



Irrawaddy dolphins in the Gulf, Chaungzone township, Mon State

BRIEFING PAPER 7: CONSERVING BIODIVERSITY AND IMPROVING LOCAL LIVELIHOODS

“People who can afford to do so go abroad. But those of us without means, we just stay around the riverbank and move from place to place as necessary. We are fully dependent on the coastal resources – the crabs, the fishing. We have no land and thus no option to farm.” Man, around 40, Sar Phhu Su village, Kawa township, Bago.

This quote (made in conversation with one of the authors) illustrates the heavy dependence of coastal communities on the natural resources of the Gulf of Mottama, and the need to engage them in the conservation of those resources as part of improving their livelihoods. Although biodiversity conservation and the local use of natural resources are often viewed as mutually exclusive, they can be highly compatible in a system of sustainable management.

FISHERIESⁱ

Increased understanding

The paucity of information available on fisheries in the Gulf of Mottama when the project started prompted support for various studies. This was essential to determine optimal ways to manage fish populations in a sustainable manner – and thus ensure the livelihoods of small fishers. Early work focused on investigating fish markets and tracking landing data from inshore (coastal) fisheries to monitor the volume and species of the catch over time. Using an approach developed by Worldfish, data was also collected from small fishers regarding fishing grounds, species, and important issues. The top three species, accounting for over 50% of the catch and 70% of the value, are Hilsa shad, *Tenualosa ilisha* (the most

valuable); Pama croaker, *Otolithoides pama* (the most widely caught); and Mango fish, *Polynemus paradiseus* (especially in the upper part of the Gulf). All three are migratory fish that spawn in freshwater rivers but spend much of their adult life out at sea.

Worryingly, the fishers widely reported that the total catch had decreased by some 80% since 2010. They identified the main reason as illegal fishing using fine mesh nets; other reasons suggested were pollution from industries, environmental changes in the river and Gulf, and the use of agro-chemicals which runoff from fields and poison the fish. In addition, the use of larger boats and motors has increased in recent times, resulting in larger volumes of catch. Nevertheless, the shallow nature of the Gulf at least prevents fishing by large trawlers.

Working with the local company Greenovator, a prototype mobile phone app was developed for use by fishers and fish buyers to monitor the daily catch by species and size category. Early trials in 2020 showed considerable promise, but unfortunately app use had to be abandoned during the Covid-19 pandemic (when inshore fishing was severely disrupted) and could not be restarted subsequently due to restrictions associated with the military takeover. The app remains an interesting tool that could, eventually, be reintroduced should conditions allow.

More specific studies were also conducted, two being especially significant in their findings. One, in the context of inshore fisheries, provided new insights into the migratory pattern of the Hilsaⁱⁱ. Another documented the practice of wild fish aquaculture in Bagoⁱⁱⁱ.

