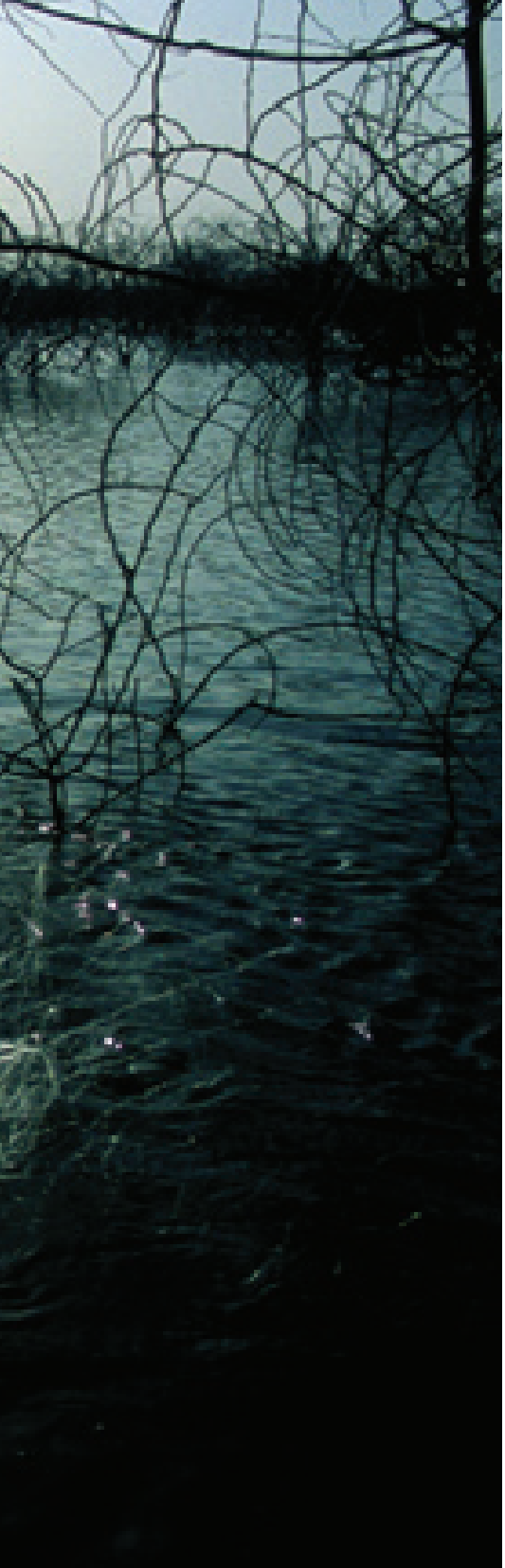

CHAPTER 7

FISHERIES

"Where there is water, Buduma people and fish cannot be separated."

[Buduma proverb]

FISHERIES

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KINASSEROM ISLAND (BOLI), CHAD

FISHERIES ARE AN IMPORTANT ECONOMIC ACTIVITY IN THE LAKE CHAD BASIN

INTRODUCTION

The arid zone of sub-Saharan African (latitudes 9–13°N), including the Sahel, and the Sudanian and Guinean savannah belts, contains some of the most productive and economically important inland fisheries in the whole of the continent, mainly in the form of large areas of seasonally inundated tropical wetlands [7.1]. Although reliable statistics and information are not widely available, fisheries such as the Sudd (River Nile floodplain) in the Sudan, the central delta of the River Niger in Mali, and the Lake Chad Basin are thought to produce several hundred thousand tonnes of fish each year [7.2].

In the case of the Lake Chad Basin, the fisheries are operated almost exclusively by thousands of artisanal fishermen using fishing gear and boats based on traditional designs. The fishermen exploit a wide range of fish species within a complex of lake, river, floodplain and swampland environments, of which they have a good knowledge and understanding. Fishing operations form an integral part of many household economies, along with farming. A significant proportion of the fish catch is smoked and dried. It then enters a well-organized commercial fish-marketing chain which extends to the large urban markets of southern Nigeria, including Lagos, Ibadan, Onitsha and Enugu, where the dried fish is much prized by local consumers.

