Integrating Community-Based Fisheries Co-Management and Protected Areas Management in Lao PDR: Opportunities for Advancement and Obstacles to Implementation

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Executive Summary

1) Fisheries supply people living in and around protected areas in central and southern Laos and northeast Cambodia with a high proportion of their subsistence protein, and sometimes income.

2) The importance of fish and fisheries with regards to protected area management has often been neglected due to the focus of biological surveys and management initiatives on large mammals and birds.

3) The co-management of natural resources by villagers is government policy in Laos, and there is considerable support for creating cooperative management systems with regards to natural resources, including aquatic resources.

4) The co-management of aquatic resources, including fisheries, has apparently succeeded in increasing fish stocks, and villager fish catches, in Khong District, Champasak Province, southern Laos. Although scientific evidence to support villager claims that aquatic resources have significantly benefited from their co-management efforts is still largely lacking, villagers from some communities with aquatic resource co-management systems, such as Kokpadek and Chan villages, have reported that increased fish catches has had unexpected spin-off benefits in terms of terrestrial wildlife and forest management and conservation.

5) There are a number of advantages to initially emphasising fisheries co-management in protected areas.

5.1) Broad villager participation in fisheries co-management is more feasible than with large mammals and rare birds because all villagers come into contact with fish on a daily basis, while only a small portion regularly encounter large mammals and rare birds.

5.2) Fish generally have a high reproductive capacity, resulting in a relatively high potential for quick and visible positive results to management initiatives.

5.3) It is sometimes easier to define and demarcate protected areas for fish due to environmental limitations, compared with many species of mammals and birds, especially those that have large ranges.

5.4) Villagers also generally have less Indigenous Ecological Knowledge (IEK) about large mammals and rare birds, as compared to fish.

5.5) Fish are the most important source of animal protein for villagers living in and around protected areas in central and southern Laos, and northeast Cambodia. Therefore, the sustainability of fisheries is critical to villager food security. If fish are in short supply, villagers may have few options but to increase hunting pressure on vulnerable populations of birds and mammals.

5.6) Fisheries co-management can act as a good entry point for conducting community-based collaborative management activities regarding a wide range of natural resources, including large mammals, rare birds and terrestrial forests. Many non-timber forest products (NTFPs) may have a high potential for initiating co-management activities in protected areas as well.

6) There remain a number of obstacles to implementing living aquatic resource management in protected areas. These include problems related to mutual trust and respect between villagers and protected areas staff, institutional constraints, a lack of Lao and Khmer language documentation regarding indigenous fish and wild-capture fisheries, biological constraints related to migratory fish species, and village to village conflict.

7) Community-based living aquatic resources co-management may not always be the most appropriate first step for cooperating with communities in protected areas, but it represents an important opportunity worthy of increased and careful consideration.

Introduction

The Lao People's Democratic Republic (Lao PDR or Laos) is a land-locked country in mainland Southeast Asia slightly larger than Great Britain and with an ethnically diverse and largely rural population of about 4.5 million people (Claridge *et al.,* 1997). In October 1993 Laos established 18 National Biodiversity Conservation Areas (NBCAs) by Prime Minister's Office decree (PMD 164) (Berkmueller *et al.,* 1995). An additional two areas were added to the national protected areas (PA) system in 1995 (IUCN, 1999), bringing the total number of NBCAs to 20, covering almost 12% of the country. A number of international organisations (IOs), non-government organisations (NGOs), and bilateral and multilateral donors have provided financial and technical support to help establish Laos' PAs system. These efforts have been led by IUCN – the World Conservation Union, Wildlife Conservation Society (WCS), World Wide Fund for Nature (WWF), Swedish International Development Agency (SIDA), Netherlands Government, and the World Bank. Lao government coordination at the central level has mainly been the responsibility of the Centre for Protected Areas and Watershed Management (CPAWM), Department of Forestry, Ministry of Agriculture and Forestry.

Experiences in Southeast Asia and other parts of the world have shown that conflicts between local people and government representatives often arise when centralised efforts are made to impose management regimes on local people living in and adjacent to PAs. Many government agencies and international conservation organisations view people, including forest dwellers, as enemies of nature conservation (Hough, 1988; Rao and Geisler, 1990; Newmark *et al.,* 1994; Steinmetz, 1996; Steinmetz and Mather, 1996; Ewers, 1998; Novellino, 1998; Dangwal, 1998; Steinmetz, 1999). Fortunately there are emerging signs of a new era of PA management in which local people are allowed to participate in decision-making processes regarding the use and conservation of natural resources in PAs (Rao and Geisler, 1990; McNeely, 1993; Steinmetz and Mather, 1996; Steinmetz and Baird, 1997; Jensen, 1998; Steinmetz, 1999).