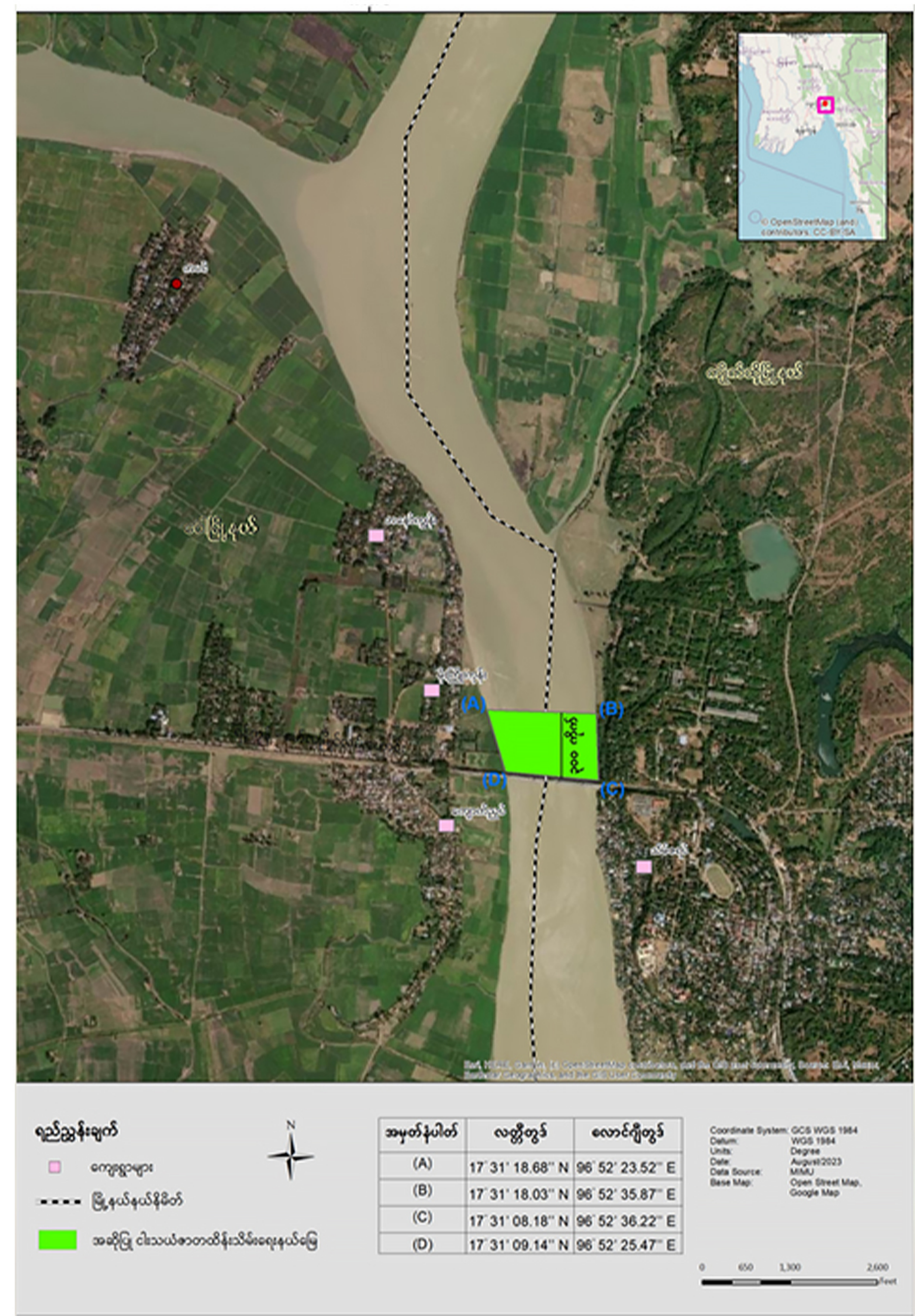
Inshore fisheries

The eating qualities of Hilsa are highly appreciated in much of Asia; it is the most valuable fish species caught in the Gulf, even now accounting for some 50% of the value of the total catch. However, fishers reported a 90% drop in the catch over the last 15 – 20 years – indicating that urgent action is needed. The study on the Hilsa’s migratory pattern identified its key spawning grounds along the Sittaung river as well as nurseries for juveniles closer to the river mouth. Unfortunately, the spawning grounds are being damaged by sand mining and other polluting activities upriver. An important finding, well known to the local fishers, was that the main spawning time is January - February, with juveniles occurring in abundance from March to May. This implies that a fishing ban in the early part of the year would be key – yet this is exactly the opposite of the current Department of Fisheries regulations, which enforces closure over May to July (the exact dates depend on the lunar calendar followed in Myanmar). The reason for this discrepancy is that the government regulations, implemented country-wide, are based on the spawning pattern of freshwater fishes in the floodplain.

The two measures identified to restore Hilsa populations were the establishment of community-based protection around the key spawning and nursery sites with appropriately timed closure periods; and the preservation of juvenile fish by halting the illegal use of fine mesh fishing nets (see below). Unfortunately, progress on both was disrupted by the Covid-19 pandemic and then the military takeover.

The protection of spawning and nursery grounds was first foreseen as part of measures taken within different Fishery Management Units – then renamed Ecosystem Management Units – that would be governed at township level. This ambition was revised to the establishment of five, much smaller, Fish Conservation Zones, FCZ. The first two established, in early 2024, are upstream and downstream of the same bridge over the Sittaung river; each cover 10 hectares. This is a key Hilsa spawning area. Thein Za Yat is a village that was included in project activities from phase II onwards, and thus has a VDC; Ta Naw Kyun, by contrast, was not. The process of discussing the conservation zone was therefore lengthier in Ta Maw Kyun, but in both cases, protection measures were agreed with the local fishers in consultation with the FDA. The area has been demarcated with signposts; no sand mining or other destructive activities are permitted within it. A maintenance fund has also been established for both Thein Za Yat and Ta Naw Kyun.

