The animals were usually used in *aow* are fish, frogs, mollusks, insects and small aquatic animals, and the cooking of this dish was based on local knowledge. According to my interviews and observations, the ingredients to make *aow* consist of lemongrass; sweet basil; kaffir lime leaves and dill, plus other flavorings including fermented fish, salt, chilli and garlic. When preparing *aow*, the aquatic animals mentioned above were scaled (fish), gutted and chopped then mixed with the other ingredients and boiled together in water for twenty to thirty minutes before being served. In addition, *khao boua* (powdered rice) was added to *aow* in Houay Yae village and made the dish particularly delicious.

⁷*Som kouang* is a kind of wild plant that found along river banks; it has red-yellow leaves and local people put them in soups.



Figure 4.11: *Aow Khuang Son* in Houay Yae Village

- ***Mok–mork***

Mok–mork was cooked in banana leaves which were wrapped around the food before being placed in a pot for steaming. *Mok–mork* was closely linked to the identity of the village, and the different types include *mork khuang son* (steamed insects and small aquatic animals), *mok pa daek* (steamed fermented fish), *mok pa* (steamed fish) and *mok kob* (steamed frog), all of which were very popular. Fish, frogs, eels, insects and small aquatic animals were normally used in this dish, and once placed in small size of the banana leaves were mixed with pounded ingredients (salt, lemongrass, garlic, chilli, onion and monosodium glutamate), sweet basil, kaffir lime leaves and dills, which were then mixed together. After the *mok* had been steamed over a fire for two or three hours, it was ready to serve. Based on my interviews and observations, how *mok–mork* was cooked was closely linked to the local knowledge. One was not allowed to look inside *mok–mork* while it was being cooked. However, the local people knew that it was done through its weight. If the *mok* was light in weight, then it was ready to serve. As Mae Chanthavong said:

Many people do not know how to tell if ‘mork’ is ready or not, so sometimes they undercook it. However, I can tell if it is cooked from its weight – which should be light. If using khao boua (powdered rice),

one can tell if it is ready from whether the rice is cooked or not (January 2013).



Figure 4.12: *Mok Pa* in Houay Yae Village

- ***Ping* (roasted/grilled food)**

Ping was food which was cooked by roasting or grilling over a fire and using a *mai ping* (bamboo rod). Fish, frogs and eels were most commonly prepared in this way, when they were gutted, mixed with salt and then roasted over a fire for fifteen to 30 minutes. *Ping pa* was normally eaten with *som phuk* (pickled vegetables) – a local food stored for a short time (two or three days) before being eaten.



Figure 4.13: *Ping Pa Khao (Puntius aurotaeniatus)*

- *Oua*

Oua was a kind of dried food which had salt, lemon grass, garlic, chilli, onions, monosodium glutamate, sweet basil, kaffir lime leaves and dill, and in some cases, chopped fish or frog. Snakehead fish were used to make *oua pa*, called *pa taiy touk* (torture–fish–dead) locally. When preparing *oua*, the fish was scaled and gutted then the ingredients were stuffed into the fish which was then bound with bamboo, holding and dried in the sun for two days before being steamed for two or three hours, then was served. The making of *oua* was not only based on the local knowledge of how to make delicious food, but also on how to store food over a short period, something which reflected local livelihoods and farming practices that dictated food demands during farm work.



Figure 4.14: *Oua Pa Khor* or *Pa Loy Khaa*

- ***Poon***

Poon was a water animal used particularly during food crisis periods, and was normally made of fish, frogs, crabs or eels. For the preparation of *poon*, that is, after scaling and gutting the fish, it was then boiled with ingredients such as salt, fermented fish, chilli, boiled egg plants, garlic and lemongrass, after which it could be eaten on the bone or minced with other ingredients. The fish stock and onions were then added before serving.

