INDIGENOUS KNOWLEDGE AND PRACTICES RELATED TO FRESHWATER FISHES, SHELLS AND OTHER AQUATIC MACROFAUNA IN BENGUET, LUZON, PHILIPPINES

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Abstract: The study aims to document the dynamics of freshwater resource management practices in selected indigenous communities in the province of Benguet. This forms part of the overall effort to update data on the fish and shell status in the region. Focus group discussions and key informant interviews have been utilized purposively to gather data among sample respondents in Kabayan, Bokod, Kapangan, Tublay and Bakun. Fishing and shell gathering is predominantly for subsistence, thus fishing strategies are also mostly designed for small catch. Most common fishing strategies include use of small nets, fish arrows and fish traps made of local materials. Site-specific cultural beliefs, practices and knowledge system towards the freshwater fishes and shells were also noted in the study areas. Generally, unseen spirits were perceived to be involved when dealing with fish and shell resources; thus, prohibitions of certain activities and caution must be observed. Results show that with various forces coming into play, indigenous conservation and management practices in these areas have been affected. This resulted in the reconfiguration of certain knowledge and practices that have implications in the sustainability of biodiversity conservation. Accordingly, there were more numerous beliefs observed in the past but these eventually became obsolete. Results also show that the shift to vegetable production on commercial scale has great implications to the maintenance of rivers and the resources within in terms of its quality, quantity and its biophysical characteristics. The shift to cash crops production would ultimately erode rice production in the long run and hence could carry further implications to food security. As the study sites have not yet been integrated into the market economy, support for organic agriculture as part of an integrated approach to watershed conservation would be a viable alternative.

Keywords: Benguet Province, fishes and shells, indigenous practices

Introduction:

Benguet Province is home to various major river systems in Northern Luzon. Record of the Provincial Veterinary Office (PVO 2002) shows that the province has an approximate area of 2,490 hectares of inland bodies of water, about 64% is from Ambuklao, Binga and San Roque Dams and the remaining 36% are from rivers, lakes, springs, creeks and small farm reservoir and water impoundment projects. In the province, rivers and other bodies of water have been customary sources of food, either supplemental or additional

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food source. Rivers have also served as means of transportation, as well as domestic and agricultural water sources. For instance, the Agno River, with its headwaters in Mt. Data, has been historically significant to communities that it traverses due to the following reasons (Cordillera Women's Education and Resource Center 2004; Orticio 2006):

- the Ibaloi people point to a particular site in the municipality of Itogon where Agno River cuts across before it drains into Pangasinan as the cradle of the first Ibaloi sedentary settlement;
- as the site of small scale mining ventures which started even during the pre-Hispanic period;
- as source of fish and shell products as form of subsistence.

With economic pressure and other forces coming into play, major river bodies have also been sites of commercial fish raising like the case of Ambuklao and Binga dams which have been utilized for tilapia production (PVO 2002). At the same time, rivers that used to host several forms of aquatic resources but have now been contaminated with wastewater, or have been redirected to accommodate hydropower projects. This contributed to the alarming loss of indigenous knowledge on the conservation of such resources and the growing food insecurity of Cordillera indigenous communities (EED-TFIP 2004; Cordillera Women's Education and Resource Center 2004). Moreover, several authors have observed that younger generation of indigenous communities have little of the indigenous knowledge that their forbearers passed down through oral tradition (Tondo et al. 2015).

While fish was not figured much as a main staple of major Cordillera communities owing to its mountainous habitat, communities along river banks certainly have aquatic resources that contribute in part to their food security. Fish and shellfish for household consumption are sourced from the rice fields, rivers, springs, and other water bodies. With the expected significant increase in population in the countrysides, as well as in urban centers, there is a growing pressure to provide the basic food needs of the local people. As prices of local commodities are rising coupled with pollution caused by urbanization and industrialization that threaten food production and food sources, there is, thus, an urgent need to identify and conserve existing and potential food sources to address these worsening problems. It is in this context that this study was undertaken. It primarily aimed to document the indigenous belief systems and practices (IKSP) related to fishes, shells and other freshwater macrofauna in the province that could be integrated in the management of these resources vis-à-vis the factors affecting their sustainability.