The Hilsa also spawns in the Bilin River; here at Mu Thin, an FCZ of 20.2 hectares (50 acres) is (at the time of writing, October 2024) under negotiation, including an area of mudflats. Further out in the estuary, the FCZ of Ko Tae Su is more complicated to demarcate as it is essentially dynamic due to the tidal currents in the area. Nevertheless, the community consultation process has been completed and is under the verification and validation process



of the local authority. It includes mudflats and deeper water and is an important nursery for juvenile fish. Unfortunately, it is also an area favored for the setting of illegal fine mesh nets. The intention is to establish a seasonal closure regime to allow the juveniles to flourish. The fifth FCZ, at Baing Laung (within Paung township) covers the mouth of a creek where mangroves and mudflats meet, which is also an important spawning area. Here a Local Conservation Group (LCG) is present, so they have been closely involved in the FCZ establishment in addition to VDC and FDA members.

To date there has been no modification of the official closure period for coastal fisheries, although it is hoped that local bans can be upheld within the FCZs.

Controlling illegal fishing

There are two forms of illegal fishing in the Gulf of Mottama; electric shocks, and the use of small mesh stake nets. The former is a problem in creeks and channels, mainly in Bago region, and has a particularly negative effect on aquaculture (see below), although it is reportedly less common now due to decreasing returns. It is the use of small mesh nets that heavily impacts migratory fish, and indeed all coastal fisheries. Set on the mud flats during low tide, and stretching some 2-5km, these nets catch large numbers of small fish – which are mainly used for fish paste. It is well known that the nets are operated by about 40 well connected individuals, mainly from Kyaikto Town. This very obvious constraint to sustainable fishery management was addressed by the project early on and was a major success in co-management efforts over the -



Burning illegal fish nets confiscated during patrolling, Thaton township, Mon State

period 2017 – 2019. Joint patrolling by government officers and village fishers led to a reduction of 85% in the number of illegal fishing boats over this period. Nets were burned, and their owners fined. Fish populations recovered rapidly; landings showed a steady increase, reaching 340% overall from 2017 to 2020. All three major species benefitted, particularly Pama Croaker for which there were especially large landings over June and July in 2019 and 2020. After this time landings seemed to decrease again due to restrictions in fishing activities during the Covid-19 pandemic and then the military takeover. Since then, patrolling has no longer been possible, and the illegal fishers have returned.

Although the impact of the current situation on fish populations is alarming, the achievements of the project cannot be readily dismissed. The damage caused by small mesh net fishing has been clearly demonstrated; the rapidity with which fish populations can be restored if it is halted has also been shown. This gives hope that a sustainable management system can be reinstated whenever democratic governance is restored.

Aquaculture

Aquaculture is more common in the coastal Bago region than the (generally more intensively cultivated and narrow) coastlands of Mon State. In its most obvious form, it comprises large commercial ponds combined with duck rearing. However, a study^{iv} conducted under project auspices revealed that there is also substantive small-scale, indigenous aquaculture in hand dug ponds and in creeks or channels. Within the eight villages covered in the study there were over 775 ponds. Although aquaculture requires land and is thus generally associated with more well-to-do households, this is not universally true; in one village covered in the study (Ko Teko), 95% of all households practiced aquaculture. Ponds range in size and may be very small; those found in the study ranged from 0.04 ha to 0.4 ha in surface.

It appears that aquaculture began somewhat accidentally, some forty to fifty years ago. Farmers dug ponds for household and livestock water supplies and found that wild fish migrated into them. They then began to encourage this, and to feed the fish (generally with rice bran, but also other foodstuffs) in the period leading up to the harvest. Natural feeding is also enhanced by adding brush to the ponds or by allowing water hyacinth to cover much of the water surface. This increases the surface area for algae and microbial growth on which the fish feed and attracts small fish (it also discourages theft). Around all the ponds a variety of trees and bamboo are grown; these not only provide shade but have other uses such as fruit, livestock fodder and timber. The system is thus highly favorable to biodiversity.