- ***Larb pa* (fish salad)**

Larb was a Lao minced-meat salad and was regarded as the national dish. The fish version of it was eaten in Houay Yae community. *Larb pa* was famous and popular among Lao people and was made from fish and used during Buddhist and local ceremonies and activities, such as New Year parties, *kheun heuan mai* (house warming ceremony), wedding parties and the *basi* ceremony. *Larb* also represented luck, good opportunities, good health and success. The fish species normally used in *larb pa* included *pa tong* (*Notopterus spp.*), common carp, tilapia nilotica, *pa chard* and *pa khing*. For the preparation of *larb*, many fish were scaled and gutted, then minced and mixed with ingredients such as *khao khoua* (roasted ground rice), garlic, chilli, roasted eggplant, mint, onion and boiled fermented fish, which were then all

pounded together. The most important part of making *larb* was the pounding, during which all the ingredients were mixed with roughly ground roasted rice (*khao khua*), an important component of the dish. Normally, *larb* was eaten with fresh herbs, including *neem* (both the leaves and the flowers), *mark kheua kheun* (native eggplant), *mark khaeng khom* (turkey berry), fresh chilli and *phark khao thong* (*houத்து-nyacordatathumb*), as well as sticky rice. Thus, it was not only the knowledge held about the making of *larb pa* which was important, but also the use of fresh vegetables and herbs.



Figure 4.15: Preparing *Larb Pa* for the *Basi* Ceremony in Houay Yae Village

- ***Chaew* (sauces)**

Chaew was a key component of any meals and a part of the identity of Lao food. In general, *chaew* was made from chilli mixed with other ingredients which gave the sauce its name. Examples of this were *chaew pa* (fish sauce); *chaew meang da* (water bug sauce); *chaew pa khaem* and *chaew nam puu*. When preparing *chaew*, the chilli was roasted, then pounded with garlic, salt, flavoring and roasted aquatic animals such as fish, insects, crabs and frogs. What I mention above is to show that Houay Yae was a community in Vang Vieng that had a diversity of traditional foods. Most of these foods were made from aquatic food resources which were part of their food culture and identity in and part of their local knowledge which was situated based on the environmental and ecological system changes. Many types of food such

as *ping*, *ouas* and *mok – mork* were not only a food for consumption but were also a storage method for saving food for later use as well. Moreover, some kinds of dishes including *larb pa* was also part of the cultural and local identity and was used to serve food in local custom activities such as *basi* – ceremony, wedding party, house warming ceremony. On the other hand, the word “*larb*” served as a sign of a good luck and friendship as well as warming welcome. In addition, the diversity of traditional food in the community was a reflection of the sustainability of household food security which meant that there were many choices in the access to food.

4.4.2 Local Knowledge on the Processing of Foods

Local knowledge on preserving and processing food was a key facet of the life in Houay Yae village. The preservation and processing of food had been practiced for a long time and was still carried out today, such as the making of *pa haeng* (dried fish), *pa daek* (fermented fish), *nam puu* (crab paste), *pa kaem* (salt fish) and *pa som* (pickled fish). These were linked closely to the local culture and livelihoods as they were eaten mostly during work times and during food crisis periods that occurred mainly in the dry season. This was why, in the wet season, most local people collected fish and other aquatic animals and processed them for use in the dry season which is a time of hard work and also of food shortages. The details of local knowledge on processing food were as follows:

- ***Pa haeng* (dried fish)**

Pa haeng (dried fish) was fish that had been dried either in the sun or over a fire. This was a local technique used to preserve aquatic foods for later use. A large-sized aquatic animal such as a fish, frog or eel could be dried easily. In preparing dried fish, many fish were scaled, gutted and mixed with salt then dried in the sun for two or three days before being stored for later use. In Houay Yae village, the making of dried fish not only involved the local knowledge in terms of storing food, but also local knowledge on the cooking of *aow larm* when using *pa haeng* (dried fish). Most fish were kept on a *hing* or *khaa* (shelf) once dried.