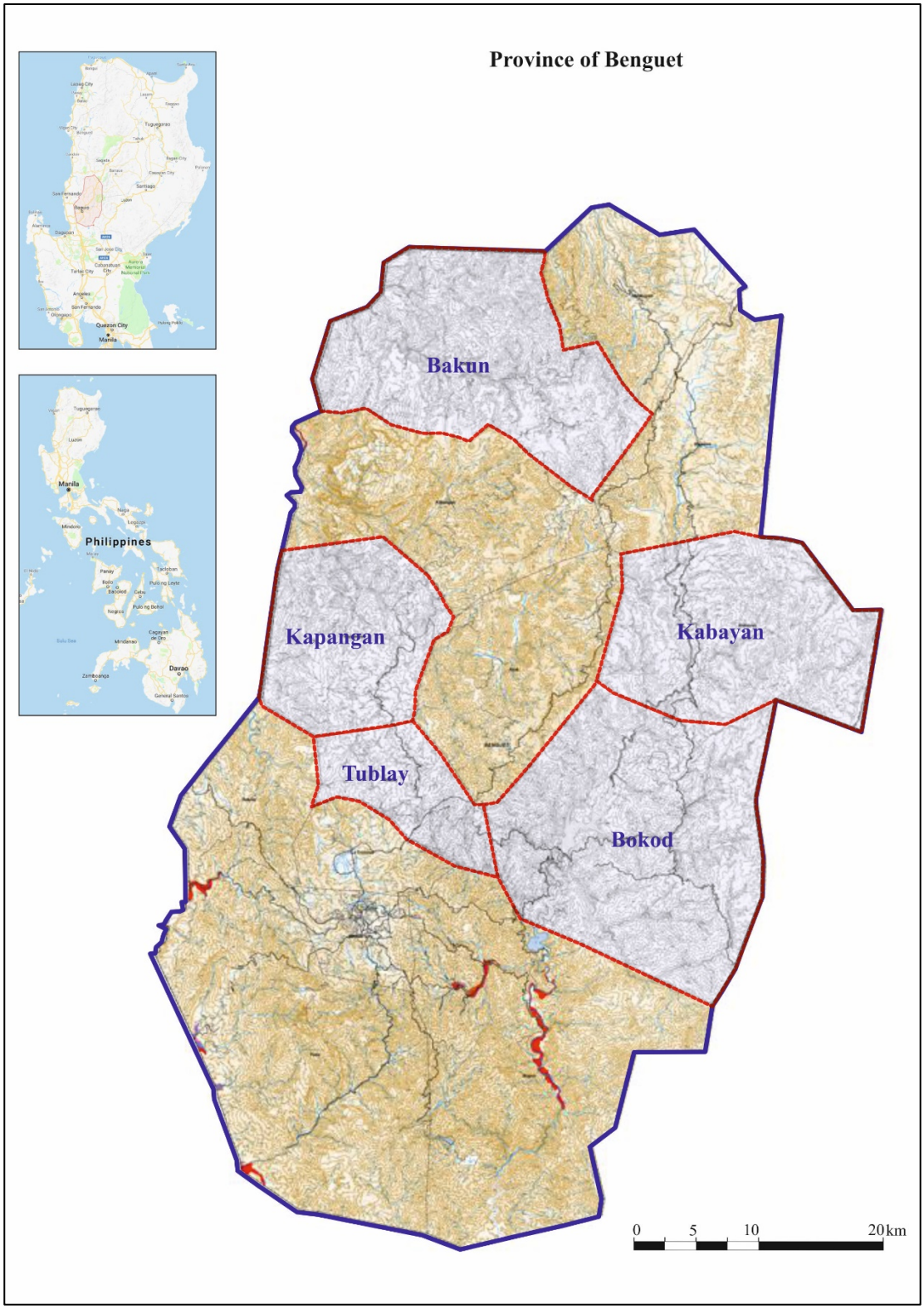
Materials and methods:

The study sites in the province were selected based on following criteria:

- presence of rivers and/or lakes;
- presence of rice terraces;
- traditional mode of farming;
- remote areas in Benguet;
- minimal exposure to commercial agricultural practices.

Selected sites include Ambuklao and Karao in the municipality of Bokod; Kabayan Barrio and Eddet in Kabayan; Cuba and Taba-ao in Kapangan; Tuel in Tublay; and Poblacion in Bakun (Fig. 1). The fishing strategies of local folks in these sites were documented through field visits in the major rivers and to the community fishing in these rivers. To document the indigenous practices and belief system related to these natural resources, the research made use of focus group discussion (FGD) and face to face interviews with informants. Respondents were purposively sampled representing the fish producing, riverine communities and representatives from the fish-rice producing communities who served as informants for the key-informant interviews (KII).

Figure no. 1 Provincial map of Benguet showing the municipality visited in the study (Modified after: Hazard Data, DENR, Mines and Geosciences Bureau [MGB] 2012)



Results and discussion:

Fishing Strategies

A total of 12 fishing strategies employed by fisherfolks have been documented in the province (see Tab. 1 and Figs. 2-9, Annexes). Most of the fishing methods are utilized during the day but some fish traps like the hook and line, '*gobo*', '*bukatot*', '*tunol*' and night fishing ('*aming*') are used at night time under the cover of darkness. It was noted that numerous fishing methods are utilized in predominantly subsistence production areas but only one is practiced in Ambuklao – the use of gill net or '*sigay*'. This could be attributed to the area of fishing ground. In Ambuklao where the water body encompasses hectares, a huge net is the most appropriate but in most study areas where fishing ground is limited, fishing gears generally are small-scale.