There is increasing consensus within the international conservation community that collaborative management of PAs may be the best way to achieve biodiversity conservation and natural resource management objectives, but there remains considerable differences between managers, conservationists, governments and local people with regards to the definition of "participation". There is a considerable divergence of views on how much decision-making power local people should be given, and how best to encourage villagers to actively participate in PA management (Steinmetz, 1999).

Freshwater wild-caught indigenous fish and other living aquatic resources constitute an extremely important resource for rural people throughout Indochina. Fisheries have been found to be the most important source of animal protein, and a significant source of cash income, for villagers living in and near established and proposed PAs in much of northeast Cambodia, and southern and central Laos (Baird, 1994; Baird, 1995a and b; Roberts and Baird, 1995; Baird *et al.,* 1996; Baird, 1997; Baird, 1998a and b; Baird, 1999a; Baird and Phylavanh, 1998; Baird *et al.,* 1998a; Baird *et al.,* 1999). Yet fisheries issues have rarely been given high priority in terms of PA management, with the exception of Marine Protected Areas and a few inland PAs in North America (see Norris *et al.,* 1998; Delaney *et al.,* 1992). Large mammals and birds have elicited most of the attention of terrestrial PA managers the world over.

Natural resource "co-management" can be defined as*, "the collaborative and participatory process of regulatory decision-making among representatives of user-groups, government agencies and research institutes."* (Jentoft *et al.,* 1998: 423). In this paper I argue that community-based co-management of wild-capture fisheries has considerable potential for contributing to the improvement of biodiversity conservation in PAs, relations between PA staff and local people, and even the management of forest and terrestrial wildlife resources. Obstacles to the implementation of fisheries co-management in PAs are considered. It is suggested that fisheries management issues should be made a priority for PA managers in Lao PDR and Cambodia, and other countries in mainland Southeast Asia.

Aquatic Resource Co-Management in Southern Laos

In January 1993 the NGO supported Lao Community Fisheries and Dolphin Protection Project (LCFDPP) was established in Khong District, Champasak Province, southern Laos (see Figure 1), a rural farming and fishing area bordering northeast Cambodia in which local people significantly depend on artisinal fisheries in the Mekong River for subsistence and income (Baird *et al.,* 1998a). In late 1993 the LCFDPP assisted the local government in Khong District in establishing a process for allowing villages to voluntarily set up regulations for managing aquatic resources. Since then, a total of 63 villages have participated in the programme. Regulations adopted by villages include establishing Fish Conservation Zones (FCZs) in the mainstream Mekong River, banning certain fishing methods, managing natural ponds and rice field paddy wetland areas, protected flooded forest habitat, and conserving and sustainably managing frogs and juvenile fishes (Baird, 1999c; Baird, 1996; Baird 1994b).

The establishment of FCZs, which are basically year round or part year "no-fishing zones" (Baird, 1999c), in parts of the mainstream Mekong River has been the most significant co-management initiative in Khong (Baird, 1999c). Between December 1993 and August 1998 60 villages established a total of 68 FCZs. Single villages manage some FCZs, while two or more communities jointly run others. The largest FCZ is 18 ha, the smallest is 0.25 ha, and the mean size is 3.52 ha. The deepest FCZ is approximately 50 metres in the dry season, the shallowest is about 2.5 metres, and the mean depth is about 19.5 metres. Villagers in Khong have widely reported that the establishment of FCZs has resulted in increases in the stocks of over 50 fish species. Fish catches have also reportedly increased, although evidence to support the claims of increased fish stocks and catches remains largely unavailable. Nevertheless, the fish species that have apparently benefited from independent FCZs differ depending on the type of riverine habitat protected within an FCZ (Baird and Flaherty, 1999). It is possible that series of FCZs provide accumulated and synergistic benefits for certain migratory fish species (Baird *et al.,* 1998b; Baird and Flaherty, 1999; Baird, 1999c).