Figure 4.16: Dried Fish in Houay Yae Village

- ***Pa daek* (fermented fish)**

The making of *pa daek* (fermented fish) was dependent on local knowledge on the preservation of food. It was used either as a flavoring or in dishes such as *larb pa* (fish salad), *aow*, *kaeng* (soup) and *som tam* (papaya salad). The adding *pa daek* enhanced the flavor of these dishes. Knowledge on the making of *pa daek* had required expertise which could only be passed down from generation to generation. According to my interviews and observations, to make a delicious *pa daek* required an important step: after preparing the fish, one was to leave them for one night, so that they do not go bad. The main ingredients used to make *pa daek* were fish, salt, rice bran, dried chilli and galangal, but not lemongrass because it made the fermented fish taste sour. After at least six months, *pa daek* was ready for consumption. The ingredients that were used to make *pa daek* are set out below:

Fish = 2 kg

Salt = ½ kg

Rice bran = ½ kg

Old galangal = 3–5 pieces

Dried chilli = 5–10 chillies

- ***Nam puu* (crab paste)**

Nam puu was a kind of flavoring paste and was used in *chaew* (sauces) like fermented fish. It was cooked before serving and was used in *som tam* (papaya salad). *Nam puu* was made from crabs that were collected from the rice fields and local knowledge was used to process the crabs that went into *nam puu*. After cleaning them, the crabs were pounded two or three times and were left in water, then left for one night or 24 hours. They were then boiled and the *nam puu* was distilled off – being sticky and black in color. *Nam puu* was usually used to make a *chaew* called *chaew nam puu*, which was used in papaya salad. My interviews showed that in order to make excellent *nam puu*, local people would add chopped lemongrass when pounding the crabs in order to make good smell and that they avoided using young crabs. They also made sure that they distilled out all the water. As Mae Chik, an expert on making *nam puu*, told me:

To be able to store it for a long time, one has to avoid using young crabs, because young crabs have milk inside that leaves a bad taste, plus one has to store it for a long time; more than one year. Once stored for long enough, one takes all the water out, by boiling and distills, with one kilogram of ‘nam puu’ normally made from more than five or six kilograms of crabs (January 2013).



Figure 4.17: *Nam Puu* in Houay Yae Village

- ***Pa khaem* (salty fish)**

Pa khaem (salty fish) was a preserved fish used to make *chaew pa kaem*. *Pa kaem* was made only from white fish species such as *pa khao* (*puntius aurotaeniatus*), *pa xiew khao* (*Rasbora septemtrionalis*) and *pa xiew aow* (*Luciosoma spilopeura*). The fish were scaled and gutted, then put in salt and rice based on a ratio of two kilos of fish to ¼ of a kilo of rice and ½ a kilo of salt; then mixed together in a jar and was kept in a plastic or glass bottle for at least three months. It was then used to make *chaew pa khaem*, with garlic, old galangal, roasted dried chilli, *khao khua* (roasted rice), *mark khaen* (*Zanthozylum Limonella Alston*) and onion which were all mixed together before serving. The key to making *pa khaem* was to use fresh fish and when cooking the sauce, and avoid the use of too much garlic because it left a sour taste in one's mouth. As Phor Sengthong, who is an expert and knowledgeable on making this food told me:

When I catch fish early in the season, I have to prepare them immediately by scaling and gutting them, then mixing all the ingredients together in a plastic bottle. After at least three months the 'pa khaem' is ready to be used, and the important thing is when cooking one should avoid adding too much garlic, because it leads to a sour taste. Khao khua (roasted sticky rice) is an important component also, as it helps with the taste (January 2013).