In general, fish and shell production in the study sites in Benguet is largely subsistent in nature. Except for Ambuklao in Bokod with its fish cage production and some parts of Kapangan and Kabayan that engage in limited pond production, the bulk of fish and shells is consumed merely at the household level. Consumption is based on its availability and the ecosystems services that land and water can provide in the area. A catch is considered 'good catch' if a sardine can size is brought home full. This good catch would usually refer to '*daring*' and/or '*wading*' (*Pseudogobius javanicus*). Still a better catch would amount to a big-sized can of '*wading*'.

According to the respondents, the duration and frequency of fishing is dependent on the fishing method employed (Tab. 2, Annexes). Peak season of fishing is reached during summer months while lean season occurs in rainy months. This is critical since most fishing strategies are suited to low water level. Also, high level of water poses great risk to the fisherfolks themselves. During summer, fishing gears such as '*pana*', '*balshew*', among others are commonly used while during the rainy season, another set of specific gears like '*suyod*' and '*asal*' are used that are more efficient at this time. However, fish traps such as '*tunol*' in Karao and '*bukatot*' are laid out in the river staying there day and night until a fish is caught. Broadly speaking, river fishing is a seasonal endeavor and this could be looked at as part of the resource management. If there is heavy fishing, it is only done during the summer period – and still using traditional river fishing methods such as '*salep*' (community fishing), '*banniit*' or hook and line and '*tunuton*' which are environmentally friendly.

Communal fishing through '*salep*' has always been looked at as a time for everyone to get reunited with the river as the site. This method of fishing allows everyone to work together on the river stones, lining them up so as to drain water, others on manually diverting water course, others are in charge of picking fish/shell from drained spaces and still others catching fish and shell using their bare hands. Afterwards, every catch is placed in one container, cooked and feasted on by the group. Intangible meanings are attached to '*salep*' particularly to friends and relatives coming back home during summer time. Almost all respondents agree that many of their community members are moving out of the community for off-farm employment, tertiary education, and seasonal migration, among others. Hence, summer period is also looked forward to as the time to welcome them back with '*salep*'. Fortunately, respondents from Bokod, Kabayan and Kapangan still highlight '*salep*' as an adventure and an expected destination for tourists. It was also observed that young people trekking to Mt. Pulag would usually drop by Karao to join in the '*salep*'. And still another people say that '*salep'* could qualify as a '*come-on*' for tourists.

Beliefs Systems and Cultural Practices on Fishes, Shells and Other Freshwater Macrofauna

Benguet communities, like the rest of the Cordilleras, have a traditional system of

safeguarding their water resources and the resources therein, and these can be gleaned from their practice of seasonal river fishing, timely consumption of fish products or even regard of critical water sources as place of abode for the spirits. Table 3 (Annexes) listed the cultural beliefs, practices and knowledge system of the respondents toward the freshwater fishes, shells and related species. Respondents from Karao, Bokod mentioned the highest number of cultural beliefs observed in the province. These include the prohibition of pregnant women from eating eel; prohibition of catching unusually big eels or frogs since they belong to unseen spirits; and the prohibition of gathering shells in rice field when the rice is flowering. There is also the belief that unseen spirits are the luck giver in fish catching thus unconsumed fish by the family must be shared to the neighbors and not sold. This is to continue gaining favor from the unseen spirits. In Eddet, Kabayan, fishing is prohibited the day after the burial of a dead person together with the prohibition of working on farms at that day. It is believed that the spirit of the dead person is still wandering thus anyone who would go out to their farm would meet the spirit of the dead. Some communities even consider certain fishes, usually big eels, as an exclusive ownership of the '*adi kaila*' or the unseen or among the Ibaloys, '*aampasit nga kiwet*'.

In Kabayan Barrio, it is believed that keeping coins in the pocket when fishing brings bad luck. The amount of coins in the pocket would determine the amount of fish that would be caught. It is also believed that seeing a foot prints in the sand or stone in the river would mean that someone (an unseen being) have gone fishing ahead. It is advisable to the fisherfolk to either go home or follow another course on the river since following the footstep would entail less catch. On the other hand, in Kapangan, large numbers of shells clumping together signify that these are poisonous, hence, should not to be consumed. These shells, allegedly, would cause drowsiness when eaten. Also, a large population of algae on rock surfaces would indicate that a storm is brewing. Furthermore, it is observed that more fish is being caught during new moon than on full moon nights. The same is true as observed in Tuel, Tublay.

Accordingly, there were many more cultural beliefs and practices being observed in the past. However, due to modernization, many of these beliefs have been lost. It's unfortunate that those beliefs were lost before they could be assessed and their potentials in natural resource management be studied and exploited. It was also noted that the cultural beliefs and practices are site specific such that one belief observed in one place was not necessarily so in other places.

