5 The 'formal' regulation of Kenya's Lake Victoria fishery

5.1 Introduction

'Formal' regulations emanating from the state represent an external intervention in the exploitation of a resource, which may either be designed to encourage the exploitation of the resource base; or else, and more commonly, set out to conserve the resource so that it will remain productive indefinitely. In the latter case, such managerial intervention is designed to be coercive, using sanctions of fines and/or other punishment to force exploiters into regulatory compliance. This chapter explores the application of such rules and regulations within the context of Kenya's Lake Victoria fishery. It specifically examines the problems inherent to these regulations and their implementation. The chapter goes on to demonstrate that many of the *a priori* assumptions typical of contemporary management models, such as the ability of the state to fund and enforce them, and that fishing communities lack heterogeneity (see Chapter 1), are invalid when applied to a fishery such as this one. Finally, the chapter explores how fishermen have responded to these regulations, what their perceptions of them are, and concludes with an assessment of the regulation's success.

Following the repeal of the 127mm gill-net mesh-size limitation in 1961 and the collapse of the Fishermen's Union in 1962, regulation of the lake passed to the Kenya Fisheries Department (KFD). In 1968, the Kenyan Government passed the Fish Industries Act, and the KFD was charged with implementing and enforcing this, although there is little to suggest that it did so successfully. It had been hoped that because of the large size of the introduced tilapia, *O. niloticus*, fishermen would be encouraged to use larger sized gill-nets, channelling pressure away from the exhausted endemic tilapia species (Balirwa 1992). This, however, did not occur, and no further attempts to implement regulation occurred until 1989, with the introduction of the 1989 Fisheries Act (Republic of Kenya 1989, 1991), which provide the Director of Fisheries with sweeping powers to control fishing and fishing effort.

5.2 Contemporary forms of fisheries management in Kenya's Lake Victoria fishery

In Chapter 3, the colonial forms of regulation on Kenya's Lake Victoria fishery were discussed. It was argued that the failure of the Lake Victoria Fisheries Service (LVFS) appears to have arisen from problems inherent to the regulations they imposed, and which arose through their incompatibility with the financial and social status aspirations of Kenya's Lake Victoria fishing communities. These were further compounded by the funding and staffing constraints faced by the LVFS. Subsequent regulatory regimes fared little better, although for different reasons, as the fishery came to be increasingly defined by coping strategies such as sequential exploitation and migration. Despite the serious problems that have confronted the application and success of state-based formal regulations throughout the history of this fishery, Kenyan authorities have consistently tried to bring the fishery under the control and direction of the state. These efforts have been characterised by attempts at imposing contemporary forms of fisheries management, the most important of which has been efforts to gain Maximum Sustainable Yields (MSYs) for the fishery (Table 5.1). These estimates are not species-specific, and cover all of the 200+ species to be found within the fishery, each with its own fecundity rates, mortality rates and growth rates. In any case, the actual catches noted in Table 5.1 suggest that these MSYs are not adhered to, and in 1994, Kenya landed some 193,652 tonnes of fish from Lake Victoria alone (Unpublished Department of Fisheries Data 1995).

The MSY levels provided in Table 5.1 are estimates, and as a consequence, much of the managerial discussion concerning the lake demands that accurate stock assessment be carried out.

Year	MSY (m.t).	Actual catch (m.t)	Source
1966	28,000-40,000	n.a	Rhodes 1966 (in Achieng 1992).
1972	25,000	15,989	Welcomme (1972)
1975	25,000	16,581	Butcher & Colaris 1975 (in Achieng 1992).
1976	20,000	18,680	Kongere 1976 (in Achieng 1992).
1979	30,000	30,592	Republic of Kenya 1979; Kongere 1979.
1982	46,000	60,958	Coche & Balarin 1982.
1983	10,000-26,000	77,327	Zonneveld 1983.
1988	150,000	125,100	Republic of Kenya 1988(b).

Table 5.1: Estimated sustainable yields for the Kenyan sector of Lake Victoria and actual catches (actual Catches from Greboval and Fryd, 1993).

"Information on stock size, stock structure, and growth and mortality of a fish stock is essential for fisheries management" (Ligtvoet *et al.*, 1995: 120), and "[f]uture research on Lake Victoria should emphasise on [sic.] fisheries biology and environmental studies...to guide policy makers, investors and managers on matters of fisheries management and conservation" (Okemwa 1995: 190; see also Okidi 1992; Ochieng' Okach 1992; Reynolds and Greboval 1988; Dunn and Ssentongo 1992; Government of the Republic of Kenya *et al.* 1995). This literature, however, does not stipulate how such information is to be gained, who will gather it, and who will fund its collection. Critically, no indication is provided as to how such information might be utilised by fisheries managers, because it makes the explicit assumption that the present regulatory framework is adequate to police the fishery within MSY parameters. Furthermore, this managerial literature does not consider in what ways MSY information might relate to the control of fishing effort levels, for no Maximum Economic Yield (MEY) figures have been calculated. Although MSYs are not explicitly referred to in the 1989 Fisheries Act, the nature of the regulations it encompasses suggests that they are implicit.

5.3 The 1989 Fisheries Act

This Act draws upon many of the same rules laid out by previous acts, and focuses on five primary areas: Net-mesh restrictions, effort restrictions, gear prohibitions, spatial restrictions and temporal restrictions (Republic of Kenya 1989, 1991):

(a) All gill nets are limited to a minimum mesh-size of 127mm. Boat seine nets used for the capture of *omena* may be no smaller than 10mm. Seine nets, except those used for the capture of *omena*, may not be less than 50mm when diagonally stretched. In addition, it is prohibited to land and/or sell any fish from Lake Victoria that is less than 25cm standard length (SL) (the length from the top lip of the fish to the base of its caudal fin).

(b) All fishermen are obliged to have a fishing license and to be working from a fully registered boat. Casual fishermen, who, because of their frequent migration, are difficult to keep track of, must normally work for a boat owner whose licence 'covers' them, and which stipulates the number of crew on board his/her boat. Both licenses and boat registration must be renewed annually. The cost of fishermen's licences depend on the size of the boat owned and boat registration charges depend on whether or not the vessel is mechanised. Registration numbers must be clearly displayed upon the bow of the boat. Fish traders must also have licences, of which there are two classes, one which permits trade within district boundaries, and one for trading beyond these. These must be renewed annually. In addition, fish traders must have annually renewable medical certificates issued by the Ministry of Health.

(c) According to The Act, trawling is a prohibited fishing method in Lake Victoria within five nautical miles from any point along the entire shore-line and within the Winam Gulf. However, in November 1993 the Kenya Government announced that trawling in all of Kenya's waters was banned (The Standard 3.11.93: 3) although this measure has not yet been gazetted in parliamentary legislation.

(d) The geographical restrictions on fishing in Lake Victoria refer to the mouths of rivers and fish breeding areas. No person may fish within a 3km radius of river mouths during a period designated by the Director of Fisheries. During the course of this study, no such designation was gazetted in Kenya Parliament legislation. Nor may any person "disturb any spawn or spawning fish in a breeding area" (Republic of Kenya, 1991: 70).

(e) Closed seasons are left to the discretion of the Director of Fisheries, who must publish his/her intentions in the Kenya Parliamentary Gazette. During the course of this study, no such intentions were publicised.

The Act covers all inland waters of Kenya (including rivers) as well as the Indian Ocean fisheries. Depending on conditions peculiar to each of these fisheries, The Act stipulates different mesh-size restrictions for different species. Thus, for example, gill-nets of 102mm mesh-size may be used in Lakes Naivasha, Baringo, Challa and Jipe, and in the dams of the Turkwell and Tana Rivers, but not in Lake Victoria; similarly, fishermen exploiting Lake Victoria's waters may not land fish of 20cm SL or below, while those exploiting other inland waters of Kenya may not land fish of 18cm SL or below.

Failure to comply with the above regulations renders the offender liable to large fines and/or imprisonment terms of not less than a year. The implementation of these proposals is left to 'authorised officers' who are defined as "a fisheries officer, a police officer above the rank of inspector, an officer of the Kenya Navy or other armed force or a person appointed by the Minister, by notice in the Gazette, to be an authorised officer for the purposes of this Act" (Republic of Kenya 1989: 22). According to one source,[1] Assistant Fisheries Officers are the lowest ranking officers able to make an arrest on the lake. Fisheries scouts, whose role it is to collect basic fish catch data from landing beaches, have no authority to enforce The Act.

5.4 The 1989 Fisheries Act: implementation and fishermen's responses

None of the fisherman encountered during this study were aware of the 1989 Fisheries Act. They did know that there was a Fisheries Department, because most beaches have a fisheries 'scout' in residence. Fishermen were aware that there are certain laws governing mesh-sizes, that illegal nets can be seized, that certain sizes of fish should not be caught, and some claimed that closed seasons were enforced by their Divisional Fisheries Departments. However, the relationship between fishermen and KFD officials is poor. The basis for this precarious relationship is double-sided. On the one hand, animosity has arisen out of the behaviour of Fisheries scouts. Although Fisheries scouts have no authority to implement the regulations of The Act, fishermen are not aware of this. Utilising this ignorance, Fisheries scouts openly proclaim their right to seize nets, and check for fishing licences and boat registration in attempts to extort bribes. On the other hand, fishermen resent the KFD in what they perceive to be its short-comings. In other words, they criticise the KFD on the basis of what it does not do, regardless of whether or not the 1989 Fisheries Act endorses this action. One example of this is the failure of the KFD to address the problem of theft on the lake, as will be discussed below.

207 fishermen were asked whether or not they felt that the KFD was beneficial to them and the lake, and just 38 (18.4 per cent) agreed that it was.[2] Some of their replies reflect the level of animosity that exists:

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[1] Two anonymous Fisheries Officers, Interview, Kisumu District Fisheries Department Headquarters, 30/3/95.

[2] Author's data.

"The Fisheries scouts do help the lake by preventing people from catching small fish, but they must be confused because they allow the very nets that catch the small fish to be 'repossessed' by their owners" (Interview no.64, Kichinjio, 4/8/94).

"The Fisheries scouts say that there is a closed season, and they patrol the area to check that no one is fishing...but all they are doing is collecting money" (Interview no.117, Nyagina, 21/10/94).

"The Fisheries Department does very little for the lake. They do not help to recover stolen nets. When my pockets are empty, they come and demand money from me...they tell me that my nets are illegal, and yet they licence them and the factory keeps on producing them" (Interview no.175, Kiumba, 23/12/94).

"The Fisheries Department does nothing for the lake. I reported the theft of my nets and they did nothing. In 1993 three people were murdered on the lake, and they did nothing. They complain to me about under-sized fish, but who is the thief if they allow the *kokorro* [beach seine] to be used? They don't help to conserve the fish in any way" (Interview no.188, Marenga, 26/1/95).

There is no such thing as a 'net licence'. Fishermen confused this with the private mark system. Under The Act, fishermen may voluntarily seek a registration number for their nets which may be used to identify these nets in the event that they are stolen and then recovered. Fishermen are required to pay a small fee for this registration, and registration occurs regardless of whether or not the net is legal or illegal. However, because scouts in some places (particularly on Rusinga Island) insist that fishermen pay for the private mark, fishermen have come to believe that it represents a net licence, and hence the confusion when their nets are then seized.

The second area of concern often mentioned is theft. The Act does not give the KFD explicit powers to tackle theft, although it is widely assumed that the KFD is responsible for the maintenance of security on the lake. Limited by resources and funding, however, the capacity for Fisheries officials to carry out this work is restricted. For example, the District Fisheries Headquarters in Kisumu has access to only one patrol boat with an outboard engine, which, at the time of this study, was out of order. The Nyanza Province Fisheries Department has two patrol boats, both of which were out of order. Fuel for the outboard engines is supplied via a complex system of fuel vouchers that have to be balanced against budget requirements. For this reason Fisheries scouts rarely have the fuel to patrol, and will ask fishermen to pay for the fuel instead.

Nets are manufactured by the Kenya Fishnet Factory in Kisumu, which has a monopoly on all fish net production in Kenya. It therefore manufactures nets for all of the country's fisheries. It is legal to produce these nets and legal to sell these nets, but illegal to use these nets in waters where they are not permitted. Gill-nets of less than 127mm. are readily available in beach-side shops and in all fishing tackle shops in Kisumu. That the law has permitted these nets to be manufactured but did not permit their use in Lake Victoria angered many fishermen.

Finally, the issue of bribery is a recurrent theme. Although no closed season was in force during the course of this study, Fisheries scouts may have claimed that there was in order to extract bribes. KFD officials, who are in charge of the scouts, are aware of the extent of bribery that occurs on the beaches, but complain that they rarely get into the 'field' to monitor the activities of their subordinates, and are, instead, assigned to office duties. In Kisumu District, for example, there are 60 Fisheries scouts spread over 32 landing beaches; there are, however, only seven Fisheries Officers of Assistant Fisheries Officer rank and above in charge of the same area (Government of the Republic of Kenya *et al.* 1995). As a result, the ability of Fisheries Officers to scrutinise the activity of Fisheries scouts is limited, and the prosecution of offending fishermen rare. During the course of this study, only one fisherman was encountered who had been arraigned in court, charged with fishing without a licence. His case was dismissed. All the same, of 139 fishermen, 51 per cent said that they had either been harassed by scouts or had their nets seized.

In all cases, nets had been returned on the payment of a bribe. The costs of bribery to fishermen are considerable, and may be considered a legitimate cost in their economy (Geheb 1995).

