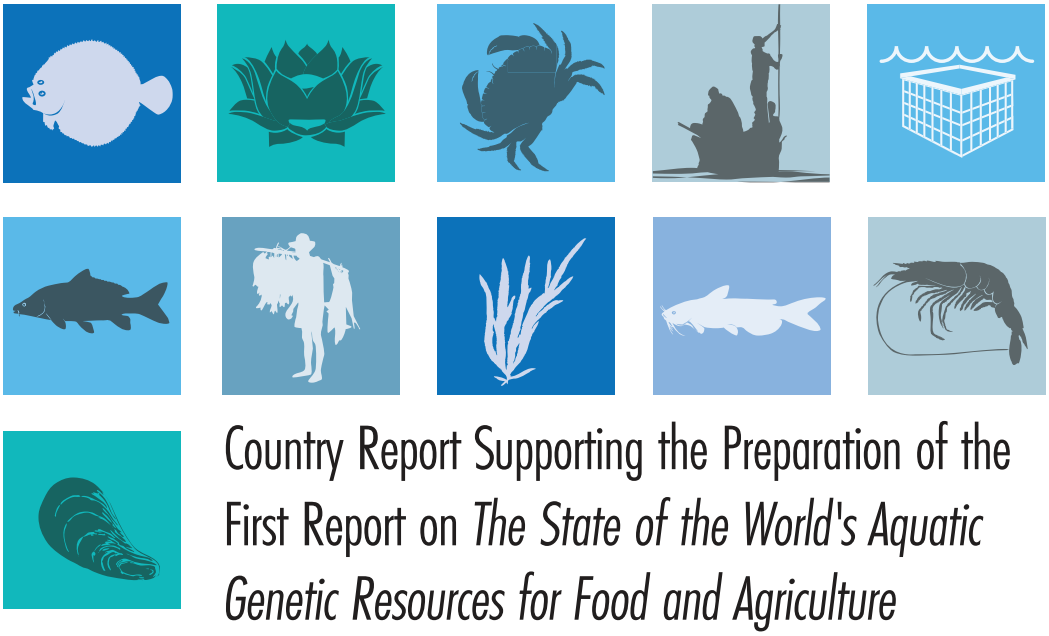
Food and Agriculture Organization of the United Nations

COUNTRY REPORTS

Bhutan



Country Report Supporting the Preparation of the First Report on *The State of the World's Aquatic Genetic Resources for Food and Agriculture*

Food and Agriculture Organization of the United Nations

COMMISSION ON GENETIC RESOURCES FOR FOOD AND AGRICULTURE

Questionnaire for the Preparation of Country Reports for *the First State of the World's Aquatic Genetic Resources for Food and Agriculture*

COMMISSION ON GENETIC RESOURCES FOR FOOD AND AGRICULTURE

INSTRUCTIONS FOR COMPLETING THE DYNAMIC GUIDELINES

How do I complete the dynamic guidelines?

1. You will require Adobe Reader to open the dynamic guidelines. Adobe Reader can be downloaded free of charge from: http://get.adobe.com/uk/reader/otherversions/. Use Adobe Reader Version 10 or higher.
2. Open the dynamic guidelines and save it (save as a pdf) on your hard drive.
3. Please rename it <name of your country>.pdf.
4. You may forward the dynamic guidelines to stakeholders you would like to involve or inform by e-mail. You may also print and/or save the dynamic guidelines.
5. It is advisable to prepare textual responses (including any formatting such as bullet points) first in a separate document and then to copy and paste them into the form. Please use font Arial 10. Acronyms and abbreviations should be avoided if possible. If included, they must be introduced (i.e. written out in full) the first time they are used. Note that the text boxes are expandable. Once text has been entered, the box will automatically enlarge to make its content fully visible when you click outside its border. To delete a row you have added, click on the "X" on the far right of the table
6. When you have finished completing the dynamic guidelines, click the “Submit form” button at the end of the form and send the completed dynamic guidelines to Devin.Bartely@fao.org; Matthias.Halwart@fao.org; and ruth.garciagomez@fao.org.
7. This should automatically attach the document to an email that you can then send. Otherwise, please attach the completed dynamic guidelines manually to an e-mail and send it to Devin.Bartely@fao.org; Matthias.Halwart@fao.org; and ruth.garciagomez@fao.org.
8. A letter confirming official endorsement by relevant authorities should also be attached to the email.
9. You will receive a confirmation that the submission was successful.

Where can I get further assistance?
If you have any questions regarding the dynamic guidelines, please contact
Devin.Bartely@fao.org; Matthias.Halwart@fao.org; ruth.garciagomez@fao.org

Several websites provide useful information on aquatic species that can be consulted for proper species names and for information on aquatic genetic resources: AlgaeBase, Aquamaps, Barcode of Life, Census of Marine Life, FishBase, Frozen Ark, GenBank, Global Biodiversity Information Facility, International Union for Conservation of Nature, National Institutes of Health Database on Genomes and Bioinformatics, Ornamental Fish International, SealifeBase, Sea Around Us, and World Register of Marine Species.

How, by whom and by when must the completed dynamic guidelines be submitted?
Once officially endorsed by the relevant authorities, the completed dynamic guidelines should be submitted (click the “Submit form” button on the header banner) by the National Focal Point. **Completed dynamic guidelines should be sent by December 31st 2015.**

www.algaebase.org
www.aquamaps.org
www.barcodeoflife.org
www.coml.org
www.fishbase.org
www.frozenark.org
www.genbank.org
www.gbif.org
www.iucn.org
http://discover.nci.nih.gov/
www.ornamental-fish-int.org
www.sealifebase.org
www.seaaroundus.org
www.marinespecies.org

I. INTRODUCTION

At its Thirteenth Regular Session, the Commission noted that the preparation of a country-driven *State of the World's Aquatic Genetic Resources for Food and Agriculture* would provide countries with opportunities for assessing the status of their aquatic genetic resources for food and agriculture and enhancing the contributions of aquatic genetic resources to food security and rural development. Additionally the process of producing Country Reports will assist countries in determining their needs and priorities for the conservation and sustainable use of aquatic genetic resources for food and agriculture, and will help raise awareness among policy-makers.

II. COUNTRY REPORTS

As with the other sectors, *The State of the World's Aquatic Genetic Resources for Food and Agriculture (SoWAqGR)* will be compiled from Country Reports. It is recognized that guidance is necessary in order to assist countries in completing those reports under a common framework. The Country Reports will become official government documents submitted to FAO.

The following questionnaire is the suggested format for the preparation and submission of Country Reports. The questionnaire has been prepared by FAO to assist in the preparation of Country Reports contributing to the SoWAqGR Report. It has been designed to assist countries to undertake a strategic assessment of their aquatic genetic resources for food and agriculture.

The scope of the first State of the World's Aquatic Genetic Resources for Food and Agriculture, and therefore the emphasis in the Country Reports, is farmed aquatic species and their wild relatives within national jurisdiction.

Country Reports should:

- become powerful tools for improving the conservation, sustainable use and development of aquatic genetic resources for food and agriculture, at national and regional levels;
- identify threats to aquatic genetic resources, gaps in information about aquatic genetic resources and needs for the strengthening of national capacity to manage aquatic genetic resources effectively;
- inform the development of national policies, legislation, research and development, education, training and extension concerning the conservation, sustainable use and development of aquatic genetic resources for food and agriculture;
- contribute to raising public awareness about the importance of aquatic genetic resources for food and agriculture;
- complement other national reporting activities on the conservation, sustainable use and development of aquatic genetic resources.

Timeline and process

In line with the overall process, as established by the Commission, the Director-General of FAO sent a Circular State Letter on 19 April 2012 to countries requesting them to identify National Focal Points for the preparation of Country Reports by 31 December, 2015.

The following steps are recommended in preparing the Country Report, using a participatory approach:

- Each participating country should appoint a National Focal Point for the coordination of the preparation of the Country Report who will also act as focal point to FAO. National Focal Points should be communicated to the Secretary, Commission on Genetic Resources for Food and Agriculture (cgrfa@fao.org) immediatly.
- Countries are encouraged to establish a national committee to oversee the preparation of the Country Report. The national committee should consist of as many representative stakeholders as practical (representing government, industry, research and civil society).
- The national committee should meet frequently to review progress and consult widely with key stakeholders.

- The National Focal Point should coordinate the preparation of the first draft of the Country Report, which should be reviewed by the national committee. The National Focal Point should facilitate a consultative process for broader stakeholder review.
- Following the stakeholder review, the National Focal Point should coordinate the finalization of the Country Report, submit it to the government for official endorsement and transmit it to FAO in one of the Organization's official languages (Arabic, Chinese, English, French, Russian and Spanish) by 31 December 2015.
- The Country Report will be an official government report.
- If countries are unable to submit final Country Reports by the set deadline, preliminary reports of findings should be provided to FAO to contribute to the identification of global priorities for inclusion in the SoWAqGR Report.

QUESTIONNAIRE FOR PREPARATION OF COUNTRY REPORTS FOR *THE STATE OF THE WORLD'S AQUATIC GENETIC RESOURCES FOR FOOD AND AGRICULTURE*

Country report supporting the preparation of

The State of the World's Aquatic Genetic Resources for Food and Agriculture

Country	Bhutan
Prepared By	Namgay Dorji
Date	Sep 14, 2016

TABLE OF CONTENTS

I. EXECUTIVE SUMMARY

The Country Report should contain an executive summary of 2-3 pages highlighting the main findings of the analysis and providing an overview of key issues, constraints and existing capacity to address the issues and challenges. The executive summary should indicate trends and driving forces and present an overview of the proposed strategic directions for future actions aimed at the national, regional and global levels.

Please include the Executive Summary here.