Due to these beliefs and benefits provided by freshwater resources, management efforts are being implemented to safeguard these resources. In all study areas visited, illegal fishing methods such as the use of fish poisons (cyanide, thiodan and sodium) and electric current are prohibited. In Poblacion, Bakun, illegal fishing has been one of their problems due to being rampant even with the presence of the local ordinance. Poachers are often not caught.

Furthermore, the municipality of Kapangan ratified an ordinance paving the way for the creation of fish sanctuaries. The municipal ordinance sought to establish, protect, and maintain suitable portions of the town's creek, rivers and streams as sanctuary and breeding ground for freshwater fish and other aquatic life forms. In these areas, fishing is banned as well as construction of fish ponds, cages, swimming pools and pig pens near or adjacent to the protected areas. Also, sourcing out of irrigation system such as diversion canal and wallowing of carabaos inside or within 100 meters the fish sanctuary are prohibited. Additionally, it bans the washing of farm implements containing pesticides residues and other pollutants in any body of water at all times. This ordinance imposed penalties for violators (Laking 2009).

Reconfigurations in Freshwater Resource Management

From an initial and emerging analysis of the experiences and observations of respondents, conditions of fish/shell resources have to be understood in the context of multiple and interrelated dimensions, including watershed conditions, which is in turn affected by the forestry conditions; exogenous factors such as mining, dam construction and commercial scale farming. Many factors are blamed for the decreasing population of fishes and shells in the province. Foremost there are the commercial/synthetic inputs in fields/farms, illegal fishing method and land use conversion (from rice farm to vegetable gardens) with 92.9%, 100% and 92.9% responses, respectively (see Tab. 3, Annexes). As observed and articulated by the respondents, rice conversion to vegetable gardens is most detrimental to rice paddy-based species such as indigenous shells and mudfish. The conversion involves the drying up of the paddies divesting the required wet habitat of these species. Also, it is subjected to heavy inputs of synthetic fertilizers and pesticides which are toxic to these freshwater species. Once the rice paddy was converted, the displaced species would not re-establish in the area even if the farm would be converted back to rice paddies.

Many factors that affect the fishes and shell resources have been documented in the study sites. These include the following:

- Changing fish-shell management practices. When asked about the resource management practice of communities, two respondents replied that ‘there is no one taking care of these resources… they just grow by themselves and take care of themselves’. This means that the ‘naturalness’ of the cycle of growth and depletion of resources if left undisturbed, would continue. This is in the context where these resources are still at the disposal of the community members.
- Commercial scale fish production. With the transformation of traditional communities, fish ponds and fish cages have made their way into Benguet communities located near major river systems in the province. Major fishing grounds for indigenous fishes have gradually been dotted with fishcages. Fishponds have also been encouraged at the municipal level as seen in Kabayan, Bokod, Kapangan and Tublay.

Ambuklao is one community in Benguet where commercialization of fish production seems to be promising - at least after decades of economic disenfranchisement brought about by the dam construction. This is because outside funding source provided intervention programs. The ERP-CASCADE (Economic Self Reliance Program-Caraballo and Southern Cordillera Agricultural Development Program), a European funding invested in tilapia fingerlings production in partnership with a community organization. This organization was called the Bantey, Pisek, Kiweng Organization Inc (BANPIKOI) which started in the mid-1990s and finally had its fish cage implementation in 1996. To date, there are 10 units privately owned under the supervision of the BANPIKOI.

The Ambuklao fish cage operators, however are confronted with issues such as sustainability of operation, pollution of the reservoir and other related issues. The issue of sustainability of operation becomes important as technically the operators are considered ‘illegal’ since the reservoir is part of the watershed area. This conflict resulted in the suspension of the renewal of MOA between NPC and the BANPIKOI. Respondents, however, strongly believe that the government has an

obligation to provide alternative livelihood for them since they have been displaced and therefore disenfranchised with the construction of the dam. As one respondent would say, '*na-dam ti lugar mi, kinnan amin ti danum… anya ngay pangalaan min*' [maybe translated as '*we have been dammed… and we can no longer plant for our food… where else would we get food…*']. The respondent goes on to say that the reservoir is more than a hundred hectares and what they are just asking for fish cage operation is just a tiny part of the area. This issue has also been raised in the Provincial Veterinary Office (PVO 2004) when it cited that the ownership authority over the waters of Ambuklao reservoir is not very clear in relation to its classification of municipal waters.

Aside from the above issue, other issues thrown to the fish cage operators include the over use of commercial feeds which pollutes the reservoir. Human waste mismanagement is also being raised to which the respondents would readily answer back just as an unfounded accusation. For the overuse of commercial feeds, respondents say there is '*shift to using leaf trimmings of trading post vegetables*' as alternative to commercial feeds. Hence, feeding is said to have been reduced from 3 feedings/day to about 1.5 feedings/day.