Fish harvesting takes place in December – January; at least 15 species are caught, of which the most common are Snakeheads (*Channa* spp.), Catfish (*Clarias batrachus*) and Climbing Perch (*Anabas testudineus*). The unique aspect of the system is that the fish farmers select and maintain brood stock (generally 10 – 20% of the total population) to spawn the next year. This is in contrast to commercial fish farms which use hatcheries. It is possible that in promoting spawning of indigenous species, indigenous aquaculture plays an important role in restocking the wider flood plain area.

“The fish are now fed systematically. I started the fish farming in the early rainy season. Compared to the last year, I get more fish this year. This is important for me because I earn more money for my family living.”
Woman, Most Significant Change Report (2022), p.8



A fishing boat in the Gulf, Bilin township, Mon State

Having identified the indigenous aquaculture system, the project sought to enhance it through training on fish husbandry (in which the woman quoted above participated). However, this raised the attention of the Department of Fisheries regarding pond licensing, which is, according to the law, necessary for ponds larger than 113 m². This would clearly impact the profits of fish farmers and might serve to discourage them from a practice that has wider environmental benefits in addition to enhancing household incomes. Fortunately, as of now the matter has not been pursued by the Department.

Mud crabs

Early in the project, mud crab collection was identified as an important livelihood practice, especially amongst poorer households^v. The crabs are found on traditionally open access mud flats, and the only equipment necessary to catch them is a hook and a basket. Whilst there are a variety of crabs present in the area, the main one of commercial importance is *Scylla olivacea*. Although once abundant, this is recognized by collectors to be declining. Large crabs are less common, and increasingly small crabs are being harvested and sold. Nevertheless, early investigations showed that crab hunters were generally not in favor of any form of co-management that would restrict access to mud flats, even if only for a short time to allow mud crab regeneration. The project did not, therefore, explore the issue further – only advising against the harvesting of undersized crabs through sign boards and other media.

An interesting and successful pilot intervention supported by the project is the farming of mud crabs within a mangrove forest. This was conducted as part of the Kar Te community forest, in which a small area was partitioned off with embankments to form a mud crab rearing enclosure. This has become an enterprise that is rented out annually, giving a local household a livelihood opportunity at the same time as generating income for the Community Forestry User Group. Unfortunately, very specific circumstances are needed to replicate such a model – notably, an existing mangrove forest and a topography suitable for forming a mud crab enclosure. These are not readily met elsewhere along the coast.



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Mud crab collection, Paung township, Mon State

MARINE MEGAFUNA

Three species of small cetaceans are known to occur in the Gulf of Mottama: the Irrawaddy dolphin (*Orcaella brevirostris*; Endangered), Indo-Pacific finless porpoise (*Neophocaena phocaenoides*; Vulnerable), and (although rarely observed) the Indo-Pacific humpback dolphin (*Sousachinensis*; Vulnerable). Spadenose sharks (*Carcharhinus* sp.) have been documented, as well as marine turtles (most likely Olive Ridley, *Lepidochelys olivacea*).^{vii} However, such sightings are rare.

The project used two approaches to promote the conservation of marine megafauna: raising community awareness using the CEPA (Communication, Education, Participation and Awareness) training materials and conducting monitoring through the Local Conservation Groups (LCGs).

The CEPA materials were developed by the local partner Point B over 2021 - 2022 in an iterative process of field testing. Apart from including a module on ecosystems and the interlinking relationships between species, cards showing different marine species (especially marine megafauna) were prepared for use in an identification game. This proved very popular with adults and children alike. Training/awareness-raising activities were conducted in the community by two local organizations, Shwe Kyun Thar (in communities and schools) and Civil Engagement Network (in communities), and later by CEPA Focal Persons in each village. Project records show that over 2021 - 2024, some 10,000 people in 70 villages and 1,505 school children in 16 villages participated in CEPA sessions. Following these sessions, at least 80% of the participants who attended the CEPA sessions were able to cite at least one example of wise use of coastal natural resources.

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A poster on sustainable mud crab collection, Paung township, Mon State

The LCGs have been engaged in marine megafauna monitoring and serve as “conservation champions” within their communities. They spread the message about the importance of marine megafauna within the coastal ecosystem, rescue stranded animals, and report deaths when corpses are found. For such work, they receive a small remuneration that is currently paid through the project but is likely to continue through other partners after project closure.