The quality and quantity of Bhutan's aquatic genetic resources are not yet fully understood: A comprehensive study to inventory the country's fisheries has never been carried out, though a couple of piece-meal studies have been done by different researchers at different times. Aquaculture in the country is comprised principally of the Indian Major Carps (IMCs), namely Catla, (Catla catla), Raohu (Labeo rohita) and Mrigal (Cirrhinus mrigala), Common carp (Cyprinus carpio) and the Chinese carps, namely Grass carp (Ctenopharyngodon idella) and Silver carp (Hypopthalmicthys molitrix). Since 2008, a trial to culture Rainbow trout (Onchorhyncus mykis) is also ongoing. While the carp broodstock materials were imported from India, Nepal and Hungary, Rainbow trout was imported from India. The increase in national output of farmed fish from 35 MT in 2007 to 150 MT in 2015 indicates that fish production is on the rise. With the government investing significantly in fish production infrastructure to counter import, the outputs of aquaculture is expected to increase in the foreseeable future. The capacity of fisheries human resource is still in the development state. Therefore, as already mentioned, Bhutan's aquatic genetic resources have not been adequately studied/ understood. Nevertheless, attempts have been/ are being made to identify/ name species, hybrids, etc. Genetic data of species farmed in the country have not been adequately maintained, and therefore whatever little of it is available is not reliable. The public sector conducts breeding programmes mainly for the production of fish farming inputs and not for genetic improvements. In the last 10 years or so, genetic materials to develop the aquaculture sector have been imported from countries like India, Nepal, Thailand and India. In this regard, in May 2016, quality fertilized eggs of a high yielding strain of Common carp were imported from Hungary, and a plan to import improved Rohu from India has been conceived. The genetic resources of the farmed aquatic species in the country are being impacted positively by different factors in recent years. For example, increasing human population is impacting the said genetic resources positively by way of causing the importation of quality genetic materials toward improving live inputs/ fingerlings/ fish seed for fish production. Use of biotechnology to improve the aquatic genetic resources of farmed species is non-existent. There are no relatives of the farmed species in the wild. Countermeasures that may prove effective in countering negative impacts on the aquatic genetic resources include awareness creation, framing of adequate policies, development of fisheries/ aquaculture human resource and instituting proper protocol for assessment of impact of anthropogenic/ development activities. With regard to conserving the aquatic genetic resources, among other things, the country has declared sanctuaries and puts a lot of emphasis on scientifically regulating capture fisheries to enable in-situ conservation, while preliminary researches to understand the biology and artificially propagate important native species have been initiated in government facilities. Bhutan does not yet have a policy exclusively for fisheries. However, measures are in place as part of other policies to conserve the aquatic genetic resources. In this regard, the Forest and Nature Conservation Act of 1995 (FNCA 1995) and Forest and Nature Conservation Rules of 2006 (FNCR 2006) declares the endangered Golden Mahaseer (Tor putitora) as a Schedule 1 species - meaning completely off-limits to fishing/ harvesting for whatsoever purpose. The same act also prohibits fishing during certain times of the year. Gene banking of aquatic genetic resources is non-existent in the country. However, National Aquaculture Research Centre (NARC) under Department of Livestock (DoL) of Ministry of Agriculture and Forests (MoAF) is in the process of establishing a gene bank for the endangered Golden Mahaseer. The NARC has also establish a most basic aquarium housing only native aquatic species as a means to impart education to public and with the long term goal of collecting biological data on them. Bhutanese women are engaged actively in the entire range of aquacultural activities, starting from farming fish through processing them for marketing. In spite of the absence of an exclusively fisheries policy, Bhutan strictly regulates the inflow and outflow of aquatic genetic resources. In this regard, an autonomous agency under the MoAF named National Biodiversity Centre (NBC) oversees matters related to genetic resources exchange. Also, another autonomous agency named Bhutan Agriculture and Food Regulatory Authority (BAFRA) enforces rules and regulations pertaining to exchange of genetic materials of plants and animals. Department of Forests and Park Services (DoFPS) enforces rules and regulations of acts such as the FNCA 1995 and rules such as FNCR 2006. Under the MoAF, Bhutan has two main fisheries/ aquaculture development programmes, namely National Research Centre for Aquaculture (NRCA) and National Centre for Lake and Riverine Fisheries (NCL&RF). While the former is the apex body for all aquaculture related matters, the latter concerns itself with capture fisheries programs, wild fisheries inventorying and Rainbow trout and sturgeon culture trials. By way of imparting education of aquatic genetic resources, there is only one institution in the country, named as College of Natural Resources (CNR) that imparts a most basic education on aquaculture and fisheries at an undergraduate level. Bilateral trade negotiations have benefited Bhutan by allowing access to/ facilitating the import of high quality genetic materials for aquaculture. Bhutan needs to build collaboration to develop cultivable species from its own native species of aquatic organisms and to import other cultivable species such as the Tilapia, silver barb, etc. Since Bhutan has more or less intact populations of the endangered Golden Mahaseer in the wild, it may serve as leader of research on this fish in the long term. To further develop aquaculture toward enabling it to contribute to the Bhutan's economy in the most effective way, the country must focus on building related infrastructure and human resource, besides framing an exclusively fisheries policy or reviewing existing policies to adequately address aquaculture concerns. To the said end, Bhutan must also strengthen collaboration at a higher level with regional champions of aquaculture like India and Thailand.

II. INTRODUCTION

The main objective of the Introduction is to present an overview that will allow a person who is unfamiliar with the country to appreciate the context for the Country Report. The Introduction should present a broad overview and present background information from your country on farmed aquatic species, their wild relatives and culture based fisheries. Detailed information should be provided in the main body of the Country Report. Countries may wish to consider developing their Introductions after completing the main body of their Country Reports.

Please write the overview here

Activities concerning the development of fisheries resources in Bhutan, such as small-scale breeding of snow trout (Schizothorax spp) for restocking purposes, date back to the mid 1970s. However, actual farming of fin-fish in the country formally started in 1984 with the operationalization of a government owned fish hatchery called National Warm Water Fish Culture Centre (NWWFCC) in a place called Gelephu in the south of the country. Since its establishment, the NWWFCC has evolved in terms of mandates, and today it is called National Aquaculture Research Centre (NARC). The NARC is the main government organization mandated to oversee the technical aspects of aquaculture development in Bhutan. It also has on its premises the only full-fledged carp hatchery in the country with a capacity of producing 2.5 million carp fingerlings a year. The only other carp hatchery in Bhutan named Regional Centre for Aquaculture (RCA) is located in the east of the country. The RCA has a capacity to produce 0.5 million carp fingerlings a year. Besides producing fish seed, the NARC, and its subsidiary RCA, also provide technical backstopping to fish farmers and conduct aquaculture researches.

Bhutan also has a fisheries organization named National Centre for Lake and Riverine Fisheries (NCR&LF). The NCR&LF is mandated to inventory the country's fisheries resources, promote rainbow trout culture, technically backstop capture fisheries programs and conduct other activities toward ensuring the conservation and sustainable use of wild fisheries. At the moment, Bhutan farms only carps and rainbow trout. Both of these species are non-native to the country. As such, there are no wild relatives of the farmed aquatic species in Bhutan. Attempts to farm aquatic plants, crustaceans, mollusks and other aquatic organisms have never been made. Biological studies of native aquatic species focusing on their potential for cultivation are also not done due to lack of technical capacity.

While rainbow trout is being cultured on a trial basis by the government, carp culture technology is well-developed with over 600 farmers engaged in it. Annually, the country's farmers produce about 150 MT of carp. The domestic output of farmed fish is very small compared to the total demand for fish in the country: For example, in 2015 while the total demand for fish was over 4500 MT (fresh weight equivalent), the domestic output was only about 150 MT. So, in 2015 alone, over 4000 MT (fresh weight equivalent) of fish was imported.

The domestic production of fish has risen steadily in the last one decade. From 35 MT in 2007 to 150 MT in 2015, the domestic fish output has grown by over 300 %. This has been possible due to focused government support for adoption of fish culture technology by farmers, improvement in the quality of fish seed, extension activities and dissemination of better management practices. Besides continuing to provide support in these areas, the government is also supporting the production of fish by farmers/ farmers' groups on state land which are not suitable for traditional agriculture/ farming activities, such as land that are prone to wildlife depredation. Also, with the dual objective of combating low rate of adoption of fish farming by farmers and producing large quantities of fish toward reducing import, the government is investing in establishing mega fish farms to be operated as a corporate/ government organization. The government is also showing interest to diversify aquaculture activities. For example, the NARC is presently working on a plan to introduce Tilapia culture technology into the country and the NCR&LF has initiated a sturgeon culture trial. Also, plans are being conceived to develop fish value added products.

Culture based capture fisheries and development of high-yielding strains and other genetic engineering related activities have never been attempted in Bhutan. There is significant potential to use power generation dams and other similar water bodies to produce large quantities of fish. A potential also exists to produce significant quantities of fish through integrated farming practices such as rice cum fish culture. However, due to factors like lack of funds, inadequate extension/ outreach activities as a result of inadequate human resource and lack of capacity to develop effective mechanisms to utilize resources such as dams, potentials such as the ones just described remain untapped.

Bhutan does not yet have an exclusively-fisheries policy. Nevertheless, the Ministry of Agriculture and Forests (MoAF) have put into place adequate measures to ensure that aquatic genetic resources in the country are conserved and sustainably used for food production and other benefits.

Several constraints hinder the development of aquaculture in Bhutan. The most important constraints are lack of funds, lack of networking opportunities, lack of accessible source of fish brood-stock genetic materials and inadequate human resource.

III. MAIN BODY OF THE COUNTRY REPORT

Aquaculture, culture-based fisheries and capture fisheries, have differing importance among countries. The structure of chapters in each Country Report will reflect those differences. Countries which do not have a well-developed aquaculture sector but where wild relatives of farmed aquatic species are located, should report on these resources. Countries should decide how to prioritize the coverage of their Country Reports depending on their aquatic genetic resources.

Chapter 1: The Use and Exchange of Aquatic Genetic Resources of Farmed Aquatic Species and their Wild Relatives within National Jurisdiction

The main objective of Chapter 1 is to provide annotated inventories of aquatic genetic resources (AqGR) of farmed aquatic species and their wild relatives.

Farmed aquatic species

1. Over the last 10 years, has production been: ***Please mark appropriate box.***

- (●) Increasing
- ( ) Stable
- ( ) Decreasing
- ( ) Stopped
- ( ) Still in Research and Development
- ( ) Fluctuating
- ( ) Not known

2. What is the expected trend over the next 10 years? ***Please mark appropriate box.***

- ○ Increasing
- ○ Stable
- ○ Decreasing
- ○ Stopped
- ○ Still in Research and Development
- ○ Fluctuating
- ◉ Not known

3. Is the identification and naming of farmed species, subspecies, hybrids, crossbreeds, strains, triploids, other distinct types accurate and up- to-date? ***Please mark appropriate box.***

- ○ Yes
- ○ No
- ◉ Mostly Yes
- ○ Mostly No

Please include any explanation or additional information here.