Indigenous Ecological Knowledge

Indigenous Ecological Knowledge (IEK) is based on generations of accumulated experiences regarding ecological and social processes that affect natural resources. While IEK is largely predicated on a long history of human inhabitation in a particular area, it is a dynamic system dependent on the personal observations and experiences of individuals (Baird, 1999c). Since there is only a limited amount of documented scientific information about Mekong River basin fish and fisheries (Rainboth, 1996; Baird *et al.,* 1999), it is necessary for both local people and government agencies to rely largely on IEK for determining what management approaches are likely to be best suited for particular aquatic resources at the village level. In Khong, IEK has been supplemented by more regionally based biological and ecological information supplied by NGO and government workers (Baird, 1999c).

Villager IEK in Khong has long recognised that many large and small sized fish congregate in deep water pools in the Mekong River during the dry season. At the height of the low-water period, water discharge in the Mekong River is reduced by about 30 fold (Cunningham, 1998), considerably reducing the amount of aquatic habitat available for fish, and increasing their vulnerability to human capture. Villagers believe that through banning or significantly limiting fishing activities in key deep-water areas that sometimes serve as dry season refuges and spawning grounds for fish, the impact of fish harvesting on populations can be significantly reduced. This is the basis for the establishment of FCZs in Khong (Baird, 1999c).

The Case of Kokpadek and Chan Villages

Kokpadek and Chan are two lowland Lao rural communities situated along the east bank of the Mekong River in northern Khong District. Although neither village is situated inside a PA, both are within the buffer zone of the Xe Piane NBCA, and villagers from both communities have long relied on natural resources obtained from areas within and adjacent to the present boundaries of the NBCA. Kokpadek and Chan are two of the 63 villages that participate in Khong District's aquatic resource co-management programme. Since 1996, both have established regulations for sustainably managing and conserving

aquatic resources, including fisheries. These unique sets of regulations, chosen by villagers based on IEK, local priorities, ecological and social conditions, and community consensus, have included the establishment of a FCZ in the mainstream Mekong River managed jointly by the two villages. The two villages have established an 18 ha and 45-50 m deep FCZ, the largest in Khong District.

Since the establishment of aquatic resource co-management regulations in Kokpadek and Chan, villagers have apparently been diligent in ensuring that their FCZ has been effectively protected from poaching by residents and outsiders. They have independently organised themselves into groups of 4 or 5 families, and a rotating system for guarding the FCZ has resulted in virtually around the clock protection during the vulnerable dry season. Villagers began observing positive results from their efforts within less than a year after having established the FCZ. They noticed that many more large fish were surfacing within the FCZ in comparison to before the area was protected, indicating to them that there were more fish inside the FCZ. They observed that some particularly rare and endangered fish species, such as the IUCN Red Data Book listed giant carp *Catlocarpio siamensis*, which can reach up to 3 m in length and over 250 kg in weight (Rainboth, 1996), have begun to return to the area after years of apparent absence. More importantly, villagers began noticing that fish catches from areas adjacent to the FCZ were increasing. Since then the situation has apparently continued to improve. Populations of certain relatively sedentary fish species, such *as Pangasius pleurotaenia, Helicophagus waandersii, Micronema micronema, Boesemania microlepis*, *Probarbus jullieni,* and others, have reportedly benefited, resulting in higher fish catches and increased incomes for villagers. Participatory fisheries monitoring activities in Kokpadek, in which fishers document fish catches, have shown that large numbers of juvenile *Catlocarpio siamensis* are now being caught near the village, whereas they were apparently very rarely found in catches prior to the establishment of the FCZ. While scientific evidence to support villagers' claims that fish stocks and catches have increased is still largely lacking, villager observations cannot be ignored or disregarded.

Initially, nobody expected that the fisheries management practices of villagers in Kokpadek and Chan would have much bearing on the management of terrestrial resources, including mammals, birds and forests. But in 1999, villagers from both Kokpadek and Chan villages independently reported that increased fish catches in their communities had resulted in significant improvements in the management of terrestrial wildlife and forest resources near their villages. They also claimed the overall socio-economic conditions in their communities had improved.

Villagers from Kokpadek claimed that prior to the establishment of fisheries co-management regulations in their communities, there were limited opportunities for generating income during the dry season, and many villagers migrated to the Boloven Plateau in Paksong District, Champasak Province to obtain seasonal employment as coffee pickers. Up to 60% of the working adult population of Kokpadek previously sought dry season employment in these coffee plantations, but now less than 10% of the work force reportedly migrates to Paksong. The social situation in the community has improved, as families are separated less and elder have more opportunities to tutor young people.