“The project has taught us about the benefits of marine mammals; also, how to treat stranded dolphins, and how to remove dolphins from nets without harming them.” Local Conservation Group member, Zee Gone village, Paung township

In the current political climate, there is a fine line to tread between monitoring for conservation and ensuring that information does not get into the wrong hands. Unfortunately, there are reports of cetaceans being eaten – not just as bycatch but deliberately being caught - and of an increased interest in “specialty” dishes featuring, for example, dolphin fins or brains.

MANGROVE PROTECTION AND PLANTATION

The main species of mangrove found in the area is *Avicennia officinalis*; *Sonneratia apetala* is also locally common. The importance of these trees for coastal protection – both from tidal erosion and from storms – seems to be well appreciated by the coastal population. Mangrove plantation was identified quite commonly as a response activity in CBDRM plans, although rarely ranked as top priority. Mangroves also provide other services to local people, such as fuelwood, timber, honey, fish bait, and a habitat for mud crabs.

As already noted in Briefing Paper 2, a positive step towards mangrove protection was the official designation as a community forest of the 121ha area of mature mangroves at Kar Te (Paung township, Mon State). The project also supported three communities (Wea Pa Tan, Zee Gone and Se Eain Su) in Paung townships to establish mangrove Community Forests totaling an area of 200 ha in the vicinity of their villages. These were under the verification and validation process of the responsible authority at the time of writing (October 2024). Nevertheless, it is easier to protect existing mangroves than to establish new plantations. The main issue limiting the latter is tenure rights. As stated earlier, mudflats in the Gulf of Mottama are traditionally considered to be open access - although they are ultimately owned by the state. Where the sea recedes and mudflats become grassland that can be eventually cultivated, households that have lost land due to coastal erosion have, traditionally, a right to a new plot (although wealthier individuals may manage to gain access instead). There is thus a clear tension between mangrove plantations and conversion to paddy. A study on economic evaluation of ecosystem services^{vii} showed that mature mangroves provide far greater benefits than paddy, to more people. However, arguing against land allocation is difficult. It can likely only be effective within the



Shorebirds in a mangrove forest, Paung township, Mon State

type of wider community-based coastal planning and management that was originally foreseen under the project.

Legally, mangrove planting must be authorized by the Forest Department, but even then, there can be problems. An upcoming issue in the Gulf of Mottama is the acquisition of mudflats by a well-connected organization that is establishing mangrove plantations for carbon credit payments. In doing this, the organization is denying local communities access for mud crab harvesting and eventually paddy cultivation. This has provoked conflict and the destruction of seedlings by local people in a number of Bago villages, most notably Aung Kan Thar.

SHOREBIRDS

Alternative livelihoods for bird hunters

Even before the project began, the local NGO BANCA was working to halt the depletion of shorebird populations by bird hunters, who then sold the dead birds in local markets for food. They addressed this issue through persuading well-known hunters to give up this practice in return for a boat to take up fishing, or other incentives to adopt an alternative livelihood. The hunters were also paid to undertake monitoring activities, thus becoming conservationists. This model has worked surprisingly well, with these people now being some of the key individuals within the Local Conservation Groups. What may be inferred is that bird hunting, even if having a significant impact on bird populations, was only conducted by relatively few individuals. More recent, post-2020 reports of dead birds being found in markets may be the result of opportunistic attempts by other individuals to make money during difficult times, rather than a return to “professional” bird-hunting. This is difficult to assess, although certainly the current political situation renders bird hunting easier, with less risk of severe consequences if caught.

Awareness-raising through CEPA sessions does seem to have turned village people against bird hunting, at least amongst individuals who have had regular contact with the project. For example, the importance of birds in controlling pests in paddy appears to be quite widely recognized. That bird hunting now takes place at all is generally denied in village meetings.

Annual survey and other monitoring

The project has supported a large-scale annual shorebird survey in late January/early February every year since 2016, with the exception of the year 2021. This has been conducted by the local NGO Nature Conservation Society (NCS) in collaboration with LCG members and international ornithological experts from Birdlife International. The survey has shown that over the years, the bird species over the years generally show significant fluctuations in several species, resulting in sharp increases and decreases, which probably indicate instability in migratory bird populations. Unfortunately, numbers of the iconic, critically endangered spoon-billed sandpiper have not increased, but reasons for this are complex (given its annual migratory route between Siberia and Myanmar) and cannot be tied solely to conditions in the Gulf of Mottama.