As a consequence, fishermen may alter the way in which they fish and develop evasion tactics in an attempt to avoid the attentions of the 'scouts.' Some fishermen try to ensure that their illegal nets are always in the water where they remain unobserved to the Fisheries scouts who rarely have the vessels nor the necessary fuel to examine them. When these nets need to come out for washing, they are washed in secluded inlets away from the landing beaches. However, scouts can also threaten to prosecute fishermen for the size of fish they catch. No fishermen interviewed in this study claimed to throw under-sized fish back into the lake. As such, under-sized fish are separated from legally-sized fish, and sold off to traders who await the fishermen at discrete locations on the journey back to the landing beaches. At Dunga Beach, a secluded piece of papyrus swamp serves this function. At Misori Beach, '*apengo*' (juvenile Nile perch) fishermen sold their fish at another beach where the resident scout was known to be lenient. *Omena* fishermen were the most vulnerable group to bribery costs. Although these fishermen fish at night when scouts are off duty, their nets are placed out in the sun to dry the following day, which is where they are then seized and money then extorted via the threat of confiscation. In these ways the 1989 Fisheries Act may inadvertently force fishermen to fish in certain ways which were unanticipated.

The extent to which the KFD is able to enforce the law is further hampered by its sympathetic awareness of the difficult conditions in which fishermen have to operate. Furthermore, many of the scouts appointed to beaches are from the Nyanza region itself and may be related to fishermen. It is claimed that this results in the 'nepotistic pardon' of many vagrant fishermen:

> "The Fisheries Department is aware of the difficulties of getting work elsewhere, and needs to allow for some opportunities to be open for these people. It was hard for a Fisheries Officer to prosecute offending fishermen...we are aware that by doing so is as good as denying the fisherman's family an income...[W]e had very few prosecutions last year and low seizures...I think it is better to educate the fishermen on the regulations - it is hard to arrest a man because he does not know that his net has an illegal mesh size, or why he should not catch under-size fish. It is better to educate fishermen as to the wrong-doing than it is to prosecute them. On the Tana River dams, education has been very effective in ensuring that the fishery is all legal. It is the responsibility of the Fisheries Officer on the ground to educate fishermen on the regulations, but whether or not this is actually done here, I don't know - I am in the office and not in the field. But such prosecutions and seizures are now on the increase. There are fewer scouts from the region now, so nepotistic pardons are going to decline. Last October, many of these officers were transferred."[3]

Some fishermen did feel that the work of the KFD benefited them, and some had the following to say about the KFD's activities:

> "The Fisheries Officers are here to guard the fish and to guide the fishermen...they do a good job. Their role is very important and the lake would be worse off without them" (Interview no.58, Kichinjio, 1/8/94).

> "The Fisheries Department will look for your gear if you have lost it, provided you give them fuel for their engine. They may also give you letters of introduction if you are going to other beaches far away. They also issue licences and check on mesh-sizes. I think they do a good job protecting the lake...it is not the scouts who bother me, but the rules" (Interview no. 138, Utajo, 28/10/94).

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[3]Provincial Director of Fisheries, Mr. S. S. Andika, Interview, Nyanza Province Fisheries Department Headquarters, 30/3/95.

"The Fisheries Department provides letters of introduction to those going off to other beaches,...they licence,...[and]...between April and August they burn the small mesh-sizes...they do an okay job...they may even help us when we have had nets stolen" (Interview no.224, Nambo, 8/2/95).

"The Fisheries Department normally licenses and checks on small mesh-sizes. If they find a mesh-size that they are unhappy with...[they will]...confiscate it and not return it. They do a very good job and catch many people" (Interview no.232, Anyanga, 23/2/95).

The KFD may provide 'letters of introduction' on request (see Chapter 4). This service, which is not outlined in the 1989 Fisheries Act, is considered a good one by most fishermen, and prevents them from getting into trouble when they migrate to new fishing grounds. Fishermen do comply with certain provisions of The Act. For example, most fishermen have licences. Of 184 asked, 47.8 per cent had their own licences, 34.2 per cent were 'covered' by the boat owner's licence, while 18 per cent did not have a licence.[4] Fishermen claimed that it was KFD policy to ensure that all boat owners had fishing licences to cover the whole of their crew. In order for this regulation to work, the KFD must be able to decide how many crew there are per boat, depending on the type of fishery in which the crew operates. However, this is in itself was a matter of some controversy. At Utajo Beach, most fishermen use beach seines, and the KFD stipulates that there are eight crew per beach seine boat. However, Utajo suffers from an acute labour shortage, and few boats have more than three crew members, utilising the services of permanent 'haulers' on the beach in exchange for '*bira*' (payment in fish) and priority in sales. Nevertheless, boat owners are obliged to pay for eight crew members, a cost they resent intensely.

The KFD collects an annual average of US$ 70,000 from the sale of fishing licenses and boat registration (Government of the Republic of Kenya *et al.* 1995). These funds represent an important contribution to the KFD's total budget, and for this reason are efficiently collected. Once a year, Fisheries Officers do appear in the 'field' touring all landing beaches to issue licences and boat registration. It is for this reason that most fishermen are licensed and that most boats are properly registered. Once a year, Fisheries Officers do appear in the 'field' touring all landing beaches to issue licences and boat registration. Of 186 fishermen questioned, 184 claimed that the boats they owned or worked on were properly registered.[5] Just two said that their boats were not registered. However, in another survey of 6,229 boats in 1991, 1,228 boats (19.7 per cent) were unregistered (Hoekstra *et al.* 1991). Once a boat has had its registration number painted upon its side, it is difficult to know whether or not the registration has been renewed as it should. However, it would appear that most fishermen are charged and pay for boat registration.

The 1989 Fisheries Act does not appear to have curbed the widespread use of illegal nets. Of 180 net users interviewed, 130 (72.2 per cent) used at least one illegal net (gill-nets of under 127mm, beach seines of under 50mm, and boat seines of under 10mm).[6] Most of those who possessed gill-nets of above 127mm were Nile perch fishermen (given that Nile perch tends to be a large fish) and large numbers of beach seiners did have mesh sizes of and above the stipulated minimum. Not a single *omena* fisherman had legal nets. There were two main reasons for this: firstly, it was claimed that the 10mm mesh boat seine was too expensive, and secondly, when *omena* is caught in a 10mm net, it acts as a gill-net, entangling individual fish behind the gills. Because each haul of *omena* contains several thousand individual fish, the job of plucking these fish from the net was deemed too time-consuming and boring. The process of fishing *omena* is extremely quick (as the name implies: '*ariap*': 'hurry up'), and the slow fishing of *omena* yields poor catches. It is understood that the stipulated minimum mesh-size for boat seines is under review.

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[4]Author's data.

[5]Author's data.

[6]Author's data.

This use of illegal nets has arisen partly because of the lack of satisfactory regulatory enforcement. However, fishermen have more compelling reasons to use them. Because of the high levels of competition that exist between fishermen, as well as declining per capita catches, the short term benefits to be gained from using small mesh-sizes far outweigh the benefits of using larger ones (see Chapter 6). Fishermen do face the possibility that they may be caught using illegal nets by Fisheries scouts, and having an illegal net necessarily means that the fisherman makes himself vulnerable to bribery costs. However, the benefits to be derived from using illegal nets outweigh the costs associated with bribery. It notable that the cost of a bribe rarely exceeds the cost of the net. Fisheries scouts are careful to ensure that this remains the case, otherwise fishermen would simply replace confiscated gear.

There is further evidence of the distorted communications between the KFD and the fishermen. Of 98 respondents questioned, just 28 (28.6 per cent) knew the legal minimum mesh-size for gill-nets.[7] Most of those questioned believed it to be 100mm, while many seemed to think it was markedly above the stipulated minimum. However, fishermen were unanimously clear as to why there were mesh-size restrictions, and all agreed that enforcement of such regulations would be of benefit to the fishery. As well as being controversial, the issue of mesh-sizes is confused. Four Fisheries scouts interviewed at one beach claimed that the legal minimum mesh-size for gill-nets was 100mm, a size apparently confirmed elsewhere: "[o]n request, the [Fisheries] department informed us that the legal net sizes are: gill-nets: 10 cm and above, dagaa nets [*omena*] - 1 cm, beach seine nets - 5 cm and above, but the scouts at Wichlum beach could not give us this information" (Riedmiller 1994: 332). However, no decrease in the legal mesh-size minimum has been gazetted, and respondents at the Kisumu District Fisheries Headquarters, and the Nyanza Provincial Fisheries Headquarters confirmed the 127mm mesh-size restriction.

The extent to which the 1989 Fisheries Act has served to control trawling is not clear. Most of the trawlers in the Kenyan Sector of Lake Victoria are in fact government owned, and their trawling is ostensibly for research purposes. Whatever fish they catch is, under the terms of The Act, allowed to be auctioned off to fish traders after the trawl is completed. The amount of research being carried out appears to be considerable. At Asat Beach, when visited in September 1994, fishermen claimed that there were five trawlers stationed there, and two of these were observed during the survey. In a period starting on July 28th, through to September 20th 1994, these trawlers caught a total of 5,820 kilograms of Nile perch, and 2,_ _8 kilograms of so-called 'under-size' fish (Nile perch of under 1 kilogram).[8] All but one of these trawlers were owned by government institutions, and all sold their catches through the Asat Fishermen's Co-operative Society to established Nile perch buyers, while they sold 'under-size' to local fish processors for smoking. As one Fisheries official commented, "[i]t is not surprising that [the trawlers] sell off their fish. What else would they do with the surpluses they catch? After all, they can't experiment on all of the fish they catch."[9]

However, in December 1994, four crew members of a trawler were charged with illegal trawling (The Standard 17/12/94); and in May 1995, two trawlers fishing off Homa Bay were seized, and their crews charged (The Daily Nation 11/5/95: 4). Fishermen claim that trawlers are too efficient, and drastically reduce the amount of fish available. Catch declines around Asat were blamed on the trawlers, and fishermen complained that their gear was sliced through and dragged away by the trawlers. Fishermen were leaving Asat Beach because of this, and Asat was the only beach in this survey that had decreasing numbers of fishermen. The controversy surrounding trawler activity has led to strong protests from fishermen.

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[7]Author's data.

[8]Asat Fishermen's Co-operative Society catch records, Interview no. 98, Asat Beach, 21/9/94.

[9]Provincial Director of Fisheries, Mr. S. S. Andika, Interview, Nyanza Province Fisheries Department Headquarters, 30/3/95.

One group of fishermen from Homa Bay District complained to their Provincial Commissioner of nightly trawling by five trawlers (The Standard 21/3/95: 4), while in January 1996 a demonstration of 'more than 300 fishermen' occurred, protesting at the 'destruction of their fish traps and equipment by trawlers,' in Winam Gulf (The Nation 12/1/96). Such conflict between small-scale fishermen and large, mechanised fisheries is common throughout the 'developing' world (Kurien 1988; Begossi 1995).

The restrictions which the 1989 Fisheries Act has placed on fishing in known fish breeding areas also appear to have failed. 98 fishermen were asked whether or not they would be prepared to fish in a fish breeding area. 70 (71.4 per cent) replied that they would not, and that this was because these contained 'the fish of the future' or 'our children's fish.'[10] The remainder said that they had no qualms about doing so, often claiming that they were 'driven by hunger', or that if there were big fish there they would fish them "you do not help fish, you kill fish"[11] Whatever the feelings of fishermen, however, the identification of fish breeding areas is problematic, and most fishermen stated that they did not know where such breeding grounds might be located.

In an attempt to gain an impression of what fishermen felt to be the short comings in regulatory enforcement and the 1989 Fisheries Act, 128 were asked what they would do if they were the Director of Fisheries. Their responses are summarised in Table 5.1 below. Many of these responses reveal fishermen's ignorance of The Act. Several of the issues that fishermen stated they wanted to be tackled are already addressed. However, in the absence of any enforcement of The Act, fishermen are often under the impression that either these regulations are not enforced rigorously enough or that they do not exist at all. Thus, for example, 57.8 per cent of the sample wished net mesh-sizes to be restricted or that some permanent minimum mesh-size be established and enforced. Others felt that there should be closed seasons or the banning of certain gear types, all of which are provided for under the terms of The Act. Just three respondents (2.3 per cent) felt that present regulations and levels of enforcement were satisfactory.

If I was the Director of Fisheries, I would:	N	%
Establish a permanent minimum mesh size/restrict mesh-sizes:	74	57.8
Do something about theft and/or piracy:	66	51.6
Provide unconditional loans to fishermen:	39	30.5
Ban certain methods/gear:	30	23.4
Advise fishers on suitable fishing methods, times of year to fish, restrictions etc.	17	13.3
Ensure that all are licensed to fish	15	11.7
Provide conditional loans to fishermen	15	11.7
Provide refrigeration facilities to beaches	14	10.9
Increase/stabilise fish prices	13	10.2
Closed season on some gear/fishing methods/mesh-sizes	12	9.4
Assist fishermen with marketing	12	9.4
Search for lost/stolen nets	10	7.8
Ban fishing in, or protect, nurseries	9	7
Improve co-operative facilities and/or services	9	7
Encourage fishermen to fish deeper/further away from shore	9	7
Place restrictions on the numbers of fishermen	8	6.2
Seek co-operation between riparian states for control of lake	7	5.5
Rid the lake of the water hyacinth (see Chapter 6)	7	5.5
Encourage the fishermen to save against days when they catch nothing	7	5.5

[10]Author's data.

[11]Interview no.261, Misori Beach, 15/3/95.