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NEAR KANIRAM VILLAGE (MALAM FATORI), NIGERIA

FISHERIES ARE OPERATED ALMOST EXCLUSIVELY BY THOUSANDS OF FISHERMEN USING TRADITIONAL GEAR, TRAPS AND BOATS BASED ON LOCAL DESIGN

FISH PRODUCTION

The regional and international importance of the inland fisheries of the Lake Chad Basin has long been recognized by travellers, various observers and, more recently, by fisheries scientists and policy-makers. In the nineteenth century, Denham, a British explorer, noted in his journal that:

"The sweet and pleasant waters of the lake (Lake Chad) abounded in fish which the women caught by wading in and then, having formed a line facing the shore, charging through the shallows, grabbing them as they tried to swim away or leapt upon the shore" [7.3].

More recently, in the 1970s, a team of French scientists from ORSTOM (Office de la recherche scientifique et technique d'outre-mer, now Institut de recherche pour le développement, or IRD) undertook an extensive investigation of the Lake Chad Basin environment from their base at N'Djamena. It was estimated that the fisheries could be harvested sustainably at a level of 180 000 tonnes each year during "normal" hydrological periods with good influent floods into the lake. For the period 1960–2000 the average annual catch has fluctuated at around 50 000–80 000 tonnes.

In 1992, the Lake Chad Basin Commission (LCBC) produced its *Master plan for the development and environmentally sound management of the natural resources of the Lake Chad Conventional Basin* [7.4]. The economic importance of fisheries for millions of people in the riparian countries was emphasized and the need for appropriate management in the future was highlighted.

STATISTICS

It has also been long recognized that our knowledge and understanding of the fisheries of the Lake Chad Basin are very limited. FAO [7.1] confirmed that the information deficit for inland fisheries in the arid zone of West Africa is particularly acute. In the case of the riparian countries of the Lake Chad Basin (Nigeria, Chad, Cameroon and the Niger), national fisheries statistics were considered to be unreliable and incomplete.[1] More seriously, the information that is available tends to lack the necessary multidisciplinary coverage required for effective planning and management.

In response to the widely perceived information deficit for the fisheries of the Lake Chad Basin, and the need to upgrade our knowledge and understanding in order to provide a basis for future planning and management, a series of international research projects have been undertaken since 1993. Based on collaborative work between African and European scientists, the research projects have significantly helped to address the information deficit for the Lake Chad Basin fisheries.

The primary objective of this chapter is to profile the fisheries of the Lake Chad Basin using the up-to-date information available from the recent collaborative research projects.

1 Two other countries (Central African Republic and the Sudan) have also joined the Lake Chad Basin Commission, but there is very little information available about their fisheries.

Information on the fisheries of the Lake Chad Basin is provided by three recent international projects

- ***Traditional management of artisanal fisheries in northeast Nigeria*** 1993-1997, funded by the Department for International Development (DFID) Project No. R5471. Implemented by the University of Portsmouth, United Kingdom; University of Maiduguri, Nigeria; and the Federal University of Technology, Yola, Nigeria (Neiland [7.5]).
- ***Sustainable development of African continental fisheries: a regional study of policy options and policy-formation mechanisms in the Lake Chad Basin***, 1999-2002, funded by the European Commission (INCO) Project No. ERBICI18CT980331. Implemented by the University of Portsmouth, United Kingdom; Institut de recherche pour le développement (IRD), Senegal; National Institute for Freshwater Fisheries Research (NIFFR), Nigeria; Ministry of Livestock, Fisheries and Animal Industries (MINEPIA), Yaoundé/Maroua, Cameroon; Ministry of Environment and Water Direction of Fisheries and Aquaculture (DPA), N'Djamena, Chad; Lake Chad Basin Commission (LCBC), Chad (Neiland and Béné, [7.6]).
- ***Study of the impact of the fish trade on sustainable livelihoods in the Lake Chad Basin***, 2002-ongoing, funded by the DFID/FAO Sustainable Fisheries Livelihoods Programme (SFLP). Implemented by IDDRA and the University of Portsmouth, United Kingdom; NIFFR, Nigeria; MINEPIA, Cameroon; DPA, Chad; Department of Fisheries, the Niger; and Department of Fisheries, Central African Republic (Neiland, Jolley and Béné, [7.7]).

