3 History and political ecology of living aquatic resources in Lao PDR

3.1 Introduction

This chapter describes the underlying justifications for the development and management of living aquatic resources in Lao PDR. This is done in two parts. The first part gives an historical account of how knowledge on Mekong fisheries has developed and been used to justify management interventions. Specific attention is given the production and reproduction of knowledge through a core set of orthodoxies that underlie the main assumptions, knowledge and power of aquaculture in international development. This builds directly on Bryant's historical political ecology, whereby the political, ecological, social and economic influence over a natural resource contextualises contemporary problems. This is supported by an overall ecological theme, within what Scoones (1999) described as the temporal dynamics of "people in places". Attention then turns to development policy within Lao PDR and how internal and external policies have supported the extension of aquaculture to the neglect of capture fisheries. Discussion then turns to how aquaculture, under the guise of the "Blue Revolution", has been supported by technological, production-based international development that stems from the green revolution. Finally, contemporary orthodoxies that are used to justify living aquatic resource management and development are critically analysed.

3.2 Historical importance of capture fisheries in the Mekong Basin

While culture based fisheries are relatively new, capture fisheries have provided a livelihood base for communities and kingdoms within the Mekong Basin for centuries. Although the historical importance is increasingly recognised in government and popular circles it remains outside of many riparian development agendas.[4]

The following is not an exhaustive account of the history of fisheries in the Mekong Basin. Instead it offers examples of how the fishery has been perceived by visitors to the

[4] The Mekong River Commission has played an important role in public awareness campaigns of capture fisheries through video and radio media. This promotion is an ongoing aim of the MRC Fisheries Component, as outlined at the 2003 Annual Meeting of the Fisheries Component, Udon Thani, Thailand, 4th-5th June 2003..

region since Angkorian times who have recorded and published their experiences and observations. These accounts help to contextualise modern fisheries development and management interventions. European accounts of the fishery in the late 1800s offer evidence of early perceptions of the resource and a means of comparison with contemporary projects by mainly western institutions over the last century. It also contextualises the progress that has been made in understanding the importance of Mekong fisheries to rural communities and how that understanding has been transferred to policy and management.

3.2.1 Cambodia and Angkor

The first records of fish and fishing activities in Cambodia are the Bas Reliefs at the temples of Angkor, built in the 11th Century, on the edge of The Great Lake, Tonle Sap. Fish are represented in daily activities: in markets, in boat racing and warring vistas. They also appear in agricultural scenes. Fishing activities are shown in Bayon and Banteay Chhmar temples including the use of cast nets and lobster pots (Roveda 1997). Fish are also shown in the forks of trees possibly representing the fall of water in the dry season from the flooded forests (ibid.).

Depictions of Hindu folklore also contain reference to fish, such as the story of Praduyma, where the son of Krishna is thrown into the sea and swallowed by a fish (Roveda 1997), and the Churning of the Sea of Milk (see Zhou 2002 [1902]).

The detail and variety of the fish species shows the intricate relationship between the Khmer people and the living aquatic resources of the Great Lake (Figure 3-1). This relationship was first described by Zhou Daguan (or Chou Ta-Kuan), a Chinese diplomatic mission sent by Timur Khan, the grandson and successor of Kublai Khan (Zhou 2002 [1902]), to Angkor in 1295.

> Of fish and tortoise the black carp is the most abundant, and very abundant too are bastard carp, ts'ao-yu. There are 'spitting fish'; the big ones weigh at least two pounds. Many fish exist of which I do not know the names. All these are found in the Great Lake; but there are also many sea fish of every kind, eels, and congers. The Cambodians do not eat frogs, so that at night they are all over the roads. Tortoise and iguana are as large as ho-ch'u, and even tortoise with liao-tsang are eaten. The prawns of Ch'a-nan weigh a pound or more. The legs of Che-p'u tortoise are up to eight or nine inches long. There are crocodiles as large as ships, they have four legs and

look exactly like dragons, but they have no horns; their belly is very crisp. In the Great Lake you can catch bivalves and octopus. (p.61, Translated by Pétillot)

This provides the first account, 700 years ago, of a dependence and importance by people of the Mekong Basin that has changed little. This abundant array of aquatic life remains to this day.

Figure 3-1 Various species of fish from the bas reliefs of Angkor Wat (Source: Roger Mollot)

3.2.2 French Indochina: Cambodia, Laos and Northeast Thailand

The main descriptions of the capture fisheries of the Mekong Basin were given by European travellers in the late 1800s. Although concerned primarily with economic surveys and travelogues, there are a few, often disinterested, observations of fishery activities and their importance to the local peoples.

The geographic extent of these descriptions is mainly confined to relatively 'exotic' or economically important areas. These included the Great Lake near Angkor, the mainstream Mekong to the Khone Falls, the Mun River, the surrounds of Vientiane and Luang Phrabang. The more intrepid travellers extended themselves to the Se Bung Hiang River, Attapeu and North of Luang Phrabang to China. It is interesting to note that most of the fishing activities reported were on the Great Lake and the main tributaries of the Mekong such as the Mun River in Thailand, and the Nam Kan and the Se Bung Hiang in Laos. Collectively they form an historical picture of a variety of Mekong fisheries.

Fishing activities

Some of the fishing gears used along the Mekong were described in great detail. Paul-Marie Néïs (1997 [1884]) observed fishing in the Nam Kan near Luang Phrabang.[5] He detailed the setting up of the traps as the annual floods recede. The structure was described as having:

> … huge tripods formed with three stakes, pushed deep into the soil and with their upper parts strongly tied together with rattan rope. On the inside of each of these tripods a bamboo floor was built, which was loaded with heavy stones to provide still more strength to the structure and to prevent it being taken away by the current. Simple bamboo racks linked the struts. The racks, pierced in the center, received hoop nets which were remarkably similar to those of our lobster fishermen. When the water was deep and the current not so fast, they made these hoop nets in huge sizes. They were not less than fifty to two hundred meters in diameter. (Néïs 1997 [1884], p.89)

The trap he refers to is the same as, or similar to, a modern day *Chip* trap of which there are many kinds (e.g. Claridge *et al.* 1997). The description of these traps is very similar to modern day traps still set on many Lao rivers (Figure 3-2).

Figure 3-2 Chip trap on Se Bang Hiang, January 2003 (Photo: Simon Bush)

[5] Paul-Marie Néïs was a medical doctor commissioned by the French government to survey the areas north and west of the Mekong in 1882 (Osborne 2000).

Mc Carthy (1994 [1900]) describes the fishery in Luang Phrabang as a busy one for fishers in June, the time of the first upstream migrations following the new rains.[6] He identified two species, *pla buk* (*Pangasianodon gigas*) and *pla rerm* (*Pangasius sanitwongsei*) as the target for the fishers.[7] He also reported a rent system paid to local authorities for the right to fish, the price being a large fish from the catch. This was clearly a system of rent from a productive annual fishery. He gives a good account of this migratory fishery:

> The fish [*P. gigas*] is taken in the sixth, seventh or eighth month, or June, July, and August, when on its upward journey. Returning in November, it keeps low in the river, and a few stray ones only are caught … The net for catching these fish is from 150-200 feet long and 6 feet wide, made of cord one-eighth of an inch thick. This is dropped across the river from a small boat, usually by two men, and is supported at one edge by calabashes, used as floats, 8 feet apart, the other edge being sunk by stones placed opposite the floats. In June the water is almost red, and the fish, keeping near the surface, are easily caught. The more they struggle the more firmly are they secured in the meshes; and the stones rattling against the side of the boat as the fishermen pull in the net, indicate a successful cast. This method of fishing is not without danger, for men have been known to be dragged from the boat and entangled in the meshes of the net with the fish. (Mc Carthy 1994 [1900], p.60).

This fishery is much the same as the gill net fisheries found all over the Mekong today. The introduction of mono-filament gill line, replacing the thicker lines McCarthy describes, is generally recognised as one of the major causes of fish decline due to increased fishing efficiency in the Mekong Basin (e.g. Claridge 1996; Coates *et al.* 2003).

Natural science observations

The travellers also made some interesting observations on the biology and ecology of fish. These descriptions concentrate on the larger, more 'exotic' species such as *P. gigas* and *P. sanitwongsei*.

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[6] James McCarthy was the self titled Director-General of the Siamese Government Surveys from 1881 to 1893 (Tipps 1994).

[7] *Pla Buk* and *Pla Reum* are the Thai transliterations. By the Lao transliterations they are known as *Pa Beuk* and *Pa Leum* (or *Pa Ling*)

> A pla buk that I helped to take weighed 130 lbs.; it was 7 feet long and 4 feet 2 inches round the body; the tail measured 1 foot 9 inches. The roe of this fish is considered a great delicacy … Returning in November, it keeps low in the river, and a few stray ones only are caught. It confines itself to the Nam Kawng [Mekong], and does not go up the Nam U [Nam Ou], which the pla rerm seems to prefer. (Mc Carthy 1994 [1900], p.63).