Bhutan's capacity to undertake activities concerning fisheries genetics is under-developed. Bhutanese hatcheries only do controlled breeding to minimize the likelihood of inbreeding taking place. Other specialized activities such as cross breeding, development of strains and triploids, etc. are not at all undertaken.

4. To what extent are genetic data for farmed aquatic organisms

a) Available? ***Please mark appropriate box.***

- ◉ Not at all
- ○ To a minor extent
- ○ To some extent
- ○ To a great extent

b) Used in management? ***Please mark appropriate box.***

- ◉ Not at all
- ○ To a minor extent
- ○ To some extent
- ○ To a great extent

Please add any explanation here.

The three government owned Bhutanese fish hatcheries do not have the capacity to generate and maintain proper data of its brood-stock. However, lately basic information/ data regarding imported genetic materials, such as Tata strain- Common carp from HAKI in Hungary are being maintained for future reference.

5. To what extent are the aquatic organisms farmed in your country sourced as wild seed or from wild brood stock*?*

Please mark appropriate box.

- (•) Not at all
- ( ) To a minor extent
- ( ) To some extent
- ( ) To a great extent

Please add any explanation here.

None of the farmed species in Bhutan is native.

6. What proportions (%) of breeding programmes and efforts for the genetic improvement of farmed aquatic species in your country are being managed by the public sector (government research, universities etc.), the private sector, and public-private partnerships?

- Percent managed by public sector. **Please Enter Percentage Here** 100
- Percent managed by private sector**.** **Please Enter Percentage Here** 0
- Percent managed by private /public partnership. **Please Enter Percentage Here** 0

Total

Please add any explanation here.

There are only 3 government owned fish hatcheries in Bhutan. These hatcheries produces fingerlings for consumption by the country's fish farms.

7. To what extent do genetically improved aquatic organisms, including hybrids, crossbreeds, strains, triploids and other distinct types contribute to national aquaculture production in terms of volume ?

Please mark appropriate box.

- ( ) Not at all
- ( ) To a minor extent
- ( ) To some extent
- (•) To a great extent

8. Please list most significant examples where genetic improvement contributed to increased production and indicate whether they were developed by public, private or public/private partnerships.

Add Row

Species	Type of genetic improvement *mark all that apply*	Developed By *mark all that apply*	
Cyprinus carpio	☒ Traditional selective breeding	☐ Private Sector ☒ Public Sector ☐ Private/Public partnership	X
	☐ Hybrids	☐ Private Sector ☐ Public Sector ☐ Private/Public partnership	
	☐ Triploids and other polyploids	☐ Private Sector ☐ Public Sector ☐ Private/Public partnership	
	☐ Mono-sex production	☐ Private Sector ☐ Public Sector ☐ Private/Public partnership	
	☐ Other	☐ Private Sector ☐ Public Sector ☐ Private/Public partnership	

9. Please fill in table 1.1

Table 1.1 Aquatic genetic resources (AqGR) of farmed aquatic species in your country

Add Row

Farmed species	Genetic type	Availability of genetic data	Trends in production	Future trends in production	Genetic improvement	Future genetic improvement	Comments	
List species (scientific names), strains and varieties as scientific names (put in brackets the most widely used national common name or names) and indicate whether native or introduced	*Indicate all genetic types that apply to the species*	Are genetic data available for farmed populations? If yes, give summary details in comments	Over the last 10 years, production has been ***(mark one)***	Expected trend over the next 10 years is that production will ***(mark one)***	Which genetic technologies are currently being used on the species ***(mark all that apply)***	***mark all that apply***	For example important traits improved, how data are used in management or name of breed, source of information, etc.	
○ Native ◉ Introduced Cyprinus carpio	☐ Wild Type ☒ Selective bred type ☐ Hybrids ☐ Cross breeds ☒ Strains ☐ Varieties ☐ Polyploids	○ Yes ◉ No ○ Not Known	◉ Increasing ○ Stable ○ Fluctuating ○ Decreasing ○ Stopped ○ Not known	○ Increasing ○ Stable ○ Fluctuating ○ Decreasing ○ Stopped ◉ Not known	☒ Selective breeding ☐ Hybridization ☐ Polyploidy (chromosome set manipulation) ☐ Monosex ☐ Marker assisted selection ☐ Other (specify in comment)	☒ Selective breeding ☐ Hybridization ☐ Polyploidy (chromosome set manipulation) ☐ Monosex ☐ Marker assisted selection ☐ Other (specify in comment)		X

◯ Native ◉ Introduced Cirrhinus mrigala	☐ Wild Type ☒ Selective bred type ☐ Hybrids ☐ Cross breeds ☐ Strains ☐ Varieties ☐ Polyploids	◯ Yes ◉ No ◯ Not Known	◯ Increasing ◯ Stable ◯ Fluctuating ◉ Decreasing ◯ Stopped ◯ Not known	◯ Increasing ◯ Stable ◯ Fluctuating ◯ Decreasing ◯ Stopped ◉ Not known	☒ Selective breeding ☐ Hybridization ☐ Polyploidy (chromosome set manipulation) ☐ Monosex ☐ Marker assisted selection ☐ Other (specify in comment)	☒ Selective breeding ☐ Hybridization ☐ Polyploidy (chromosome set manipulation) ☐ Monosex ☐ Marker assisted selection ☐ Other (specify in comment)		X
◯ Native ◉ Introduced Ctenopharyngodon idellus	☐ Wild Type ☒ Selective bred type ☐ Hybrids ☐ Cross breeds ☐ Strains ☐ Varieties ☐ Polyploids	◯ Yes ◉ No ◯ Not Known	◉ Increasing ◯ Stable ◯ Fluctuating ◯ Decreasing ◯ Stopped ◯ Not known	◯ Increasing ◯ Stable ◯ Fluctuating ◯ Decreasing ◯ Stopped ◉ Not known	☒ Selective breeding ☐ Hybridization ☐ Polyploidy (chromosome set manipulation) ☐ Monosex ☐ Marker assisted selection ☐ Other (specify in comment)	☒ Selective breeding ☐ Hybridization ☐ Polyploidy (chromosome set manipulation) ☐ Monosex ☐ Marker assisted selection ☐ Other (specify in comment)		X

◯ Native ◉ Introduced Hypophthalmichthys molitrix	☐ Wild Type ☒ Selective bred type ☐ Hybrids ☐ Cross breeds ☐ Strains ☐ Varieties ☐ Polyploids	◯ Yes ◉ No ◯ Not Known	◯ Increasing ◉ Stable ◯ Fluctuating ◯ Decreasing ◯ Stopped ◯ Not known	◯ Increasing ◯ Stable ◯ Fluctuating ◯ Decreasing ◯ Stopped ◉ Not known	☐ Selective breeding ☐ Hybridization ☐ Polyploidy (chromosome set manipulation) ☐ Monosex ☐ Marker assisted selection ☐ Other (specify in comment)	☒ Selective breeding ☐ Hybridization ☐ Polyploidy (chromosome set manipulation) ☐ Monosex ☐ Marker assisted selection ☐ Other (specify in comment)		X
◯ Native ◉ Introduced Labeo rohita	☐ Wild Type ☒ Selective bred type ☐ Hybrids ☐ Cross breeds ☐ Strains ☐ Varieties ☐ Polyploids	◯ Yes ◉ No ◯ Not Known	◯ Increasing ◉ Stable ◯ Fluctuating ◯ Decreasing ◯ Stopped ◯ Not known	◯ Increasing ◯ Stable ◯ Fluctuating ◯ Decreasing ◯ Stopped ◉ Not known	☒ Selective breeding ☐ Hybridization ☐ Polyploidy (chromosome set manipulation) ☐ Monosex ☐ Marker assisted selection ☐ Other (specify in comment)	☒ Selective breeding ☐ Hybridization ☐ Polyploidy (chromosome set manipulation) ☐ Monosex ☐ Marker assisted selection ☐ Other (specify in comment)		X

○ Native ◉ Introduced Catla catla	☐ Wild Type ☒ Selective bred type ☐ Hybrids ☐ Cross breeds ☐ Strains ☐ Varieties ☐ Polyploids	○ Yes ◉ No ○ Not Known	◉ Increasing ○ Stable ○ Fluctuating ○ Decreasing ○ Stopped ○ Not known	○ Increasing ○ Stable ○ Fluctuating ○ Decreasing ○ Stopped ◉ Not known	☒ Selective breeding ☐ Hybridization ☐ Polyploidy (chromosome set manipulation) ☐ Monosex ☐ Marker assisted selection ☐ Other (specify in comment)	☒ Selective breeding ☐ Hybridization ☐ Polyploidy (chromosome set manipulation) ☐ Monosex ☐ Marker assisted selection ☐ Other (specify in comment)		X
○ Native ◉ Introduced Oncorhynchus mykiss	☐ Wild Type ☒ Selective bred type ☐ Hybrids ☐ Cross breeds ☒ Strains ☐ Varieties ☐ Polyploids	○ Yes ◉ No ○ Not Known	◉ Increasing ○ Stable ○ Fluctuating ○ Decreasing ○ Stopped ○ Not known	○ Increasing ○ Stable ○ Fluctuating ○ Decreasing ○ Stopped ◉ Not known	☒ Selective breeding ☐ Hybridization ☐ Polyploidy (chromosome set manipulation) ☐ Monosex ☐ Marker assisted selection ☐ Other (specify in comment)	☒ Selective breeding ☐ Hybridization ☐ Polyploidy (chromosome set manipulation) ☐ Monosex ☐ Marker assisted selection ☐ Other (specify in comment)		X

10. Which aquatic species in your country are thought to have potential for domestication and future use in aquaculture?

Add Row

Species ***Type and select a species***	Is the species native to your country?	Comments ***For example main sources of information***	
Labeo spp	(•) Yes ( ) No ( ) Not Known	National Aquaculture Research Centre's (NARC) observation from preliminary studies	X
Tor tor	(•) Yes ( ) No ( ) Not Known	Tor tor is native to Bhutan. If a breeding technology can be developed, this species has potential for aquaculture.	X
Salmo trutta	(•) Yes ( ) No ( ) Not Known	This species was introduced into Bhutan in the 1930s and has now develop self-replenishing populations. If culture requirements can be understood, it has aquaculture potential.	X

11. Please list the aquatic genetic resources of farmed aquatic species your country has transferred or exchanged with other countries over the past 10 years.