Provide some kind of rescue service for fishermen in trouble	6	4.7
Reduce the price of/banish fishing licences	6	4.7
Decrease/control gear prices	6	4.7
Abolish middle-men	6	4.7
Encourage employment alternatives by developing farming	6	4.7
Ban the manufacture of under-sized nets	6	4.7
Closed season on all gear types	5	3.9
Improve/maintain/create access roads to beaches	5	3.9

Table 5.2: Fishermen's Resolves if they were to be appointed Director of Fisheries.[12]
N.B: Most respondents gave more than one response and percentages exceed 100.

In addition, fishermen do want action to be taken over such issues as theft and piracy on the lake, control of the water hyacinth and assistance in the improvement of co-operatives and the provision of refrigeration facilities, all of which are beyond the present mandate of the KFD. On the whole, however, fishermen seem to regard regulatory mechanisms such as mesh-size control, gear prohibition, closed seasons and area closures as legitimate means for controlling the fishery. The reason for fishermen's enthusiasm for these regulatory mechanisms may lie in the fact that, on the one hand, they are unaware that alternative regulatory mechanisms might be utilised in managing a fishery; and on the other hand, that they are ignorant of the regulations embodied in The Act, either because no one has explained these to them, or else because of inefficient enforcement. Indeed, 13 per cent of fishermen felt that the KFD could play a bigger role in providing advice to fishermen on such things as gear usage, the best times of year for fishing and indeed, why certain rules and regulations exist. As one respondent put it,

> "The Fisheries Department does not help the lake one little bit...we fishermen are normally seen as stupid because we do not know what to do with our money. The Fisheries Department should teach us how to invest our money best...we are uneducated, and we do not understand our rights, so when the scouts come and harass us, then we just live in fear of the scouts, and yet we should work together" (Interview no.178, Kiumba, 24/11/94).

5.5 Conclusion

The 1989 Fisheries Act utilises regulatory measures typical of many fisheries around the world. The major failing within many of these kinds of contemporary fisheries management models is that they treat fisheries as ubiquitous, irrespective of the kind of ecology within them, or the culture of the people who exploit them. Despite this, the locationally specific differences between the globe's fisheries necessarily mean that the results of such regulatory systems cannot be expected to be homogenous. This is certainly the case with Kenya's Lake Victoria fishery, where contemporary management models have been applied with little consideration either for the past failure of similar models, or for the fishing populations who are supposed to be regulated by them. The nature of the regulatory tools in force in the fishery suggest that they are derived from Maximum Sustainable Yield (MSY) and Maximum Economic Yield (MEY) models. However, in the absence of any stock or effort data, these regulations operate within a vacuum, with no objectives to aim for and no parameters within which to work.

An additional failing with these models is that they assume that governments will have the technical expertise, funding and monitoring capability with which to implement and enforce them. Earlier, it was mentioned that the KFD earns some US$ 70,000 from the sales of fishing licenses and boat registration (Government of the Republic of Kenya *et al.* 1995).

[12] Author's data.

Despite additional contributions from central government and, occasionally, international development agencies, the total cost of wages for all of the 611 KFD personnel stationed on Lake Victoria comes to a yearly average of some US$ 413,019 (Government of the Republic of Kenya *et al.* 1995). As central government finds itself increasingly unable to meet budgetary demands, KFD personnel only draw wages, and have not the funding to provide services. Indeed, recurrent operating expenses within the KFD represent just 9 per cent of the total KFD budget, while the remaining 91 per cent is used exclusively to pay wages (Government of the Republic of Kenya *et al.* 1995). As a consequence, the assumption made in much contemporary fisheries management planning that governments will automatically be able to pay for the implementation and enforcement of formal, state-based, fishing regulations is untrue. Such high-cost management models are inappropriate to the funding and monitoring capabilities of the Kenya Fisheries Department (KFD). The 1989 Fisheries Act has not, therefore, been adequately enforced, has not been explained to fishermen and the presence of certain variables - such as the wide-spread use of illegal fishing gear - suggests that The Act has been an ineffective means of controlling exploitation within, and production from, the fishery. Furthermore, the most visible evidence of the KFD on the beaches are the fisheries scouts, who, through their persistent harassment of fishermen for bribes, have served to foster poor relations between the KFD and the fishing communities. While many of the attributes of The Act are both necessary and desirable, the difficulties of enforcement render it close to redundant. The Kenyan Government admits that, on the whole, regulations are rarely enforced: "Visits to the beaches revealed total disregard of regulations [sic.] (e.g. landing of undersize fish) even in the presence of fisheries personnel" (Government of the Republic of Kenya *et al.* 1995: 55). This failure to enforce regulations occurs despite Kenya, with the smallest portion of the lake, having the highest number of KFD staff: 611, compared to 106 in Uganda and 178 in Tanzania (Government of the Republic of Kenya *et al.* 1995). These problems are those which are restricted largely to the design of the 1989 Fisheries Act itself and its poor application. The failure of The Act, however, cannot be restricted to these problems alone. One of the greatest determinants of its success is the extent to which fishermen perceive any benefits in obeying the regulations outlined above. In Chapter 6, the study will examine some of the factors that influence obedience of The Act, as well as serving to define exploitation patterns within the fishery.

6 'Informal' regulation in Kenya's Lake Victoria fishery

[F]isheries are a human phenomenon...strictly speaking, there is no fishery without a human fishing effort (J. R. McGoodwin 1990: 3).

6.1 Introduction

Like many common property fisheries that suffer from open-access conditions, Kenya's Lake Victoria fishery in the 1990's has come to be characterised by high effort levels and intense competition between fishers. These and other factors are problems to fishers insofar as they represent restrictions on access to good catches. They may also determine the perceived benefits to be gained from adhering to formal regulations and, indeed, determine the extent to which localised initiatives develop to create community-based regulatory institutions. Under conditions of acute competition, fishing becomes defined in terms of meeting livelihood needs through coping strategies designed to minimise competition and the chance of a zero catch on a given day. 181 fishers were asked what they considered to be the main problems that they faced on the lake, and these are summarised in Table 6.1 below:

Main problems	N	%
Catch declines	78	43
Theft of nets and/or theft of fish from nets	76	42
High cost or rising cost of fishing gear	58	32
Illegal fishing methods, under-size mesh-sizes and/or *ochun* fishing methods	46	25.4
Rain and/or strong winds as a limitation on fishing	38	21
Mbita Causeway	27	15
Fluctuating on unstable fish prices	24	13
Too many fishers and/or nets on lake	21	11.6
Fisheries 'scouts' because of corruption and/or harassment	18	10
Water hyacinth	16	8.8
Trawlers	15	8.2
Catches are too variable	15	8.2
Fish prices are too low	14	7.7
Diseases and illnesses that can be caught on the lake	11	6
Poor enforcement of (formal) fishing regulations	10	5.5

Table 6.1: Major problems faced by fishers.[1] N.B. percentages exceed 100 because most fishers listed several grievances. Only problems mentioned by 10 per cent or more fishers are noted.

Fishers's concerns over the behaviour of Fisheries 'scouts', corruption, poor regulatory enforcement and trawlers, and how these have come to influence fishing activities, have already been discussed in Chapter 5. The rest of the problems noted in Table 6.1 are addressed in this chapter from eight broad perspectives, all of which influence access to fish stocks to greater or lesser degrees:

(a) Farming: this may, on the one hand, serve to diminish fishing effort, or, on the other hand, to increase it, depending on whether or not fishers see it as viable or not.
(b) Investment limitations and capacity: these do not serve to stem the flow of fishers into the fishery, but do limit their access to fish.

[1] Author's data.

(c) Theft: this may affect what types of gear fishers invest in, how much gear they buy, the time they spend on the lake and where they fish.
(d) Catch declines: these limit access to fish and play an important role in defining how fishers view the future of the lake and their investment patterns.
(e) Increases in fishing effort: these limit access to fish through the competition it generates, and consequently, reduce the amount of fish per fishing unit.
(f) The impact of marketing variables: these may not limit fishing efforts. However, because the market is unpredictable and subject to rapid change, fishers try to limit its impact by intensifying their fishing.
(g) Community change: traditional Luo community structures appear to be breaking down, and this has contributed to the decline of community-based controls over resources.
(h) Ecological factors: fishers have limited control over these, and may result in the collapse of the fishery in the future.

All of these factors have a bearing on access to fish and will determine the nature of exploitation and henceforth, production levels. These are also factors which will affect the degree to which fishers are prepared to obey regulations. As will be shown below, most of these factors do ensure that fishers perceive no benefits from adhering to state-based formal regulations, and, conversely, do perceive benefits from disobeying them. This appears to have resulted in the the over-exploitation of fish stocks and declines in the fishery's productivity. In the long-run, these trends will undermine the fishery's contribution to the regional and national economy. These worrying trends are the direct result of the increasing inability of fishing communities to fulfill various livelihood functions and needs. This chapter sets out to demonstrate how important these factors are in influencing access to fish, fishing activity, production levels, and, ultimately, how they serve to regulate the fishery. Figure 6.1 below shows the location of place names mentioned in the text.

6.2 Farming

The lake-side farming zones are not ideal farming areas, suffering from unreliable rainfall and poor soils (See Chapter 1, 1.6).

> "Although the region's cash crops are many (notably cotton, groundnuts, tobacco, sugar cane and coffee as one goes uphill from the lake), the Luo are far outfarmed in both cash and food crops by other Kenyans like the adjoining Gusii and the central Kenyan Kikuyu - people whose highland climes and richer volcanic soils give them the edge to begin with" (Shipton 1995: 166).

Nevertheless, farming constitutes an important component of fishers's livelihoods. Of 238 respondents questioned, 87 per cent had access to land (owned or borrowed).[2] Of these, just 5.3 per cent of them did not farm it. Most fishers will spend some time of the year on their farms, or, in the event that they have no access to land, spend time helping their families with their farms. As a consequence, farming will influence the amount of time that fishers spend fishing over a year, and for 60 per cent of fishers interviewed, farming did interrupt fishing.[3] Most of these had land located far from where they were fishing, and, on average they spent 105.2 days of the year away from the lake. For the remaining 40 per cent of the sample, farming did not interrupt fishing. As such, it would seem that during the farming seasons (late February-early May, August-September) effort levels on the lake do drop (Geheb and Binns 1997). However, while farming may draw labour away from the lake periodically, the problems associated with it may also encourage people to seek income-generating employment in the fish industry.

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[2]Author's data.

[3]n=168; Author's data.

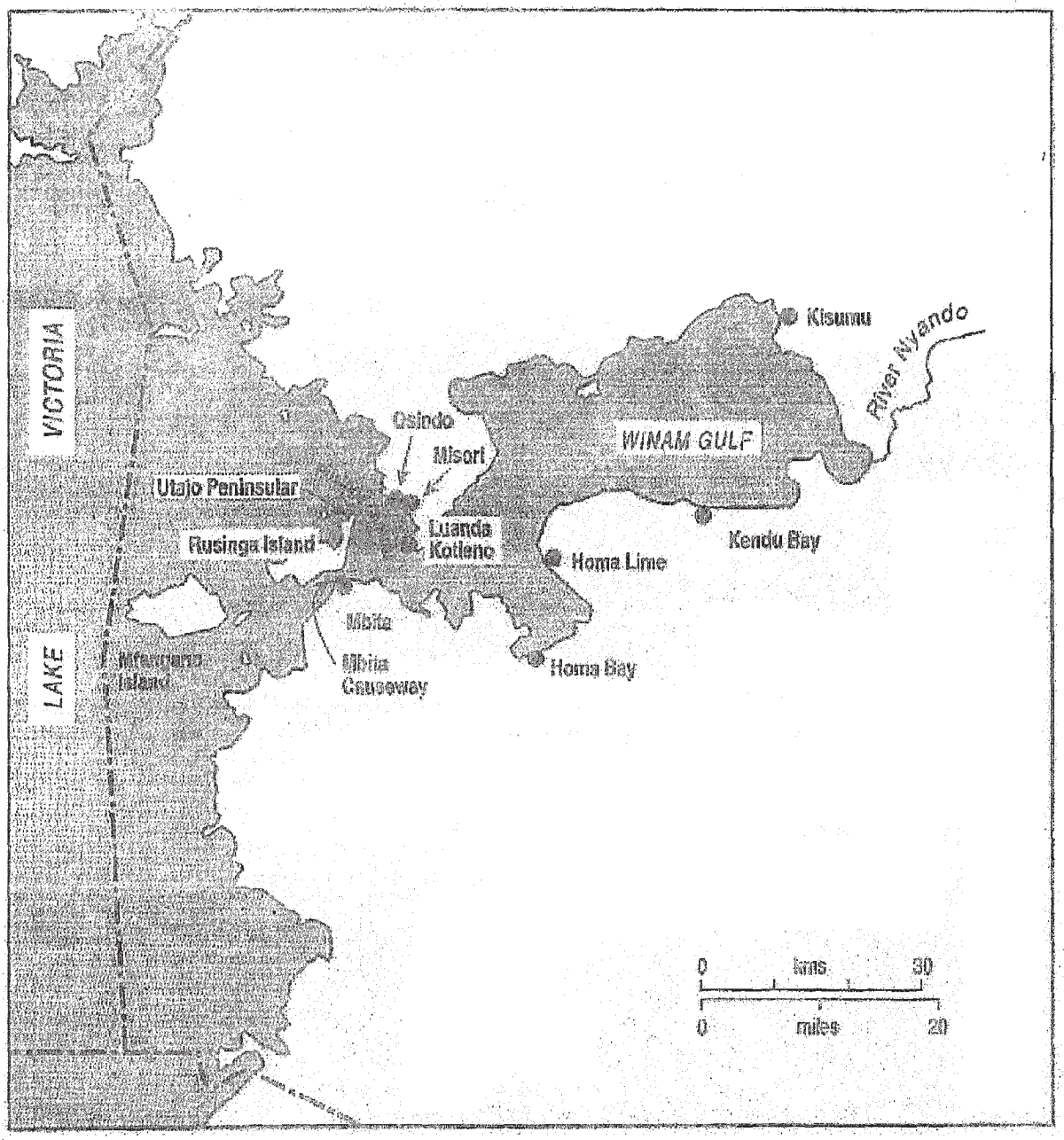

Fig. 6.1: The Kenyan Sector of Lake Victoria, showing place names mentioned in Chapter 6.