Figure 4.18: *Pa Khaem* in Houay Yae Village

- ***Pa som* (pickled fish)**

Pa som (pickled fish) was also used to preserve food for later use and was used as a flavor enhancer. *Pa Som* in Houay Yae village was made from *pa khao* (*puntius aurotaeniatus*), *pa xiew khao* (*Rasbora septemtrionalis*) and *pa xiew aow* (*Luciosoma spilopeura*), which were scaled, gutted and mixed with salt, garlic and cooked sticky rice. After mixing all the ingredients together the mixture was put in a plastic bottle for two to three days, after which it was ready to be used. The key when making *pa som*, was to use fresh fish and cooked sticky rice that was cleaned with water. If no clean water was used the fish would rot.

The above sections show how both the cooking and processing of food involved local knowledge and were a key part of the food culture. In addition, it reflected the local livelihoods, identity and culture of the study village. Local people's livelihoods interacted closely with and were closely related to natural foods in the area, and in particular aquatic animals present in the rice fields. The local knowledge people used had been passed down from generation to generation over a long period and were still practiced in Houay Yae community today. The diversity of processed food was a local knowledge of food storage and concerned the process of food made such as *aow larm*, *chaew nam puu*, *chaew pa khaem*, etc. The processing of some aquatic food also represented their culture and identity in local community as well as Lao identity. This processed food included *pa daek* (fermented fish) which was one of the local food cultures and was not just a food that had a high nutritional value but also was part of the local identity and culture. As Lao proverbs said:

*“Norn heuan harn, pao khaen, kin khao niew chum pa daek kaeng
nor mai sai phuk kha yaeng, meu laeng kin poon pa douk na lae som
pa noi, lom phut yen joy joy taiy theing na noi houa na”*

From the viewpoint of proverbs shown that eating *pa daek* (fermented fish) with *khao niew* (sticky rice) associates as a cultural identity of Lao people.

4.5 Local Knowledge and Beliefs Regarding the Collection of Aquatic Animals

Sutton and Anderson (2010) claimed that resource management functions could be practiced in many forms such as passive resource management activities that include cultural and ritual practices. Cultural beliefs played an important role in resource management. Beckford and Barker (2007) supported this view and stated that local knowledge, in the form of cultural and ritual practices, played an important role in rural livelihoods. In Houay Yae village, local knowledge in the form of rituals and beliefs played a significant role with regard to natural food resource management, including the use of aquatic animals. This sub-chapter will highlight the local knowledge of the Houay Yae villager and their belief regarding the use of tools to gather and use aquatic animals.

4.5.1 Local Knowledge and Beliefs on the Usage of Gathering Tools

The use of gathering tools reflects local knowledge and is sometimes linked to cultural beliefs and practices. Cultural beliefs regarding the gathering of aquatic animal diversity were practiced in the Houay Yae village and this meant that local people respected these animals since it is believed they have super natural properties and that they helped in protecting the river basin, which in the local language was called *vang sak sit*. Hence the belief in using *sok kheung meu* in fishing tools. This detailed below.

- ***Vang sak sit***

Vang sak sit (the river basin), was a *phée chao nam vang pa* (a super natural being or ghost) who protected the water and fish there. Local people had paid their respect to the ghosts by not entering this area on *vanh sin* days (no and full moon days). Therefore, whenever local people in Houay Yae village collected fish and other aquatic animals, they would pay their respects to the supernatural being by using spells or uttering favorable words. In an interview, Phor Syphon said:

Everywhere such as forests, water and land has a 'chao' (supernatural being or ghost) who protects the natural resources, so we have to pay our respects to them, and if we do not before catching fish in the river basin, people will fall ill with headaches, nosebleeds and get sick after one or two days; some even die. In my case, I pay my respects before catching fish in 'vang sak sit'; I usually use a spell and say some appropriate words, such as "er..chao thee chao than ery pou khar khor ha yuu ha kin nam vang eun ni yadai ma tae tong der khor aow puu aow pa pai kin sa tuu, sa tuu, sa tuu". After saying these words, I throw some stones in the water or hit the water (January 2013).

