

MK19

Fisheries and Aquaculture Production in Reservoirs in Lao PDR

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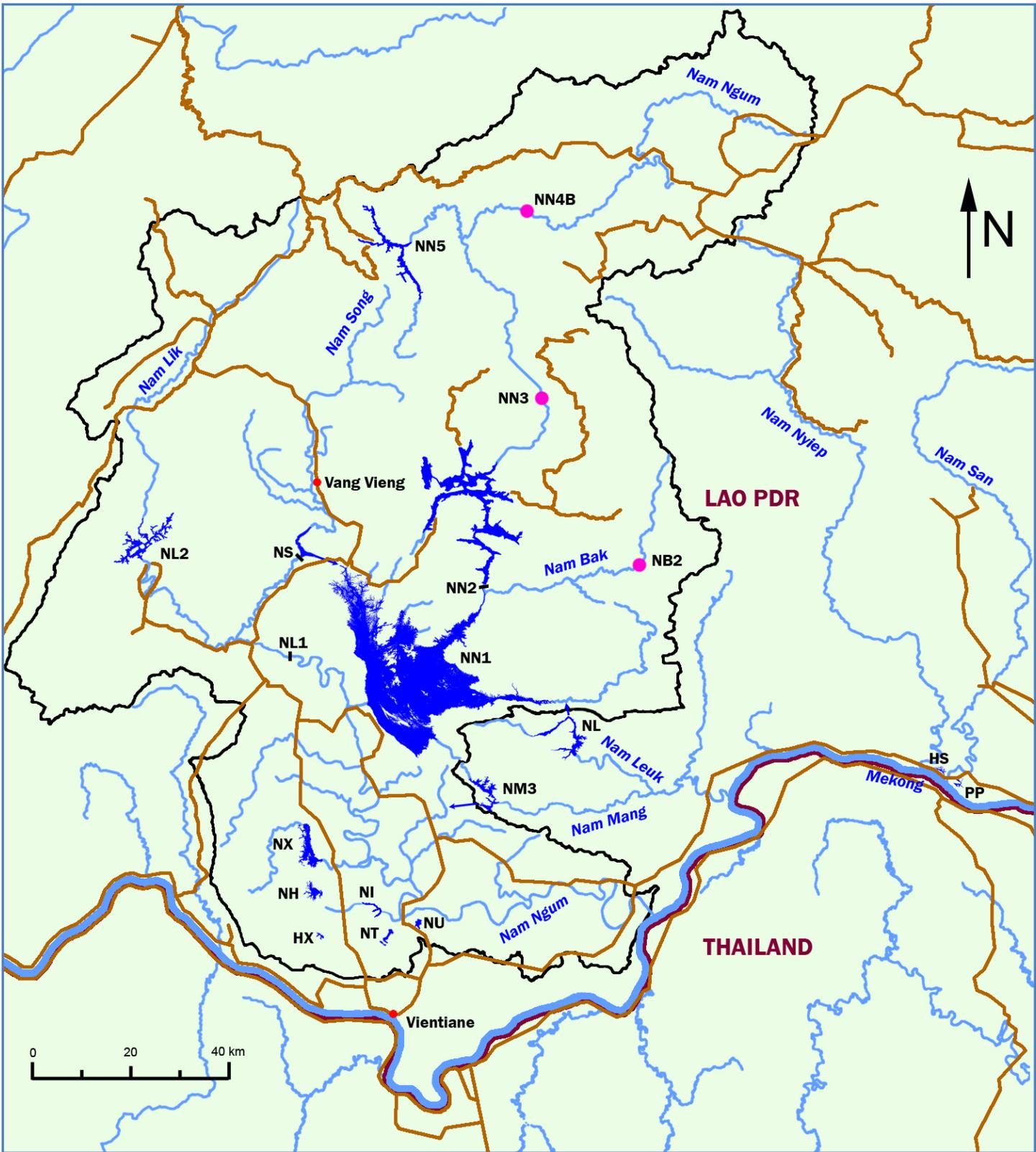
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Dams near Vientiane in Lao PDR, as shown on the map. The six highlighted reservoirs were studied in detail, while other available information on fisheries was compiled for all reservoirs.