Add Row

Species	Genetic alteration of exchanged material **Mark all that apply**	Details of transfer or exchange	Type of genetic material exchanged **Mark all that apply**	Country or countries involved with exchange **Hold CTRL button to select more than one country**	Comments ***Please add main purpose or objective of the exchange and main sources of information***	
Labeo rohita	☒ No deliberate genetic alteration ☒ Traditional selective breeding ☐ Hybrids ☐ Triploids and other polyploids ☐ Mono-sex production ☐ Other	☒ Import ☐ Export	☐ DNA ☐ Genes ☐ Gametes ☐ Tissues ☐ Embryos ☒ Living specimens ☐ Other	France Gabon Gambia Georgia Germany Ghana Greece Grenada Guatemala Guinea Guinea-Bissau Guyana Haiti Hungary Iceland India Indonesia	To introduce fresh genetic materials into hatchery brood-stock	X
Cyprinus carpio	☒ No deliberate genetic alteration ☒ Traditional selective breeding ☐ Hybrids ☐ Triploids and other polyploids ☐ Mono-sex production ☐ Other	☒ Import ☐ Export	☐ DNA ☐ Genes ☐ Gametes ☐ Tissues ☐ Embryos ☒ Living specimens ☐ Other	Fiji Finland France Gabon Gambia Georgia Germany Ghana Greece Grenada Guatemala Guinea Guinea-Bissau Guyana Haiti Hungary Iceland	To introduce fresh genetic materials into hatchery brood-stock	X

Cirrhinus mrigala	☒ No deliberate genetic alteration ☒ Traditional selective breeding ☐ Hybrids ☐ Triploids and other polyploids ☐ Mono-sex production ☐ Other	☒ Import ☐ Export	☐ DNA ☐ Genes ☐ Gametes ☐ Tissues ☐ Embryos ☒ Living specimens ☐ Other	France Gabon Gambia Georgia Germany Ghana Greece Grenada Guatemala Guinea Guinea-Bissau Guyana Haiti Hungary Iceland India Indonesia	To introduce fresh genetic materials into hatchery brood-stock	X
Catla catla	☒ No deliberate genetic alteration ☒ Traditional selective breeding ☐ Hybrids ☐ Triploids and other polyploids ☐ Mono-sex production ☐ Other	☒ Import ☐ Export	☐ DNA ☐ Genes ☐ Gametes ☐ Tissues ☐ Embryos ☒ Living specimens ☐ Other	France Gabon Gambia Georgia Germany Ghana Greece Grenada Guatemala Guinea Guinea-Bissau Guyana Haiti Hungary Iceland India Indonesia	To introduce fresh genetic materials into hatchery brood-stock	X
Oncorhynchus mykiss	☒ No deliberate genetic alteration ☒ Traditional selective breeding ☐ Hybrids ☐ Triploids and other polyploids ☐ Mono-sex production ☐ Other	☒ Import ☐ Export	☐ DNA ☐ Genes ☒ Gametes ☐ Tissues ☐ Embryos ☐ Living specimens ☐ Other	Ecuador Egypt El Salvador Equatorial Guinea Eritrea Estonia Ethiopia European Union (Mer Faroe Islands (Associa Fiji Finland France Gabon Gambia Georgia Germany Ghana	To create a brood-stock for culture promotion	X

Cyprinus carpio	☒ No deliberate genetic alteration ☒ Traditional selective breeding ☐ Hybrids ☐ Triploids and other polyploids ☐ Mono-sex production ☐ Other	☒ Import ☐ Export	☐ DNA ☐ Genes ☐ Gametes ☐ Tissues ☐ Embryos ☐ Living specimens ☐ Other	France Gabon Gambia Georgia Germany Ghana Greece Grenada Guatemala Guinea Guinea-Bissau Guyana Haiti Hungary Iceland India Indonesia	To introduce fresh genetic materials into hatchery brood-stock	X
Oncorhynchus mykiss	☒ No deliberate genetic alteration ☒ Traditional selective breeding ☐ Hybrids ☐ Triploids and other polyploids ☐ Mono-sex production ☐ Other	☒ Import ☐ Export	☐ DNA ☐ Genes ☐ Gametes ☐ Tissues ☐ Embryos ☐ Living specimens ☐ Other	France Gabon Gambia Georgia Germany Ghana Greece Grenada Guatemala Guinea Guinea-Bissau Guyana Haiti Hungary Iceland India Indonesia	To create a brood-stock for culture promotion	X

Wild relatives of farmed aquatic species

12. Please list any wild relatives of aquatic species present in your country that are farmed in another country (but not in your country) and indicate their uses.

Add Row

This question refers to aquatic genetic resources that are present in the wild in your country and that are being farmed elsewhere (but not farmed in your country), indicating any uses these resources may have in your country.

Species	Use *(mark all that apply)*	Comments	
Tor putitora	☐ Capture fisheries ☒ Recreational fishery ☐ Aquaria ☐ Biological control ☐ Research and develpment ☐ Other (specify in comments)	The endangered Golden Mahaseer (Tor putitora) is native to Bhutan. At the moment, its biology and movement are being studied toward developing a strategy to conserve it and develop sustainable uses for it. In countries like India and Nepal, recreational fishery based on this fish could/ may be well-developed.	X
Tor tor	☐ Capture fisheries ☒ Recreational fishery ☐ Aquaria ☐ Biological control ☐ Research and develpment ☐ Other (specify in comments)	The Tor mahseer (Tor tor) is native to Bhutan. Presently, Bhutan is developing plans to study its biology and movement with the long term goal of developing a strategy to conserve it and develop sustainable uses for it. In countries like India and Nepal, recreational fishery based on this fish could/ may be well-developed.	X

13. Please list the aquatic genetic resources of wild relatives of farmed aquatic species your country has transferred or exchanged with other countries over the past 10 years.

Add Row

This question refers to wild aquatic genetic resources collected from the wild, not from farming facilities as in question 11.

Species	Details of transfer or exchange ***mark all that apply***	Type of genetic material exchanged	Country **Hold CTRL button to select more than one country**	Comments ***main sources of information, if the transfer was legal or not***	
see comments	☐ Import ☐ Export	☐ Tissues ☐ Gametes ☐ DNA ☐ Genes ☐ Embryos ☐ Living specimens ☐ Other	Gabon Gambia Georgia Germany Ghana Greece Grenada Guatemala Guinea Guinea-Bissau Guyana Haiti Hungary Iceland India Indonesia	30,000 Post larva of the crustacean were imported legally to conduct a trial culture under Bhutanese conditions.	X

14. Please fill in table 1.2

Table 1.2 Aquatic genetic resources of wild relatives of farmed aquatic species in your country.

Add Row

Target species, stocks or other management units	Characteristics of species	Capture fisheries	Management measures	Availability of genetic data	Use of genetic data in management	Trends in catches	Future trends in catches	Ecosystem(s) where the fishery is located	Changes in ranges and habitats	Reasons for change in abundance of species	
For each row, list the species as scientific names (put in brackets the most widely used national common For each species, include the named stocks and name of other management units if known)	Is the species ***(mark as appropriate):***	Is this species targeted by capture fisheries?	Are there any management measures in place?	Are genetic data available for the fishery?	Are genetic data used in management?	Over the last 10 years, catches have been:	Expected trend over the next 10 years.	Indicate the ecosystem where the fishery is located (***mark all that apply)***	The habitat or range is	What are likely reasons for changes? (***mark all that apply)***	
	☐ Straddling ☐ Transboundary ☐ Introduced ☐ Native	◯ Yes ◯ No ◯ Not Known	◯ Yes ◯ No ◯ Not Known	◯ Yes ◯ No ◯ Not Known	◯ Yes ◯ No ◯ Not Known	◯ Increasing ◯ Stable ◯ Fluctuating ◯ Decreasing ◯ Depleted ◯ Not known	◯ Increasing ◯ Stable ◯ Fluctuating ◯ Decreasing ◯ Depleted ◯ Not known	☐ Intertital ☐ Coastal in EEZ ☐ High seas ☐ Lake ☐ Reservoir ☐ River ☐ Swamp ☐ Other **(specify)**	◯ Increasing ◯ Stable ◯ Decreasing ◯ Not known	☐ Habitat ☐ Climate ☐ Invasive species ☐ Pollution ☐ Rehabilitation of habitat ☐ Others ☐ Not known	X

Chapter 2: Drivers and Trends in Aquaculture: Consequences for Aquatic Genetic Resources within National Jurisdiction

The main objective of Chapter 2 is to review the main drivers and trends that are shaping aquaculture and their consequences for aquatic genetic resources.

15. Please indicate the ways the aquatic genetic resources (AqGR) of **farmed aquatic species** have been impacted by the following drivers. Please give examples of positive and negative impacts for specific drivers.

This question refers to drivers impacting farmed aquatic genetic resources, not about impacts on the entire aquaculture sector. Drivers should be seen from a national perspective.

Driver impacting aquaculture	Effect on AqGR ***Mark appropriate box***	Comments ***List examples or other relevant information***
Human population increase	◯ Strongly positive ◉ Positive ◯ Negative ◯ Strongly negative ◯ No effect ◯ Unknown	Increasing demand for fish caused by increasing human population is causing the government to pay enhnced attention to developing fish hatchery brood-stock by way of introduction of fresh genetic materials.
Increased wealth and demand for fish	◯ Strongly positive ◉ Positive ◯ Negative ◯ Strongly negative ◯ No effect ◯ Unknown	Increased demand for fish caused by increased wealth has resulted in efforts to introduce fresh genetic materials into government hatchery broodstock.
Governance (ability of government, industry and the public to work together in managing resources)	◯ Strongly positive ◉ Positive ◯ Negative ◯ Strongly negative ◯ No effect ◯ Unknown	Improvement in governance has caused the government to initiate efforts to improve broodstock genetics by way of import of fresh broodstock.
Climate change	◯ Strongly positive ◯ Positive ◯ Negative ◯ Strongly negative ◯ No effect ◉ Unknown	The impact of this driver is yet to be understood.
Competition for resources, especially freshwater	◯ Strongly positive ◯ Positive ◯ Negative ◯ Strongly negative ◯ No effect ◉ Unknown	The impact of this driver is yet to be understood.