Prior to the establishment of village co-management regulations in Kokpadek, villagers estimate that approximately 10 families generated the majority of their dry season income through the hunting and trading of wild mammals, birds and reptiles, along with the illegal cutting and hand sawing of timber. Wood and wildlife was often sold to outside traders. However, since the establishment of the village's FCZ and other regulations, villagers claim that there are no longer any families in the village that rely on the hunting of terrestrial wildlife and the cutting of trees for a significant portion of their income. This is not to say that hunting and tree cutting have stopped altogether, but these activities apparently occur less regularly, and are more in tune with what the natural system can support. This is believed to have had a very positive impact on forest and terrestrial wildlife management and conservation near the village, and possibly on the Xe Piane PA as well. While quantitative evidence to support village claims is lacking, villagers believe that the condition of the forest near their village is improving. They have reported noticing increased numbers of birds, wild boar, civet cats, and other small mammals in forests near their community. These wildlife populations are beginning to be a source of pride for villagers, who now see that village natural resources are not necessarily destined to decline. Villagers in Chan village, which is adjacent to Kokpadek, independently told the same story, although they were somewhat less articulate in their presentation.

So have all these reported positive impacts been entirely due to aquatic resource regulations established in the villages? One obvious change in the villages that could easily be attributed to having improved the livelihoods of villagers has been the introduction of dry season second rice cropping in both Chan and Kokpadek over the last two years (1998 and 1999). The government has provided water pumps, and many villagers have begun growing second rice crops. However, deeper investigation indicates that while the second rice crop may have initially been at least partially responsible for keeping people from migrating out of their villages, it has certainly not provided villagers with the extra food and income needed to survive in the village without seeking outside employment. In 1998, Kokpadek villagers planted indigenous varieties of rice in the dry season, resulting in very poor yields due to the sun sensitive nature of their rice seed. Most were not even able to harvest enough rice to pay for the gasoline and chemical fertilisers they obtained from the Agriculture Promotion Bank. Villagers were certainly not able to generate any income as compensation for the labour they had invested. In 1999, Kokpadek villagers planted appropriate varieties of rice, but they received gasoline and fertilisers very late, resulting in late planting. Later, before harvesting, early rains caused damage to the crop. Although the harvest was better than in 1998, profits were nonetheless slim or non-existent.

For Chan village, the positive impacts of second rice cropping have been even less visible. There, the amount of paddy land suitable for dry season irrigation is very small, resulting in very few villagers being able to participate in second rice cropping. Secondly, those who do have land suitable for dry season cropping have experienced two consecutive years of losses due to the use of inappropriate seed, and damage caused by unseasonal rains and flooding in low lying areas at the end of the dry season. Nobody in the village has profited from second rice cropping.

Through extensive discussions with villagers from both Kokpadek and Chan, it has become clear that villagers have survived two years of poor second rice crop harvests and little outside employment through generating increased income from fishing adjacent to the villages' FCZ. While Kokpadek has always been a well-known village for fishing, fishing has apparently never been the primary occupation of villagers. Now villagers claim that the abundance of fish near the village has caused many villagers to become small-scale "professional" fishers. That implies that fish conservation has actually led to more fishing. Villagers claim that long periods of fishing were previously generally not sufficient for them to catch even enough fish to feed their families. However, it is reportedly now reasonable to expect that a few hours of dry season drift gillnetting near the village will generate a minimum of 15-20,000 kip in profit (approximately US$4 at the time discussions took place). Therefore, if fishing takes place on a daily basis, villagers can survive relatively comfortably with a regular dry season income. Moreover, the work is relatively easy, requiring just a few hours a day on the water for one or two members of the family. As one villager put it, *"Who wants to be out facing hardship in the forest hunting for wildlife or cutting trees when he could be sleeping at home and making a better and more reliable income."* Those who used to make their living in the forest have naturally come to the conclusion that they would be better off if they devoted their labour to fishing. No persuasion was apparently required.