The roe of the *P. gigas* is also referred to as being paid as part of a tribute, payable every 10 years, to the governor of Yunnan by Luang Phrabang. The tribute consisted of:

> … 4 elephants, 41 mules, 533 lbs. of Nok (Metal composed of gold and copper), 25 lbs. of rhinoceros' horns, 1000 lbs. of ivory, 250 pieces of home spun cloth, 1 horn, 150 bundles of areca-palm nuts, 150 cocoanuts, and 33 bags of the roe of the fish pla buk. (Mc Carthy 1994 [1900], p.60)

McCarthy, the more fishery observant of the travellers, also reported the occurrence of a large fish kill in which "the water ran red, and the fish were poisoned by a plant called by the Lao "idam" … " (p.76). He reported that the only two fish species to escape the poison were *Anabas testudineus* and *Channa spp.* by "taking trips overland" (p. 76). [8]

The most poignant and relevant observations were however made by Francis Garnier (1996 [1885]).[9] He made some very insightful observations of the ecology of the fishery; firstly describing the habitat in which large fish are caught such as deep pools. He observes that the fishery concentrated on these areas:

> A few locals used the remaining days before the rise of the waters to throw their nets for the last time into the parts of the river that were sheltered by a fortunate disposition of the rocks on the banks. In these cool, calm and deep places, the big fish which the Cambodian river nurtures find the rest that they need to milt. We were a witness to the capture of one of them, which astounded us by its enormous size: they needed the help of five or six men to lift it on to the bank. (Garnier 1996 [1885], p. 289).

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[8] Both of these fish were reported by their Thai names. *Ananbas testudineus* is reported as *pla maw* (Lao: *Pa Kheng***)** and *Channa spp*. as *pla chom* (Correct transliteration *Chon*, Lao: *Pa Kor*).

[9] Francis Garnier led the Mekong Expedition (1866-1868) after the death of Doudart de Lagrée died in China

Over 100 years later this observation of Mekong fish ecology is being confirmed scientifically. Studies by the MRC confirm that deep pools are important as dry season refuges (Poulson *et al.* 2002; Poulson and Jorgensen 2001). Deep pools are classified as important areas for fish conservation in Southern Laos (Baird and Flaherty 1999) and on tributaries of the Mekong such as the Se Bung Hiang (Pers. Comm. Roger Mollot, 2003).

Garnier, obviously interested in the large species, also questioned wider scales of fish ecology in the Basin. He asks whether:

> … it was a relative of one of the big species which is fed by the great lake of Cambodia and which are, when the waters recede, the object of very fruitful fishing. (Garnier 1996 [1885], p.289)

Again, the importance of fish migration and passage, especially from the Great Lake, has only been established in recent years (see Warren *et al.* 1998; Baird and Phylavanh 2000; Poulson and Jorgensen 2001). This is followed by a much broader questioning of the source of fish migration and spawning. As a challenge to inland fishery workers, Garnier's questions remain important:

> Is it in Tibet that we must find the spawning place of these fish which are surely the kings of fresh waters? The bed rocks and the enormous depths which one finds in the five great rivers [10] … are they the determining factors of their production? Here then are a number of questions for a naturalist to solve. (Garnier 1996 [1885], p. 289).

Importance to livelihoods

Despite such challenges, the importance of fisheries to local livelihoods is a recurrent theme through many of the early accounts. For example, Louis De Carne (1995 [1872]) notes the ease with which fish are caught relative to other food gathering activities such as hunting. He describes an evening in Ubon Ratchatani on the Mun River when fishing was a much easier option to hunting:

> … we set out to hunt in the forest, which was inhabited by wild animals of all sizes and kinds, from the tiger, the elephant, and the wild boar, to the hare and the goat … It would be necessary to

[10] The five great rivers Garnier refers to are the Brahmaputra, Irrawaddy, Salween, Yang-Tse-Kiang and the Cambodia. The Cambodia refers to Mekong River, an early name given by the French (Osborne 2000).

> study habits, and to surprise them by watching, and we had not the time. Fishing was at once easier and more successful. (de Carne 1995 [1872], p. 91)

This shows that in the Mun River area fish were in great abundance and also describes an attribute of the fishery often given by farmers today: that fishing is important because it is more time effective than many other activities (see Chapter 6).

De Carne later goes on to describe, with far more colonial prejudice, the importance of the fishery near Paklai. He identifies fish as making up a large proportion of the local diet and again makes reference to the allocation of time. He goes on to say:

> The Laotians, who, indolent and hating work, prefer fishing to farming, and leave their rice-ground when evening comes, to visit the nets set in the morning in favourable places, or cast lines … (de Carne 1995 [1872], p.91)

This statement again shows the importance of fish for Lao communities and the importance of fishing in the management of daily work. It requires less work than other forms of agricultural activities, therefore providing a 'cheap' source of protein. De Carne goes on to describe, however, that fish such as he purchased on his trip provide an invaluable source of food for fishers and their families over extended periods of time when processed. As he says:

> … a fish a metre and a half long, and as fat as a fed pig, with flesh of the colour and consistency of beef. The capture of one of these monsters is a piece of good fortune for a family. It is cut into strips and smoked, and supports them for long. (de Carne 1995 [1872], p.91).

Conservation and management

In the 20th century there was a distinct move to conservancy and intervention of fisheries management and development in countries such as Thailand and Cambodia. In 1925 Hugh McCormick Smith, the first advisor to the Royal Department of Fisheries in Thailand, reported some recommendations for the future development of fisheries in the Thailand (Smith 1925). He was pro-conservation and his writings consisted of plans and recommendations for aquaculture development as well the conservation of freshwater and marine fisheries. Most notably he recognised the importance of aquatic animals and their role in self sufficiency to the future welfare of Siam.

He notes, contrary to the accounts of rent acquisition by Mc Carthy in Luang Phrabang and others in Cambodia (van Zalinge *et al.* 1998), that in Thailand:

> … in no important fishing ground and in no important organised fishery has there ever been any adequate protection afforded the fishes, and in most cases three has been no protection whatever. (Smith 1925, p. 48).

Smith stresses the importance of local access to the fisheries. The lakes and swamps are the "fountainhead" of the inland fishery resources. These resources, he notes, had been taken over by government-created monopolists. Smith suggests that these resources should instead be in the hands of farmers and the interests of the monopolists should be curtailed in favour of "the great agricultural community" (Smith 1925).

In the first attempt at reducing the pressure on the inland fisheries and stock replacement he made a series of recommendations including the following regulations:

1. Withdrawal of commercial fishing from lakes and swamps connected to rivers for the purposes of spawning habitat.
2. Restriction of fishing in areas surrounding spawning grounds at the end of the spawning season.
3. Raising water levels in swamps and lakes to avoid these water bodies drying up.
4. Installation of fish-ladders or fish-ways to enable migrating fish passage.
5. Restriction of fishing in surrounding areas above and below dams and in irrigation canals to allow fish safe passage.
6. Prohibition of fishing gears that remove all fish within their scope.
7. Supplementation of native stocks by artificial propagation.

The right questions were being asked 80 to over 100 years ago. Smith identifies the need in Thailand for the mediation of water management project impacts to inland fisheries. He also shows insight into access to and control of inland fisheries and debate over the active management of community fisheries, all of which remain contemporary issues for the management of fisheries in the Mekong Basin.

3.2.3 Summary

The European travellers who left accounts of the Mekong recognised the importance of living aquatic resources to the riparian communities they encountered. They identified a range of aqua-ecosystems exploited in a variety of ways. They also made poignant observations and posed interesting questions about the natural ecology of the river basin. Importantly these travellers also recognised the value of the fishery in terms of income and food. These observations provide an account of Mekong fisheries representative of the last 200 years. Over this time the Basin has changed markedly, however, for agrarian communities throughout each of the riparian countries, the importance of the fishery remains the same. It appears however, that whereas the French sought value in the natural resources of the Mekong Basin, modern day development organisations seek to alleviate poverty and the 'burden' of natural resource dependency.

Despite the prophetic recommendations of early fishery advisors such as Hugh McCormick Smith, capture fisheries have taken a back seat to water management and development over the entire course of the last century. It is only recently that they have gained some measure of importance in development and planning through such proponents such as the MRC. However, fisheries development does not reflect the significance and recognition afforded the resource by early travellers. Instead the focus firmly lies with the production of fish through aquaculture. In the case of Lao PDR this is partly the result of external agents fostering the perception of Asia as the home of fish farming, based on early representations of the centrality of fish in Asian cultures.

3.3 Ancients or Adopters: the roots of 'Asian' aquaculture

> Give a man a fish and he eats for a day, teach a man to fish and he eats for a lifetime
> - Chinese proverb
>
> Give a person a fish and he will have food for a day; teach him to grow fish and he will have food for a lifetime
> - Shao Wen Ling (1977) the first man to raise the Malaysian prawn from egg to adult under controlled conditions.

The Organisation for Economic Cooperation and Development (OECD) only identified aquaculture as an emerging industry in 1989 (OECD 1989). However, small-scale rural aquaculture has been practiced for hundreds of years in various parts of the world (see

Ackefors *et al.* 1994; Ling 1977; Parker 1989; Bowen 1970; Brummett and Williams 2000). It is only relatively recently that aquaculture has been formalised within Western science and packaged as an object of international technical assistance.

While there is much evidence to show the importance of fish in Asian cultures, commentators have tended to see fishing and aquaculture as an 'essential' part of the 'Asian' character (e.g. Liao 1988). Textbooks often start with a statement of the Asian roots of fish farming (e.g. Iversen 1968; Bardach 1997; Ling 1977). Without denying the essential role of fish in Asian societies, it can be demonstrated that most of the technical assistance to South, Southeast and East Asia has its roots in Western countries, with their own aquacultural histories. The following therefore begins by outlining the Asian history of aquaculture before tracing the European history of aquaculture and Western influence on aquaculture in Asia.

3.3.1 Ancient Asian aquaculture

It is believed that aquaculture goes back approximately 3500 years to Weng Fang, the founder of the Zhou Dynasty in what is now modern day China. From around 1135-1122 BC it is reported that he built ponds in Hunan Province, filled them with ornamental fish, and made the first ever recording of aquaculture techniques (Ling 1977).