Unfortunately, the high commercial input required of intensive fish production at Ambuklao has contributed to the organic pollution and the loss of freshwater biodiversity. To begin with, the construction of the Binga and Ambuklao dams contributed much to the disappearance of indigenous fishes. For example, '*kiwet*' (eel, *Anguilla marmorata*) coming from the seas are no longer spotted in the upstream.

The decreasing access and control over these resources has also implied the decreasing '*space*' for the continuous observation of indigenous conservation practices. Deforestation, mining and dam constructions bring about heavy siltation that would affect the hydraulic capacity of the river. Despite these conditions, seasonal fishing is still practiced, but under more difficult circumstances. Fish catch become less common and is no longer seen as a stable source of additional food item in the household. Perhaps this would also provide the context in which some community members resort to the use of fish poison, replacing '*tabako*', as a means to increase fish catch.

- Irrigation development. Observations by local fisherfolks and farmers also revealed that cementing of irrigation canals has contributed to the disappearance of breeding sites for certain freshwater shells such as the '*nuso*' (*Melanoides maculata*). The irrigation canals used to be sites for '*kolokol*'; '*nuso*', '*batkel*' (algae) and '*bedbed-ok*' but once the canal was cemented, they disappeared. This is most likely attributed to the loss of burrowing site and food of these shells. Since the canals were cemented, shells could no longer burrow into the clay substratum to escape from predators. Also, cementing of the canals would practically wipe out the existing plants such as algae, plankton as well as the decaying organic materials that serve as food for these freshwater shell species. On the other hand, the use of '*kuliglig*' in some parts of Kapangan has observably contributed to the disappearance of the '*binga*' (*Radix* sp.) shells which have delicate

shells. It is also said to have determined the fast loss of tadpoles and frogs in the rice fields by either destroying the eggs of the frogs or overrunning adult individuals.

It was also been observed that wherever there is tungsoy or water cress, there are always edible shells. However presently, shells attached to water cress were notably smaller in size. '*Bedbed-ek*' (*Radix rubiginosa*), a commonly shell is no longer found in many parts of Benguet (at least in the study sites) except in Ekip, Bokod.

- Riceland conversion. The increasing frequency of ricefields conversion to vegetable gardens for commercial crops production had and is still contributing greatly to the decreasing volume of fishes and shells. Reasons provided for the fast conversion of ricelands to vegetable farms, aside from the increasing need to cash, is the noted drying of ricefields. Also, as families divide ricelands to their offspring, lands become scarce and growing rice is no longer practical. Vegetable production becomes more attractive. It follows that these commercialization of farms also means the use of pesticides which eventually leach into rivers. All respondents agreed that pesticide application contribute much to river pollution.

  Crop rotation of rice and semi-temperate vegetable is common in Karao in Bokod, Kabayan Barrio and Eddet in Kabayan. After rice, the field is planted with vegetables such as Chinese cabbage, onion leeks to name a few. This somehow affected the continuity of certain species of '*nuso*' shell as well as fishes like '*jojo*' or Japanese fish (*Misgurnus anguillicaudatus*). However, it was noted by the respondents that this practice favours the proliferation of certain indigenous shells such as '*tumdid*' or '*tulichan*' (*Radix rubiginosa*), '*ginga*', '*kit-an*' or '*nuso*'. '*Tik-am/ binek*' (*Corbicula manilensis*) is abundant only in the Ambuklao reservoir and '*agudong*' (*Faunus ater*) is found solely in Kapangan. '*Angkop*' or '*kumbibi*' (*Pilsbryconcha exilis*), however, is becoming endangered.
- Waste disposal. Respondents along the Agno River also highlight the indiscriminate throwing of garbage by upstream communities, particularly Buguias. Pesticide containers, for instance are seen to be floating along the river banks during rainy season. Municipal Agriculture Office (MAO 2007) in Kabayan also reveals that the Agno River is one of the dirtiest rivers in the region where the Eddet river of Kabayan is a tributary of.

  Application of commercial fertilizers has also contributed to the demise of '*jojo*', native kohol, '*tumdid*' and '*nuso*'. Currently, the presence of gardens at the upper slopes makes run-off contaminated with pesticide residues. Ironically, golden kuhol (*Pomacea canaliculata*) is the only visible shell resource in the rice fields of Bakun.
- Mining. The Amburayan River of Kapangan has been affected by the operation of the Buneng mines in Atok. Starting the 1980s, with the closing of the mines, freshwater fish resources began to recover. But just when the river is starting to recover, cyanide fishing takes to beset the community. The use of cyanide in fishing was also observed in Bakun and in Kabayan.
- Introduction of exotic species. The introduction of golden kuhol had widely been acknowledged as a technology that has invaded indigenous shell species aside from its fast consumption of rice seedlings. Although, apple snails (golden kuhol)

are mainly vegetarian, many species are known to predate on other snails and their eggs. Predation on the eggs of other snails is quite common, while predation on other snails is mostly exhibited during starvation. In extreme, prolonged starvation apple snails are known to deploy cannibalistic behavior. Also, tilapia introduced in Ambuklao was said to have caused the extinction of certain indigenous fishes. Tilapia species usually dominate in introduced habitats, representing a competitive threat to native species and lowers biodiversity. They are extremely aggressive and territorial while breeding. They are capable of rapid invasion and have high fecundity. Native fish may be displaced and outcompeted for resources such as prey or breeding sites. In much of its introduced range, tilapia is the dominant species both by number and biomass.