182 fishers were asked whether or not they considered themselves more farmers than fishers.[4] 51.6 per cent of the sample said that they were fishers, 45 per cent felt that they were farmers, and 3.4 per cent felt that they were either both or neither. Of this sample, 140 of the respondents qualified their answers. Table 6.2(a) provides the reasons given by those fishers who considered themselves to be more fishers than farmers, while Table 6.2(b) provides the reasons given by those who considered themselves more farmers than fishers.[5]

[4]Author's data.
[5]Author's data.

Reasons why more fisher than farmer	N	%
Because fishing provides a daily income, unlike farming	14	22.9
Fishing is 'my tradition' or 'in my blood'	14	22.9
Plot size too small to be productive or because they have no land	10	16.4
The lake provides a better income than farming	9	14.7
Harvests too poor to merit farming	5	8.2
Rainfall too poor to merit farming	5	8.2
Because I have never farmed before	4	6.6
Farming does not provide a cash income	3	4.9
Farming is too hard work	3	4.9
Because the lake, unlike the land, will always provide	3	4.9
The lake is more 'secure' than the land	2	3.3
Farming in-puts are too expensive	2	3.3

Table 6.2(a) Reasons stated as to why respondents considered themselves to be more fishers than farmers.

Reasons why more farmer than fisher	N	%
lake too insecure (declining catches, theft, variable incomes)	29	50.9
Farming earns more than fishing	8	14
I only fish while I await harvest	7	12.3
The lake holds no future	5	8.8
The land gives us grain, and therefore we save money by not having to buy it	5	8.8
I only fish to cover daily living expenses	2	3.1

Table 6.2(b) Reasons stated as to why respondents considered themselves to be more farmers than fishers.

The particular circumstances faced by any individual, therefore, may determine whether or not farming is an incentive that draws him/her away from the lake, or a disincentive to encourage him/her into the fishing industry, depending on a variety of factors regarding the security and the income making potential of either resource base. The amount of time a person spends fishing may also be an indication of whether he is a 'full-time' or a 'part-time' fishers. Other researchers have noted that for many lake-side sub-clans, there is an annual move from the land to the lake when the farming season has ended after harvest between late July to early September:

> "From March until August or September, the people of Katweng'a are preoccupied with gardening, weeding, and harvesting of millet and some maize. By October, the harvests are done, and like many other communities in Yimbo, Uyoma, and Asembo, the people turn their attention to the lake, spending the next four or five months on the lake shore or on the lake" (Cohen and Odhiambo 1989: 99).

Ochumba and Mainga (1992: 129) note that "[t]here is an annual movement of fishers between the shore, open lake and agricultural farm." It is these population groups that we may consider to be 'part-time' fishers, spending only a small part of the year away from their farms. These farmers will only fish as they await their crops to grow, or when farming activity is limited, such as immediately after the harvest.

In the pre-colonial fishery, this movement between lake and land was probably defined by broad nutritional security concerns within which farming was a priority. The movement represented a means by which risks associated with either farming, herding or fishing could be spread, lest the productivity of any one resource should decline. This was especially true of communities along the lake shores, where rainfall tends to be more unreliable and soils more infertile than areas inland from the lake shore. Although the reasons behind this mobility in the 1990's remain the same, the necessity for the movement has become accentuated.

It is no longer clear that if, for example, farming should fail fishers, then the fishery will sustain them through the drought. Instead, both farming and fishing are necessary if broader nutritional security objectives are to be accomplished. As the need for cash remains high, and Luos have increasingly fewer subsistence resources on which they can rely, the relative importance of fishing while they await harvest has become much greater (Geheb and Binns 1997).

Assuming that a part-time fisher is one who spends at least half of the year away from the lake, then 21.7 per cent of the sample may be classified as part-time fishers.[6] No fisher who had land adjacent to the lake harvested more than once a year. Most harvests are stored in granaries, and it was rare for a granary to fulfil the nutritional needs of a whole family from one harvest to the next. As a consequence, this annual movement between lake and land represents a coping mechanism designed to mitigate the impact of declining yields and farming difficulties.

168 fishers were asked what they considered to be the main problems in farming (Table 6.3), which would affect their choice for fishing over farming or *vice versa*. Needless to say, the problems stated are often the product of localised conditions, and those which occurred in some areas, were not relevant to others. Thus, for example, fishers from the Karichwonyo Clan in South Nyanza faced three primary problems that fishers who farmed elsewhere encountered to a far lesser extent. Firstly, disease had wiped out much of the cattle population of the area. This meant that most Karichwonyans ploughed by hand. Because ploughing by hand is a hard and exhausting activity, many Karichwonyans did not have the physical energy to plough all of their land.

Problem	N	%
Poor and/or unreliable rainfall	112	66.7
Insect pests (termites, ball weevils, stock borers, army worms)	43	25.6
Insufficient capital to pay for labour and ploughing inputs	40	23.8
Animal Pests (hippos, weaver birds, cut throats, squirrels, monkeys)	30	17.9
Plots too small to be really productive	21	12.5
Insufficient capital for other inputs (pesticides, insecticides, herbicides, seeds, fertilisers, farming equipment)	20	11.9
Soil too infertile to be productive	15	8.9
Difficulties irrigating land/not having a pump	15	8.9
Crop diseases (esp. 'smut')	12	7.1
Domestic livestock wandering on to farms and eating and/or trampling crops	12	7.1
Sometimes too much rain, resulting in water-logging and/or flooding	11	6.5
Timing problems (arising from inability to secure sufficient capital and/or labour in time for rains)	11	6.5
Poor market for maize and/or millet because everyone grows these	7	4.2
Soil gets too hot, killing shoots and/or making it too hard to plough	7	4.2
Not enough technical advice/assistance	6	3.6
Soil erosion	5	3

Table 6.3: Main Farming Problems Listed by Respondents.[7] N.B. Percentages exceed 100 because most respondents listed several problems. Only problems mentioned by five or more people are listed here.

Secondly, cow dung restricts the growth of the purple witch weed.[8] In the absence of cattle herds in Karichwonyo, the weed had prospered. Finally, Karichwonyans have also been subjected to the designs of a

[6] n=166; 21.7% = 36.

[7] Author's data.

[8] *Striga hermonthica*.

Norwegian aid company based at Homa Lime, which had introduced a quick-yielding millet variety, 'Serendo'. The organisation was also responsible for the marketing of the product, and while they were still based at Homa Lime, Karichwonyan farmers were pleased with the outcome of the project. When the organisation departed, however, Karichwonyan farmers were left with no marketing out-let for their millet given that the local population did not like it, and the original, and more popular, indigenous seed variety was said to have been lost.

Farming problems have also arisen as a consequence of land fragmentation. For most Luo land-owners, land is inherited from their fathers or given to them by their families when they marry. Of 163 fishers questioned, just 18 (11 per cent) had bought any land. 120 (73.6 per cent) had inherited their land, and 54 (33.1 per cent) had been given land by their families.[9] The land an heir will receive is almost always in a number of plots. Fathers will divide land between their sons in such a way that each son receives a piece of the best land, a piece of the poor land and so on. Of 157 respondents questioned, 56.7 per cent (89) had two or more plots of land.[10] Of these, each person had an average of 3.2 plots of varying sizes. As a consequence, the land available to be inherited declines through generations, while the number of plots often increases. This land fragmentation places considerable limitations on harvest potentials, since the smaller the piece of land owned, the less the potential harvest. Since fishers do not own much land in any case, an average of 2.25 hectares apiece,[11] land fragmentation poses considerable problems to fishers. While this may not affect net agricultural production from the Nyanza region, it does affect per capita production levels. In this way, cultural traditions serve to influence the production potential of land, and the amount of land an individual stands to inherit is dependent on how much land his father owns, how many brothers he has, and what kind of relationship he shares with his father, given that a favoured son often receives more land than his brothers. This also means that while most farming is carried out by women, most of the land in the Nyanza region is owned by men. While women may be allocated land by their husbands for personal use, this land will then pass on to their sons. Land is available for purchase in most places around the lake. However, this land tends to be the least fertile, and will only be sold in the event that its owner urgently needs cash for whatever reason. As such, poor access to land or owning infertile plots may lead farmers to turn to fishing for an additional income, so as to try and accumulate enough capital to purchase the additional agricultural produce which he and his family needs.

The unreliability of rainfall poses an additional problem for fishers. As mentioned earlier, the land immediately adjacent to the lake normally suffers from unreliable and/or poor rainfall (Herring 1979), and it is here that most fishers have their land. 164 fishers were asked if they felt that rainfall reliability in their farming area was good, fair or poor. 20.7 per cent (34) felt that it was good, 4.3 per cent (7) felt that it was fair, while the majority, 75.6 per cent (124), felt it was poor.[12] It has also been suggested that land in the area adjacent to the lake tends to be infertile (Kenya Task Force 1988). However, most fishers did not feel that this was the case. 79.7 per cent (122) felt that the land in their area was fertile, 5.9 per cent (23) considered it to be of moderate fertility, while 5.9 per cent (23) felt it to be of poor fertility.[13] Thus, inadequate and/or unreliable rainfall may be another factor that encourages people to turn from farming and to seek incomes from the lake.

Labour and input constraints may encourage people to seek incomes from the lake. Most labour used on farms is family-based: of 203 fishers questioned, 57.6 per cent (117) used family labour exclusively; 38.9 per cent (79) used a combination of family labour and paid casual labour, 2.5 per cent (5) used help from their church congregations in return for a meal or a small payment to the church donations box, while 1 per

[9]Figures do not add up to 163 - many fishers received land from several sources; author's data.
[10]Author's data.
[11]n=205; Author's data.
[12]Author's data.
[13]Author's data.

cent (2) used additional help from groups of friends.[14] Labour demands are highest during weeding which occurs just after the rains have started, normally in April. Inability to find sufficient labour at this time may have severe repercussions on harvests. In previous years, Luo farmers could rely on the '*rika*'[15] labour sharing system to ensure that enough labour was at hand on the farm at the right time of the year. The *rika* system involved groups of neighbours helping one another on farms in rotation (Shipton 1995: 175). The *rika* system is increasingly rare, however, and farmers must now pay for whatever additional labour requirements they need.

Farmers must also consider labour requirements during ploughing. This normally occurs late in the year or at some time between January and February. The *rika* system could also be used during ploughing, with neighbours sharing oxen and ploughs between them. However, ploughing now costs money, and many fishers cannot afford to have all of their land ploughed. Of 58 fishers questioned, 55.2 per cent (32) said that they did not plough all their land because of this constraint.[16] As such, farming costs represent constraints on farming, and may compel people to seek cash-incomes in the lake in order to pay for these.

Labour and ploughing represent the most expensive farming costs that fishers face. In the year prior to interviewing (1993/1994) those fishers who had paid for these expenses each spent an average of Kshs. 2,607.8/-.[17] Expenditure on other inputs, such as pesticides, fertilisers and so on, are negligible because most do not feel that the returns on these are good enough. Money for these farming costs comes from two primary sources: the lake and the sale of livestock - which may also have been bought with lake earnings. It is rare to find fishers who are prepared to invest money earned from their farms in the lake. Land represents an integral part of Luo society and custom, and is the most important component of sub-clan identity. The concept of 'home' is always associated with land. A fishers may never have lived in a place, although he still considers it his home because he expects to inherit land located there. The dead are buried on home land, and it therefore represents a component of Luo history and genealogy. The prospect of using land as a collateral in the securing of loans and/or credit seems absurd to many Luos (Shipton 1995; Wilson 1968).

Traditionally, Luos prioritise farm produce as a source of nutrition, the most important of which is '*kuon*' (maize or millet meal). This prioritisation will even occur if fish prices are lower than *kuon* prices on the market. Therefore, if the price of *kuon* rises on the market, or milling fees increase, Luos prefer not to buy any fish to accompany their meals lest they risk going without *kuon*. Indeed, at such times fish prices drop. As a result, ensuring that farms continue to produce, albeit in ever decreasing amounts, can be a compelling reason for Luos to fish so as to cover farm input costs and to make up for any agricultural deficits that they encounter.

Fishers grow a variety of crops, the most common of which are those which are drought-resistant, such as maize, millet, cotton, cow peas and beans, and those which can tolerate water-logged conditions, such as arrowroot, rice, kale and sugar cane. Most of the drought-resistant crops are grown for subsistence purposes (with the exception of cotton). Many of those crops that tolerate water-logged conditions are perennial, and in the majority of cases it is these crops which are offered for sale. Thus, farming also represents an important income-making option, and in recent years, the farming of horticultural crops has become popular. This has two advantages. Firstly, most horticultural crops are perennial, and farmers can earn from sales throughout the year. Secondly, the types of crops grown have a high demand, particularly kale and tomatoes. Because maize and millet are grown by virtually everyone, the latter do not have good markets, unlike horticultural crops.