Driver impacting aquaculture	Effect on AqGR ***Mark appropriate box***	Comments ***List examples or other relevant information***
Changes in values and ethics of consumers	○ Strongly positive ◉ Positive ○ Negative ○ Strongly negative ○ No effect ○ Unknown	Increased awareness about about quality of fish among consumers is causing government to improve its broodstock quality through import of quality genetic materials.
Other ***Add other drivers as necessary*** Increased government support/ policy support Add Row Remove Row	◉ Strongly positive ○ Positive ○ Negative ○ Strongly negative ○ No effect ○ Unknown	Increased government/ policy support has resulted in activities to greatly improve and diversify fish broodstock.

16. Please indicate the ways the aquatic genetic resources of **wild relatives of farmed aquatic species** in nature have been impacted by the following drivers. Please give examples of positive and negative impacts for specific drivers.

This question refers to drivers impacting wild aquatic genetic resources of farmed species, not about impacts on the entire aquaculture sector. Drivers should be seen from a national perspective.

Driver impacting aquaculture	Effect on AqGR ***Mark appropriate box***	Comments ***List examples or other relevant information***
Human population increase	◯ Strongly positive ◯ Positive ◉ Negative ◯ Strongly negative ◯ No effect ◯ Unknown	Not applicable. None of the farmed aquatic species is native to Bhutan.
Increased wealth and demand for fish	◯ Strongly positive ◯ Positive ◉ Negative ◯ Strongly negative ◯ No effect ◯ Unknown	
Governance (ability of government, industry and the public to work together in managing resources)	◯ Strongly positive ◉ Positive ◯ Negative ◯ Strongly negative ◯ No effect ◯ Unknown	
Climate change	◯ Strongly positive ◯ Positive ◯ Negative ◯ Strongly negative ◯ No effect ◉ Unknown	
Competition for resources, especially freshwater	◯ Strongly positive ◯ Positive ◉ Negative ◯ Strongly negative ◯ No effect ◯ Unknown	

Driver impacting aquaculture	Effect on AqGR ***Mark appropriate box***	Comments ***List examples or other relevant information***
Changes in values and ethics of consumers	◯ Strongly positive ◉ Positive ◯ Negative ◯ Strongly negative ◯ No effect ◯ Unknown	
Other ***Add other drivers as necessary*** Increased government support/ policy support Add Row Remove Row	◯ Strongly positive ◉ Positive ◯ Negative ◯ Strongly negative ◯ No effect ◯ Unknown	

17. What countermeasures might be taken to reduce adverse impacts on the aquatic genetic resources that sustain current aquaculture and/or provide for its future development?

Describe countermeasures

1. Support framing of adequate policies;
2. Support development of competency (HRD);
3. Institute proper protocol for assessment of impact of anthropogenic/ development activities;
4. Support development of infrastructure.
5. Spreading awareness/ Conduct public education programs.

Biotechnologies

18. To what extent have the following biotechnologies been used in your country for the genetic improvement of farmed aquatic organisms.

Biotechnology	Extent of use	Comments ***main sources of information, important species for which the biotechnology is applied***
Selective breeding	○ Not at all ◉ To a minor extent ○ To some extent ○ To a great extent	Carps are bred in a controlled manner to avoid inbreeding.
Hybridization	◉ Not at all ○ To a minor extent ○ To some extent ○ To a great extent	
Polyploidy (chromosome set manipulation)	◉ Not at all ○ To a minor extent ○ To some extent ○ To a great extent	
Monosex production	◉ Not at all ○ To a minor extent ○ To some extent ○ To a great extent	
Marker assisted selection	◉ Not at all ○ To a minor extent ○ To some extent ○ To a great extent	
Gynogenesis/androgenesis	◉ Not at all ○ To a minor extent ○ To some extent ○ To a great extent	
Other **Continue adding row as necessary** Add Row | Remove Row	○ Not at all ○ To a minor extent ○ To some extent ○ To a great extent	

19. Please indicate the ways aquatic genetic resources of the wild relatives of farmed aquatic species have been impacted by drivers that are changing aquatic ecosystems. Please give countermeasures that might be taken to reduce adverse consequences for the aquatic genetic resources that sustain capture fisheries on wild relatives of farmed species.

Drivers that are changing aquatic ecosystems	Effect on AqGR ***mark appropriate box***	Countermeasures and effects
Habitat loss and degradation	◯ Strongly positive ◯ Positive ◯ Negative ◯ Strongly negative ◯ No effect ◯ Unknown	Not applicable. None of the farmed aquatic species is native to Bhutan.
Pollution of waters	◯ Strongly positive ◯ Positive ◯ Negative ◯ Strongly negative ◯ No effect ◉ Unknown	
Increased frequency of extreme climatic events and long-term climate change	◯ Strongly positive ◯ Positive ◯ Negative ◯ Strongly negative ◯ No effect ◉ Unknown	
Establishment of invasive species	◯ Strongly positive ◯ Positive ◯ Negative ◯ Strongly negative ◯ No effect ◉ Unknown	
Introductions of parasites and pathogens	◯ Strongly positive ◯ Positive ◯ Negative ◯ Strongly negative ◯ No effect ◉ Unknown	

Drivers that are changing aquatic ecosystems	Effect on AqGR ***mark appropriate box***	Countermeasures and effects
Impacts of purposeful stocking and escapes from aquaculture	◯ Strongly positive ◯ Positive ◯ Negative ◯ Strongly negative ◯ No effect ◉ Unknown	
Capture fisheries	◯ Strongly positive ◯ Positive ◯ Negative ◯ Strongly negative ◯ No effect ◉ Unknown	
Other ***Continue listing other driverst*** Add Row Remove Row	◯ Strongly positive ◯ Positive ◯ Negative ◯ Strongly negative ◯ No effect ◯ Unknown	

Chapter 3: *In Situ* Conservation of Aquatic Genetic Resources of Farmed Aquatic Species and their wild Relatives within National Jurisdiction

The main objective of Chapter 3 is to review the current status and future prospects for the *in situ* conservation of aquatic genetic resources of farmed aquatic species and their wild relatives within national jurisdiction for food and agriculture.

The specific objectives are as follows:

- To review the current and likely future contributions to *in sit*u conservation of aquatic genetic resources of farmed aquatic species and their wild relatives by those who use them in responsible and well managed capture fisheries, aquaculture, and culture-based fisheries.
- To identify and describe any existing and planned aquatic protected areas that are contributing, or will contribute, to *in situ* conservation of aquatic genetic resources of wild relatives of farmed aquatic species.
- To identify and describe any major existing and planned efforts for the *in situ* conservation of threatened or endangered aquatic genetic resources (farmed and wild).
- To review needs and priorities for the future development of *in situ* conservation of aquatic genetic resources of farmed aquatic species and their wild relatives.

Overview of the current status and future prospects for the *in situ* conservation of aquatic genetic resources of farmed aquatic species and their wild relatives

20. To what extent are responsible and well managed aquaculture and culture-based fisher*ies* contributing to *in situ* conservation of the aquatic genetic resources of farmed aquatic species and their wild relatives.

Please mark appropriate box.

- ○ To a great extent
- ○ To a limited extent
- ○ Not at all
- ◉ Not applicable

Please include any additional information

Not applicable. None of the farmed species is native to Bhutan.

21. To what extent are existing facilities contributing to *in situ* conservation of aquatic genetic resources of wild relatives of farmed aquatic species?

Please mark appropriate box.

- ○ To a great extent
- ○ To a limited extent
- ○ Not at all
- ◉ Not applicable

Please include any additional information

22. Please provide ex*amples* of current or planned activities for the *in situ* conservation of endangered or threatened farmed species and their wild relatives with demonstrated or potential importance for aquaculture, culture-based fisheries, and capture fisheries.

Please describe examples

23. Please rank (from 1 to 10) the importance of the following objectives for *in situ* conservation of aquatic genetic resources of farmed aquatic species and their wild relatives in your country.

Objectives of *in situ* conservation	Rank 1=Very Important 10=No importance
Preservation of aquatic genetic diversity	1
Maintain good strains for aquaculture production	10
Meet consumer and market demands	10
To help adapt to impacts of climate change	6
Future breed improvement in aquaculture	10
Please continue listing any other objectives as needed	
Development of eco-tourism/ recreational fishing	3
Add Row / Remove Row	

Review of the *in situ* conservation of aquatic genetic resources of farmed aquatic species and their wild relatives through their use in responsible and well managed aquaculture and culture-based fisheries

24. Is the *in situ* conservation of aquatic genetic resources included in the policy as an objective in the management of aquaculture and/or culture-based fisheries in your country?

Please mark appropriate box

- ○ Yes
- ○ Not yet, but planned to be included
- ○ No
- ◉ Unknown

If yes, please give examples

Not applicable as none of the farmed species is native to Bhutan.

25. To what extent are collectors of wild seed and brood stock for aquaculture and culture-based fisheries contributing to the conservation of aquatic genetic resources by maintaining habitats and/or limiting the quantities collected?

Please mark appropriate box

- ○ To a great extent
- ○ To a limited extent
- ○ Not at all
- ◉ Not applicable

Please include any additional details

Review of the *in situ* conservation of aquatic genetic resources of farmed aquatic species and their wild relatives through their use in responsible and well managed capture fisheries

26. Is the conservation of aquatic genetic resources of wild relatives of farmed aquatic species included as an objective in the management of any capture fisheries in your country?

Please mark appropriate box

- ○ Yes
- ○ Not yet, but under development
- ○ No
- ◉ Unknown

If yes, please give examples

Not applicable as none of the farmed species is native to Bhutan.

Review of the *in situ* conservation of aquatic genetic resources of farmed aquatic species and their wild relatives through the establishment and management of aquatic protected areas

27. Please list any aquatic protected areas in your country that are contributing to the *in situ* conservation of aquatic genetic resources of wild relatives of farmed aquatic species and an assessment of effectiveness

Add Row

Aquatic protected area	Effectiveness of conserving Aquatic Genetic Resources	Comments ***provide any additional information***	
	○ Very effective ○ Somewhat effective ○ Not effective ○ Unknown		X

Chapter 4: *Ex Situ* Conservation of Aquatic Genetic Resources of Farmed Aquatic Species and their Wild Relatives within National Jurisdiction

The main objective of Chapter 4 is to review the current status and future prospects for the *ex situ* conservation of aquatic genetic resources of farmed aquatic species and their wild relatives.