In 460 BC Fan Li, a minister of Emperor Guo Jian in Yue State, wrote his classic treatise on the culture of Common Carp (Cyprinus carpio), making the first effort to record the process of fish cultivation (Ackefors *et al.* 1994; Ling 1977). His interest in the culture of fish for food is thought to have been a strategy for strengthening the state against war and revolt (Sun 1987). Modern day China is also regarded as one of the first areas of the world to develop forms of mariculture when 200 years after Fan Li, people began an era of sea animal husbandry during the Qin dynasty (221-206 BC) (Sun and Sun 1999) and also 1000 years later during the Sung dynasty (960-1279 AD) when people began to develop the first oyster, pen shellfish, and pearl fields (ibid.).

The evolutionary process leading to modern forms of aquaculture is thought to have started with storing wild caught fish in baskets submerged in water (Ling 1977). It is believed that this practice gradually developed into the rearing of caught fingerlings in nets and eventually earthen ponds (ibid.). Other evolutions of aquaculture may have

involved the use of trap ponds much the same as are used extensively in Northeast Thailand today. These trap ponds are developed in response to the hydrological patterns of floodplain areas to trap fish in depressions during the receding waters. Much of this evolution continues to occur as present day farmers move up what Setboonsarng (1993) called the 'ladder of intensification' - from capture to culture. Such evolution could have occurred in a number of places around the globe, however China is seen as the source of aquaculture as it developed the first entirely closed husbandry techniques. Mariculture has also had a long history in other Asian nations such as Japan where communities raised clams in the 8th century and seaweed in the 11th century (Ackefors *et al.* 1994).

It is thought that the introduction of fish husbandry to Southeast Asia occurred around 1000 years ago (Williams 1997; Edwards 2000). As ethnic Han Chinese moved down the Southeast Asia peninsula bringing with them the hardy *Cyprinus carpio* (Common Carp) as well as the required technical knowledge for both rice-fish and urban aquaculture systems, they settled and disseminated their technologies. It is thought that during this time the Giant Goldfish (*Carassius auratus*) was introduced to the upland regions of Laos and Thailand where it remains to this day (Funge-Smith, Pers. Comm. 2000).

It was not until the end of the Second World War that real advances in the techniques of fish farming were made with the selective breeding of species and controlled reproduction by hormonal injection (Coull 1993). This set a platform for incorporation of fish rearing techniques in green revolution technology during the 1960s.

With such an historical legacy it is not surprising that Asia and Asian traditional practice has become, in some circles, the assumed antecedent to present day fish culture. The opening two quotes of this section show how the idea of aquaculture and fish husbandry have in some respects been co-opted and perhaps even normalised into a fundamentally Asian practice. Despite such beliefs however, it appears to be not widely recognised that, apart from ancient practices within China, modern day protagonists of aquaculture are mainly Western-based institutions pushing aquaculture as a practice yet to reach its potential as a panacea for food production and income generation in developing countries (Edwards 1997; Bardach 1997; Coull 1993; Williams 1997). Therefore a European

history is important in giving context to the current practices of aquaculture in rural development within Asia.

3.3.2 Ancients, adopters and developers: Europe and United States

The Asian dominance of aquaculture histories overlooks the long record of fish husbandry in Europe and also the important contribution to aquaculture made in North America over the last two centuries. In the context of modern aquaculture technologies and international development, the legacy of these histories have played a significant role.

Fish culture dates back 2000 years in Europe to both the Greek and Roman empires. Evidence from this time includes the description of Carp by Aristotle (384-322 BC) - *kyprinos* or *kyprianos*, derived from the Latin *Cypria* (secondary name for Aphrodite the god of love and fertility) as a function of the fecund nature of the fish (Balon 1995). Both the Greeks and the Romans grew Carp, however confined themselves to the rearing of wild caught juveniles (Ackefors *et al.* 1994).

It is proposed by Balon (1995b) that the origin of aquaculture, although documented as starting in China, may have also had origins in Europe (Balon 1995). He argues, through a history of the domestication of the Common Carp (*Cyprinus carpio*), that the origins of fish culture may have occurred simultaneously in China and Europe. The basis for this argument is evidence showing that the contemporary species *Cyprinus carpio carpio* evolved from a riverine species found in the Danube, and early reference to 'Carp' in Asia may in fact refer to the East Asian subspecies *Cyprinus carpio haematopterus*. The implication of convergent evolutions of Common Carp is that it appears plausible that the development of aquacultural technologies in Asia and Europe have occurred in isolation from each other.

Within Europe the spread of aquaculture is attributed to the spread of the Roman Empire. Archaeological evidence of Roman period fishponds has been found from Rome to Britain. These ponds are usually associated with manner houses or royalty (Zeepvat 1988). There is also evidence from Roman literature describing fish being kept for food, pleasure or profit, fishponds being referred to as piscinae or vivaria, and those that kept the ponds *piscinarii*. These early aquaculturalists raised freshwater trout (Latin: *salar*),

roach (*rhedo*), perch (*perca*), tench (*tinca*), gudgeon (*gobius*) and saltwater sea-eel (*murena*), bearded mullet (*Barbatus mullus*), turbots (*rhombi*), and bass (*lupi*) (ibid.).

In medieval times numerous fishponds were built as a system for the provision of fish for the royal courts of what is now the United Kingdom (Roberts 1988; Steane 1988). In England, and across Europe, cathedrals were also responsible for the development of the culture of Common Carp (*C. carpio*), kept for days of fasting (Balon 1995). In Scotland the rearing of trout and salmon has occurred from at least medieval times where their systematic production was used by various church institutions (Coull 1988).

Across the Atlantic the United States has had a more recent history of aquaculture roughly spanning the last 200 years. One of the first records of fish culture in North America was in 1853 when two aquaculturalists were among the first to fertilise the eggs of brook trout (*Salvelinus fontinalis*) (Bowen 1970). Until the 1880s the main focus of aquaculture in North America was on stock enhancement in rivers that had depleted salmon or trout stocks from pollution or overfishing. Stocks were also introduced for the purposes of sport with the introduction of brown trout from Scotland and Germany in 1883 (Parker 1989).

In 1875 leather and mirror carp were imported from Germany and were the basis for the development of the first food culture in the southern states (Bowen 1970). The 1880s saw a massive increase in interest in the culture of carp and further links were made between European fish culture societies and the newly named American Fish Cultural Association (Parker 1989). However, this interest subsided with the recognition that it had a detrimental impact on native fish stocks (Bowen 1970).

The earliest course in fish husbandry started in 1812 at Cornell University. The early 1900s then saw growing interest in the development of aquaculture at educational institutions and for the first time in the world aquaculture was formalised and institutionalised. Other Universities took lead from this institution and courses were soon developed at the University of Washington and Stanford University. In 1930 courses were also developed at a number of other institutions. Of note was the commencement of the course at Auburn University in Alabama under Professor H.S. Swingle who was heavily involved in aquaculture development in Thailand through the

1950s, 1960s and 1970s (Swingle *et al.* 1970). In 1970 the University opened *The International Centre for Aquaculture* organised within the Department of Fisheries and Allied Aquacultures. The centre then received a continuing grant from United States Agency for International Aid (USAID) for the development of its international assistance work (Parker 1989).

Early training concentrated on raising baitfish in small water bodies during the 1930s, catfishes in the 1940s and warm water species such as Channel Catfish in the 1960s (Smitherman and Dunham 1985). With added funding from USAID, both teaching and research built on their warm water fish experiences and by 1987 courses gave emphasis to species such as Tilapia (Jauncey and Ross 1982; Macintosh 1984; Balarin and Hatton 1979; Rouse *et al.* 1987; Almazan and Boyd 1978; Smitherman and Tave 1987; Bocek year unknown) and Common Carp (Bocek year unknown).

As such, the development of aquaculture in US and European Universities served to institutionalise aquaculture in education and directly influence the development of aquaculture in Southeast Asia through technical assistance.

3.3.3 Summary

Asia has a long association with fish culture dating back 2500 years. This has led to a major perception that Asian cultures are generally more likely to adopt aquaculture today. However, European fish culture also has a long history dating back as long as Asian histories. In the last century aquaculture has been institutionalised in European and North American universities. As a consequence it gained ascendency as a technology based tool for rural development. In Southeast Asia, and especially countries such as Thailand and Laos, the extension of aquaculture has been premised on its 'Asian' roots. It appears therefore, that this narrative has provided the basis for fish culture and, through the hegemony of donor funding, has overshadowed the alternative histories of capture fisheries. The development of fisheries in Lao PDR is testament to this. Even though there is a rich and abundant capture fishery, the emphasis on fishery development has focused on aquaculture.

3.4 Fisheries development in Lao PDR

> In most rural parts of the lowland plains [of Laos], as well as in much of the uplands, fish and other aquatic animals provide between seventy and ninety percent of the animal protein in people's diet. For many of these people, not yet or barely in the cash economy, there is no affordable substitute source of protein. (Claridge 1996).

The importance of living aquatic resources in Lao PDR is increasingly recognised in development circles. However, the majority of both external and internal development policy is aimed at the production of fish through aquaculture rather than the conservation of existing capture fishery stocks. The following describes how a syncretic aquaculture model was developed from the 'Asian appropriateness' of fish and European development agendas in the form of international projects, as well as from the internal socialist development agendas of the Lao government.