Fishing communities, with land by the lake, are particularly well placed to grow horticultural crops which require irrigation throughout the year.

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[14]Author's data.

[15]Also called the '*saga*' system.

[16]Author's data.

[17]n=74; Author's data.

Most irrigation is carried out by hand, which is hard work, and may discourage fishers from investing in this area. Nevertheless, from a sample of 206 fishers, 62 per cent of them or their families sold some of the crops that they grew.[18] Most sold tomatoes (34.4 per cent) and kale (32.8 per cent). Other important cash crops are cotton (grown and sold by 25.8 per cent of respondents), maize (sold by 17.2 per cent of respondents), ground nuts (sold by 17.2 per cent of respondents) and sugar cane (sold by 13.3 per cent of respondents).[19] Of the 93 fishers who sold crops, net sales earned them an average of Kshs. 11,868.5/- each over the year prior to the interview (1993/1994), although with wide variation.[20]

Fishers will often divide the labour in their families, so that their wives and sometimes their children are solely responsible for the farming. The small lake-side plots where horticultural crops are grown ('*orundu*') are almost exclusively the domain of women who use the money these generate on household needs such as school fees and extra foodstuffs, while their husbands fish to earn additional incomes which may then be invested on the farms. However, *orundu* farming can be problematic. Irrigating the plots by hand, as has already been mentioned, is hard work. In addition, *orundu* farmers face the threat of hippopotami, which are particularly fond of crops such as kale and potatoes (Geheb and Binns 1997). All the same, the *orundu* play an important role for farmers who, increasingly, can no longer rely on just one income, such as fishing, to cover domestic costs. As plot sizes have decreased and populations increased, fishers face compelling needs to either increase their incomes or to find additional income sources, which may inspire them to seek employment in the fishery and/or to invest in cash-crops (such as cotton), possibly to the neglect of food crops.

The problems associated with farming may make employment in the fishery attractive to many farmers, while conversely, problems associated with the lake may compel fishers to invest in their farms or elsewhere. Thus, it was hypothesised that fishers might consider problems in the lake to be so severe that, as a precaution against the collapse of the fishery, they were investing their earnings beyond the lake. 184 fishers were asked whether or not they had observed if their colleagues were spending more time and/or money outside the lake. 127 (69 per cent) agreed that this was the case; 55 (29.9 per cent) said that this was untrue, while the remainder were unsure.[21] 83 (69 per cent) of those who agreed that this was the case said that fishers were spending increasingly more time and/or money on their own farms or on the purchase of land for agricultural purposes; 49 (27.1 per cent) said that investment was occurring in livestock, in the building of cheap rental housing and small businesses.[22] 68 of those who felt that such a trend was occurring stated when they believed it had commenced, and 63.2 per cent said that the trend had started at some time between 1989 and 1992.[23] There may be two reasons for the choice of this period. On the one hand, the shifting of investment away from the lake may be a response to declining Catch Rates per Unit of Effort (CPUEs). Indeed, the end of the 1980's may well signify the end of the Nile perch 'boom'. On the other hand, it may also reflect improved potentials beyond the lake, particularly in farming. The early 1990's were characterised by severe drought in Nyanza, but following good rains in 1992, fishers may have felt that it was worthwhile to return to farming in 1993 and 1994. In all probability it was a combination of both factors.

Many of the problems listed in Table 6.2 above can be overcome by the provision of farm inputs such as insecticides, herbicides, irrigation, fencing and improved availability of ploughing facilities. At present, however, these problems represent disincentives to farming. If these problems persist and escalate, farmers may be increasingly obliged to turn to the fishery in search of income-generating activities, *despite any catch declines that might occur*.

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[18]Author's data.

[19]Percentages exceed 100 because most respondents sold more than one crop; author's data.

[20]Author's data.

[21]Author's data.

[22]Figures do not add up to 184 because many fishers observed investments occurring in several areas.

[23]Author's data.

It is both necessary and desirable to utilise farming and its development as a means of regulating fishing effort. There is a duality in the movement of fishers between lake and land and *vice versa*, dependent on conditions in each resource base. Thus, if farming fails to yield sufficiently, people may turn to the fishery, while if the lake is not productive enough, people may turn to farming. This dynamic mobility is a response to declining CPUEs in the lake as well as increasing farming problems, and represents a flexible coping mechanism aimed to minimise the increasing problems associated with both resource bases. The above discussion also shows how it is that a community's reliance on other resource pools may affect their relationship with the resource pool under study.

6.3 Investment capacity and limitations

Investment limitations and capacity may serve to limit access to fish. The cheapest way of entering the fishery is as a casual fisher, who will not even have to buy a fishing license because these are normally provided by the boat owners for whom they work. This method of entry into the fishery is extremely common, and for many boat owners, the cash needed for buying their first boat was raised in this fashion. However, cash receipts to casual fishers are not large, being percentages of the catch. Normally, the boat and gear owners stipulate that they expect to receive the largest part of the catch value, some 40-50 per cent. The remainder of the catch is divided between the 'budget' - costs for food, repair twine, boat repairs and so on - and the crew. Thus, the larger the crew, the lower the percentage of the catch value each receives.

It is, therefore, helpful that a fisher can invest in the fishery incrementally, as his financial situation allows him to do so. Thus, many fishers will buy individual planks for their boats over several months or years, building up a stock until such time as they have all that they need to build a boat, and enough money to pay for its construction. Similarly, beach seine fishers may buy rolls of '*manila*' twine little by little, until they have enough to make a net. For *omena* casuals wishing to have their own boat and gear, an entry point may be via buying a lamp. Many *omena* boat owners use the '*agok*' (literally, 'the back') system of paying their crews. The boat owner normally has four lamps on the boat, while an additional two lamps are owned by casuals employed on the boat. These two lamps represent the *agok*, at the back of the boat, and all fish caught from these two lamps are kept separate from the catch caught around the four other lamps. At the end of the fishing trip, the *agok* will pay certain, fixed amounts to the boat owner to cover net and boat usage, and then keep the rest of the catch value, earning more than those casuals without lamps. In this way, a casual with a lamp may accumulate savings more rapidly than those who have not made a similar investment.

Fishers may also enter the fishery by purchasing some cheap type of fishing gear. The most common form of gear in this case is a fishing rod and line, and a fishers need only spend some Kshs. 178/- to enter the fishery in this fashion (see below). This fishing technique does not require a boat, and most angling is done from the shore or from rocks close to the shore. This form of fishing has the advantage that the angler has few overheads, and the most common recurrent cost in this fishery is the purchase of new rods, lines, hooks and bait, all of which are cheap. An angler can further minimise his over-heads by finding his own bait and cutting his own '*odundu*' to make his rod. In this way, an angler may catch enough fish over a short period of time to merit further investment in the fishery should he wish. Once these small investments have been made, the fisher is then in a stronger position to make larger investments.

In Chapter 4, the cost and life span of boats were discussed. Generally, recurrent maintenance costs on boats are fairly low, restricted to the occasional application of tar, the stuffing of cracks or holes with bits of cotton, or the replacement of a rotted plank. Owning a boat can, therefore, be inexpensive. However, the fisher may wish to invest further, for example, in additional gear, and can try to raise the cash needed for this by renting the boat out. Being able to rent a boat is, in itself, a means to improving ones access to fish.

The payment of rent is incremental, and normally paid as a percentage of the catch. Of 62 renters interviewed, 40.3 per cent paid their rent in this fashion (around 10 per cent of the daily catch).[24] In most of these cases, the boat owner would also accompany the boat onto the lake. In this way, most boat owners rent out a seat on the boat, rather than the boat itself, and so will stand to earn an additional income from the rent without affecting his own access to fish.

However, some boat owners, such as those with a large number of boats, or those who have had all their gear stolen, may rent out boats without accompanying them in order to ensure that the boats pay for themselves. Dues on boats rented out in this way are normally paid for in regular, monthly amounts. Of the sample referred to earlier, 33.9 per cent paid their rent in this fashion, paying an average of Khs. 762/- a month. The final method of paying boat rent was by giving the boat owner a full day's catch once a week and 25.8 per cent of respondents paid in this fashion. Again, boat renters who paid in this way were not normally accompanied by the boat owner. The importance of most of these payment systems is that they allow the fisher to pay in instalments. Additionally, since many rent payments are percentages of the catch, a fisher need not worry about ensuring that he has enough money to pay the rent on a given day. An additional merit of renting a boat is that it does not tie fishers to the fishery, and in the event that catches declined, they can leave the fishery without having made any substantial investment in it. Those fishers who paid their rent by the month did have to ensure that they had enough money at the end of the month, and this necessitated that they save in some way.

Like many small-scale fishing communities around the world (cf. McGoodwin 1990), the level of institutional saving amongst Kenya's Lake Victoria fishers is low, and generally restricted to a few, wealthy boat owners. There are several possible reasons for this. Fishers generally budget on a daily basis, where budgets are defined by the daily catch. The most commonly cited reason amongst respondents for not saving was that "we will always catch more fish tomorrow". Fishers, additionally, have two possible sources of institutional credit: banks and co-operative societies. However, fishers have limited access to these because they tend to be located in urban centres which are often far from the landing beaches. In addition, such institutions revolve around high levels of bureaucracy and in environments with which fishers are not familiar, and utilising conventions which, to many Luo, seem alien. Banks are often seen as places inhabited by the wealthy educated, and not places where fishers are welcome. An additional problem, which banking institutions share with co-operative societies, is that the conditions on which credit and loans are advanced generally do not reflect the high-risk environment in which fishers operate, which means that few fishers are able to advance any kind collateral.

Co-operative societies, on the other hand, are wide-spread and fairly accessible to fishers. However, fishers are deeply suspicious of co-operatives, and complain that they are biased, awarding loans only to the kinsfolk and friends of committee members. "The co-operative could work a bit better if it were better managed...it suffers from nepotism...and the fishers that are not in the same clan as the co-operative officials are unlikely to get a loan regardless of their merit."[25] One former co-operative chairman explained that he awarded loans to fishers on the basis of "...their hard work and how close they are to me."[26] Of 194 fishers interviewed, only 35 per cent were fully paid-up members of a fishing co-operative.[27] Of 62 fishers interviewed, 30.6 per cent had received a loan or a 'bonus' from their co-operative society.[28] With these low rates of payments to members, fishers often failed to see why they had to make regular contributions, and invariably stopped doing so.

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[24]Author's data.

[25]Interview no.5, Dunga, 19/3/94.

[26]Interview no.69, Kichinjio, 10/8/94.

[27]Author's data.

[28]Author's data.

Nonetheless, fishers do require credit. Although the daily budget derived from fishing allows them to survive in a 'hand to mouth' fashion, there will invariably be times when fishers must be able to draw on credit if some large expenditure must be made, such as the purchase of nets and/or a boat. In some cases, fishers are able to obtain goods on credit from store-owners with whom they have a good relationship or to whom they are related (Jansen 1973). More commonly credit systems in Luo fishing communities are a product of a series of patron-client relationships as well as inter-linked deals, which have evolved within the socio-cultural context of the fishing community. Thus, as examined in Chapter 4, fishers often have special arrangements with fish traders from whom they may get loans for certain necessary purchases. Indeed, fish traders normally prefer to have their suppliers indebted to them so that they may exercise greater control over fish supplies, and actively encourage this form of debt-bondage. In this sense, the trader plays a patron role, and the fisher a client role (see Amarasinghe 1989).

Credit systems are equally defined by the role of capital within community structures. Luo fishing communities are generally characterised by high levels of inter-linkage between members. Indeed, these kinds of relationships serve to distinguish one sub-clan from another, and most sub-clans members are, in some way or another, related to each other. If one community member should, for example, make a windfall catch, then all other members generally react to this by seeking credit, demanding the repayment of past loans and favours, or by announcing an urgent need for cash. Because of the relationship that the fisher shares with his community, he is not generally able to forgo these demands, lest he is seen to be parsimonious or that he does not respect the honour of his association with the sub-clan. The repercussions of failing to meet these demands undermines the role of the fisher within his own community and can even erode the basis from which he draws sub-clan identity. In their efforts to ensure that these demands are met, fishers may be rendered close to poverty, or, as will be discussed below, driven to migration. As a consequence, fishers may go to some length to try and conceal their earnings, or else to spend their money as quickly as possible, before it all disappears into the community. This may be part of the reason why fishers rely so heavily on the daily budget system, ensuring that they have no money left at the end of the day which may be vulnerable to community demands. Additionally, fishers also seek to protect cash from themselves "...since cash is so versatile and divisible. They fear it will burn a hole in their pocket" (Shipton 1995: 181), and for these reasons, fishers consider it prudent to get rid of ready cash as quickly as possible, be it on liquid investments such as livestock, in fixed investments such as gear or farming inputs, or indeed, on prostitutes and alcohol.

However, the function of these demands and relationships is double-edged, for the fisher can similarly call upon other community members for credit, loans or financial contributions as he needs them, and ensuring that demands on his own financial success is, in many ways, an investment in the future and represents a coping mechanism designed to ensure that while the fisher may rarely have access to ready cash, he does have access to his previous investment in the community on which he can draw at any time. This credit system is radically different from that offered by institutional credit sources. With the latter credit sources, applications have to be made well in advance of requirements, paper work must be completed and adequate collateral found. In a working environment which often necessitates quick decisions, it is important that cash be quickly obtainable. This credit system does not normally yield large amounts of money, and most expenditure is limited to fairly small sums, something which institutional credit sources rarely supply. However, institutional sources can provide larger loans, but fishers nevertheless prefer to prepare themselves for large expenditure through incremental investments. This system of saving is far more flexible and dynamic than any institutional form of credit, and allows the fisher to respond rapidly to changing conditions. It is, in this sense, a coping mechanism on which the fisher can rely.