Phor Syphone's perspective showed that *vang sak sit* formed a set of rules and a conservation zone that did not allow people to catch fish and other aquatic animals in the zone. This could be treated as a form of aquatic resource management. The *vang sak sit* also reflected the relationship between local community and their natural food sources. Most of local people paid their respect before they entered to catch fish or did not catch fish at all in these places. A violent access could cause headaches, bleed nose and some people could die.

- ***Sok khuang meu* and the Belief in Collecting Fish**

Sok khuang meu was a local belief regarding the use of fishing gears. Local people in Houay Yae village believed that all their fishing tools contained a spirit that dwelled inside them called a *chin*, and people said the *sok khuang meu* when they selected the bamboo used to make the tools and when they made the *pong mai fai* (slots) for the fishhook or the holes in a dip-net. This saying went as follows:

pong puu (crab), *pong pa* (fish), *ma pao* (nothing at all), *khao khon* (tired knees), *norn chao* (rotten) and *aow kin* (enough fish)

These words were uttered when making the holes for the fish hooks, and started with *pong puu* and ended with *norn chao* or *aow kin*. Likewise, for a *khob ving* (triangular bamboo tool) the last hole was referred to as *norn chao* or *aow kin*. This

saying represented part of the local, cultural beliefs system, and meant that, through their fishing tools, they would be able to catch a lot of fish. In addition, before going out to the catch fish, there was also a saying that was used for their fish hooks called *sok khun bet* ('lucky fishing tool'). The saying was as follows:

khao tem hia, mia tem suam ka bor ao (rice in the store and wives in the bedroom we do not need), ja ao pa khing yuu houa hard, pa chard yuu houa vang (but we will need fish at the head of the river basin), om phaeng

These words were said while they blew on the gathering tool, called a fish hook, so that they could ensure a good fish catch. These beliefs were also practiced when collecting bait, such as ant's eggs. The fishermen avoided jumping or groping to remove the ants from their arms or legs, because it was believed that this would cause the fish to swim away. Phor Ong, a villager in Houay Yae, said:

If you jump and grope down when the ants crawl on your legs and arms, it is a bad sign and you may not catch any fish. According to local beliefs, acting like this will wake the fish up; they will swim away and not enter your 'toum' (January 2013).

4.5.2 Local Knowledge and Beliefs Regarding the Usefulness of Aquatic Foods

Cultural beliefs have played an important role in local livelihoods in terms of health and medicines, and this was reflected in the relationship the people had with the natural resources around them. Krishna Den and Emdad Haque (2011) argued that fish and other aquatic animals were not only used for food, but also to cure a host of other ailments and diseases. In Bangladesh, fish and shellfish were widely used for their galactagogue and aphrodisiac properties, for aiding the recovery from long-term illnesses, enhancing childrens' intelligence, and preventing and treating a host of diseases such as night blindness, muscular inflammation, skin diseases and 'big belly' syndrome in children.

In Houay Yae village, aquatic animals were not only used for food but could also be used to make medicines for the treatment of illness and for the enhancement of the health of the local people. All this was based on the people's local knowledge and beliefs. The use of aquatic animals involved taboos that was prevalent amongst pregnant women and new mothers and was passed from generation to generation and continues to be practiced today. These practices played an important role as part of local resource management. As an example, Begossi, Hanazaki and Peroni (2000) argued that rural populations in the *ciaicaras* of the Southeast Atlantic forest coast and the *caboclos* in the Amazon had a system of resource use that was based on the surrounding vegetation, and included the collection of plants, the cultivation of fruit orchards, a swidden system for crops and the careful management and extraction of fibers. Within this system, food taboos played a key role in everyday practices and contributed to the maintenance of local resources. Details of the beliefs related to the use of aquatic resources as well as the procedures and taboos related to it are shown in Table 4.9 below.