The specific objectives are:

- To review existing *ex situ* conservation of aquatic genetic resources of farmed aquatic species and their wild relatives in aquaculture facilities, culture collections and gene banks, research facilities, zoos and aquaria;
- To review the contributions that various stakeholders are making to the *ex situ* conservation of aquatic genetic resources of farmed aquatic species and their wild relatives;
- To review needs and priorities for the future development of *ex situ* conservation of aquatic genetic resources of farmed aquatic species and their wild relatives, including any that are threatened or endangered.

Review of existing and planned collections of live breeding individuals of aquatic genetic resources of farmed aquatic species and their wild relatives

28. Please list your country's existing collections of live breeding aquatic organisms that can be considered as contributing to the *ex situ* conservation of aquatic genetic resources. This includes not only collections of species farmed directly for human use, but also collections of live feed organisms (e.g., bacterial flocs, yeasts, microalgae, rotifers and brine shrimp (*Artemia*)).

Add Row

Species (*include information on subspecies or strain in comments if available*)	Type of use ***Please mark all that apply***	Is the species (or subspecies) threatened or endangered for example in the IUCN Red List, CITES Appendices or national lists? ***Please mark appropriate box***	Comments ***Please list any additional information***	
Tor putitora	☐ Direct human consumption ☐ Live feed organism ☒ Other	◉ Yes ○ No ○ Unknown	Bhutan has initiated the development of a Golden Mahaseer gene bank at NARC, DoI, MoAF, Gelephu.	X

Review of existing *ex situ* conservation activities of aquatic genetic resources of farmed aquatic species and their wild relatives *in vitro.*

29. Please list your country's *in vitro* collections and gene banks of the gametes, embryos, tissues, spores and other quiescent forms of farmed aquatic species and their wild relatives , using cryopreservation or other methods of long-term storage. Describe the major examples, identifying the facilities in which the collections are held. Include examples of any such genetic material from your country that is being kept in *in vitro* collections outside your country on behalf of beneficiaries in your country.

Add Row

Species (include information on subspecies or strain if available in comments)	Users and managers ***List all that apply***	Type of *ex-situ* conservation collection *in vitro* ***mark all that apply***	Facilities where collection is located ***mark all that apply***	Comments ***list all breeds, subspecies of the species and any additional information***	
		☐ In vitro collection of gametes ☐ In vitro collextion of embryos ☐ In vitro collection of tissues ☐ Spores ☐ Other	☐ Aquaculture facilities ☐ Research facilities ☐ Universities ☐ Zoos and aquaria ☐ Other		X

30. Please rank (from 1 – 10) the importance of the following objectives for ex situ conservation of aquatic genetic resources of farmed aquatic species and their wild relatives in your country

Objectives of *ex situ* conservation	Rank 1=Very Important 10=No importance
Preservation of aquatic genetic diversity	1
Maintain good strains for aquaculture production	9
Meet consumer and market demands	9
To help adapt to impacts of climate change	7
Future breed improvement in aquaculture	9
Other ***Continue adding row as necessary***	
Development of eco-tourism/ recreational fisheries	3
Add Row / Remove Row	

Chapter 5: Stakeholders with Interests in Aquatic Genetic Resources of Farmed Aquatic Species and their Wild Relatives within National Jurisdiction

The main objective of Chapter 5 is to provide an overview of the perspectives and needs of the principal stakeholders who have interests in aquatic genetic resources of farmed aquatic species and their wild relatives for food and agriculture. Stakeholder groups can be identified from existing institutional knowledge, from sectoral and sub-sectoral consultations conducted during the country reporting process and where necessary from expert opinions. Gender issues pertaining to the conservation, sustainable use and development of aquatic genetic resources of farmed aquatic species and their wild relatives should be considered, as well as the perspectives and needs of indigenous peoples and local communities.

The specific objectives are:

- To describe the different principal stakeholder groups with interests in aquatic genetic resources of farmed aquatic species and their wild relatives To identify the type(s) of aquatic genetic resources of farmed aquatic species and their wild relatives in which each stakeholder group has interests and why.

- To describe the roles of stakeholder groups and the actions they are taking for the conservation, sustainable use and development of the aquatic genetic resources in which they have interests.

- To describe the further actions that stakeholder groups would like to see taken for the conservation, sustainable use and development of aquatic genetic resources in which they have interests, and the constraints that are hindering those actions, including lack of capacity and perceived threats.

Overview of the principal stakeholder groups who have interests in aquatic genetic resources of farmed aquatic species and their wild relatives

31. Please indicate the principal stakeholder groups who have interests in aquatic genetic resources of farmed aquatic species and their wild relatives including, *inter alia*: fish farmers; fishers in capture fisheries; persons involved in stocking and harvesting in culture-based fisheries; persons employed in postharvest chains; government officials; staff and members of aquaculture associations; managers of aquatic protected areas and others working for the conservation of aquatic ecosystems; researchers; and civil society.

Stakeholders	Role of stakeholder in regards og AqGR ***mark all that apply***	Genetic resource of main interest ***mark all that apply***	Comments ***Please provide any information or explanation of stakeholders' role***
Fish Farmers	☐ Conservation ☒ Production ☐ Feed manufactoring ☐ Breeding ☐ Research ☐ Marketing ☐ Processing ☐ Advocacy ☐ Outreach/Extension ☐ Other (**specify**)	☐ DNA ☒ Stock, breed or variety ☒ Species ☐ Other	
Fishers	☐ Conservation ☒ Production ☐ Feed manufactoring ☐ Breeding ☐ Research ☐ Marketing ☐ Processing ☐ Advocacy ☐ Outreach/Extension ☐ Other (**specify**)	☐ DNA ☐ Stock, breed or variety ☒ Species ☐ Other	

Stakeholders	Role of stakeholder in regards og AqGR ***mark all that apply***	Genetic resource of main interest ***mark all that apply***	Comments ***Please provide any information or explanation of stakeholders' role***
Fish hatchery people	☐ Conservation ☒ Production ☐ Feed manufactoring ☒ Breeding ☒ Research ☐ Marketing ☐ Processing ☒ Advocacy ☒ Outreach/Extension ☐ Other (**specify**)	☐ DNA ☒ Stock, breed or variety ☒ Species ☐ Other	
People involved in marketing	☐ Conservation ☐ Production ☐ Feed manufactoring ☐ Breeding ☐ Research ☒ Marketing ☐ Processing ☒ Advocacy ☐ Outreach/Extension ☐ Other (**specify**)	☐ DNA ☒ Stock, breed or variety ☒ Species ☐ Other	
Government resource managers	☐ Conservation ☒ Production ☐ Feed manufactoring ☐ Breeding ☒ Research ☒ Marketing ☒ Processing ☒ Advocacy ☒ Outreach/Extension ☐ Other (**specify**)	☐ DNA ☒ Stock, breed or variety ☒ Species ☐ Other	

Stakeholders	Role of stakeholder in regards og AqGR ***mark all that apply***	Genetic resource of main interest ***mark all that apply***	Comments ***Please provide any information or explanation of stakeholders' role***
Fishing or aquaculture associations	☐ Conservation ☒ Production ☐ Feed manufactoring ☐ Breeding ☒ Research ☐ Marketing ☐ Processing ☒ Advocacy ☐ Outreach/Extension ☐ Other (**specify**)	☐ DNA ☐ Stock, breed or variety ☒ Species ☐ Other	
Aquatic protected area managers	☒ Conservation ☐ Production ☐ Feed manufactoring ☐ Breeding ☒ Research ☐ Marketing ☐ Processing ☒ Advocacy ☐ Outreach/Extension ☐ Other (**specify**)	☐ DNA ☐ Stock, breed or variety ☒ Species ☐ Other	Aquatic protected area managers are concerned with controlling the introduction of farmed species into wild waters, and its impact on the native aquatic biodiversity.
Policy Makers	☒ Conservation ☒ Production ☒ Feed manufactoring ☒ Breeding ☒ Research ☒ Marketing ☒ Processing ☒ Advocacy ☒ Outreach/Extension ☐ Other (**specify**)	☐ DNA ☒ Stock, breed or variety ☒ Species ☐ Other	

Stakeholders	Role of stakeholder in regards og AqGR ***mark all that apply***	Genetic resource of main interest ***mark all that apply***	Comments ***Please provide any information or explanation of stakeholders' role***
Non-Governmental Organizations	☒ Conservation ☐ Production ☐ Feed manufactoring ☐ Breeding ☒ Research ☐ Marketing ☐ Processing ☒ Advocacy ☐ Outreach/Extension ☐ Other (**specify**)	☒ DNA ☒ Stock, breed or variety ☒ Species ☐ Other	
Intergovernmental Organizations	☐ Conservation ☒ Production ☐ Feed manufactoring ☒ Breeding ☒ Research ☒ Marketing ☒ Processing ☒ Advocacy ☒ Outreach/Extension ☐ Other (**specify**)	☐ DNA ☒ Stock, breed or variety ☒ Species ☐ Other	
Donors	☐ Conservation ☒ Production ☐ Feed manufactoring ☒ Breeding ☒ Research ☒ Marketing ☒ Processing ☒ Advocacy ☒ Outreach/Extension ☐ Other (**specify**)	☐ DNA ☒ Stock, breed or variety ☒ Species ☐ Other	Donor funded projects support the development of brood-stock through importation of fresh genetic materials.

Stakeholders	Role of stakeholder in regards og AqGR ***mark all that apply***	Genetic resource of main interest ***mark all that apply***	Comments ***Please provide any information or explanation of stakeholders' role***
Consumers	☐ Conservation ☒ Production ☐ Feed manufactoring ☐ Breeding ☐ Research ☒ Marketing ☒ Processing ☒ Advocacy ☐ Outreach/Extension ☐ Other (**specify**)	☐ DNA ☒ Stock, breed or variety ☒ Species ☐ Other	

a) Please indicate the most important role of women in regards to AqGR

1. Production;
2. Management of capture fishery programs;
3. Marketing and processing of fish and products;
4. Breeding, research and extension.
5. Advocacy.

b) Please indicate the most important role of indigenous and local communities in regards to AqGR

1. Farm fish;
2. Management of capture fishery programs;
3. Marketing and processing of fish and products;
4. Advocacy.

Chapter 6: National Policies and Legislation for Aquatic Genetic Resources of Farmed Aquatic Species and their Wild Relatives within National Jurisdiction

The main objective of Chapter 6 is to review the status and adequacy of national policies and legislation concerning aquatic genetic resources of farmed aquatic species and their wild relatives including access and benefit sharing.