The benefits received from fisheries co-management in Kokpadek and Chan are certainly exceptional for Khong, and no other villages have reported such major shifts in lifestyles as a result of regulation establishment. However, virtually all the villages in Khong have reported some degree of improvement in fish catches since having joined the co-management programme (Baird, 1999b). I have not, however, inquired about possible spin-off benefits for terrestrial wildlife and forests. Despite a lack of scientific evidence to back up the claims of villagers, the apparent situation in Kokpadek and Chan represents an important example of how fisheries co-management may provide villagers with significant tangible benefits and lead to spin-off benefits for the management of other natural resources, including terrestrial forests and wildlife.

Reasons for Integrating Community-based Living Aquatic Resources Co-Management and Protected Areas

There are a number of compelling reasons why PA managers should consider focussing initial cooperative management with villagers on fisheries issues. The first relates to participation. Initial

collaborative natural resource management activities between villagers and PA staff should aim at encouraging broad villager participation as a means for familiarising villagers with the PA concept, and building a cooperative atmosphere to base future activities. Because fish are observed and eaten on a daily basis by most villagers, regardless of age, gender or social class, they represent a resource that is of fundamental importance and interest to all. The opposite is true for large mammals and rare birds, since only a small proportion of villagers come into contact with them on a regular basis, and an even smaller number have intimate IEK regarding their movements and behaviour (Steinmetz, 1999; Steinmetz, 1996; Steinmetz and Mather, 1996). Villagers are also not always keen to protect all species of birds and mammals. Tigers sometimes represent a threat to village livestock and occasionally even human safety, elephants and macaques can cause serious damage to agriculture crops, and some species of birds and small mammals prey on crops and domestic animals. Fish, on the other hand, represent a resource that most villagers are immediately concerned with sustaining because of it's immense value to their lives (Steinmetz and Baird, 1997).

Apart from living aquatic resources, other resources that should be given special attention for co-management initiatives are Non-Timber Forest Products (NTFPs) such as honey, rattan, bamboo, etc. However, IUCN's NTFP Project in Champasak Province, southern Laos, recently conducted a participatory study of Nong Hin village near the Xe Piane NBCA and found that villagers ranked fish as the most important "NTFP" in the village. They also ranked indigenous fish as the natural resource that they are most interested in managing for greater productivity (*pers. comm.,* Varunee Kritcharoen*,* NTFP Project, 1999).

Another reason why fisheries often represent an appropriate resource to initiate co-management efforts at the village level is that keystone fish habitats are in some ways easier to define and demarcate than keystone forest habitats. Rivers and streams are basically linear systems, and critical habitat for fish, such as deep water pools or particular spawning and nursery grounds, are often easier to identify and protect compared to critical habitats for mammals and birds. This is not to say that it is not possible for villagers to identify and protect critical habitat for mammals and birds, but since most large mammals use large areas of forest, protecting small areas is less likely to have a significant impact on their conservation. In the dry season fish are often restricted by the relatively small amount of aquatic habitat available. Therefore, it is relatively easy for villagers to visualise both the areas to be protected, and the results that protective measures are likely to have on the fish. It is also generally easier to clearly mark areas with signs, and protect them from poaching. FCZs in Khong District are only an average of 3.52 ha. Nevertheless, like mammals and birds, some fish species are highly migratory, making them difficult to manage at the local level. However, many fishes in Laos are apparently relatively sedentary or are only moderately migratory and have potential for being locally managed (Baird e*t al.,* 1999).

It is desirable if the first experience of villagers with co-management results in relatively quick tangible results that villagers can easily observe. Because of the low reproductive potential of many large mammals and birds, co-management activities directed at them rarely lead to quick results. The same is true for most forest resources. Fish, on the other hand, have a high reproductive potential, making it possible for results to become observable within even a year or less in some cases. This has already been the case for Mekong River dependent villages in Khong District, Champasak Province, southern Laos (Baird, 1996; Hogan, 1997; Cunningham, 1998; Baird, 1998c; Baird *et al.,* 1998b; Baird, 1999b and c). If villagers clearly see that a management initiative is resulting in the increase of a particular resource of everyday importance, and that the end result is more food and income for individuals in the community, it is not likely to be difficult to convince them that conservation is of value.

It is somewhat easier to monitor management successes when it comes to fish, because it is reasonable to expect that fish targeted for protection are mainly going to be found in the linear river or stream system or connected ponds and back-water swamps. However, mammals and some birds are generally not easy to observe in the wild, and their behaviours are often less predictable compared to those of economically important species of fish. Fish are caught each day and fishers can easily monitor catches (Baird, 1999b).