NEAR DUMBA VILLAGE (BAGA), NIGERIA

SINCE 1998, THERE HAVE BEEN SOME SIGNS THAT WATER LEVELS IN THE LAKE ARE RISING SLIGHTLY

<< LEFT: SWAMPLAND AND FLOATING ISLANDS COVER LARGE AREAS OF THE LAKE
NEAR BOL, CHAD

ENVIRONMENT

The characteristics and performance of the Lake Chad Basin fisheries are closely linked with regional hydrological regimes and the distribution of water. This is largely determined by climatic patterns, but human activities, such as irrigation and dam construction, are also important. While the arid zone of Africa is characterized by fluctuating climate and hydrology, there has been a marked change over the past 50 years that has caused Lake Chad in particular to change from a stable, shallow lake (covering a northern and a southern basin) to a more unstable, marshy or swampland environment (with some open water only in the southern basin).

During the 1970s and 1980s, dam construction on major influent rivers, such as the Yobé in Nigeria and the Logone in Cameroon, further altered the hydrological pattern in the Lake Chad Basin. This led to the loss of an estimated 200 000 ha of floodplains along the lakeshore and rivers, which were critical fish breeding and nursery areas. The important *yaéré* floodplain south of Lake Chad was affected very severely at this time. Sahelian droughts in 1982–1984 reduced the water flows even further and, by 1990, Lake Chad covered less than 2 000 km^2. Around this open-water area, the swampland covered a further 4 000 km^2. By 1998, there were some signs that water flows in the influent rivers to Lake Chad were rising, and that Lake Chad and the floodplains were increasing in size. For example, in the year 2000, the northern basin of Lake Chad was reported to have experienced some flooding.

KANIRAM VILLAGE (MALAM FATORI), NIGERIA

IN THE LAKE CHAD BASIN THERE ARE 176 SPECIES OF FISH. THIS RICH BIODIVERSITY IS AN IMPORTANT CONTRIBUTION TO THE FOOD SECURITY OF THE POPULATION

RESOURCES

There are 176 species of fish in the Lake Chad Basin. Together they form a large, multispecies fish resource. For fisheries monitoring purposes, the species can be grouped into 21 major genera or family groups (Table 13). The drastic environmental changes that have affected the region have also had an impact on the composition of the fish resource and, in turn, on the catch composition recorded by fishermen. Detailed research has been undertaken that highlights the relationship between environmental changes and fish population ecology [7,8] and also on the fisheries [7,9]. During the "drying period" (1972–1978), natural selection operating on the fish communities favoured "marshy" species (e.g. *Clarias* catfish, tilapiine cichlids and *Heterotis* spp.) endowed with adaptations of diet, reproduction and respiration that allowed them to survive and dominate this unstable and hostile environment (low water, high temperature and low dissolved oxygen). "Lacustrine" species (e.g. *Lates, Hydrocynus*, *Labeo* and *Distichodus*) could not survive in these conditions and soon disappeared from the new swampland.

This process of change was also hastened by opportunistic fishing in the northern basin of Lake Chad, as concentrated fish populations were easily targeted and fished out by fishermen. Today, "marshy" fish species still dominate the fisheries of the Lake Chad Basin (Table 13) and "lacustrine" fish are found only in the small area of "open water"of Lake Chad and in some of the larger river channels and floodplain lakes of the Logone and Chari, along with other riverine and migratory species (e.g. *Alestes*).