Generally, it would appear that the higher the amount a fisher invests in any particular gear, the better his access to fish. In other words, the more efficient a fishing gear is, the higher its cost. 'Access', as far as fishers are concerned, implies the level of guarantee that he has in securing a catch on any given day. For example, initial investment requirements into the angling fishery tend to be low, and anglers rely heavily on 'luck'.

They are limited by the number of rods they can carry, as well as being restricted to fishing from the shore or rocks close to shore. Tables 6.3(a) through 6.3(g) give the minimum investment requirements for each of the main fisheries: angling, boat seining, long-lining, beach seining, gill-netting (both tilapia and Nile perch) and mosquito beach seining.[29] These are based on the average costs provided by fishers for each of the necessary components.

Gear Requirement for Angling	Cost (Kshs.)
Rod (*Odundu*)	11.75/-
1 Hook (size 13)	2.50/-
1 Line (7.5 metres)	23.25/-
Bait (earth worms = 1 night fishing)	41.25/-
Fishing licence: 100/- (for those with no boat)	100/-
Total	178.75/-

Table 6.4(a) Initial expenditure requirement for entry into the angling fishery. N.B. Assumes that bait is bought, which it may not be.

Gear Requirement for gill-netting in the Tilapia/Diverse Fisheries	Cost (Kshs.)
1 boat (non-mechanised, no sail, *Cypress* timber, 7 metres long)	12,338/-
1 net (2-ply, 100 mm, 90 metres long)	383.6/-
Floats: (@ 4/-, one attached per metre)	360/-
Rope (Sisal, attached to top and base of net, @ 1/- per metre)	180/-
1 Roll 2-ply twine to mount net	85/-
Boat registration (non-mechanised vessel)	100/-
Fishing licence (with boat > 5 metres)	200/-
Total	13,646.6/-

Table 6.4(b) Initial expenditure requirement for entry into the gill-net (tilapia/diverse) fishery.;.N.B. Sinkers assumed to be of stone.

Gear Requirement for gill-netting in the Nile perch Fishery	Cost (Kshs.)
1 boat (non-mechanised, *Cypress* timber, 7 metres long)	12,338/-
1 net (4-ply, 127 mm, 90 metres)	657/-
1 sail (sacking)	1,590/-
Floats: (@ 4/-, one attached per metre)	360/-
Rope (Sisal, attached to top and base of net, @ 1/- per metre)	180/-
1 Roll 2-ply twine to mount net	85/-
Boat registration (non-mechanised vessel)	100/-
Fishing licence (with boat > 5 metres)	200/-
Total	15,510/-

Table 6.4(c) Initial expenditure requirement for entry into the gill-net (Nile perch, long stretch) fishery. N.B. Sinkers assumed to be of stone.

Gear requirement for beach seining	Cost
1 boat (non-mechanised, no sail, *Cypress* timber, 7 metres long)	12,338/-
1 net (except for ropes, fully mounted, 198.3 metres)	17,726/-
2 paddles (wood, @ 50/-)	100/-

[29]Costs all calculated from Author's data.

2 hauling ropes (sisal, 281.2 metres each, @ 1/- per metre)	562.4/-
2 rolls repair twine (18-ply @ 27/-, 42-ply @ 36.7/-)	63.7/-
Boat registration (non-mechanised vessel)	100/-
Fishing licence (with boat > 5 metres, 8 crew @ 200/-)	1,600/-
Total	33,190.1/-

Table 6.4(d) Initial expenditure requirement for entry into the beach seine fishery. N.B. Crew hire assumed to be paid as percentage of catch.

Gear Requirement for Boat seining	Cost (Kshs.)
1 boat (non-mechanised, no sail, *Cypress* timber, 7 metres long)	12,338/-
1 net (3 mm, 231.8 metres, @ 34.5/- per metre)	7997.1/-
1 lamp ('Anchor' Brand pressure lamp)	1,342/-
1 lamp float ('*kengere*')	66/-
1 lamp mantel	15.5/-
Paraffin for 1 lamp	20/-
2 paddles (wood, @ 50/-)	100/-
Floats: (@ 4/-, one attached per metre)	360/-
Rope (sisal, attached to top and base of net, @ 1/- per metre)	180/-
1 roll cotton thread to mount net with	12/-
Boat registration (non-mechanised vessel)	100/-
Fishing licence (with boat > 5 metres, 4 crew @ 200/-)	800/-
Total	23,330.6/-

Table 6.4(e) Initial expenditure requirement for entry into the purse seine fishery. N.B. Crew hire assumed to be paid as percentage of catch.

Gear requirement for mosquito beach seining	Cost (Kshs.)
1 boat (non-mechanised, no sail, *Cypress* timber, 7 metres long)	12,338/-
1 net (except for ropes, fully mounted, 194 metres)	22,500/-
2 paddles (wood, @ 50/-)	100/-
2 hauling ropes (sisal, 60 metres each, @ 1/- per metre)	120/-
1 roll cotton thread to mount net with	12/-
Boat Registration (non-mechanised vessel)	100/-
Fishing licence (with boat > 5 metres, 8 crew @ 200/-)	1,600/-
Total	36,770/-

Table 6.4(f) Initial expenditure requirement for entry into the mosquito beach seine fishery. N.B. Crew hire assumed to be paid as percentage of catch.

Gear requirement for long-lining	Cost (Kshs.)
1 boat (non-mechanised, *Cypress* timber, 7 metres long)	12,338/-
1 sail (sacking)	1,590/-
Hooks (50 per line, @ 320/- per 100, Size 8 hooks)	160/-
1 Roll (400 grams - to include snoods) 21-ply line	300/-
Floats (@ 4/-, 25 required)	100/-
Bait (50 '*ndhira*' @ 5/-)	250/-
Boat Registration (non-mechanised vessel)	100/-
Fishing licence (with boat > 5 metres)	200/-
Total	15,038/-

Table 6.4(g) Initial expenditure requirement for entry into the long-line fishery. N.B Bait assumed bought and that fisher has no mosquito beach seine with which to catch own bait.

The mosquito beach seine, beach seine and purse seine fisheries are the most expensive to enter, but they are also the most efficient gear types, and returns on initial investment can be extremely rapid. Fishers were asked what the value of their best and worst catches over the pervious year had been. Invariably, for many fishers the worst possible was a zero catch. However, no mosquito beach seiners ever claimed to have experienced a zero catch. Because of the small mesh-size of this gear, and the manner in which the net scrapes along the lake bed as it is hauled in, very little escapes this net. Furthermore, mosquito beach seiners tend to be highly mobile, and do not fish from one beach or spot alone, and rarely target a single fish species. In these ways, mosquito beach seiners always catch something.

Beach seine fishers can experience zero catches, although infrequently. These nets tend only to catch Nile perch, which excludes them from other fisheries. Furthermore, these tend to be used from one spot only, normally a single beach. This is primarily because these nets must be used over beds which are free from rocks in which their larger mesh-sizes can get caught (unlike mosquito beach seines which have such small mesh-sizes they tend not to get 'snagged' in anything). This sedentary fishing method means that beach seine fishers cannot take advantage of a wide range of fish species to guarantee catches. They are, nevertheless, extremely efficient gear types, which is reflected in their cost.

Purse seines concentrate on *omena* alone, and the abundance of this fish does, to some extent, ensure that purse seiners will always catch something during the *mudho*. This kind of fishing is carried out from a boat, and the *omena* fisher is able to cover a wide geographical range during an evening, further ensuring that they will always catch something. The success of gill-nets or long-lines, on the other hand, relies a great deal on 'luck' - the hope that some fish will inadvertently swim into the net, or take the bait on the line. There are few ways in which fishers involved in the set gear fisheries can intervene in the catching process to improve the efficiency of their gear, and therefore have a higher chance of experiencing zero catches.

Boats enable fishers to expand their geographical field of operations, and hence access to a boat improves a fisher's access to fish. Additionally, a boat also enables him to migrate in the event that catches at the home beach decline. Investment in a boat or additional boats can greatly improve a fisher's catching power. 20 Nile perch fishers based at Osieko Beach, with access to a single boat apiece, each caught an average of 3,605 kilograms of fish in 1994. Those with access to 2 boats (8), however, each caught an average of 13,474 kilograms of fish in the same year.[30] At Dunga Beach, 27 Nile perch fishers with access to one boat each caught an average of 1,753.9 kilograms of perch in 1994. Those with two boats (5) each caught an average of 3,531.2 kilograms.[31] If these figures are to be relied upon, a fisher stands to improve his chances of catching fish by a factor of between two and four with each successive boat he buys. As a consequence of the improvements in access to fish that arise with boat ownership, fishers may choose not to invest in more efficient gear, and instead invest in additional boats.

The manner in which boats can improve a fisher's access to fish is also reflected in fishers's incomes. 158 fishers were asked to provide estimates of their total earnings for the year prior to the interview (1993/1994). On average, each earned Kshs. 39,083/-.[32] 103 of these respondents were boat owners, who earned an average of Kshs. 47,482/- over the year prior to the interview, while the 55 casual fishers interviewed had an average stated wage of Kshs. 23,166/- over the same period. While these estimates are probably not accurate, they do reveal that boat owners expect to earn almost twice as much per year as casuals do.

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[30]From data provided by the Osieko Fishers's Co-operative Society.

[31]From data provided by the Dunga Fishers's Co-operative Society.

[32]Author's data.

Investment choices and patterns may also be regulated in other ways. Jansen (1973) has suggested that fishers will only expand their individual fishing efforts to the extent that they can control them. Once a boat owner attains a certain number of boats and/or nets, he begins to lose control over the activities of his crew members, making himself more vulnerable to the theft of fish and/or nets. Boat owners, therefore, appear to have investment 'ceilings,' which are dependent on their ability to over-see production. If this ceiling is reached, the fisher may see fit to invest elsewhere, such as in farming or in a small business, spreading his risks and ensuring that he is not overly reliant on a single source of income.

Investment patterns may also be influenced by fishers's perceptions on the future of the fishery. Of 128 fishers interviewed, 54.5 per cent (90) felt that its future was 'bleak,' primarily because they felt that the value of their catches would decline *vis a vis* escalating gear prices. For this reason, many of these fishers believed that, in the future, the fishery would 'be a place for the rich,' and confined only to those wealthy fishers who could absorb increasing gear prices. These fears imply that fishers are facing increasingly problematic in-put costs, which, they say, are compounded by declining per capita catches. This in turn suggests that the fishery may be approaching Maximum Economic Yields (MEYs). 35.7 per cent (59) of the sample felt that the future was 'uncertain', while the remainder thought it 'satisfactory.'[33] This latter group of fishers, like their colonial predecessors, argued that the 'lake is so big, the fish will never be finished'.

These pessimistic views on the future economic viability of the fishery invariably influences the areas in which fishers are prepared to invest. 171 fishers were asked where they would invest their money should they receive a windfall - in excess of Kshs. 100,000/-.[34] 31 per cent (53) said that they would invest it in the lake, where most felt that quick returns could be made on the investment. 45.6 per cent (78) said that they would invest it in the purchase of land or on their farms; 14 per cent (24) said that they would invest it in a business of some kind; 7 per cent (12) said that they would invest it in the building of cheap rental houses, while 2.3 per cent (4) said that they would invest it in 'other' areas not repeated elsewhere. In total, 69 per cent (118) of this sample said that they would not invest it in the lake, mainly because they felt that catches were declining and/or because of the threat of theft.

As discussed above, the more efficient a gear, generally, the more expensive it is. In addition, most efficient gear types are not set and are therefore less vulnerable to theft. This suggests that there are two groups of fishers, divided between those who have the wealth to invest in expensive gear, and those who are too poor to have access to these gear types, and are forced to invest in less efficient, cheaper and set gear. The ability of fishers to invest in more expensive gear enables them to minimise the possibility of a zero catch, despite net catch declines throughout Kenya's Lake Victoria fishery. These more expensive gear types are not as common as set gear, and those who can afford them are able to improve their competitive advantage over less wealthy fishers. In this way, the ability of fishers to improve their access to fish through the purchase of more efficient gear types is dependent on wealth. In turn, the ability to gain access to such wealth appears to be the product of fishers's access to credit, previous investment in the fishery, and whether or not the fisher has access to other income sources, such as small businesses.

6.4 Theft

Fishers may limit the number of nets and/or boats under their control in order to reduce their vulnerability to theft. Of 101 fishers questioned, 75.2 per cent had had some item or part of their gear stolen, while the rest had not been affected.[35] 150 fishers were asked if they thought theft of gear on the lake was problem. 62 per cent felt that it was, while 32 per cent felt that is was not, and 6 per cent felt that it had been bad, but that security was now improving.

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[33]Author's data.

[34]Author's data.

[35]Author's data.

Theft is a major problem for fishers based along the north-eastern part of the lake close to the Ugandan border. Lured there by the promise of large catches from deeper Ugandan waters, fishers must also contend with high levels of cross-border theft. Ugandan fishers are said to cross into Kenyan waters at night and return to the safety of their own waters with stolen nets which may then be sold or used by the thieves themselves. It is also claimed that pirates often operate in these waters, holding up fishers on the lake and stealing all their fish, nets and, if available, their out-board engines as well. The threat of theft also affects the time that fishers spend in the lake. Many fishers who use gill-nets will remain on the lake overnight so as to keep guard on them. Fishers may also try to camouflage the white floats on their nets and long-lines by replacing them with bits of wood debris and small, floating bits of water hyacinth. This, however, can prove a problem to the gear owner, who may be unable to find his own gear again. The threat of theft can also determine the areas in which fishers will invest. Theft mainly affects the gill-net and long-line fisheries, where fishing gear is left unattended in the lake. If the threat of theft is considered great enough, a fisher may well invest in a gear types that is always attended to and never left in the water, such as purse seines, beach seines and all of the *ochun* methods.