Lao villagers tend to harvest fish more than other kinds of wildlife. However, mammals and birds are often hunted when fish catches are not sufficient to feed local people (Baird, 1997; Baird, 1998a and b). Therefore, if PAs can help ensure that villagers living in and near PAs have plentiful supplies of fish to harvest, the result may be a reduction in hunting pressure on other more vulnerable wildlife species. Importantly, this can be done without creating conflict in villages, or having to coerce villagers to reduce hunting activities for terrestrial wildlife species.

Finally, successful aquatic resource co-management activities within PAs have a great potential for leading to cooperative management initiatives regarding forest and terrestrial wildlife resources. If villagers have a positive first impression regarding the types of benefits that are attainable through co-management, it should be relatively easy for them to address issues related to other more difficult to manage wildlife species and forests. Already understanding the principle of co-management, villagers are likely to be more patient in trying to protect large mammals, rare birds and forest habitats. They may no longer feel such a need to prove that their actions can lead to positive results. Villagers may feel more confident that PA managers have their best interests at heart, because a relationship between villagers and PA staff based on mutual trust and understanding should already have been built up as a result of previous positive cooperative efforts related to fisheries.

Obstacles to Implementation

Despite the arguments presented above, there are obstacles to the implementation of living aquatic resources community-based co-management in PAs. One relates to creating an atmosphere of trust and mutual understanding between PA staff and villagers, which is at the heart of community-based natural resources co-management. This issue is the key to cooperative PA management, and it should not be expected that any productive co-management activities could be possible unless a foundation of mutual respect is built. My experience indicates that villagers are open to outsiders who are sensitive to their concerns. The biggest challenge for PA staff is that they are commonly unwilling or unable to give villagers the type of humble respect that should be offered to people who generally know the most about the resources that PAs are mandated to protect. Respecting and understanding villager IEK is important. If PA managers expect to "fool" villagers into believing that they respect IEK, when in fact they find little of value in it, they can expect to fail in their attempt to build bridges between the PA and villagers. Villagers are not stupid, and they are sensitive enough to instinctively know when outsiders are sincere, and when they are not.

A second obstacle is an institutional one. In Lao PDR PAs are under the direction of the Department of Forestry (DoF), while wild-capture fisheries are officially the responsibility of the Department of Livestock and Fisheries (DLF). However, it is still unclear who should be responsible for coordinating wild-capture fisheries management issues inside PAs. While the de facto responsibility seems to be with the DoF at present, providing the DLF with more opportunities for participating in wild-capture fisheries management work within PAs could be advantageous for all parties. Yet both the DoF and the DLF are limited in their abilities to manage wild-capture fisheries. On the one hand, most PA staff from DoF are forestry officials with little knowledge of fisheries management. Expatriate advisors to PAs also generally only have very limited backgrounds in fisheries. Therefore, the tendency of both PA advisors and their Lao counterparts is to concentrate on forestry and terrestrial wildlife issues. On the other hand, DLF officials sometimes have more of a fisheries background, but often have a very limited background in natural resource management issues, and PA management principles in particular. Moreover, many have only a very limited understanding of wild-capture fisheries, since most fisheries officials have aquaculture, not wild-capture fisheries educational backgrounds.

Despite these limitations, it would be advantageous if DLF contributed more to the management of living aquatic resources in PAs. However, PA staff should also take the time and effort to learn more about fisheries management, at least the basics. What is needed is an integrated and inter-disciplinary approach to PA management. At another level, agriculture, education and health are other important disciplines that need to be integrated. PA managers need to learn to view PAs as more than just forests, large mammals and birds. They are complex systems, and they are the homes of people.

Another obstacle to community-based living aquatic resources co-management in PAs has been the lack of documented information about living aquatic resources, especially in Lao and Khmer languages. It is very difficult for PA managers to feel comfortable with fisheries management issues when even basic information about the organisms they are concerned with has not been made available in their own language. In fact, this problem is not unique for fisheries, but actually applies to most biological groups. Fortunately, the first Lao language fish book, entitled, "The Fishes of Southern Lao" has recently been published (see Baird *et al.,* 1999). It could act as a catalyst for fisheries co-management extension work, but certainly more information is required. IEK can help to fill the gaps, and provide unique perspectives suitable for local situations and habitats. PA managers need to rely on villagers to supply them with information relevant for making management decisions related to living aquatic resources, but they also need to supply villagers with information that they have but is not available in the communities. IEK should be given a fundamental role in determining management decisions at the local level, but IEK will be most useful when it is used as a tool during two-way information exchanges.