- Climate change. Apart from the usual observation of weather and climate patterns becoming unpredictable, poorer water quality and decreasing number of aquatic resources has been commonly articulated by the respondents. Observed effect of change in climate has figured more in Ambuklao. Fish cage operators complain of the high mortality rate of tilapia fingerlings because of the unpredictable rain pattern as well as the increasing unpredictability of cold temperature. Though it is a common knowledge that during the colder months of December through February fish growth is negatively affected, it has also been observed that tilapia fingerlings have difficulty adapting to this climatic change, hence, resulting in increased fish mortality. When asked about their 'prospects for the future' one respondent quipped 'as long as there is still fish, there is life hope for tomorrow…' ('…*basta ada mabati nga lames, ada ti namnamaen nu bigat*…').

Conclusions:

This study documented the indigenous practices and beliefs on fish and shell resources of Benguet. It was found out that 74.5% of the barangays of the province have access to inland waters (mostly rivers) but the production of these indigenous resources is predominantly for subsistence only. Fishing is not a major livelihood in the area. Nonetheless, several fishing strategies were employed by fisherfolks such as nets, fish arrow, fish trap, fish hook, fish trap and indigenous fish poison. Several beliefs were also noted in the study sites which primarily associated these freshwater resources with supernatural beings / unseen spirits. These fishing strategies and belief system form an integral part of the indigenous resource management that can be integrated in the government's program to maintain the sustainability of these resources.

The interplay of various forces such as commercial scale vegetable production, river pollution, dam construction, cementing of irrigation canals, mining and climate change contributed to the changing landscapes of freshwater resource management. With the degradation of rivers and water resources, fish and shell catching in the indigenous ways are done under more difficult circumstances. Problems besetting communities engaging in fish cage production include the lack of support services, from production to marketing as well as sustainable rehabilitation of its fishing grounds. There is, however, a stronger sense of awareness on the fast depletion of these resources and community initiatives to save and protect the remaining freshwater resources have been undertaken.

Rezumat:

CUNOȘTINȚE ȘI PRACTICI INDIGENE LEGATE DE PEȘTII, MOLUȘTELE ȘI ALTE SPECII DE MACROFAUNĂ DE APĂ DULCE DIN BENGUET, LUZON, FILIPINE

Studiul își propune o documentare privind dinamica practicilor de gestionare a resurselor de apă dulce în comunitățile indigene selectate din provincia Benguet. Acesta face parte din efortul global de actualizare a datelor privind situația peștilor și moluștelor din regiune. Discuțiile de grup țintă și interviurile cu persoane cheie au fost utilizate pentru a aduna date printre respondenții selectați din zonele Kabayan, Bokod, Kapangan, Tublay și Bakun. Pescuitul și colectarea moluștelor sunt practicate predominant pentru subzistență, astfel strategiile de pescuit sunt destinate, în cea mai mare parte, capturilor mici. Cele mai comune strategii de pescuit includ utilizarea de plase mici, săgeți de pește și capcane de pește din materiale locale. Credințele culturale specifice locului, sistemul de practici și cunoștințe cu privire la peștii și moluștele de apă dulce au fost, de asemenea, înregistrate din zonele de studiu. În general, spiritele nevăzute au fost percepute ca fiind implicate în gestionarea resurselor de pește și moluște; în acest sens, interdicțiile anumitor activități și precauția trebuie respectate. Rezultatele arată că, o dată cu intrarea în joc a diferitelor forțe, au fost afectate practicile de conservare și gestionare indigene în aceste zone. Aceasta a dus la reconfigurarea anumitor cunoștințe și practici care au implicații în sustenabilitatea conservării biodiversității. În consecință, au existat mai multe credințe observate în trecut, dar acestea au fost uitate. De asemenea, rezultatele arată că trecerea la producția de legume la scară comercială are mari implicații în menținerea râurilor și a resurselor în termeni de calitate, cantitate, precum și a caracteristicilor lor biofizice. Trecerea la culturi pentru profit ar afecta în cele din urmă producția de orez pe termen lung și, prin urmare, ar putea avea implicații suplimentare asupra siguranței alimentare. Întrucât siturile studiate nu au fost încă integrate în economia de piață, sprijinul acordat agriculturii ecologice ca parte a unei abordări integrate a conservării bazinelor hidrografice ar fi o alternativă viabilă.