It is not clear why theft appears to have increased. Fishers claimed several reasons, amongst which were declines in morality, increasing poverty and ethnic tensions between Luhya, Luo and Ugandan fishers. What 'morality' constitutes is ambiguous, but respondents equate it with the breakdown of traditional Luo systems of security, the right to communally judge offenders, community justice systems and so on. To some extent, community decisions on this level do still occur. On several beaches visited, public 'tribunals' were observed, where fishers accused of various infringements were condemned either to a public whipping or banishment from the beach. However, it is not clear if these forms of justice act as disincentives to theft. Increases in poverty may also be a contributory factor. Although second hand-nets cannot normally be sold for large amounts of money, in circumstances where the need for cash is high any amount of money gained from the sale of stolen nets may be satisfactory.

Theft, and the perceived threat of theft, therefore, may determine in which gear a fisher invests and how much gear he is prepared to buy. A fisher may limit the number of nets he has because the vulnerability to theft increases with the amount of gear owned. By being forced to restrict the amount of gear owned, theft can serve to regulate a fisher's access to fish. Theft may also affect exploitation patterns. If theft is known to be particularly bad in an area, fishers may avoid fishing there. Theft also affects the amount of time a fisher spends on the lake, if he feels he should guard his nets. In this way, theft serves as an informal regulation. Increases in theft appear to be the result of a number of factors, including increasing poverty and the break-down of community self-regulation and governance. The culmination of these declines in wealth and community structure may be reflected in increasing ethnic tensions, particularly between Kenyan fishing communities and their Ugandan counterparts.

6.5 Falling catches

Total fish catches in the Kenyan waters of Lake Victoria appear to have risen steadily ever since records started (see Chapter 4). However, the collection of these statistics is flawed. On the one hand these statistics do not reveal the source of the fish landed. There is a strong possibility that Kenyan catch tonnages are being sustained by fish smuggled in from Tanzania and Uganda. Many fishers from these countries will land their fish on Kenyan beaches because of the higher prices offered (cf. Reynolds *et al.* 1992). On the other hand, the collection statistics give no indication of the size of fish landed, which is important because the greater the number of juvenile or immature fish landed, the more likely that conditions of biological over-fishing are being approached. Thus, the impression that catches from Kenya waters are increasing may be untrue, a fact that fishers confirm.

Of 178 fishers interviewed, 90 per cent (160) felt that catches had declined;[36] 9.5 per cent (17) said that catch levels remained unchanged, while the remainder felt that catches had increased. Of this sample, 161 respondents qualified their answers which are summarised in Table 6.5 below.

Currents ('*nger*') play an important role in fishing, and may serve to attract fish or to repel them. Fishers claim that in the past, water entered the Winam Gulf through the Mbita Passage between Rusinga Island and the mainland, passed around the Winam Gulf in an anticlockwise rotation, and exited through the Rusinga Channel (Fig. 6.1). However, in 1983 the Mbita Causeway, linking Rusinga Island to the mainland, was completed, and water no longer enters the Gulf through this entrance. Although the distance from the mainland to the island is no more than 500 metres, fishers claim that the water volume that passed through it was great and the current extremely strong, such that many people who tried to cross the channel died when their boats capsized. The clusters of evil spirits ('*nyawawa*') living on either shore are said to be testimony to this. This current, it is said, brought 'good' water to the Gulf, pushing the 'bad' water out in front of it through the Rusinga Channel. Because the water is now 'bad' in the Gulf, fish are no longer willing to enter it. Indeed, there are indications that water in the lake is anoxic and that there is a permanent oxycline below which no oxygen in solution exists (Kaufman and Ochumba, 1993). Whether or not the Mbita Causeway actually contributes to this condition is not clear. A survey carried out by the Kenya Academy of Sciences in 1988 dismissed it as a cause for declining fish catches and mass fish kills (Wandera, 1992). Fishers, however, are adamant that the Mbita Causeway has affected their catches.

Reasons suggested for declining catches	N	%
Because of illegal and/or *ochun* fishing methods and gear	60	37.3
Because there are too many fishers and/or nets	41	25.5
Because fish have been caught before they have a chance to breed	36	22.4
The Mbita Causeway	29	18
Single responses (not repeated elsewhere)	13	8.1
Rain brings food to the fish in its run-off. Now there is less rain	9	5.6
Because the Nile perch has eaten all the other fish	8	5
Because of fishing in and/or the destruction of fish nurseries	8	5
No net decline, but because so many fishers, less fish per fisher	7	4.4
Because of the water hyacinth and/or other noxious weed/grass	7	4.4
Respondent does not know	7	4.4
Because the fish have all moved into the open lake	5	3.1
Fish no longer have breeding places because all the streams are blocked/silted up	4	2.5
Because the lake is getting shallower	3	1.9
Because there are no longer any closed seasons	3	1.9
Because of algal blooms	2	1.2

Table 6.5: Reasons given by fishers as to why catches have declined.[37] N.B. percentages exceed 100 because many respondents stated several reasons.

The water hyacinth is not native to Lake Victoria. This attractive floating weed was introduced from South America to Rwanda in the 1940's by Belgian colonisers as an ornamental plant for garden ponds, and from there it made its way to Lake Victoria via the Kagera River (Kaufman 1992). Currently, large areas of the lake shore-line are covered by the plant, impeding access to beaches and getting tangled in nets. It is particularly troublesome to beach seiners, whose nets, once filled with the weed, are often too heavy to haul in. Fishers claim that there are no fish in the water below the hyacinth, possibly because it reduces the amount of light that can penetrate the water, as well as de-oxygenating it.

[36]Author's data.

[37]Author's data.

In addition to fishers's claims that catches are declining, they also claim that fish sizes are getting smaller. Fishers have a distinct view of what constitutes a 'large' fish of any species. For example, they identify three age-size cohorts in *omena*, and claim that each of the cohorts swim in shoals comprising only the one size. As mentioned in Chapter 4, tilapia species are sold according to size, the largest being the '*nyamami*' or '*ngiaba*'. Similar names and size-recognition are associated with the Nile perch. Fishers are also aware that it is only the large fish that have bred, that the medium sizes may not have done so, and that the smallest have certainly not. Thus, of 137 fishers interviewed, 97 per cent said that large fish were now rare, 1.5 per cent said that they saw no difference, while 1.5 per cent said that the sizes in the *omena* fishery had not changed, but had in the others.[38]

Fishers also claimed that fat and roe on the Nile perch had disappeared. Needless to say, the larger the fish, the more likely it is to have bred. Fishers also say that it is only large Nile perch who have fat deposits, so much so that its skin is said to 'wobble' from the fat beneath it. Many traders claim that they can no longer buy Nile perch oil on the beaches in which to fry fish in, and that it now comes only from the filleting factories in Nairobi or Kisumu. Of 105 respondents interviewed, 92 per cent claimed that the amounts of fat and/or roe they observed on the Nile perch landed had either decreased, was rare or had completely disappeared. 3 per cent said that they still found these, while 5 per cent said that they still saw the fat, but rarely the roe.[39] 64 respondents provided reasons as to why they thought the fat and roe had disappeared, and their responses are summarised in Table 6.6 below.

Reasons provided for why roe/fat have disappeared from the Nile perch.	N	%
Do not know why	24	37.5
It is caught before it has time to produce fat or roe	17	26.6
Only big perch have these, and they have all been fished from the lake	17	26.6
The perch is constantly harassed and agitated by nets and fishers, so it does not produce these things	10	15.6
Fat and roe appear only on large perch, and these are taken by the trucks from the filleting companies, so these are no longer seen	8	12.5
It no longer gets the 'correct food'	6	9.4
It has been poisoned by the authorities, so as to rid the lake of it	6	9.4
Single responses (not repeated elsewhere)	3	4.7
Because of pollution	2	3.1
The Mbita Causeway prevents it getting enough food	2	3.1

Table 6.6: Reasons stated by fishers as to why fat and roe have disappeared from the Nile perch.[40] N.B. percentages exceed 100 because many stated several reasons.

The largest proportion of fishers who provided reasons for the disappearance of fat and/or roe from the Nile perch felt that it was because of over-fishing. The notion that the authorities are trying to poison the Nile perch was encountered at several beaches, although no other evidence relating to this was uncovered. However, Riedmiller (1994) suggests that the fishing authorities may be pursuing an unofficial policy of encouraging Nile perch fishers to use under-sized nets for exactly this purpose. Evidence of catch declines may also be derived from changes to the amount of the time that fishers spend on the lake. Of 150 fishers interviewed, 104 (69.3 per cent) said that they spent longer on the lake now than they did when they first started fishing.

[38]Author's data.
[39]Author's data.
[40]Author's data.

[41] 32 (21.3 per cent) said that they spent less time on the lake now than when they first started fishing, while 14 (9.3 per cent) said that the time they spent on the lake had not changed. The reasons given for why these changes had occurred are provided in Table 6.7 below.

Regardless of whether or not the amount of time spent fishing had increased or decreased, fishers generally claimed that the reasons for the changes were directly related to declining access to fish, either because of net stock declines, or else because of competition increases. For many of those fishers who had experienced declines in the amount of time they spent fishing, it was because of the shrinking benefits to be gained from increasing or sustaining previous fishing times. In other words, time decreases had occurred because it was no longer cost effective to spend longer periods of time on the lake. For beach seiners, times had decreased because the amount of beach space available to them to haul from had decreased as a result of heavy effort increases in this fishery.

Reasons provided for why amounts of time spent fishing have changed	N	%
Catches in in-shore areas have declined, so we must now fish further out	32	24.4
There is less fish now, so we have to work harder and longer to get it	28	21.4
There is less fish now, so we have to spend longer looking for it	26	19.8
There is less fish now, so there is less work and less time on lake	13	9.9
There is less fish now, so more gear is needed, and this takes time to handle	10	7.6
There is less fish now, so it does not pay to spend any longer looking for it	9	6.9
Single responses (not repeated elsewhere)	7	5.3
Because there is so much theft, we have to stay with the gear at all times	4	3.1
Because competition has increased, we have to stay out longer if we are to get our share of the fish	4	3.1
Because of competition, we cannot fish for longer (beach seiners)	4	3.1
There is less bait (*Haplochromis*) and we have to spend longer looking for this (long-liners only)	2	1.5

Table 6.7: Reasons stated by fishers as to why the amount of time they spend on the lake has changed.[42]
N.B. percentages exceed 100 because many stated several reasons.

One final indicator of declining catches is the widespread use of 'medicines' applied to nets and/or boats which are thought to improve a fisher's chances of realising good catches. These medicines are bought, often at considerable expense, from traditional healers and doctors, '*jabilo*' and/or '*ajuoga*', and are said to contain magical properties that guarantee good catches. Fishers were questioned as to whether or not they felt that the amount of such medicine use had increased in recent years, but no conclusive data was gained. However, given that such medicine is deemed important in guaranteeing the capture of fish, it may be inferred that per capita catches are low enough to justify its use.

Fishers, then, do perceive significant catch declines. These declines are not reflected in official catch records except for tilapia catches. Since 1991, tilapia catches have declined from 4,691.1 tonnes in 1991 to 1,562.8 tonnes in 1994 (Unpublished Fisheries Department statistics 1995). The reasons for this are not clear, although one source suggests that its breeding cycle has been 'interfered with', and that it has also been affected by pollution and siltation in rain water run-off.[43] Another possibility is that given anoxic conditions within the lake, tilapia stocks have been driven towards the shore where they are more vulnerable to fishers's nets, and have been over-fished as a consequence (Lowe-McConnell pers. comm.). Tilapia declines are also reflected in the growing market for exported tilapia in Kisumu.

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[41] Author's data.

[42] Author's data.

[43] Mr. P. N. Gikonyo, Assistant Director of Fisheries, quoted in The Standard 8/4/95 and 25/4/95.

At Kichinjio beach there are a number of store houses in which a group of fish traders store dried tilapia exported from Lake Turkana. Every week, one or two trucks, fully loaded with some 10 tonnes of tilapia from the north of Kenya, arrive to sell them to these women who then sell them on at local markets and towns within the Nyanza region.

The reasons for these catch declines are by no means clear. Fishers may be right that declines per fishing unit have occurred because there are less fish in total. On the other hand, fish stocks may remain unchanged and stable, but catches per fishing unit have declined because of net effort increases. On the whole, declines in fish per fishing unit would appear to be a combination of both effort increases and declines in the net fish stock.

Declining catches per fishing unit necessarily have implications for fishers's access to fish. They also have wider repercussions. Fishers may be turning their investments away from the lake because of declines and the perceived increase of financial 'insecurity' on the lake. Catch declines per capita alongside increasing effort levels do serve to increase competition between fishers, which is partly reflected in the increased amount of time some fishers spend on the lake. Per capita catch declines, furthermore, compel fishers to invest in more efficient fishing gear such as beach seines, mosquito beach seines and other *ochun* methods, which improve the guarantee that fishers will always catch something on any given day, and also serve to improve a fisher's competitive advantage over other fishers. Catch declines may further affect fishers's investment priorities, as many fishers now try to spread their risks by investing in several fisheries, so that if catches in one falter, then hopefully catches in the others will enable them to survive. Fishers may also invest in those fisheries that appear to be doing better than faltering ones. Thus, for example, there appear to be great increases in investment in the *omena* fishery, which does not seem to have experienced catch declines (Othina and Odera 1995).