Code	Dam	Commissioned	Main Purpose	Surface area at Full Supply Level (km ²)
HS	Huay Siet	1987	Irrigation	1.7
HX	Huay Xone	nd	Irrigation	0.4
NB2	Nam Bak 2	planned	Hydropower	4.9
NH	Nam Houm	1981	Irrigation	8.8
NI	Nong Niaou	nd	Irrigation	0.5
NL	Nam Leuk	2000	Hydropower	17.2
NL1	Nam Lik 2	2010	Hydropower	24.4
NL2	Nam Lik 1	2011	Hydropower	22.3
NM3	Nam Mang 3	2004	Hydropower	11
NN1	Nam Ngum 1	1971	Hydropower	460
NN2	Nam Ngum 2	2010	Hydropower	122.2
NN3	Nam Ngum 3	2014	Hydropower	25.6
NN4b	Nam Ngum 4b	planned	Hydropower	0.2
NN5	Nam Ngum 5	2018	Hydropower	14.6
NS	Nam Song Diversion	2011	Hydropower	1.3
NT	Nong Taleuk	1990s	Irrigation	1.5
NU	Nong Seuam	1990s	Irrigation	1.6
NX	Nam Souang	1981	Irrigation	15
P	Pak Peung	1990	Irrigation	3.9



The main rivers, dams and reservoirs near Vientiane, Lao PDR. Some dams are under construction or planned ● . The Nam Ngum catchment is outlined in black.

Introduction and Overview of the MK19 Project

Lao PDR is developing many new hydropower and irrigation dams, which are likely to cause significant negative impacts on river and floodplain fisheries. However, the new reservoirs will also provide increased opportunities for fisheries and aquaculture, but information on existing reservoirs is scattered, incomplete and poorly documented.

This project is synthesising and will publish and disseminate what is known about fisheries and aquaculture in reservoirs in Lao PDR, and has also carried out field surveys to describe the fisheries of several existing reservoirs, as well as the types of aquaculture operations that can benefit in and downstream of reservoirs. The project has also investigated some of the issues and problems confronting fishers and fish farmers who depend upon reservoirs for their livelihoods, as well as attempting to estimate the size and value of fisheries and aquaculture production from reservoirs.

The project's overall aim is to provide better information on reservoir fisheries and aquaculture so that reservoirs will be planned and managed to provide a broader range of benefits, particularly to rural people living nearby. Some specific questions which the project is addressing include the following.

- Which species of fish and other aquatic animals (OAAs) are caught in Lao reservoirs; what quantities are caught and what is their value?
- What are the patterns of development of reservoir fisheries in Lao PDR; i.e. the changes in species and size composition and in the fishery itself?
- What additional production of fish and OAAs can be expected from planned reservoirs?
- What are the main factors that drive or are correlated with production?
- What management measures have been tried and which are likely to be effective?
- What is the history of stocking and is it effective?
- What is the history of aquaculture and what lessons have been learned?
- What problems have reservoirs caused for aquaculture in and downstream, and what are the appropriate responses?

The MK19 project began in mid-2013, so analyses and reports are still in progress. The approach is straightforward, with five main elements, which are summarised briefly below. The project is reviewing all background information on fisheries at reservoirs in Lao PDR (Activity 1) Fieldwork was carried out at six reservoirs chosen to represent a cross-section of types found in Lao PDR, and four kinds of field surveys were carried out (Activities 2 to 5.)

Review of Production of Fish and Other Aquatic Animals from Reservoirs in Lao PDR

Responsible Agency: Dept of Livestock and Fisheries. Key Team Members: Mr Sommano Phounsavath: Mr Douangkham Singhanouvong (LARREC) & Mr Kent G. Hortle, Consultant.