3.4.1 External influences: fishery development agencies

The modern history of aquaculture in Laos can be broken into four distinct periods. The first of these is the pre-revolution period from the 1950s to 1975. The second is the post-revolution period from 1975 until the Fourth Congress of the Lao People's Revolutionary Party in 1986. This marked a change in emphasis of the role of aquaculture in the provision of food security and was the first recognition that aquaculture could offset the decline in the capture production (Phonvisay 1994). The third period, from 1986 to 2000 is characterised by increased accessibility to Laos by international development organisations. The current period, post-2000 is characterised by a shift toward a holistic view of aquatic resources management.

Laos has a broad aquatic resource base that can be divided into upland and lowland areas with varying degrees of resource access and productivity. This natural, resource and skills based distribution appears to have existed up until the 1950s when the first aquaculture development intervention was undertaken. A plan for inland aquaculture was written in 1956 with support from USAID and the Government of Thailand identifying the construction of seven centres around the country (USAID 1973). The four stations targeted were Nongteng in Vientiane, Km 8 at Pakse, Phak Bo in Savannakhet and Khongsedone in Salavane (ibid.). However the stations were never completed due to political instability in 1959 (see Figure 3-3). In 1965 further development resumed after a USAID study into the feasibility of aquaculture in the

country (USAID 1973). A contract was written between the Lao and American governments pertaining to the development of aquaculture, the restoration of the abandoned stations and the training of Lao personnel in the production of Common Carp and Tilapia. During this time Japanese assistance built a series of spawning facilities. Only three of the stations were developed, Nong Teng, Pakse and Luang Phrabang (Ministere-de-L'Economie-Nationale 1972; USAID 1973). Then in the early 1970s stations were also constructed in Houa Phan, Xieng Khouang and Oudomxay with assistance from Vietnam and China (Gupta *et al.* 2000). These stations were however isolated and based on the Chinese methods of mass production rendering them inappropriate and ineffective.

The interest in aquaculture as a development programme was only part of the much wider aid portfolio estimated at US$74.4 million per year from 1968 to 1973 (Chanda 1982). This massive input made citizens living in the Vientiane special zone the highest per capita recipients of aid in the world (ibid.).

In 1975 with the end of the revolution and victory to the communist Pathet Lao there was an abrupt end to US aid with the closure of USAID and Multilateral budgetary assistance (Chanda 1982). The new regime then sought unilateral and bilateral assistance from socialist block countries such as the then Soviet Union, Hungary, Czechoslovakia and nearby Vietnam (Burley 1982). From 1975 to 1982 over US$400 million non-military aid was delivered to Laos from such connections, most of which was programmed after the 1978 Moscow meeting of the Council for Mutual Economic Assistance (CMEA), an organisation consisting of socialist states. However, funds from the Asian Development Bank (ADB), International Monetary fund (IMF), World Bank (WB) and United Nations (UN) continued to some degree through the initial transition (ibid.).
Most of the programmed aid from politically aligned states generally came in the form of fellowships for Lao students to study overseas. The appropriateness of many of the industrial, technology driven skills obtained through these fellowships is questionable in an agrarian context such as Laos. Many of the returning students had degrees up to Masters and Doctorate level in large animal husbandry and engineering, with little chance of meaningful employment on return. Those that did find employment through the government were placed in jobs in which they had no training at all. This is especially evident in the case of the fish stations where to this day some of the managers

in place have engineering degrees and have had to develop their skills through subsequent projects and self-reliance. Other returning students with skills relevant to areas such as fisheries found that their skills were ignored by a government more interested in the collectivisation of rural production than in the development of the fishery sector. This was also, it appears, a function of poor institutional understanding of, or indifference to, fisheries resources that is still an issue of rural development in the country (Guttman 2000).

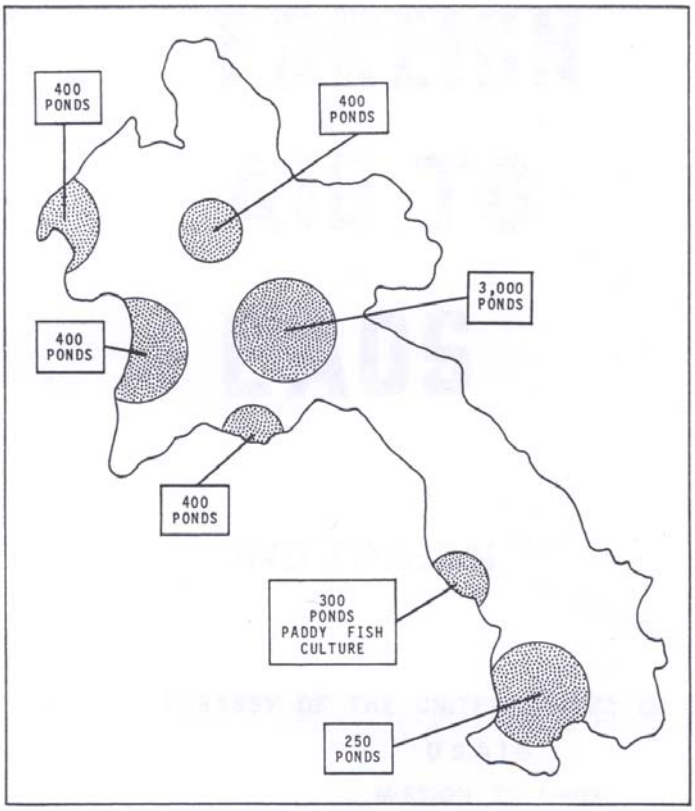

Figure 3-3 Location and number of ponds in Laos by province at the end of the 1950s
(Source: USAID 1973)

Development projects after 1977 focused on the development of government hatcheries, or fish stations (). One of the international institutions involved in agricultural development and able to maintain a presence through the revolution was the Interim Mekong Committee (forerunner to the Mekong River Commission) under the United Nations Economic and Social Commission for Asia-Pacific (UN-ESCAP). In 1977 UN-ESCAP instigated a project to once again rehabilitate the Nong Teng Fish station in Vientiane with funding from the Government of the Netherlands and so begin a presence of the UN in Lao aquaculture for the next two decades (Gupta *et al.* 2000). This project

introduced Silver Carp (*Hypothalmichtys molitrix*), Big Head Carp (*Aristichthys nobilis*) and Grass Carp (*Ctenopharyngodon idella*) from Thailand and later in 1979 successfully bred the Indian Carps Rohu (*Labeo rohita*) and Mrigal (*Cirrhinus cirrhosus*). Despite a drought these fish were successfully bred in the same year (ibid.). As a follow up to this success the Interim Mekong Committee, again with funding from the Government of the Netherlands, built a pilot farm for the production of fingerlings to supply to farmers in Vientiane province from 1978-1980.

Table 3-1 Fisheries projects 1978 to 1991 in Lao PDR (Source: UNDP, 1981; 1991)

Project	Duration	Description	Budget (US$)
Tha Ngone farm development by the Interim Mekong Committee	Phase I 1978-1981 Phase II 1981-1984	Development of infrastructure at Tha Ngone fish farm	150000
Nam Ngum Fisheries project, Interim Mekong Committee	1978-1985	Lao component of a project to establish pilot projects in four Mekong Basin reservoirs	100000
Development of Fishing Communities in the Nam Ngum River Basin, Interim Mekong Committee, Vientiane.	Nov 87 - March 91,	Improvement of living conditions skills and organisation ability of fishery communities around Nam Ngum Reservoir, State Agro-processing Society.	3160000
Nong Hai Fish farm, CIDSE, Vientiane	Jan 1989-1991,	Development of staff technical capacity at fish farms.	60000
Development of Fishery extension, UNDP, Ministry of Agriculture and Forestry	Jun 1989-Dec 1990	Development of aquaculture extension capacity in Savannakhet, Vientiane, Xieng Khwang,	975000
Fishery Development in Nam Souang Reservoir, Ministry of Agriculture and Forestry.	Jun 1989-1990	Development of fish culture in Nam Souang Reservoir, Vientiane Province	84000
Rehabilitation of Fish Seed farm, UNDP, Ministry of Agriculture and Forestry.	1984-1991	Rehabilitation of provincial fish stations in Savannakhet, Vientiane, Luang Phrabang and Pakse	1044000

In 1980 the Interim Committee once more developed a project for the development of the Fish stations targeting Pakse, Savannakhet and Luang Phrabang. This plan was taken up by the FAO/UNDP and so initiated an involvement in aquaculture development in Laos that lasted for the next two decades. The first two Phases, LAO\78\014 and LAO\82\014, were predominantly concerned with increasing seed production and the

technical capacity of the hatcheries. Towards the end of the 1980s the project had accounted for the production of 32 million fingerlings of both Indian and Chinese Carps (Gupta *et al.* 2000). This supply reportedly increased the demand by farmers and forced pressure on some farmers to develop producing seed in their own ponds (ibid.). The FAO/UNDP was mainly focused on upgrading existing aquaculture facilities. The development of the central hatcheries was a major part of the production of fry and a series of 'model farms' were set up as a means of disseminating the technologies.

The Fourth Party Congress of the Lao People's Revolutionary Party in 1986 marked a turning point for much of the policy related to agriculture. The Congress placed greater emphasis on the role of aquaculture in the provision of food security (Phonvisay 1994). At this time the DLF identified the development of aquaculture as the primary component for achieving this goal (ibid).