Table 4.9: Local Beliefs Regarding the Use of Aquatic Resources in Houay Yae

Procedures and Taboos	Local Beliefs
Procedures and taboos for pregnant women	Use seven dried eel and snake tails with <i>nam muak</i> (water from the soaked sticky rice) to clean the pregnant women's head, particularly during birth on a dark moon day, as it leads to an easy birth.
Procedures and taboos for women after giving birth	<p>After giving birth, women should eat dried fish soup with banana flowers; it helps to enhance the new mother's milk.</p> <p>Women should not eat certain kinds of fish, such as <i>pa tong</i> (<i>Notopterus spp.</i>), <i>pa kheung</i> (Asian redbtail catfish), frogs, eels or <i>pa khao hang dum</i> (white blacktail fish), as it will have an adverse impact on the mother's health, making her ill, thin and weak.</p> <p>The woman should not eat <i>pa daek</i> (fermented fish), <i>pa khaem</i> (salty fish) and <i>pa som</i> (pickled fish), as it is believed this will cause uterine inflammation.</p>
Procedures and taboos for adults and children	<p>People should eat fish to enhance their intelligence, particularly children, and to make them good swimmers.</p> <p>People should not eat snails when suffering from a cough, as it is believed that it will make it worse.</p> <p>People should not eat pickled food, such as <i>pa daek</i> (fermented fish), <i>pa khaem</i> (salt fish) and <i>pa som</i> (pickled fish) when they have a wound or bruising; it is believed to slow down recovery.</p> <p>People should eat <i>tom som ien ka ti</i> (eel soup with coconut milk) and <i>ien oy</i> (eel cooking in sugarcane) as it is believed to cure backache and stomach ache, plus to enhance sexuality.</p>
Procedures and taboos for livestock	<p>Feed fighting cocks with eels and snails; it is believed to make them strong and fit.</p> <p>Feed ducks and chickens with ground shells; it is believed to improve the strength of their eggshells.</p>

4.6 Local Knowledge as Situated Knowledge

The Houay Yae community's livelihood involved the use of local resources and, in particular, aquatic resource management. The community used on local knowledge for the making and using of fishing gears, the gathering methods and the cooking and processing of food.

At least thirty four types of fishing tools were used in the Houay Yae community and are categorised into eight groupings: *bet* (fish hooks); *xai* (bamboo fish traps); *toum* (rounded bamboo fish traps); *peun laem* and *laem sak pa* (fish guns); *ving* (dip – nets); *soum sak pa* (fish coops); *mornng* and *hae* (fish nets) as well as *khong* (fish baskets). These fishing tools were produced by local people as part of their knowledge production processes that are culturally situated. The tools have evolved over time as a result of changing environmental contexts and differing market demands. An example of the change is *ka tong sorn pa*. This research has revealed that certain types of traditional fishing tools used in the past, for example, *lun*, *ving sorn tae*, *xai* (bamboo fish traps) and *soum sak pa* (fish coops), have become obsolete due to their ineffectiveness in a context of modernization, rapid climate change and negative environmental impacts that have caused decline in the aquatic habitat of the area. Many traditional fishing gears were utilized during processes to secure their livelihood; for cultural activities and for ritual activities. Examples of these tools are: *ka tong kob* (frog collecting tool), *ka tong son pa* (a type of dip–net), *dang kuad pa* and *peun laem* and *laem sak pa* (fish guns). The *ka tong sorn pa*, *ka tong kob*, *dang kuad pa*, and *laem sak pa* and *peun laem* (fish guns) were new forms of technology that were created from situated knowledge and adapted to the evolving ecosystem. A *ka tong sorn pa* was a fishing tool made from bamboo and dip- net and looked like a half of circle and was more effective than *ving* (dip–net) in catching fish on channels and streams. A *ka tong kob* was a frog catching tool effective as a catching tool for collecting frogs and was made from small bamboo stems around three to five meters long with a dip–net at the end of its stem. A *peun laem* and *laem sak pa* were new fishing gears suitable for catching in deep water and the *dang kuad pa*, a fishing tool made from bamboo stems and green nets was a new technology that replaced *ving sorn tae* (similar to a dip–net).