The specific objectives are as follows:

- To describe the existing national policy and legal framework for the conservation, sustainable use and development of aquatic genetic resources of farmed aquatic species and their wild relatives.
- To review current national policies and instruments for access to aquatic genetic resources of farmed aquatic species and their wild relatives and the fair and equitable sharing of benefits arising from their utilization.
- To identify any significant gaps in policies and legislation concerning aquatic genetic resources of farmed aquatic species and their wild relatives..

Review of national policies and legislation for Aquatic Genetic Resources of farmed aquatic species and their wild relatives within national jurisdiction

32. Please list national legislation, policies and/or mechanisms that address aquatic genetic resources of farmed species and their wild relatives (see question 47 regarding international agreements).

Add Row

National legislation, policy and/or mechanism	Date established	Scope ***Select all that apply***	Comments ***Please provide any additional information for example whether it has been effective or not; and main sources of information***	
The Food Act of Bhutan, 2005	30 November, 2005	☐ Genes or molecules only ☐ Aquaculture ☐ Capture fisheries ☐ Conservation ☐ Intellectual property protection ☐ Importation ☐ Trade and commerce ☐ Access and benefit sharing ☒ Other	There are no legislation instruments concerning specifically aquaculture and genetic resources of farmed aquatic species and their wild relatives. However, several acts do provide for basic mechanisms to regulate/ control/ enforce activities concerning food, agriculture, livestock, fishery and wildlife items and biodiversity in a general fashion.	X
The Livestock Act of Bhutan, 2001	25 July, 2001	☒ Genes or molecules only ☒ Aquaculture ☐ Capture fisheries ☐ Conservation ☐ Intellectual property protection ☒ Importation ☒ Trade and commerce ☐ Access and benefit sharing ☒ Other	There are no legislation instruments concerning specifically aquaculture and genetic resources of farmed aquatic species and their wild relatives. However, several acts do provide for basic mechanisms to regulate/ control/ enforce activities concerning food, agriculture, livestock, fishery and wildlife items and biodiversity in a general fashion.	X

National legislation, policy and/or mechanism	Date established	Scope ***Select all that apply***	Comments ***Please provide any additional information for example whether it has been effective or not; and main sources of information***	
National Environment Protection Act, 2007	21 June, 2007	☐ Genes or molecules only ☐ Aquaculture ☐ Capture fisheries ☒ Conservation ☐ Intellectual property protection ☒ Importation ☐ Trade and commerce ☐ Access and benefit sharing ☒ Other		X
The Biodiversity Act of Bhutan, 2003	4 August, 2003	☒ Genes or molecules only ☐ Aquaculture ☐ Capture fisheries ☒ Conservation ☐ Intellectual property protection ☒ Importation ☒ Trade and commerce ☒ Access and benefit sharing ☒ Other		X

Review of the current status and gaps in national policies and legislation for the conservation, sustainable use and development of aquatic genetic resources of farmed aquatic species and their wild relatives

33. Please list any gaps in the coverage or constraints in implementing national legislation, policies and/or mechanisms in regard to aquatic genetic resources.

There are no legislation instruments concerning specifically aquaculture and genetic resources of farmed aquatic species and their wild relatives. However, several acts do provide for basic mechanisms to regulate/ control/ enforce activities concerning food, agriculture, livestock, fishery and wildlife items and biodiversity in a general fashion. As aquaculture develops, it may become necessary to have policies and acts concerning aquaculture specifically.

34. Please indicate any national aquatic genetic resources of farmed aquatic species and their wild relatives for which your country restricts access.

Type of genetic resource (can be species name, DNA, gametes or other descriptor)	Comments ***Please, provide verifiable main sources of information, effectiveness of the restriction, description of type of restriction and for whom does the restriction apply***
DNA	
Stock, breed or variety	
Species	
Other **Continue adding row as necessary** Add Row / Remove Row	

35. Over the past 10 years, indicate the actions your country has taken to maintain or enhance access to aquatic genetic resources of farmed aquatic species and their wild relatives located outside your country; for example, by establishing germplasm acquisition agreements or material transfer agreements.

Add Row

Action taken to enhance access to aquatic genetic resources outside your country	Type of genetic resource ***Mark all that apply***	Comment ***for example other types of genetic resources***	
Inter-aquaculture-agencies agreements and negotiations to trade fish genetic materials	☐ DNA ☐ Genes ☒ Gametes ☐ Tissues ☐ Embryos ☒ Living specimens	No formal agreements exist, but genetic materials of common carp, trout and other carps have been imported from India, Hungary, Denmark and Nepal.	X

36. Please indicate any obstacles your country has encountered when trying to access aquatic genetic resources of farmed aquatic species and their wild relatives outside of your country (including access for research purposes).

Obstacles to accessing aquatic genetic resources	Please describe type of genetic resource ***mark all that apply***	Comments ***please include additional information as needed***
Intellectual property protection	☐ DNA ☐ Stock, breed or variety ☐ Species ☐ Other	
National laws of your country	☐ DNA ☐ Stock, breed or variety ☐ Species ☐ Other	
National laws of donor country	☐ DNA ☐ Stock, breed or variety ☒ Species ☐ Other	Legislation of the donor country appears restrictive for importation of desirable genetic materials.
Internationl laws or protocols	☐ DNA ☐ Stock, breed or variety ☐ Species ☐ Other	
Too expensive	☐ DNA ☒ Stock, breed or variety ☒ Species ☐ Other	Importation of genetic materials, when enabled, is costly.
Material transfer agreements required	☐ DNA ☐ Stock, breed or variety ☐ Species ☐ Other	
Knowledge gaps	☐ DNA ☒ Stock, breed or variety ☒ Species ☐ Other	Lack of information makes it difficult to identify/ source genetic materials of desired aquatic species.
Public perception	☐ DNA ☐ Stock, breed or variety ☐ Species ☐ Other	

Obstacles to accessing aquatic genetic resources	Please describe type of genetic resource ***mark all that apply***	Comments ***please include additional information as needed***
Other **Continue adding row as necessary** Add Row / Remove Row	☐ DNA ☐ Stock, breed or variety ☐ Species ☐ Other	

Chapter 7: Research, Education, Training and Extension on Aquatic Genetic Resources within National Jurisdiction: Coordination, Networking and Information

The main objective of Chapter 7 is to review the status and adequacy of national research, education, training and extension, coordination and networking arrangements and information systems that support the conservation, sustainable use and development of aquatic genetic resources of farmed aquatic species and their wild relatives for food and agriculture.

The specific objectives are:

- To describe the current status, future plans, gaps, needs and priorities for research, training, extension and education on the conservation, sustainable use and development of aquatic genetic resources of farmed aquatic species and their wild relatives
- To describe existing or planned national networks for the conservation, sustainable use and development of aquatic genetic resources of farmed aquatic species and their wild relatives.
- To describe existing or planned information systems for the conservation, sustainable use and development of aquatic genetic resources of farmed aquatic species and their wild relatives.

Research

37. Does your national research programme support the conservation, sustainable use and development of aquatic genetic resources of farmed aquatic species and their wild relatives? If yes, give details of current and/or planned research; if no, explain the main reasons why not in box below.

Please mark appropriate box

- ○ Yes
- ◉ No
- ○ Unknown

Please provide details

Since none of the farmed aquatic species is native, no emphasis is placed on conserving and developing their genetic resources.

38. Please list main institutions, organizations, corporations and other entities in your country that are engaged in field and/or laboratory research related to the conservation, sustainable use and development of aquatic genetic resources of farmed aquatic species and their wild relatives.

Add Row

Main institutions, organizations, corporations and other entities	Area of research ***Mark all that apply***	Comments ***Please provide any additional information***	
National Aquaculture Research Centre (NARC), Department of Livestock (DoL), Ministry of Agriculture and Forests (MoAF).	☒ Genetic resource management ☒ Basic knowledge on aquatic genetic resources ☐ Characterization and monitoring of aquatic genetic resources ☐ Genetic improvement ☐ Economic valuation of aquatic genetic resources ☒ Conservation of aquatic genetic resources ☒ Communication on aquatic genetic resources ☒ Access and distribution of aquatic genetic resources ☐ Other		X
National Centre for Lake and Riverine Fisheries (NCL&RF), DoL, MoAF.	☒ Genetic resource management ☒ Basic knowledge on aquatic genetic resources ☐ Characterization and monitoring of aquatic genetic resources ☐ Genetic improvement ☐ Economic valuation of aquatic genetic resources ☒ Conservation of aquatic genetic resources ☒ Communication on aquatic genetic resources ☒ Access and distribution of aquatic genetic resources ☐ Other		X

Main institutions, organizations, corporations and other entities	Area of research ***Mark all that apply***	Comments ***Please provide any additional information***	
Regional Centre for Aquaculture (RCA), DoL, MoAF.	☒ Genetic resource management ☒ Basic knowledge on aquatic genetic resources ☐ Characterization and monitoring of aquatic genetic resources ☐ Genetic improvement ☐ Economic valuation of aquatic genetic resources ☐ Conservation of aquatic genetic resources ☒ Communication on aquatic genetic resources ☒ Access and distribution of aquatic genetic resources ☐ Other		X

39. What capacity strengthening is needed to improve national research in support of the conservation, sustainable use and development of aquatic genetic resources of farmed aquatic species and their wild relatives?

Please rank the following in regard to capacity strengthening.

Capacities	Rank 1=Very Important 10=No importance
Improve basic knowledge on aquatic genetic resources	1
Improve capacities for characterization and monitoring of aquatic genetic resources	4
Improve capacities for genetic improvement	1
Improve capacities for genetic resource management	1
Improve capacities for economic valuation of aquatic genetic resources	4
Improve capacities for conservation of aquatic genetic resources	1
Improve communication on aquatic genetic resources	4
Improve access to and distribution of aquatic genetic resources	8
Add other rows as appropriate and rank Add Row Remove Row	

Please describe any other capacity building needs in regards to aquatic genetic resources

Bhutan needs to develop the capacity to conduct inventory studies of fisheries resources also.