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Annexes:

Istros – Museum of Braila "Carol I"

Figure no. 2 '*Nesines*' in Tuel, Tublay

Figure no. 3 '*Bukatot*'

Figure no. 4 '*Pana*' with goggles

Figure no. 5 '*Tunol*' in Karao

Figure no. 6 Fishing with hook and line

Figure no. 7 '*Tunoton*' in Kapangan

Figure no. 8 Fishing with '*balshew/luyloy*'

Figure no. 9 Fish container similar with '*gobo*'

Istros – Museum of Braila "Carol I"

Table no. 1 Fishing gadgets and strategies employed in the study sites

Fishing strategies	Local Terms	Description	Fishes caught	Fish catch (kg)	Duration	Municipality practiced
Push net	Balshew (Ibaloi)/ Sapa (Bakun)/ Lul-loy/Sagada (Kapangan)	- A cone-shaped net (widest in the mouth portion) fasten to two sticks parallel to each other	All fishes in the river but, usual catch are goby and tadpoles	0.3 - 1	Day	Kabayan (Eddet), Tublay, Bakun, Bokod (Karao), Kapangan
	Suyod (Karao)/Apdos (Kabayan Barrio)	- Utilizing also push net but this was done when the water in the river is murky by driving the net along the shore. Riverine fish are observed to ashore when the waterflow is so strong and silty	All fishes in the river, but usual catch are goby and tadpoles	1 - 3	Day	Bokod (Karao), Kabayan (Kabayan Barrio)
	Kalaskas	- Also using push net but this time two fisherfolk is involved; one individual is driving the fishes toward the push net of the other one	All fishes in the river, but usual catch are goby and tadpoles	1 - 3	Day	Kabayan (Kabayan Barrio)
Gill net	Sigay	- A huge net submerged in the water in the morning then pulled up in the afternoon with the trapped fishes in it - Come in different sizes - #3 for goby while #4 for tilapia, carp and other larger fish in the area	Could catch all fishes found in the reservoir bigger than the holes of the net	5 - 10	Day	Bokod (Ambuklao)
Net traps	Bukatot	- A large cone-shaped net when stretched widest at the mouth portion and narrow until it closes in the other end. The inside portion has overlapping nets fastened in metal rings that entangles and traps the fishes that enter	Intended for eel, but may catch other aquatic resources such as crabs and goby	0.5 - 5 (usual catch is 2 - 3 kg wrist size eel)	Both day and night	Tublay, Bokod (Karao), Kapangan
Cast net	Tabukol	- A huge net used to catch fish by throwing it into the water; applied only when the water is murky and its level is high	All riverine fish and other aquatic resources	5 - 10	Day	Kapangan
Net		- Used to gather clams (*bennek*)	*Bennek* (freshwater clam)	10 - 15	Day	Bokod (Ambuklao)

Hook and line	Bani-et/ Kumbit/ kawet	- Provided with a bait usually laid out in the evening, was left overnight and to be check in next morning if it caught fish - Comes in two sizes - the bigger hook is for larger fish; while the smaller one is for goby and tilapias	The bigger hook is intended to catch eel; the smaller hook is for goby, tilapia and other smaller fish	0.5 – 5 (usual catch is 2 - 3 kg eel)	Day	All of the study sites
Rubber-band gun/ Fish arrow	Pana	- Improvised fishing gadgets having a 0.1 mm rod with pointed tip secured in a pistol-like wooden handle	All riverine fish, but the usual catch is goby	0.3 - 1	Day	All of the study sites
Fish trap made of bamboo	Gobo/ king-git (Bakun) apedjaw (Ibaloi)	- A fish gadget woven out of rattan/bamboo in a cylindrical fashion having two openings; one opening is treacherously design with pointed tip facing inward letting fish to enter but preventing their way out; while the other opening could be closed to trap fish inside or could be opened to collect the trapped fish	Yoyo/ goby/eel/ kampa/ freshwater prawn and other smaller fish	0.3 - 1	Night in some places and day in others	Kabayan (Eddet), Tublay, Bakun, Bokod (Karao), Kapangan
	Tunol	- Especially design to catch eel	Eel	0.5 – 5 (usual catch is 2 - 3 kg wrist size eel)	Night	Bokod (Karao)
Water diversion to other course	Salep (Ibaloi)/ Sa-ep (Kapangan)	- Manual diversion of water to another course thus drying its previous course. Fish and other aquatic resources are easier to catch this way-just picking them - Usually observed during Holy Week as many community members attend	All riverine fish and other aquatic resources	0.3 - 1	Day	Kabayan (Eddet and Kabayan Barrio), Tublay, Bokod (Karao), Kapangan
Night fishing	Aming/ Silag/ Silaw (Bakun)/ Tambol (Karao)	- Fishing at night	All riverine fish, especially frogs	1 – 3	Night	All of the study sites
Fish trap	Nesines	- Two parallel lines of grasses and stones established against the flow of water. One line has a gap where a net is positioned trapping fishes drove by fisherfolks	Goby, freshwater shrimps	0.3 - 1	Day	Tublay