The knowledge of fishing methods was rooted in the knowledge of the Houay

Yae community that was accumulated over time and handed down from generation to generation. This situated knowledge expended time, space access boundaries and fishing rotation. The research showed that local people in the Houay Yae community had rotated their space access boundaries and time based on the observed knowledge that was divided into the four zones, namely, Houay Yae, Nalongkuang, Phatang and Hinkhanmark. The rotation of collection was based on aquatic species such as fish, frogs, snails and eels were collected in rainy season. The *khuang son* (mixed aquatic insects), part of the situated knowledge and based on time and space was collected in the dry season.

The knowledge of this community is known as situated knowledge and has been adapted and changed as a result of development practices such as modern agricultural practices and tourism development. According to Nygren (1999), Beckford and Barker (2007), local knowledge is situated knowledge because it can be viewed as a continuous process of change, adaptation and contestation, and combines the traditional and modern, the situational and the hybrid, and local and global knowledge. All of these are integrated to create a complex local life.

Local knowledge as situated knowledge is defined as a process of negotiation in local resource use in the context of development and modernisation including the implementation of modern agricultural practices and tourism development to support livelihoods. Local people in Houay Yae community have adapted their local and culturally situated knowledge to create new forms of fishing gears that was appropriate to the changing aquatic resource landscape including tools and methods used. The process of knowledge production was used to negotiate modern knowledge in resource use including the use of electric shock tools and fish poisons. At the same time, local knowledge was employed by different actors, on different purposes based on capital and labour. The traditional fishing tools were produced by local people for their use to catch aquatic foods and these tools represented local identity; local food culture and the local community. Local foods were exploited by the tourism authorities for tourism purpose and this was a process of negotiation so that the tourism industry could benefit from this local knowledge. This process is in line with Nygren (1999) who, after studying migrant peasants in south eastern Nicaragua, asserted that knowledge production was a process of social negotiation that involved

multiple actors and involved complex power relations.

4.7 Summary

Local knowledge regarding the use of aquatic resources formed part of the intellectual property of the local people in Houay Yae village, particularly the knowledge related to the use of fishing tools; gathering methods; the classification of aquatic animals; the cooking of food and food processing; and their beliefs as it relates to aquatic animals and their utilization. This knowledge had been passed down from generation to generation.

At least 34 types of fishing tool were used, of which there were eight groupings: *bet* (fish hooks), *xai* (bamboo fish traps), *toum* (rounded bamboo fish traps), *peun laem* and *laem sak pa* (fish guns), *ving* (dip-nets), *soum sak pa* (fish coops), *mornng* (fish nets) and *khong* (fish baskets). The making and use of these tools also reflected local knowledge. Local people had extensive knowledge on the use of these fishing tools and this knowledge and their beliefs have played an important role in the gathering methods they had used. Furthermore, local people also classified aquatic animals according to their characteristics and use, and this system reflected the local livelihoods of the community, as many aquatic species were closely linked with their local culture, their food culture and their daily lives. For example, *maeng ta lua* was the name of a farming tool used in the traditional farming system. At least 88 species of aquatic animal existed in the area, and were classified into six types based on their characteristics, for example, fish, frogs, mollusks, crabs, shrimp and aquatic insects. In addition, aquatic animals were also classified according to their habitat and size and what they were used for. It reflected the knowledge held by local people on the cooking and processing of food.

In addition, local knowledge about the beliefs of the community played supported their livelihoods. Examples of this could be seeing with the use of fishing tools and the collecting methods that were used such as their beliefs on the type of bamboo they would use to make tools such as *phée chao nam vang pa*, *sok kheung meu*. Food taboos were closely linked to these activities. These practices were important for the preservation and maintenance of aquatic biodiversity in the Houay Yae village.