KANIRAM VILLAGE (MALAM FATORI), NIGERIA

FRESH FISH BEING SOLD IN THE MARKET IN KANIRAM VILLAGE

NEAR DUMBA VILLAGE (BAGA), NIGERIA

BLANGOUA MARKET (KOUSSERI), CAMEROON

ENVIRONMENTAL VARIATIONS HAVE A DRASTIC IMPACT ON THE COMPOSITION OF THE FISH RESOURCE

TABLE 13 **COMPOSITION OF FISH IN THE LAKE CHAD FISHERIES IN 2001 (PERCENTAGE COMPOSITION ON THE BASIS OF MARKET MONITORING)**

Genera or groups	Baga-Doro, Nigeria	Kinasserom, Chad	Mean values
Alestes	0.43	3.27	1.85
Auchenoglanis	–	1.78	0.89
Bagrus	–	2.54	1.27
Clarias	50.03	23.02	36.52
Distichodus	–	0.01	0.01
Gymnarchus	0.01	17.00	8.50
Gnathonemus	–	–	-
Heterotis	18.89	25.17	22.03
Hydrocynus	–	3.25	1.63
Hyperopisus	–	0.42	0.21
Labeo	0.01	0.21	0.11
Lates	–	4.36	2.18
Mormyrops	2.07	0.35	1.21
Mormyrus	0.29	0.07	0.18
Petersius	–	–	-
Peterochephalus	–	0.53	0.27
Polypterus	–	0.38	0.19
Protopterus	2.90	–	1.45
Schilbe	–	–	-
Synodontis	0.01	0.69	0.35
Tilapiine cichlids	25.36	16.95	21.15
Total	**100.00**	**100**	**100.00**

Source: T. Jolley *et al.*, 2002 [7.10]

Changes in the Lake Chad fishery

A tale of two fish: the freshwater sardine (*Alestes*) and the catfish (*Clarias*)

Before 1970, the small sardine-like fish called *Alestes baremoze* was an important component of the fisheries of the Lake Chad Basin. Feeding on zooplankton, *Alestes* was abundant in the zones of reed-bed islands and the archipelago of Lake Chad, and was also found in the open waters. During periods of rising river levels and flooding (from October to December), huge numbers of *Alestes* would migrate into the Logone and Chari rivers and invade the surrounding floodplain to breed in the shallow waters. With the subsequent decrease in water levels a few months later, adult and juvenile fish would retreat into the main channels and eventually into Lake Chad. The annual cycle of migration of both adults and juveniles, which is adapted to the hydrological patterns, is crucial to the maintenance of the stock of *Alestes* in the Lake Chad Basin system. In particular, the setting of fishing nets along river channels and in the floodplain areas of northern Cameroon was also timed to coincide with this pattern of migration. As a result this species made up a large part of the catch in these seasonal riverine fisheries.

Since 1970, and up to the present day, the fisheries of the Lake Chad Basin have witnessed a significant decline in catches of *Alestes*. Instead, the fisheries are now dominated overall by *Clarias* catfish. One of the main reasons for this has been the change in environmental conditions in the Lake Chad Basin. The recent Sahelian drought periods, decline of river flows, the reduction in the size of Lake Chad and the emergence of large areas of swampland in the southern and northern basins have not favoured fish such as *Alestes*. The life cycle and migration of *Alestes* has been severely disrupted. Instead, highly resilient and fast-breeding omnivorous fish, such as *Clarias*, have taken their place. *Clarias* is perfectly adapted to the new swampland conditions and can even breathe air, through auxiliary gills, in low-water conditions. *Alestes* remains a minor component of the river fisheries in the region at present.