	Epon	- Fishing gadget used to catch small fish carried by falling water	Small fish	0.3 - 1	Day	Kabayan (Kabayan Barrio)
	Asal	- Made of sticks fastened in a wood; its width is similar to the width of the flow of water; set up across the flow of water during rainy season to trap fish that is being carried by the strong flow of water	All riverine fish and other aquatic resources	10 - 15	Day	Kapangan
	Tunotun	- This is just a pile of stone in the flowing part of the river, established to serve as habitat or home of the fish. This would be left untouched for two months or until algae and other aquatic plants grow in the rocks. After two months or more, it would be surrounded with net and *apedjaw* and the rocks would be removed to disturbe the fish therein luring them into the *apedjaw*. Fishes not lured would be manually caught using pana	All riverine fish and other aquatic resources	1 – 3	Day	Kapangan
Fish poison	Tabako	- Used to intoxicate eels; used in combination with other fishing methods such as push net or fish arrow	Eels	2 - 7	Day	Tublay

Table no. 2 Seasonality of fishing strategies and methods

Fishing Strategies	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Balshew (Ibaloi)/ Sapa (Bakun)/ Lul-loy/Sagada (Kapangan)	x	x	x	x	x					x	x	x
Suyod (Karao)/Apdos (Kabayan Barrio)						x	x	x	x			
Kalaskas			x	x	x							
Sigay	x	x	x	x	x					x	x	x
Bukatot	x	x	x	x	x	x	x	x	x	x	x	x
Tabukol						x	x	x	x			
Shell net	x	x	x	x	x							
Bani-et/ Kumbit/ kawet	x	x	x	x	x	x	x	x	x	x	x	x
Pana	x	x	x	x	x					x	x	x
Gobo/ king-git (Bakun) apedjaw (Ibaloi)	x	x	x	x	x	x	x	x	x	x	x	x
Tunol	x	x	x	x	x	x	x	x	x	x	x	x
Salep (Ibaloi)/ Sa-ep (Kapangan)			x	x	x							
Aming/ Silag/ Silaw (Bakun)/ Tambol (Karao)	x	x	x	x	x					x	x	x
Nesines			x	x	x							
Tabako			x	x	x							
Epon		x	x	x	x							
Asal						x	x	x	x	x	x	
Tunotun	x	x	x	x	x	x	x	x	x	x	x	x

Table no. 3 Cultural beliefs, practices and knowledge system toward the fish-shell resources

Common beliefs/ superstitions	Respondents (n = 28)	Percentage (%)*	Status	Municipality observed
Fishing is prohibited the day after the burial of a dead person	5	17.9	+	Kabayan (Eddet)
Pregnant women are prohibited to eat eel because it would cause them hard labor in giving birth	5	17.9	+	Bokod (Karao)
Unseen spirits (anitos) own unusually big eels and other aquatic resources. They could cause sickness to anyone who consume these	5	17.9	+	Bokod (Karao)
Gathering of shells in the rice fields during flowering of the rice would cause the grains to fall	5	17.9	+	Bokod (Karao)
Unseen spirits (anitos) are the one granting you luck in fishing – either you catch many fish or nothing at all	5	17.9	+	Bokod (Karao)
Unconsumed fishes in the household must be shared to neighbors and not to be sold to gain favor from the unseen spirits to continue giving luck in fishing	5	17.9	+	Bokod (Karao)
Eels may cause drowsiness to anyone who consume it	3	10.7	-	Poblacion, Bakun
When fishing, do not proceed or simply skip the area if you saw footprints in the sand since an unseen spirit have gone fishing ahead. Proceeding would mean you wouldn't catch any fish	3	10.7	+	Kabayan (Kabayan Barrio)
Do not put coins in your pocket when fishing because there's a tendency that the amount of coins in your pocket, that would be the quantity of fish you would gather	3	10.7	+	Kabayan (Kabayan Barrio)
Some pools in the river are believed to pull people into drowning when fishing alone	8	28.6	-	Kapangan
Large group of shells (such as ginga) indicate that they are poisonous causing drowsiness when eaten	8	28.6	+	Kapangan
There are more fishes caught during new moon than full moon	10	35.7	+	Kapangan, Tublay (Tuel)
Huge mat of algae in the river would indicate that a typhoon is approaching	8	28.6	+	Kapangan
Total	73	260.7		

Note: * multiple response; + still applicable and observed; - no longer observed or practiced.