Education, training and extension

40. Please indicate the extent that education, training and extension in your country covers the conservation, sustainable use and development of aquatic genetic resources of farmed aquatic species and their wild relatives? List the main institutions involved and the types of courses offered.

Add Row

Institution	Thematic Area	Type of courses **mark all that apply**	Comments	
College of Natural Resources (CNR), Royal University of Bhutan.	Genetic resource management	☒ Undergraduate ☐ Post-graduate ☐ Training ☐ Extension	The module just introduces the students to carp propagation and hatchery management.	
	Characterization and monitoring of aquatic genetic resources	☐ Undergraduate ☐ Post-graduate ☐ Training ☐ Extension		
	Genetic improvement	☐ Undergraduate ☐ Post-graduate ☐ Training ☐ Extension		X
	Economic valuation of aquatic genetic resources	☐ Undergraduate ☐ Post-graduate ☐ Training ☐ Extension		
	Conservation of aquatic genetic resources	☒ Undergraduate ☐ Post-graduate ☐ Training ☐ Extension	The module just introduces the students to the need to conserve fisheries resources.	

Coordination and networking

41. Please list any mechanisms within your country responsible for coordinating the aquaculture, culture-based fisheries and capture fisheries subsectors with the other sectors that use watersheds and coastal ecosystems and have impacts on aquatic genetic resources of wild relatives of farmed aquatic species (e.g., agriculture, forestry, mining, tourism, waste management and water resources).

If no mechanism exists check here: ☐

Add Row

Name of mechanism	Description of how mechanism operates	
Policy and Planning Division (PPD) of the MoAF.	The PPD serves as the go-between for activities that link aquaculture, culture based fisheries, capture fisheries, agriculture, forestry, environment and other sectors that use watersheds.	X

42. Please indicate how capacity strengthening can be improved in intersectoral coordination in support of the conservation, sustainable use and development of aquatic genetic resources.

Please rank the following in regards to capacity strengthening.

Capacities	Rank 1=Very Important 10=No importance
Increase awareness in institutions	1
Increase technical capacities of institutions	1
Increase information sharing between institutions	3
Add other rows as appropriate and rank Increase other forms of collaboration between institutions Add Row / Remove Row	1

Please specify in box below

Example: Inter-sectoral collaboration in the form of joint study of natural fisheries resources, feasibility studies for aquaculture resource allocation, socioeconomic impacts of aquaculture/ fisheries development programs, etc. should be promoted.

43. Please list any national networks in your country or any international networks your country belongs to that support the conservation, sustainable use and development of aquatic genetic resources.

Add Row

Network	Objectives of the network ***Please mark all that apply*** to your country	Comments	
	☐ Improve basic knowledge on aquatic genetic resources ☐ Improve capacities for characterization and monitoring of aquatic genetic resources ☐ Improve capacities for genetic improvement ☐ Improve capacities for economic valuation of aquatic genetic resources ☐ Improve capacities for conservation of aquatic genetic resources ☐ Improve communication on aquatic genetic resources ☐ Improve access to and distribution of aquatic genetic resources		X

Information systems

44. Please list any information systems existing in your country for receiving, managing and communicating information about the conservation, sustainable use and development of aquatic genetic resources of farmed aquatic species and their wild relatives.

Add Row

Name of information system	Type of information stored ***mark all that apply***	Main stakeholders ***mark all that apply***	
Information Management Section (IMS) of DoL and Information and Communication Section (ICS) of the MoAF	☐ DNA sequence ☐ Genes and genotype ☒ Breeds, strains or stocks ☒ Species names ☒ Production figures ☒ Distribution ☒ Level of endangerment ☐ Other	☐ Fish farmers ☐ Fishers in capture fisheries ☒ Fish hatchery people ☐ People involved in marketing ☒ Government resource managers ☐ Fishing or aquaculture associations ☒ Aquatic protected area managers ☒ University and academic people ☐ Non-Governmental Organizations ☐ Intergovernmental Organizations ☒ Policy makers ☐ Donors ☐ Consumers ☐ Politicians **Please list other stakeholders as necessary**	X

45. What capacity strengthening is needed to improve national information systems to support the conservation, sustainable use and development of aquatic genetic resources?

Please describe what capacities need to be strengthened

Bhutan's capacity to collect/ compile, manage and communicate aquatic genetic resources information needs to be strengthened.

Please describe any other capacity building needs in regards to information systems for aquatic genetic resources

Chapter 8: International Collaboration on Aquatic Genetic Resources of Farmed Aquatic Species and Their Wild Relatives

The main objective of Chapter 8 is to review the mechanisms and instruments through which your country participates in international collaborations on aquatic genetic resources of farmed aquatic species and their wild relatives.

The specific objectives are:

- To identify your country's current participation in bilateral, sub-regional, regional, other international and global forms of collaboration on aquatic genetic resources. List national memberships, status as a Party and other forms of affiliation in agreements, conventions, treaties, international organizations, international networks and international programmes.
- To identify any other forms of international collaboration on aquatic genetic resources.
- To review the benefits from existing forms of international collaboration on aquatic genetic resources.
- To identify needs and priorities for future international collaboration on aquatic genetic resources

International collaboration includes bilateral arrangements and the sharing of particular waters and stocks of wild relatives of farmed aquatic species.

International, regional or sub-regional agreements, conventions and treaties concerning aquatic genetic resources of farmed aquatic species and their wild relatives

46. Please list the international, regional or sub-regional agreements your country subscribes to that cover aquatic genetic resources of farmed species and their wild relatives, such as the Nagoya Protocol[2] the Convention on Biological Diversity and the Cartagena Protocol and how they have impacted aquatic genetic resources and stakeholders in your country. Examples could include:

[2] http://www.cbd.int/abs/nagoya-protocol/signatories/

- Establishment and management of shared or networked aquatic protected areas as far as wild relatives of farmed aquatic species are concerned
- Aquaculture and culture-based fisheries in transboundary or shared water bodies
- Sharing aquatic genetic material and related information
- Fishing rights, seasons and quotas as far as wild relatives of farmed aquatic species are concerned
- Conservation and sustainable use of shared water bodies and watercourses as far as wild relatives of farmed aquatic species are concerned
- Quarantine procedures for aquatic organisms and for control and notification of aquatic diseases

Add Row

International, Regional, bilateral or Sub-Regional agreement	Year your country ratified or subscribed to the agreement	Impact on aquatic genetic resources	Impact on stakeholders	Comments	
RAMSAR		○ Strongly positive ○ Positive ○ Negative ○ Strongly negative ◉ No effect	○ Strongly positive ○ Positive ○ Negative ○ Strongly negative ◉ No effect	The effects remain unstudied.	X

International, Regional, bilateral or Sub-Regional agreement	Year your country ratified or subscribed to the agreement	Impact on aquatic genetic resources	Impact on stakeholders	Comments	
CITES		◯ Strongly positive ◯ Positive ◯ Negative ◯ Strongly negative ◉ No effect	◯ Strongly positive ◯ Positive ◯ Negative ◯ Strongly negative ◉ No effect		X
Code of conduct for Responsible Fisheries		◯ Strongly positive ◯ Positive ◯ Negative ◯ Strongly negative ◉ No effect	◯ Strongly positive ◯ Positive ◯ Negative ◯ Strongly negative ◉ No effect		X
Nagoya protocol		◯ Strongly positive ◯ Positive ◯ Negative ◯ Strongly negative ◉ No effect	◯ Strongly positive ◯ Positive ◯ Negative ◯ Strongly negative ◉ No effect		X

47. Please list the priority needs regarding collaboration on conservation and sustainable use of aquatic genetic resources of farmed aquatic species and their wild relatives. Are they being addressed, i.e. are there any critical gaps?

Collaboration is needed in order to ...	Rank 1=Very Important 10=No importance	To what extent are the needs being met	Comments ***For example any critical gaps***
Improve information technology and database management	1	◯ To a great extent ◯ To some extent ◯ None ◯ Unknown	
Improve basic knowledge on aquatic genetic resources	1	◯ To a great extent ◯ To some extent ◯ None ◯ Unknown	
Improve capacities for characterization and monitoring of aquatic genetic resources	4	◯ To a great extent ◯ To some extent ◯ None ◯ Unknown	
Improve capacities for genetic improvement	1	◯ To a great extent ◯ To some extent ◯ None ◯ Unknown	
Improve capacities for economic valuation of aquatic genetic resources	1	◯ To a great extent ◯ To some extent ◯ None ◯ Unknown	
Improve capacities for conservation of aquatic genetic resources	1	◯ To a great extent ◯ To some extent ◯ None ◯ Unknown	
Improve communication on aquatic genetic resources	1	◯ To a great extent ◯ To some extent ◯ None ◯ Unknown	

Collaboration is needed in order to ...	Rank 1=Very Important 10=No importance	To what extent are the needs being met	Comments ***For example any critical gaps***
To improve access to and distribution of aquatic genetic resources	2	◯ To a great extent ◯ To some extent ◯ None ◯ Unknown	
Other **Continue adding row as necessary** Add Row / Remove Row		◯ To a great extent ◯ To some extent ◯ None ◯ Unknown	

48. Please describe the types of collaboration that have been most beneficial for your country, and why?

Bilateral dialogues and inter-agency trade negotiations and agreements have benefitted Bhutan by allowing access to/ facilitating the import of high quality genetic materials for aquaculture.

49. Is there a need for your country to expand its collaboration concerning the conservation, sustainable use and development of aquatic genetic resources? If yes, give details, including any requirements for capacity strengthening in box below

- (•) Yes
- ( ) No

If yes, please give details

Bhutan needs to start building collaboration to develop cultivable species from its own native fisheries and to import other cultivable species such as the Tilapia, silver barb, etc. In this regard, Bhutanese aquaculture/ fisheries personnel need to be trained adequately in the areas of fisheries biology and taxonomy, domestication of species, selective breeding, fish propagation and hatchery management, aquaculture farms operation management, etc.

50. Describe important roles that your country performs within its region (and/or sub-region) and globally in terms of being a keeper, user and sharer of aquatic genetic resources.

Bhutan has more or less intact populations of the endangered Golden Mahaseer in its waters, and therefore may serve as leader of research on this fish in the long term.

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