NEAR KALAMALOUÉ, CAMEROON

THE CATFISH IS PERFECTLY ADAPTED TO SWAMP CONDITIONS. IT CAN SURVIVE IN VERY LOW WATER CONDITIONS BECAUSE IT CAN BREATHE AIR THROUGH AUXILIARY GILLS

NEAR KALAMALOUÉ, CAMEROON

THE SHRUB *AESCHYNOMENE ELAPHROXYLON* IS NATIVE TO THE LAKE. ITS WOOD, BEING VERY LIGHT, IS EXPLOITED AS A CHEAP AND NATURAL MEANS OF FLOTATION

>> RIGHT: THE MIGRATION CYCLES OF THE *ALESTES* HAVE BEEN DISRUPTED BY THE DECLINE IN RIVER FLOWS. THEIR NUMBERS ARE DECREASING IN FAVOUR OF HIGHLY RESILIENT AND FAST-BREEDING OMNIVOROUS FISH, SUCH AS THE CATFISH (*CLARIAS*)

NEAR KALAMALOUÉ, CAMEROON

CHARI RIVER, CHAD

THE SEASONAL FLUCTUATIONS IN WATER LEVELS AND IN THE MIGRATORY CYCLES OF FISH ARE WELL KNOWN AND ARE EXPLOITED BY FISHERMEN

SEASONALITY AND FISHING GROUNDS

As well as the major environmental changes described above, the nature and extent of the swampland and floodplain environments, and of the open waters of Lake Chad itself, also vary on an intra-annual seasonal basis. This is largely dictated by the seasonal patterns of discharge of the two major influent rivers, the Logone and the Chari. Because the basin is very flat and Lake Chad is shallow, the surface area of the lake varies widely in response to even small changes in seasonal inflow. Each year during the flood period (from September to December), Lake Chad's open waters expand, causing water levels to increase in the fringing swampland and inundating previously dry areas. In effect, floodplains fringe both the lake and the main river channels, and both increase in size during the flood period.

Conversely, as the riverine discharge decreases (from February to April), the receding floods leave numerous temporary ponds and areas of swampland scattered along the floodplains. The seasonal changes in the aquatic environment have a major impact on the fish populations. Fish move into the floodplain areas to feed and to breed, and then retreat with the floods to the main channels and open lake along well-defined channels and outlets. Many fish are trapped and concentrated in isolated pools and swamps, which shrink and dry out within a few months.

There are at least eight different "types" of fishing grounds exploited across the Lake Chad Basin (Table 14). Seasonal ponds and receding channels are the most commonly used, followed by major rivers (Chari and Logone), the open waters of Lake Chad and

TABLE 14 **TYPES OF WATERBODY EXPLOITED IN THE LAKE CHAD BASIN**

Type of waterbody	Numbers of waterbody types exploited by villages in different regions			
	Aggregate [%]	*Yaéré*	Chari delta	Western shores
Seasonal ponds and receding channels	39 (31 %)	9	15	15
Main river*	30 (23 %)	8	22	-
Lake Chad's open waters	22 (17 %)	-	8	14
Permanent ponds and oxbows	15 (12 %)	1	13	1
Tributaries**	9 (7 %)	9	-	-
Artificial reservoir***	6 (5 %)	6	-	-
Irrigation channels	4 (3 %)	4	-	-
Floodplain	3 (2 %)	3	-	-
Total waterbodies	**128 (100 %)**	**40**	**58**	**30**
Number of different waterbodies	8	7	4	3
Total number of villages surveyed	**64**	**20**	**29**	**15**

* Main river = Chari and/or Logone
** Tributaries of the Logone = Logomatia, Loromé Mazéra, Mayo Vrick and Petit Gorom
*** Maga reservoir

Source: C. Béné *et al.*, 2002 [7.11]

permanent ponds. A comparison among different regions shows that the *yaéré* floodplain offers the greatest diversity of fisheries, followed by the river deltas (e.g. Chari) and then shoreline areas, such as those on the western shore in Nigeria. The fact that the seasonal ponds and receding channels are the most common type of fisheries across the basin indicates that fishing has developed as a temporary activity that is adapted to the seasonal dynamics of the environment and that, in particular, makes the most of water and fish movements (flood/recession).

CHARI RIVER, CHAD

ALL COMPONENTS OF THE ECOSYSTEM FOLLOW THE FLUCTUATIONS: FISH, LIVESTOCK, WILDLIFE, AGRICULTURE AND PEOPLE, WHO CAN MOVE THEIR ENTIRE HOUSEHOLDS, ACCORDING TO THEIR RHYTHM