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Tailoring entrepreneur, Thanatpin township, Bago Region

ALTERNATIVE LIVELIHOODS

A clear part of the project design was to support coastal peoples in finding alternative livelihoods from fishing, farming and bird hunting – livelihoods that would relieve pressure on natural resources. To this end, skills training was offered to young village people in a variety of occupations, including, motorbike maintenance, tailoring and beauty care. This training program showed early promise, and in total, 1,600 people graduated with basic vocational skills training, out of whom 88% were employed (self or wage employment). However, for a number of reasons, it has become increasingly difficult to attract training recruits. One was that the skills offered were more appropriate for life in townships than villages. More importantly, even before the military takeover, those young people seeking alternative employment focused their sights on Thailand rather than locally, due to the difference in earning potential. Restrictions during the Covid-19 pandemic further stalled training activities. On resumption, training focused on preparing young people for labor migration, but this also did not attract large numbers as people were anxious to depart as quickly as possible. As a result, in 2022 the program was discontinued.

Highlights of experience

- Scientific research combined with local consultations can be an important first step before beginning any intervention on biodiversity. Even if time-consuming, it can be essential for well-targeted interventions, as illustrated by the work on fish conservation.
- “Early wins” can be key in convincing stakeholders about conservation activities. This was the case regarding the rapid recovery of fish populations following the ban on the use of fine nets. Even though the ban cannot be enforced in the current context, belief in the method remains, as well as the hope of reintroducing it as soon as conditions allow.

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Awareness of biodiversity conservation in school, Chaungzone township, Mon State

ENVIRONMENTALLY APPROPRIATE AGRICULTURE

Through the promotion of paddy cultivation corresponding to the Standard of the Sustainable Rice Platform and the cultivation of other crops (such as green gram) according to Good Agricultural Practices, the project has sought to maximize returns to farmers at the same time as minimizing negative effects on the environment – such as through the runoff of pesticides and chemical fertilizer. This is described more fully in Briefing Paper 4 and is thus not repeated here.

Highlights of experience

- Tenure rights, both as traditionally recognized and de jure, must always be understood when conducting land-based interventions; this was well incorporated into project activities on mud crabs and mangroves.
- Adapting to the context is essential, as illustrated by the discontinuation of the use of the Greenovator App and the way that training in skills for alternative livelihoods was first adapted and then discontinued. Yet the experience is not lost and might still regain pertinence in the future.

ENDNOTE

ⁱ This section draws heavily from Mackay, Kenneth, Aung, Kyaw Thu and Oo, Soe Min (2023) Fisheries Data from the Gulf of Mottama. A summary of Eight Year's Data Collection. GoMP Internal Report.

ⁱⁱ Zau Lunn, Khin Myo Myo Tint, Nyein Chan Fauna & Flora International-Myanmar Programme (2021) Rapid Assessment of Diadromous Migration of Economically Relevant Fish-Species with a focus on Hilsa shad (*Tenuulosa ilisha*) between the Gulf of Mottama and the Sittaung River Basin: Hilsa shad Conservation Planning in Sittaung and Major Tributaries. Internal report for the GoMP, SDC, Helvetas, Nag and IUCN. October 2021.

ⁱⁱⁱ Oo, Soe Min and MacKay, Kenneth (2018) Small-scale aquaculture of wild fish in Myanmar: A preliminary report from the Bago Region. Aquaculture Vol 22 No., 2 April – June 2018.

^{iv} Oo, Soe Min and Mackay, Kenneth (2018) *ibid*

^v Whitty, Tara Sayuri with Wint Hte, Yin Yin, Aung Naing Soe (2017), Social Potential for Mud Crab Co-management in the Gulf of Mottama. GoMP Report 07/2017.

^{vi} Whitty, Tara Sayuri (2023) State of the Gulf of Mottama Report. Kieruna Inc. Prepared for the Gulf of Mottama Project.
https://www.iucn.org/sites/default/files/2023-10/230811_state_of_the_gulf_of_mottama_report_final.pdf

^{vii} Hte, Wint et. al., (2023) Economic Valuation of Coastal Ecosystems in the Gulf of Mottama of Bago Region, GoMP

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