The next involvement of the FAO/UNDP was a continuation of the model farmer program through the "Development of Fish Culture Extension" (LAO\89\003) project designed to develop an extension network for aquaculture in Champasak, Savannakhet, Luang Phrabang, Xieng Khouang and Sam Neua provinces. The main aim of the project was 'to disseminate suitable scientific aquaculture technologies to the farmers to improve their traditional methods and in turn improve their nutritional level and family income' (cited in Guttman 2000). The project collected large amounts of information on the progress of model farmers in these provinces who acted as village level extension workers. It was during this project that the first efforts were made to breed *Puntius goniotus* and *Cirrhinus microlepis*; the former successfully, the latter unsuccessfully (Gupta *et al.* 2000).

The next FAO UNDP project, "Provincial Aquaculture Development" (LAO\97\007), sought to strengthen the extension models begun in the "Development of Fish Culture Extension" and increase the number of provinces involved in the project. This project was not only instrumental in increasing the national extent of aquaculture development but also the information on aquaculture and aquatic resources and technical knowledge of both farmers and government hatcheries (Funge-Smith 2000). The main aim of this project was to develop aquaculture accessible to farmers and so raise both income and nutrition of the target communities.

Other efforts in the development of aquaculture include AIT Aqua Outreach (AOP) in the South. An extension of the AOP in Northeast Thailand, the project has focused on the extension of low technology nursing and spawning technologies as a means of decentralising fish production from government run hatcheries (Litdamlong *et al.* 1998). The project has focused strongly on the development of spawning and nursing networks, enabling technology to spread from farmer to farmer (Litdamlong *et al.* 1998; Haitook 1997; Haitook *et al.* 1999).

Smaller projects such as the ACIAR IDRC Indigenous Fisheries Development and Management Project (IFDMP), the Small-Scale Wetlands Indigenous Management Project (SWIM) and MRAG Adaptive Management project are focused more on enhanced fisheries. However, they have also been responsible for the upgrade of government hatcheries and training of government staff (Noraseng *et al.* 1999; Lorenzen and Garaway 1999). One of the most recent projects dedicated to aquaculture development and extension is the AQIP being developed through JICA.

As outlined above, aquaculture in Laos has a relatively short history. Its application as a means of targeting poverty in rural communities has been adopted by both pre and post revolution governments. Although the current government has been active in adopting aquaculture into its agriculture and aquatic resources management policy, international development institutions such as FAO, UNDP, AIT and JICA have implemented the projects.

International assistance in Laos has been influential in developing aquaculture. This has meant that despite having been perceived by many as an essentially Asian practice much of the development and extension of aquaculture has been developed through western-based institutions and projects as well as through training programmes at foreign universities. In spite of the documented Asian-ness of aquaculture, the main impetus behind its modern development has been Western technical assistance.

The recent history of aquaculture in Laos has highlighted the growing interest by not only the Government of Lao but also international development institutions. It is proposed here that the goals and agendas of these institutions rather than the capabilities

and needs of local communities have driven the development of aquaculture in Laos. However, there has been a considerable amount of influence from internal socialist development politics within which external development has operated.

3.4.2 Internal socialist development

External development fits in with internal development policies. These policies reflect an attitude of production, not natural resource management or conservation. 'Fisheries' then falls within this productionist agenda, with little distinction between capture and culture.

From the time that the Lao People's Revolutionary Party (LPRP) came into power they put into action a plan for "progress toward socialism". This included limiting the tertiary sector, development of the state sector and direction of the peasantry toward greater productivity and collective modes of living (Doré 1982). This was proposed with no practical plan until mid-1976 and Vietnamese unification. After this point the Vietnamese gained socialist dominance over the fledgling Lao PDR (Doré 1982). Simultaneously the Fourth Congress of the Vietnamese communist party and the Fourth Resolution of the LPRP expressed three revolutions based on a theoretical framework for socialism in Indochina; itself based on heavy industry and collective mastery (essentially collectivisation). It was at this time the first three year plan was put into action from 1977-1980. The main purpose of this was to bring planning into line with COMECON countries, and establish a socialist geopolitics of resource use and development. This was most explicitly reflected in Vietnamese assistance in a five year series of protocols on economic, social, scientific and technological cooperation signed in June 1982 (Bedlington 1982).

Three revolutions - 1) revolution in the mode of production, 2) scientific and technical revolution and 3) the ideological and cultural revolution - were aimed at developing a new socialist mode of production in which the scientific revolution was the "keystone" in the simultaneous implementation of all three (see Stuart-Fox 1996). At the core of this framework was the development of a new socialist man who would be impregnated with the right of collective mastery, directly attributable to the ideological and cultural revolution. Initial government policies reflected this philosophy by suppressing supplemental activities by households (Evans 1995). As Laos had little in the way of

heavy industry and a proletariat comprising some 80% of the population, agriculture was the main focus of these revolutions and materialised through the collectivisation programme. This however collapsed by 1979 because of a complex combination of no material incentive (Worner 1994), the attachment to traditional lifestyle and the predominant 'moral economy' (Ireson 1992), a lack of understanding of co-operative values and reward system (Bourdet 1995), out-migration of farmers to Thailand and failure of material support from the government (Stuart-Fox 1996). Failure was also attributed to the inability of the government to consolidate the five sectors of the economy: the collective economy, the individual economy, the state economy, the capitalist economy and state capitalist economy (Evans 1995; Luther 1983). This was compounded by the remoteness of many communities living in a pre-feudal state, hindering the government's ability to consolidate the range of economies at work that the Lao government had to deal with (Luther 1983).

The collectivisation programme was designed to promote a decentralised socialism in which a highly diffuse agriculture would be able to be coordinated. Any attempt to bring natural resources under a common system was also a challenge for the government. In the case of forestry this worked as it was not in opposition to a traditional system such as agriculture. Bringing in systems such as fisheries was seen a not worth pursuing, although attempts were apparently occurring in Champasak province (Baird 1994). The Lao mode of socialism was seen as a way of coordinating all economies and especially consolidating the move from the dominant natural economy to a new socialist economy (Luther 1983; Evans 1995).

Control was also actively sought through the taxation system established in 1977 based on surpluses of rice production. This was revised in 1979 in conjunction with fiscal planning devaluing the kip by 75% (Luther 1983). Declining productivity in 1979 as a result of low recorded surpluses, drought and severe flooding meant that the government's vision of collective mastery was questioned by the people and also within the party (Evans 1995). By 1980 the tax system was revised and the need for external assistance recognised and actively sought.

By the early 1980s the government realised that it had not achieved its goal of self sufficiency and sought external assistance. This was seen as the only way to generate the

capital with which to invest in the agriculture sector and so generate future income. It is interesting to note however that at this time hydropower and forestry were the highest income earners (Luther 1983), a fact which is linked to Vietnamese involvement under the rhetoric of the cultural and ideological revolution (Doré 1982). Socialist rhetoric was still prominent, especially in relation to the three revolutions. At the Third Congress of the LPRP, Kaysone reiterated the role of the three revolutions to pave the way for productive forces to develop with the specific aim of moving the country from small-scale natural economy to large scale socialist economy (Thayer 1983).

This marked the start of development planning in the country and was aimed at bringing national planning into line with other COMECON countries (Worner 1994), followed by the First (1981-1985) and Second (1986-1990) Five Year Plans. Both of these emphasised the role of agriculture through rice production with goals of national self-sufficiency and food security (Worner 1994). It was these two main policy areas that the UNDP aquaculture projects operated under during the 1980s, providing a production system for fish protein.

The second five year plan (1986-1990) introduced the New Economic Mechanism (NEM). This was inaugurated at the fourth Party Congress in 1986, moving the government perspective from food security and self-sufficiency to export orientation. This change initiated a process of decentralisation, re-administering control over pricing, production targets and wages to provinces and districts (Worner 1994). Even though self-sufficiency had failed during the late 1970s it remained a central tenet of the government. Phoumasavan, for example, argued that the Second Five Year plan needed to "ensure a fundamental solution to the food problem" (Cited in Worner 1994). The 'problem' existed due to the fundamental belief in a productionist mode of food security and self-sufficiency. The targets for agriculture were dominated by crops and livestock, with no appreciation of living aquatic resources or non-timber forest products. However, better statistics on food collection, including fish and other aquatic animals, weakens notions of a crisis in national food security.

The Third Five Year Plan (1991-1995) promoted the private sector and the development of a market economy. No mention is given to the objective of self sufficiency. It sought to consolidate the economic reforms put in place through the NEM and sought further

market integration (Bourdet 2001). According to Geoffrey Gunn (1991) agriculture was identified as the main area of growth for the national economy and was allocated one fifth of the national budget. He identified how agriculture remained at the heart of the economic growth, but first the nation had to achieve food self sufficiency. However, the loss of COMECON aid meant that Laos had to further push for Western, Chinese and Vietnamese assistance.

Most recently in the 7th Party Congress and planning for the period 2001-2005, the government has focused on a continuation of market oriented reforms. There was an abandonment of communist economics in the congress but at the same time a reiteration of adherence to Marxist-Leninist principles (see Bourdet 2001). It was noted that growth was based on the agricultural sector which, being mainly subsistence would not grow or would grow very slowly (Bourdet 2001). Nevertheless, a strong emphasis on production remains.

The transition to a market economy from the early 1980s after the collapse of collective agriculture and a reformed tax system and state pricing policy was bolstered by agricultural activity (Bourdet 1995). Despite variation in staple crop production the government continued to promote agricultural productivity under both socialist and market oriented economies. Under this rhetoric living aquatic resources was translated as the production of fish, a fundamentally agricultural activity. Therefore productionist thinking underwrote much of the policy and project work dealing with 'fishery' management and development.