The nature of fish migrations and other fish behaviour needs to receive adequate attention with regard to fisheries co-management in PAs. While some species of fish are only moderately migratory or basically sedentary, others migrate long distances seasonally. Villagers generally have a good knowledge regarding the behaviours of individual fish species, and they need to be allowed to participate in management planning so they can help identify the types of interventions that are likely to first and foremost benefit sedentary and moderately migratory fish species. This is not to say that village co-management measures will not benefit highly migratory species, but the situation is certainly more complex when dealing with long distance migrators. Nevertheless, if a large number of communities establish measures for conserving fisheries resources, it is possible that many migratory species could benefit from accumulative and synergistic impacts (Baird *et al.,* 1998b; Baird, 1999c). Highly migratory species can benefit when they are provided protection during key parts of their life-cycles (Baird *et al.,* 1998b). These important issues are the subject of continuing research regarding FCZs in the Mekong River in Khong District and other parts of the region (see Baird *et al.,* 1998b).

Finally, particular communities may already be experiencing serious conflicts related to living aquatic resources that may make interventions inappropriate due to the potential for them to result in intensified community conflict. In those cases steps must be taken slowly, and efforts must be made to increase exchanges between the conflicting user groups in order to resolve differences. Inter-community relationships are especially critical when it comes to community-based natural resource management issues. As has been observed in Khong, community-based living aquatic resource co-management has the potential to actually improve cooperation within and between communities (Baird, 1999b). But PA managers need to be wary that poorly targeted initiatives that are not backed up by real communication between resource user groups do not actually increase conflicts and animosity. Khong District officials see the reduction of inter-village conflict as one of the primary goals of community-based living aquatic resources co-management systems (Baird, 1999b). They have worked hard to reduce chances for community conflict by mandating that villages not be allowed to establish co-management regulations that discriminate against certain user groups while providing special privileges to others. An important principle for reducing conflict between communities is that villages should only be allowed to limit other user groups from particular activities after they first agree to limit their own actions in the same way. This principle should help reduce the chances that outsiders will see co-management simply as a way for host communities to limit their actions. It should make it clearer to all stakeholders that regulations have been adopted to protect the resource for everyone, not to put the resources in the hands of a particular group (Baird, 1999b). This principle should apply not only to living aquatic resource management issues, but also to other common property resources.

Concluding Remarks

Living aquatic resource co-management is not easy, but it is apparently possible to achieve real benefits over a short period of time provided that villagers are allowed to participate and planning is coordinated well (Baird, 1994a; Baird, 1996; Hogan, 1997; Cunningham, 1998; Baird, 1999a and b; Baird, 1999a and c). Apart from Khong, positive examples of freshwater fisheries community-based co-management can also be found in the Nan River in northern Thailand (Hogan, 1997), and most recently the

NGO Community Aid Abroad (CAA) and government counterparts have apparently had positive experiences with fisheries co-management in Stung Treng and Kratie provinces in northeast Cambodia. In less than two years 17 villages in Siam Bok District, Stung Treng Province and 13 villages in Sambor District, Kratie Province have used participatory processes to set up regulations designed to empower villagers to take action against illegal and destructive fishing practices. The initial result has apparently been an almost complete cessation of illegal fishing activities in Siam Bok, and a significant reducation in Sambor. Villagers are reportedly happy with their succeses (Choun Phong, *pers comm.,* July, 1999; Baird, 1999a & c). Although scientific data to back up such claims is still not available, villager reports seem very plausible. The main purpose of this paper has not been to provide concrete about how aquatic resource co-management can benefit communities and PAs, but I have tried to provide those involved and interested in PA management with perspective that they may not have encountered in the past.

We are at a critical crossroads with regards to PA management in Laos and Cambodia, the region, and the world. The PA systems of Lao PDR and Cambodia are in their infancy, and the type of deep-set animosity that has developed between PA managers and local people in other parts of Southeast Asia has generally not yet soured relationships between PA staff and local people in the two countries. Community-based living aquatic resources co-management represents only one of many possible entry points for collaborating with local people on PA management issues, but it an important opportunity that deserves adequate consideration. While I have not been able to scientifically quantify the reported successes of FCZs in Khong, hopefully this paper will at least provide PA managers with some food for thought.

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