Abstract from 1st Draft of Review Report, August 2013

Lao PDR, the only landlocked country in southeast Asia, lies mostly within the lower Mekong basin (~14° 23' N and 100° 108' E). Government policies favour irrigation to support rice production, which has led to construction of many small irrigation reservoirs. Several larger reservoirs support hydropower or multiple uses, and many more reservoirs are being constructed. Fisheries in the larger reservoirs have been based mainly on indigenous self-recruiting species, whereas smaller reservoirs are often stocked with exotic species to increase yields. There are few reliable data on capture fishery yields, because of limited agency capacity and the cost and time involved in surveys of large and rather inaccessible water-bodies. Aid-funded surveys of the largest reservoir, Nam Ngum in 1982 and 1998, accurately reported catches that were much larger than official govt figures, which are based on only partial surveys at some landing sites. Unfortunately, the official figures continue to be reported, placing an unrealistically low value on reservoir fisheries and leading to their neglect in development planning, which include dams on tributaries that support Nam Ngum's reservoir fishery.

This report summarises prior published work on reservoir fisheries in Lao PDR and makes reference to other data from the region. We also present for the first time the results of catch assessment surveys that were carried out at four small irrigation reservoirs from 2000 to 2010, using landing-site surveys and fisher logbooks. In the two larger reservoirs (1200 and 1500 ha in area), catches averaged at least 99 and 175 kg/ha/year respectively and included stocked herbivorous species and about 30 indigenous species. In the two smaller reservoirs (150 and 300 ha in area), catches averaged at least 304 and 490 kg/ha/year respectively, and mainly comprised indigenous self-recruiting predatory species. Higher yields per unit area are typically found elsewhere for smaller reservoirs, and here the pattern may also reflect that the larger reservoirs are on forested tributaries, whereas one of the smaller reservoirs is on the floodplain of the Mekong River, offering a diverse, swampy habitat and being also probably more nutrient-rich. Yields could be further enhanced by management, as there was a high abundance of predators in all of the reservoirs and stocked fish made up a very low proportion of catches. The reservoirs also support cage and cove culture as well as aquaculture in ponds downstream, and these offer considerable scope for expansion.

We also review how productivity in reservoirs can be increased through management by 1) environmental management, 2) stocking or removing fish or other species, and 3) managing the activities of fishers. Fisheries management also needs to address various ongoing problems for resource users, such as impacts of other water users, apparent declines in catches, illegal fishing and fishing by outsiders, low income for fishers and a lack of fisheries management systems and capacity. The status and potential for applying fisheries management at Lao reservoirs are reviewed with reference to the current institutional framework and GoL policies as well as the socioeconomic setting and possible alternatives for management systems.

Keywords: *Lao PDR, reservoir, fisheries, fish, irrigation, hydropower, management*



Nam Ngum multi-purpose reservoir covers 460 km² at full supply level, making it the largest waterbody in Lao PDR.

MK19 Activity 2

A PRA survey of key fisheries stakeholders and market traders at reservoirs in Lao PDR

Responsible Agency: Dept of Livestock and Fisheries.

Key Team Members: Mr Sommano Phounsavath, Mr Bounthanome Chamsing, Mr Oudone Kounsavanh, Mr Nokham Chomvichit and Ms Vannida Boualaphan.

This activity aims to describe general aspects of fish and fisheries in the six selected reservoirs, as well as identifying market channels and approximate quantities and value of fish traded.



At Pak Peung – DLF staff interview members of the fisher’s committee who manage the reservoir fishery under co-management arrangements supported by the Dept of Livestock and Fisheries and Provincial and District staff



The annual drawdown zone exposed at Nam Houm Reservoir, a likely factor in the reservoir's productivity. Re-flooding each year liberates nutrients and stimulates plankton production.



At Huay Siet Reservoir - meeting with fishers in the temple near the reservoir.



Nam Ngum Reservoir fishers who were interviewed demonstrate equipment used for night-time light fishing for small pelagic herrings, *pa kiaou*.



Fish trader (background) who was interviewed, shown with her staff; and a fisher (left foreground) with large silver carp from Nam Ngum Reservoir.