3.4.3 Summary

Fishery development in Lao PDR over the last 40 years, both pre and post revolution, has focused on aquaculture and not capture fisheries. This focus has mainly been promoted by external organisations such as USAID, UNDP, FAO and AIT, each using technical expertise and funds from either Europe or North America. These fishery activities after the 1975 revolution have all been complementary with internal socialist policies of the government throughout each of the seven social and economic development plans. The aims of each of these have moved from communisation of agricultural production, to market reform and regional economic re-integration. In each case the central philosophy of self sufficiency and food security has remained. There has been a focus on agriculture

production over natural resource stewardship and a lack of attention to the capture fishery. As such living aquatic resources have been subsumed under aquaculture in the development and extension of fisheries development and management. This in turn reflects dominant global narratives of technologically driven green revolution production.

3.5 Waiting for the revolution

The 'blue revolution', like the green revolution before it, has been heralded as the next wave of food production that will serve to eradicate protein deficiencies and assist the plight of the world's rural poor (Doumenge 1986; Kwei-Lin 2001; Villeneuve 1995). However, it is yet to be realised (Kelly 1996; Stonich and Bailey 2000; Deb 1998). The rapid growth in fish culture has been developed from green revolution philosophies throughout the last 40 years. Over this time the green revolution has faced a series of social and environmental critiques questioning the appropriateness of agricultural modernisation and technologies for small-scale farmers in the developing world. Although the blue revolution has faced similar critiques, as outlined in chapter two, there remains no critical investigation of the main justifications or orthodoxies that underlie the promotion of inland small-scale rural aquaculture in Southeast Asia.

A critique of these orthodoxies questions the central assumptions that support the promotion of small-scale aquaculture as a panacea for food and income in a country such as Lao PDR. These orthodoxies have not been developed in a vacuum. They have become generally accepted truths through the identification of real problems such as fishery supply deficits and stock decline. However, these problems are not universal but locally contingent. The orthodoxies that support the promotion of small-scale rural aquaculture in Southeast Asia have been extrapolated from these locally specific problems and contextualised by the narrative histories outlined above.

Questioning these orthodoxies is central to critical political ecology, whereby knowledge and its support systems are scrutinised (Forsyth 2003). This process , when applied to environmental 'crises', is not what Paul Ehrlich calls 'brownlash', but rather critically

reflects on the assumptions on which they are based.[11] Central to this is an understanding of the circumstances of knowledge production. As Haraway (1991) argues in opposition to scientific objectivity, all knowledge is 'situated', tempered by location of the individual within wider political, disciplinary or power structures. A critical analysis of situated knowledges means that not only are ideas open to review but researchers also become "...answerable for what [they] learn how to see" (ibid., p. 116). This is directly applicable to the rest of this thesis by reconsidering not only the reasons underlying the development and management of living aquatic resources but understanding the 'location' of different actors who produce the knowledge that supports these reasons. This is especially important in an information poor environment where the production of knowledge is mediated by politics and agency (see Leach and Mearns 1996; Leach and Fairhead 2000; Fairhead and Leach 1998, 1995).

The following discussion is presented in three parts. The first section outlines the changes to development practice under the rubric of the green revolution and how this has been translated into the blue revolution. This is followed by a presentation of the main development orthodoxies associated with aquaculture, based mainly on revolutionary thinking. The final section then presents some of the counter-orthodoxies that have emerged in support of the importance and promotion of capture fisheries in the Mekong Basin.

3.5.1 Revolutions and agrarian change

> The challenge for the coming decades is to find ways to reach farmers with improved technologies; for many, the future green revolutions hold the best, and perhaps the only, hope for an escape from poverty (Evenson and Gollin 2003, p. 762)

This opening quote, published in an article reviewing 40 years of technologically driven agriculture in *Nature* in 2003, highlights green revolution ideologies that inform thinking about the future of much agricultural research and development. The authors, Robert Evenson and Douglas Gollin, argue that without the green revolution the world would have undergone a severe 'human welfare' problem, with 13.3% to 14.4% lower global caloric intake and 6.1 to 7.9% higher per capita child malnutrition. There may be some

[11] 'Brownlash' is used to describe critiques that are perceived as anti-environmental, undermining existing beliefs of the existence and causes of environmental degradation.

truth to these figures, however, they do not take into consideration any of the social and environmental critiques since the 1960s.

These critiques traditionally focus on three main areas. Firstly, the use of hybrid, high yielding staple crops varieties (see Shiva 1989). Secondly, the high cost and environmental impact of inputs such as fertilisers and pesticides (ibid.); and finally a social critique of equity whereby rural communities are constrained not only by their ability to produce food but also in their ability to access food in times of shortage (e.g. Sen 1981). This social critique has also been expressed by Conway and Barbier (1990) as the implementation of "…technical innovations in the most favourable agroclimatic regions and for those classes of farmers with the best expectations of realising the potential yields" (p.20) to the detriment or exclusion of others.

The blue revolution is similar to its green predecessor in that it grew from new technology that gave opportunity for a new food production system. In the 1970s fish farming was seen as a panacea for world food shortages, just as the green revolution before it. Fish were seen as a means of producing an unprecedented amount of protein more efficiently than livestock in terms of volume, cost and protein content (McGinn 1998). The major nutritional benefit of fish is their low fat content and high levels of Omega-3 fatty acids, which are increasingly recognised as preventing heart disease and important for brain development in children. One of the major justifications for the blue revolution is, however, the same as for the green revolution: the neo-Malthusian model of food production deficits.

The potential for aquaculture as the pre-eminent panacea for food production and poverty alleviation is still to be realised despite earlier claims that the potential of aquaculture to fulfil a 'blue revolution' is stronger and deeper than the former agricultural 'Green Revolution' (Doumenge 1986). This belief, however, still persists. In a recent article in *The Economist* (2003) it is argued that future fish supply is dependent on the continued environmentally successful development of aquaculture. Indeed, the increases in production have been remarkable. Globally the aquaculture sector grew 11.2% between 1985 and 1997 (FAO 2000). However, as with its green counterpart, a range of constraints have emerged. These include issues of access to water resources, land ownership, gender imbalance in fish pond access and income inequity between

households; all of which have meant that poorer households have not benefited from aquaculture development (e.g. Lewis 1997). The social critique of the blue revolution, therefore, lies in the investigation of equity, power and knowledge surrounding the promotion and extension of fish culture, especially as a technology for rural development (Weeks 1992; Barton and Staniford 1998).

Uneven development of the blue revolution, at both international and local scales, also emerges as a contemporary issue, just as the green revolution did. As outlined above, countries such as Japan and in Europe and North America have progressed to industrial forms of fish culture. James Coull (1993) draws comparison between the social impacts of the blue and green revolutions stating that:

> Experience to date suggests that the development of fish farming in Third World situations have the essential complication of necessitating a level of investment which requires entrepreneurs of some substance, and it is in danger of helping mainly those who are already relatively well off, as has happened so often with the green revolution (p. 356)

Critiques that highlight the difference between green and blue revolutions focus on what food is produced and for whom. That is, the inequity involved in food distribution as well as the potential of farmers to participate. Conner Bailey (1997), for example, outlines the contradictions of developing aquaculture as an export industry in conjunction with its goals of food security. He notes that although striving for export earnings is not inherently bad it places stress on the ability of small-scale farmers to benefit as capital replaces labour and commodity chains globalise.

Nonetheless, a number of researchers still see the blue revolution as a solution for underdevelopment and poverty alleviation. Like the green revolutionaries before them they continue to focus on the technical inputs of aquaculture to provide income generating activities for rural poor with little consideration of social equity (e.g. Demaine 1999; Edwards 1999; Kwei-Lin 2001). This highlights the split in contemporary thinking between technology based development and existing natural resource based systems on which many people live throughout Southeast Asia and the Mekong Basin. Most of the benefits that aquaculture has in increasing incomes of these groups are

contingent on specific aquaculture systems in specific locations which have an advantage. This has been clearly seen with the success of shrimp aquaculture.

As Evenson and Gollin highlight with reference to the green revolution, the overriding assumption is that technology can provide a solution to poverty in the developing world. However, unlike the green revolution there has been little critique of the underlying justifications for pursuing a blue revolution. There is also a conspicuous lack of attention given to the existing levels and importance of capture fisheries. The main orthodoxies of fisheries development and extension in developing countries either concentrates on the benefits that aquaculture can bring, or the declining benefits of capture fisheries and the place of aquaculture in replacing them. Only recently has there been a concerted effort to raise the profile of the livelihood importance of existing capture fisheries. Without this balanced view the 'blue revolution' becomes, as Kelly argues, a "common-sensical and irrefutable positive solution to underdevelopment" (p.43), giving little opportunity to existing or alternative avenues of development.

3.5.2 Aquaculture development orthodoxies

Presenting and critiquing aquaculture development orthodoxies does not seek to negate the benefits that are derived from aquaculture and the role it has played. Instead critical analysis provides a means of challenging common beliefs and assessing the relevance of alternative paths to living aquatic resource management and development. Three main orthodoxies of fisheries development in Lao PDR are outlined below. Each is derived from 'blue revolution' ideology.

Capture fisheries in decline

It is a generally accepted truth that fisheries around the world are being exploited at maximum capacity or are in decline. The FAO (2002) identifies 47% of world marine fish stocks as fully exploited and a further 28% as overexploited or significantly depleted. However, fishery decline is more complex than these categories reveal, especially in artisanal inland fisheries where multiple species are exploited in a wide range of habitats for both subsistence and commercial purposes.

The lack of fisheries data in countries such as Laos has meant that 'fisheries decline' is, to some degree, a political construction negotiated through misperceptions and

misunderstandings of what decline means to fishers, planners and politicians (Bush and Hirsch 2004). It is also based on pseudo statistical information, collected by the Lao government, based largely on anecdotal evidence and translated though individual perceptions of government staff (Coates 2002). For example, Imre Csavas noted that there was a decline in the fishery by 20% from the mid-1970s to the 1980s (cited in Phonvisay 1994). Singh (1990) outlined a decline in the catch of Nam Ngum reservoir from an estimated 50kg/ha in 1975 to 20 kg/ha by 1988. He also indicated that the country had undergone a decline in floodplain fishery area from estimated 1500-2000 ha in 1983 to 1200 ha in 1988. Ataur Rahman (1990) noted that there was a decline from 27000 to 20000 tonnes from 1980 to 1990. In contrast, the most recent DLF figures indicate a 152% increase in overall fishery production attributed to an increase in aquaculture (Phonvisay 2002), and Pravongviengkham (1998) indicated an increase in yields in Nam Ngum from 1140 Mt in 1990 to 1750 Mt in 1996, a change attributed to institutional strengthening and community based control over resources management. All of these figures have been influential in policy at different times; however none of these figures are based on statistical sampling.

Despite the inherent confusion over the status of fishery resources in Laos, there is an underlying assumption that the living aquatic resources are in decline. A declining fishery infers a need to either replace the lost protein with cultured fish, or alternatively reduce pressure on the capture fisheries. In Laos aquaculture is seen as a way of mitigating the decline in fish protein (Phonvisay 1997, 1994) as well as a means of reducing the pressure on riverine and reservoir fisheries (e.g. NORPLAN 1995; THPC 2000).

Supply and demand: productionist agendas

> It has been projected that the world population will reach 7 billion in 2010, when the likely demand for fish will reach about 105 million tons. On the other hand, the present food fish production has reached a plateau at 72 million tons. This production is not likely to greatly increase due to various factors such as overexploitation and environmental degradation. Unless appropriate actions are taken, the gap between supply and demand will be expanded, resulting in the increase in fish prices. This may cause disappearance of fish from the diets of poor consumers who currently rely on fish for their source of protein (FAO 1995, p.2)

According to the FAO there is an imminent crisis in food fish supply. This crisis is often seen as a result of increasing human populations, expanding markets and fishing technologies (Delgado *et al.* 2003). It is reiterated in most, if not all, major international fishery policy documents, forming the main underlying orthodoxy of fisheries management and development (e.g. FAO 1995, 1995, 1997; NACA/FAO 2000). Proposed solutions are varied, however, the most widely promoted method of meeting the deficit between rising demand and shortfall in capture production is the development of aquaculture (e.g. FAO 2002; Rana *et al.* 1996; Delgado *et al.* 2003; NACA/FAO 2000). A cursory glance at FAO (2000) figures supports this. In 2000 total fish production reached 87.3 million MT, with 32% coming from aquaculture.[12] The sector grew 11.2 % from 1985 to 1997 while capture fisheries grew only 1.1%. Under various scenarios of fish production to 2020, as proposed by Delgado *et al.* (2003), it appears that a combination of factors will mean that aquaculture will increase its share of food fish from 31% to 41%. If this is realised then the world average annual per capita consumption will increase from 15.7 to 17.1 kg/yr. Alternatively, if aquaculture expands at a lower rate and capture fisheries collapse there could be a net decline of 1.5 kg/person/yr available for consumption (ibid.).

As outlined above, inland fishery statistics are notoriously inaccurate (Coates 2002) and in many cases they are constructed to fit political agendas. Lao PDR is a case in point. As the only landlocked country in the Lower Mekong Basin it provides the only example of a population exclusively dependent on an inland fishery resource in the Basin.[13]

There are a number of sets of official government production figures. For example, those that are presented by the FAO are different to the Lao DLF figures. In both cases however there is a low production estimate given for capture fisheries. Based on estimated per capita requirements the DLF calculated a production target of 115200 MT in 2010. If compared with the FAO FISHSTAT production estimates, capture production in 2000 was 29250 MT (FAO 2000). A comparison of different demand and supply scenarios shows the political construction of production figures. The FAO

[12] Total fishery production includes mollusks, crustaceans, finfish in both marine and freshwater systems

[13] There is a considerable amount of marine fish imported into Lao PDR from both Thailand and Vietnam. This is, however, limited to the main urban centres, especially Savannakhet, Pakse and Vientiane.

figures show that aquaculture in Laos has increased 134% since 1995 at an average annual growth rate of 19% (see Figure 3-4). These growth figures far exceed growth in world production by 3% (excluding China), and China's growth by 10% over the same period. In order to meet demand by 2010 capture fishery production would have to increase by 29% per year, instead of the current average 6% per year (1990-2000). The remarkable growth of aquaculture is questionable. It appears to be driven more by political will to meet various production targets than any real need to produce a realistic picture of the status of the Lao fishery. The low likelihood of meeting this demand through capture fisheries immediately sets an agenda for developing fish production capacity.

In the case of having a capture fishery that supplies a deficit, as in the Lao case, there is an immediate need to increase production, as opposed to conserving the capture fishery resource available. This is apparent in the many international documents (e.g. FAO 2002; Delgado *et al.* 2003) that stress that this deficit is more likely to be selected by policy makers as it has one of the "greatest potential[s] to fill this gap between supply and demand" (ASEAN-SEAFDEC 2001, p.123).

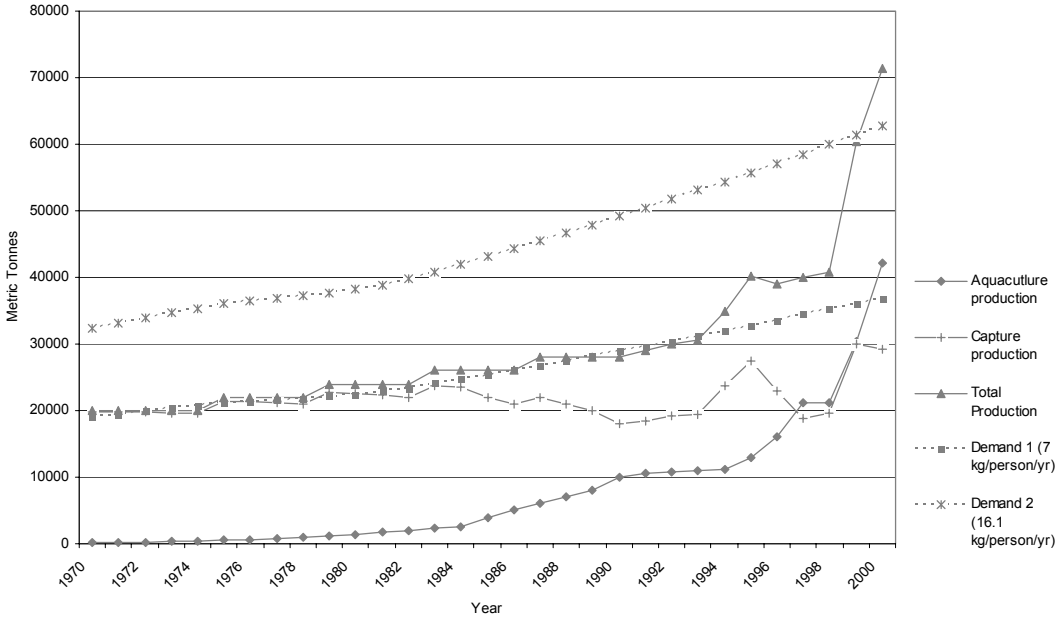

Figure 3-4 Supply and demand analysis for Lao PDR, 1970-2000. Source: Production from FISHSTAT, Population from FAO Agricultural Statistics, Demand from Government of Lao and De Nigris 2000, quoted in ASEAN-SEAFDEC (2001).

Aquaculture benefits the rural poor

It is widely believed in development circles that small-scale aquaculture benefits the poor (Edwards *et al.* 2002; Friend and Funge-Smith 2002). This is most explicitly stated by Edwards (1999) who argues that

> Aquaculture may benefit the livelihoods of the poor in several ways: through an improved food supply and/or employment and increased income. Benefits may be either direct to household farming aquatic products; or indirect from increased availability of low-cost fish in local markets, or from employment in the agricultural sector. (p.8)

This is expressed variously, but is most reminiscent of green revolution thinking expressed by the *ladder of intensification* model outlined by Sununtar Setboonsarng (1993). This model, shown in Figure 3-5, suggests that small-scale farmers operate along a vertical continuum (or ladder) from capture fishing practices at the bottom 'up' to industrial aquaculture at the top. A corollary of this is the alleviation of poverty as farmers move up this ladder. This belief is implicit in much of the development literature. In Lao PDR this is expressed through a variety of cultural views of fishing as well as in socialist productionist philosophies, as outlined above.