Sellers of preserved and dried fish at Ban Tha Heua, near Nam Ngum 1 Reservoir. The number of sellers appears to be increasing and the products are distributed throughout Lao PDR. Most sellers and traders are women.



Fresh fish for sale at Ban Tha Heua near Nam Ngum 1 Reservoir. Many are traded to other places including Vientiane for resale. Most fish in Lao reservoirs are indigenous, but some exotic species are becoming more common – silver carp and common carp are to the left.



A family fishes in the main irrigation canal from Nam Xouang Reservoir. Shrimps and clams are abundant in such canals.



Fisheries support many other industries. Boat construction at Nam Lik 2, a newly formed reservoir.



An arm of the Nam Ngum 5 Reservoir, one of the newest in Lao PDR. Submerged vegetation provides a pulse of productivity, supporting a ‘windfall fishery’ in new impoundments.



Fishers are active on the new Nam Nguang Reservoir, part of the Nam Theun – Hinboun expansion project. The canoes are made from old fuel tanks of B-52 bombers. Photo courtesy of Mr Jens Laugen, NTPC.



Fishing in the main irrigation canal downstream of Nam Houm Reservoir



Indigenous snakeheads and barbs for sale in Thonkhankam Market in Vientiane. These fish were caught in the new Nam Theun 2 Reservoir, which now supports an important fishery and associated traders and market sellers.

MK19 Activity 3

A survey of aquaculture operations at selected reservoirs in Lao PDR

Responsible Agency: Dept of Livestock and Fisheries.

Key Team Members: Mr Thongkhoun Khonglaliene and Mr Sommano Phounsavath.

Aquaculture associated with reservoirs in coves, cages and ponds, and in downstream rivers and canals, is increasing in Lao PDR, with aquaculture fish now dominating trade into Vientiane. This study interviewed farmers at each of the six selected reservoirs regarding cultured species, quantities and value, and issues and constraints for their operations.



Integrated aquaculture-livestock farming is expanding downstream of Nam Souang near the main irrigation canals from the reservoir. Canals provide water supply to ponds, which are fertilised by the wastes from chickens or pigs, improving efficiency of nutrient conversion. Ponds are stocked mainly with exotic fast-growing and hardy species such as Nile tilapia and carps.



Nam Houm, a small irrigation reservoir which supports capture fisheries, cove aquaculture (right centre) and pond aquaculture downstream (left side).



New fish ponds near Nam Ngum where *Clarias* catfish are farmed for trading to other towns

MK19 Activity 4

A household survey of fish catches and consumption

Responsible Agency: National University of Laos.

Key Team Members: Dr Phouvin Phousavanh and Mr Latsamay Sylavong.

Surveys were carried out around each reservoir as a way to estimate catches and consumption. Near each reservoir 100 households were surveyed, making 600 in total. Access was difficult around some reservoirs and this was the most time-consuming survey.



NUOL staff interviewed each household member, here at Nam Houm the lady is a member of the Fisheries Management Committee and a fish trader.



Flooding and wet weather delayed access to some locations and caused delays in interviews during the household surveys.



Survey of water quality in reservoirs and a survey of tilapia farmers along the Nam Ngum River

Responsible Agency: National University of Laos. Key Team Members: Mr Thonglom Phommavong, Mr Somphone Phommanivong and Mr Hans Poutsma.

This survey was carried out along the Nam Ngum River downstream of the Nam Ngum 1 Dam, to describe the expanding tilapia farming industry and its management needs, and to investigate reports of fish kills. The surveyors also collected basic information on water quality at the project's selected reservoirs as an aid to understanding fisheries productivity.



One of many tilapia farms on the Nam Ngum River. There are 60 cages at this farm which produces over 300 tonnes of fish per year.



Interview with tilapia farmer (background) at Thalath.



Tilapia in cages and a farmer at Ban Keung – the fish is 1.5 kg at 5 months old. Many of the farmers are women who have increased their income dramatically by adopting fish farming.



Project staff measure basic water quality parameters in tilapia cages. A multi-parameter water quality meter was purchased and project staff were trained in water quality assessment.