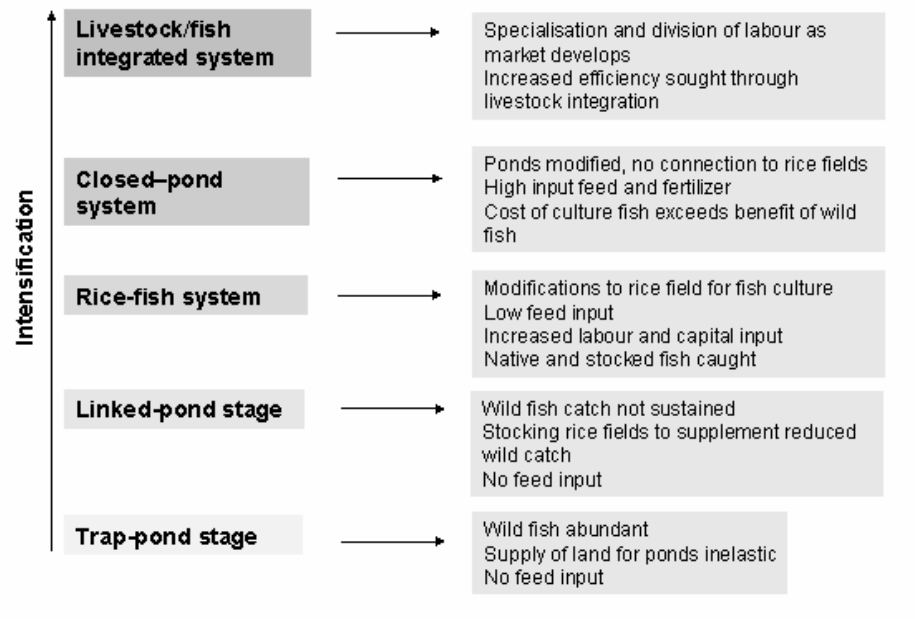

Figure 3-5. Developmental progression of aquaculture in northeast Thailand,
Adapted from Setboonsarng (1993)

Researchers increasingly understand that capture fisheries are an important livelihood activity of the rural poor in Southeast Asia (e.g. Claridge *et al.* 1997; Townsley 1998; Gregory *et al.* 1996), although an intrinsic link between poor people and fishing should be avoided (Béné 2003). However, capture fisheries are rarely associated with the alleviation of poverty in the same way as aquaculture is as a development intervention.

A review by Mafuz Ahmed and Mylene Lorica (2002) of the role of aquaculture in poverty alleviation identifies some dominant beliefs. Their study concludes that demand for fish (as a non-staple commodity) should continue to grow in response to increased income to practitioners and act to lower market prices. As a result fish is more available to poorer people increasing consumption and providing essential micro-nutrients. They also argue that increased demand leads to higher levels of employment, usually of asset poor or landless farmers. The net result is overall increases in societal welfare and a reduction in poverty of low income and resource/asset poor households. Their study therefore highlights the main poverty oriented benefits of aquaculture that are increasingly assumed achievable in national and NGO policy and project objectives.

A received wisdom from the Green Revolution is that as agrarian societies change, there are differential benefits to rich and poorer farmers. The analysis of Ahmed and Lorica focusing on trickle down effects through increased supply leading to lower market prices of fish, and the provision of labour is too narrow. The adoption and benefits of aquaculture to rural poor communities is however, more complex than this analysis reflects. A range of inequalities can occur as a result of aquaculture adoption including income and social differentiation (Adger 1999). More emphasis is needed on the state's role in rural differentiation, focusing on the role of complex and often conflicting interests in rural development (Hart 1989). Therefore the question of poverty alleviation is not straightforward. The central question is who benefits from aquaculture and who does not at the local level

3.5.3 Capture fishery management orthodoxies

There are a number of counter orthodoxies that increasingly highlight the importance of capture fisheries. This is often for political gain, using fisheries as a means of valuing aquatic resources (Sverdrup-Jensen 2002; Hirsch 2003). The following represent how capture fisheries are increasingly framed in policy that seeks to raise the profile of

capture fisheries or counter-development claims to water management and development projects.

Fishery yields and economic value

Production estimates in the Mekong Basin have been continually revised upwards for the last decade. The most recent value estimate is US$1478 million based on a production figure of 2.1 million tonnes (MRC 1992; Sjorslev 2001). However, more recent estimates have revised this figure to over 3 million tonnes (Hortle and Bush 2003). These production estimates show the agenda of the MRC in reflecting the full value so that it can compete with water development and management projects. However, there is considerable resistance to revaluation and increasing production estimates based on the politics of who produces the figures (Hirsch 2003).

Biodiversity

The importance of biodiversity in the Mekong Basin is highlighted by David Coates *et al.* (2003) who suggest that "…fisheries are, in fact, not the villain but perhaps the most important ally in the quest for sustaining aquatic biodiversity in the Mekong" (p.2). They estimated that there are at least 1200 species in the Mekong Basin and possibly as many as 1700. Biodiversity is important because of direct use value, indirect use value, option values and intrinsic value (ibid.). In subsistence economies such as Lao PDR direct use values are most important and are reflected in livelihood value.

Livelihood value of fisheries

The livelihood values of fisheries are also being championed. These counter-orthodoxies are showing that fisheries are not only a resource of the poor but also a resource of richer farmers and that there is a need to conserve these resources. In Laos this is shown to be reflected in the value of the fishery in terms of how all socio-economic strata exist (Garaway and Beddington In Prep.).

The sustainable rural livelihoods concept is being brought to attention over poverty alleviation because it places aquaculture and capture fisheries as activities within a broader livelihood portfolio. Eddie Allison and Frank Ellis (2001) argue that a better understanding of the role of fishing in rural communities increases the chance of appropriate interventions in the management and conservation of fish stocks. In the

Mekong Basin there is growing understanding of the role of not only aquaculture but also capture fisheries in the livelihoods of poor people, especially rice field fisheries (Gregory and Guttman 1996). More specifically in Laos the profile of capture fisheries in the livelihood of rural communities is also increasing (e.g. Garaway 1999; Baird *et al.* 1998; Meusch 1996; Noraseng *et al.* 1999).

3.5.4 Summary

Modern rhetoric of aquaculture development focuses on the 'Blue Revolution', which grew directly out of green revolution philosophies as a panacea for protein production. Both have come under intense scrutiny over their environmental impacts however the blue revolution has not received the level of social critique to which its green counterpart has been subjected. A closer critique of social and developmental issues, especially as they relate to rural farmers in developing countries such as Lao PDR, is therefore needed.

The development orthodoxies that have grown out of the green revolution - aimed toward meeting food supply deficits, addressing poverty alleviation and increasing human well being – have also been applied to aquaculture. The support given to the production orientation of both blue and green revolutions is directly proportional to the assumptions made about natural resources decline and degradation, including living aquatic resources. These assumptions, as outlined above, are based on poor data and generated by politics rather than good science. Therefore further critical investigation is needed to determine not only how applicable these orthodoxies are to the Lao context, but also how and by whom they are being maintained within development discourse.

Conversely there is a series of counter-orthodoxies that have emerged which aim to raise the profile of capture fisheries. They stress the high value of wild fish in terms of the economy and rural livelihoods. This value, although historically well supported, may not be integrated into mainstream development policy for some time to come. Instead, the hegemonic nature of aquaculture as a development agenda, backed by the received wisdoms of the green revolution persists. Questioning the realities of these two sets of orthodoxies is therefore imperative. Without critical analysis aquaculture continues to be seen as a common-sensical solution to underdevelopment and capture fisheries remains an unknown, complex and undervalued resource.

3.6 Conclusion

Contemporary thinking in living aquatic resources management and development is contingent on complex global and local histories converging in the Mekong Basin. The underlying beliefs or orthodoxies that justify the promotion of aquaculture to provide a basis for extension and development reflect a series of histories, beliefs, and policy directions. Likewise, current thinking in capture fisheries reflects an understanding of the importance of aquatic resources to rural livelihoods in the Mekong Basin. Aquaculture and capture fisheries have had different goals and agendas. Instead of being complementary components of an overall living aquatic resources agenda, both aquaculture and capture fisheries appear to be competing areas of development reaching for different national and human development agendas.

Perceptions of living aquatic resources in the Mekong Basin and Lao PDR are both externally and internally driven. Early European accounts highlight the importance of capture fisheries to the livelihoods, cultures and societies of the Basin. However, this early resource dependency was often perceived as negative. Despite this, European travellers strongly associated people of the Basin with a presumed predisposition to fish and fishing. This was reiterated with the narratives of Chinese fish husbandry dating back 2000 years. The importance of capture fish for rural livelihoods was stated clearly by early fishery advisors to the Royal Thai government, highlighting the need for a balanced approach to conservation and culture production. Subsequently, however, this balance has been translated through the need to meet social development goals as aquaculture, backed by productionist green revolution philosophies.

In Lao PDR fish culture found resonance with socialist productionist philosophies of production and a rejection of the predominant natural economy to the neglect of capture fisheries. Early policies of the post-1975 government focused on the industrial communisation of agriculture, into which aquaculture fitted. After this was abandoned the government continued to develop input driven agriculture appropriate for the development of a market oriented economy. Throughout both phases, foreign assistance focused on technical support for aquaculture complimenting government policies. Therefore, aquaculture received support from both external interpretations of the importance of fish as aquaculture and a belief in the need for production oriented food

systems to replace the natural economy. In neither case were capture fisheries recognised as an important, existing livelihood activity in development policy.

The contemporary justification for the extension of aquaculture, under the rhetoric of the blue revolution, is based on the neo-Malthusian food supply crisis. The orthodoxies of aquaculture development presented in this chapter are premised on two beliefs. Firstly, the perception of an Asian predisposition to fish in culture and secondly, that there are few social or environmental dis-benefits of small-scale rural aquaculture, which dominates in countries such as Lao PDR. Exposure of the main development orthodoxies on which aquaculture is based to critical analysis is therefore needed. Conversely, there is also a need for counter-orthodoxies that promote the value and role of capture fisheries need to be empirically examined so that the importance of culture and capture fisheries can be better understood.

The next two chapters attempt to critically examine the orthodoxies and counter-orthodoxies outlined above. Chapter six then explores how these orthodoxies are translated into policy of NGOs and government and reflects on the realties of living aquatic resource use in Savannakhet province.