Catch declines are a product of a number of factors which are themselves embedded in wider socio-economic trends. As fishers are faced with declines in the resources they have traditionally been able to rely upon, the need for cash has increased to make up for any production shortfalls. Because fishing represents one of the easiest means to a cash income, its relative importance as a cash income generator has increased *vis a vis* other sectors of the household economy, such as farming and herding. This represents a compelling reason for many to seek employment within the fishery, and is one of the most important causes behind effort increases. There are, however, other reasons why effort increases have occurred, and these are discussed below.

6.6 Increases in fishing effort

Although estimates of the effort size in Kenya's Lake Victoria fishery have been made (see Chapters 4 and 5), no census of fishers has ever been undertaken. Fishers, however, do claim that there have been considerable increases. 164 fishers were asked if they felt that the numbers of fishers on the lake had increased since they started fishing,[44] and 95.7 per cent (157) agreed that they had; 3.7 per cent (6) said that numbers had declined and 0.6 per cent (1) felt that numbers remained unchanged. 131 of these fishers stated why they thought these changes had occurred (Table 6.8).

[44]Author's data.

Reason provided for effort increases	N	%
Because there is no work to be found elsewhere	103	78.6
Because the population has increased	15	11.4
Because people must eat and therefore they need incomes	14	10.7
Fishing is the only income-making option for people here	14	10.7
Because the land can no longer support people	14	10.7
Because people can no longer have just one income now	8	6.1
Because of high-levels of school drop-outs/parents cannot afford school fees	8	6.1
Because others have seen what is to be derived from the lake	7	5.3
Because fishing is a means to an income	7	5.3
Single responses (not repeated elsewhere)	6	4.6
Because people have poor qualifications and cannot find work elsewhere	5	3.8
Because people have invested in the fishery, so there are jobs here	5	3.8
Numbers have decreased because of declining catches	4	3.05
Because the lake is the easiest place to find work	4	3.05
Because work in the towns pays so badly	3	2.3

Table 6.8: Reasons given by fishers as to why increases in effort have Occurred.[45] N.B. Percentages exceed 100 because many respondents gave several reasons.

The great majority of fishers blame effort increases on the lack of alternative employment elsewhere. Amongst other reasons, they also cite population increases, the need for cash incomes with which to buy food, and the decline of farming. Effort increases have two important consequences for fishers. On the one hand, they mean that there is less fish per fishing unit, a problem compounded if there are net declines in fish stock occurring at the same time. On the other hand, competition between fishers over declining fish stocks gives rise to conditions ripe for conflict between fishers and between fishing communities. As alternative employment opportunities outside the fishery decline, and as the need for ready cash increases, then people start to seek employment in the most easily accessible sector of the economy, even if cash returns are low. In many cases, those who seek such employment do so on a strictly temporary basis, fishing as they await possible job opportunities. This form of transient fishing has implications for investment in the fishery. If a fisher believes that he will be leaving the fishery in any case, he is less likely to invest in it, and joins the casual employment market where investment requirements are low. However, if employment opportunities outside the fishery fail to improve, then the fishery only experiences effort increases, and effort declines rarely occur.

The Maximum Economic Yield (MEY) model discussed in Chapter 1, predicts that as effort increases, fishers must sooner or later reach a point where the costs of fishing are not recouped through catches. The model suggests that this may result in effort decreases. However, in a fishery based on numerous gear types, such as Kenya's Lake Victoria fishery, MEYs for one gear type are not necessarily the same as they are for others because of the varying costs of the gear. Thus, an angler has a much higher MEY than a beach seiner, because costs of angling are far lower than they are in beach seining. Similarly, fishers may invest in long-lines because they are cheap, even though they are not very efficient (Ligtvoet *et al.* 1995). This facility enables fishers to switch between gear types in the event that the costs of using one gear type exceeds the value of catches derived from it. Thus, a fisher with a beach seine who feels that he has attained the MEY can sell the net, and then invest in another type of gear for use in a different fishery where catches appear to be better or where the market has improved. Alternatively, a fisher may invest in numerous gear types. In this way, he can use one type of gear when markets and catches are deemed to be good enough, and costs can be adequately met, and then switch to another gear if catches and market conditions change.

[45] Author's data.

This allows a fisher to cope with both catch and market variations as it suits him, and delays the impact of any MEY on effort levels. This dynamism, furthermore, ensures that the fishery can maintain its value, and in this way continually serves to attract new entrants.

Employment opportunities beyond Lake Victoria are poor. According to fishers, many university graduates, unable to find employment elsewhere, have joined the fishery, a trend which has been confirmed elsewhere (The Standard 7/1/95). Additionally, many of those who join the fishery are school 'drop-outs' (Ogutu 1992). During the 1970's and early 1980's education was seen by many as a means to a paid job. Increasingly, however, education no longer provides the promise of salaried employment. To many fishers, investing in their children's education when there is no guarantee of a job afterwards seems an unnecessary expenditure when their children can be employed in more useful income-earning activities such as fishing. On average, fishers had 3.4 children each, and only a quarter of fishers interviewed had no children at all.[46] The costs of schooling can be a considerable domestic expense, and fishers will gladly forgo this if they can find alternative income-earning activities for their children. At Anyanga beach, truant school pupils were routinely rounded up, and forced to go to school, bound together and marched off like prisoners. At N'Gou, beach leaders and senior fishers did not permit children to fish unless they had completed their schooling to a standard 8 level. Beach officials at N'Gou felt that the costs of primary school education were not so high that parents could not afford them. At this level of education, parents pay some nominal fees, and must also buy pens, exercise books, uniforms and shoes for their children, and are also obliged to pay for a series of school 'activity' fees. These total approximately Kshs. 3,200/- per child per year. After primary school, children are expected to proceed onto secondary school where fees are much higher, some Kshs. 12,000/- per child per year, and officials at N'Gou beach did not expect parents to afford such fees. Fishers had an average education of 6.42 years out of a total possible 12 years,[47] and in virtually every case, fishers claimed to have left school because of problems with paying fees. For those who do feel that their children ought to complete their education, fees are often staggered, depending on the money coming into the family. As such, a child will often spend long periods of time assisting his/her family to find school fees either from relatives and friends, or from fishing. Schooling is then intermittent, and takes a long time to complete. It was not uncommon to encounter primary school pupils in their twenties.

Encouraging children to stay in school would appear to represent an effective mechanism of controlling fishing effort levels. However, fishers must be persuaded that it is worthwhile to send their children to school, a difficult task if fishers do not feel that employment opportunities will improve with education. "The fishing sector is a dumping ground for those youths that are unable to find salaried jobs."[48] The combination of low school attendance with poor alternative income-paying job opportunities results in increases in the total effort level, and with it, competition. There is evidence of this congestion on the lake. At Utajo, for example, the number of fishers on the beach was so high that there was physically not enough space for fishers to haul in their beach seines at the same time. The beach leaders had therefore designed a rota system for fishing. At any one time during the day, four seines were being pulled at once, each encircling the other. As the last seine approached the shore, the next crew of fishers in the 'queue' commenced with setting their net. At Misori Beach, all tilapia fishers fished in an area no further than 10 metres off the shore, and no longer than 500 metres along the beach. In an effort to minimise the competition between fishers for space, the beach authorities insisted that fishers all had to leave the beach at the same time, and no fishers were allowed on the lake after a certain time of the day, so that competition was considered 'equal' and all fishers had the same chance of setting their nets in favoured spots. In order to enforce this rule, fishers were obliged to hand their paddles in to the beach co-operative after they had re-set their nets. At 7 o'clock every morning the crews would line up outside the co-operative store, make a rush for their paddles, and then stampede towards the lake where their colleagues awaited them in boats.

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[46]n=233; Author's data.

[47]n=231; Author's data.

[48]J. I. Ochieng Okach, Head of Fisheries Section, Lake Basin Development Authority, Kisumu, Interview no.102, 22/9/94.

Another symptom of competition has been the rise of '*kanyaga*' fees, charged by beaches to migrant fishers not normally resident on the beach, and which enables them to fish from the beach for the duration of a year.

While some beaches have attempted to limit the amount of competition between their fishers, conflict can nevertheless occur. 138 respondents were asked if they had ever encountered trouble on the lake from other fishers. Most - 84 per cent - had not, and said that when going to other beaches a letter of introduction, the explanation of intention, the payment of *kanyaga* fees and/or having contacts on the beaches usually averted any kind of problems. However, incidents have occurred where fights have broken out between competing fishers, sometimes resulting in death.[49]

Of the 16 per cent of fishers who had encountered trouble, most used one of the *ochun* methods of fishing. Non-users of these gear types feel that they are unfair because of their superior efficiency to other, more conventional types of gear. Users of *ochun* methods, therefore, receive much verbal abuse from people fishing along the shores, and in some cases have stones hurled at them.[50] However, tensions do not only occur between *ochun* method users and non-users. At Asat, fishers claim that deep-water spots yield the best catches. However, such spots are rare around Asat, and fishers often argue amongst themselves for the right to fish these.[51] Fishers from Asat often cross the Winam Gulf to fish in waters off Got Huma, near Homa Lime (Fig. 6.1), where they receive verbal abuse from local fishers who object to them fishing in Got Huma waters.

These latter examples are fairly subdued forms of complaint. However, violence between fishers is quite common in Kenya's Lake Victoria fishery, and some examples of this are as follows: In March and April 1993, the beach leader at Tako beach objected to fishers from Nyakach fishing off 'his' section of the shore-line, and 'hired' Fisheries 'scouts' to accost them and to have them thrashed. In the ensuing violence, five fishers drowned.[52] In May 1995, *omena* fishers from Nyagina beach on Rusinga Island were accused by long-line fishers from Luanda Kotieno beach of disturbing their lines and stealing their fish. The Luanda Kotieno fishers accosted and seized a Nyagina fishing boat and crew, and locked up the crew. They threatened to call in the police, saying that they had caught them red-handed with fish stolen from the long-lines. However, following discussions between the respective beach-leaders, it was agreed that the median line between the two beaches along which the steamer passed was to be a boundary over which fishers from neither beach could cross.[53] In 1987 two Misori fishers were attacked by Osindo fishers claiming that they were fishing too close to Osindo shores. Both fishers drowned.[54]

There are only a limited number of places along the shores of the lake from where beach seining can be carried out. This is mainly because the water off the shore has to be cleared of rocks before seining can occur, an often arduous and expensive task. Congestion at beach seining spots can, therefore, become extreme. At Utajo beach in 1978 and 1979, congestion was extreme. Several members of the beach community decided upon a rota system of fishing (described above), and enforced this. However, many fishers felt the system was unfair, and two factions were formed between those who agreed with the system and those who did not. The factions fought, and several deaths resulted. The Kenya Fisheries Department (KFD) sent a delegation to the beach to try and calm the fishers down and it was decided to divide the two factions along two beaches, one which would practise the rota system and the other which would not.

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[49]Author's data.

[50]Interview no.163, Kiumba, 17/11/94; Interview no.165, Kiumba, 18/11/94; Interview no.169, Kiumba, 19/11/94.

[51]Interview no.281, Asat, 19/3/95.

[52]Interview no.38, Tako, 23/4/94.

[53]Interview no.s 121 and 122, Nyagina, 22/10/94.

[54]Interview no.259, 15/3/95.

They further added that anyone who was unhappy with this should establish their own beaches. As a result, five new beaches were opened and all are 'private'.[55]

Finally, the Nyando River divides two major Luo clans, the Kano and the Nyakach, and the mouth of the river is a productive fishing ground. In 1987, Kano fishers complained that nets set by Nyakachian fishers in the mouth interfered with the success of the *osadhe* traps they had set there. Fights ensued, and one Kano fisher was killed. Kano fishers are said not to trouble Nyakachian fishers any longer.[56] Conflict arising over competition for fish stocks, fishing grounds and over different types of gear can and does occur. As already discussed in Chapter 5, conflict also arises between small-scale fishers and trawler crews.

Competition between fishers has further repercussions for the fishery. As competition increases and fish stocks decline, then a fisher's guarantee of catches is undermined, and few can afford to return home at the end of the day without a catch (Geheb 1995). Responding to this, fishers may start fishing in ways they have never done before as they attempt to recover some of the guarantee which provided them with fish previously. These risk-aversion techniques may manifest themselves in benevolent ways, such as fishers trying to keep favoured fishing spots secret, a tactic observed along the Sondu-Miriu River (Ochumba and Mainga 1992), or by diversifying their production base by investing in a variety of fishing gear and exploiting several different fish species. Alternatively, risk-aversion techniques may manifest themselves in detrimental ways, such as using under-size nets to exploit hitherto under- or unexploited fish stocks and size ranges. These latter responses are indicative of the competitive relationships that fishers share, and it is increasingly the case in Kenya's Lake Victoria fishery that the benefits to be derived from using legal gear are far outweighed by the benefits to be gained from using illegal gear. Fishers generally anticipate that the cost of their fishing gear, along with profits, will be met before the end of the gear's life-span. The use of legal fishing gear does not guarantee this outcome.

Because these conditions prevail within Kenya's Lake Victoria fishery, there are good reasons to expect that the use of these illegal gear will increase. This is particularly the case given that fishers have few alternative job opportunities to which they can turn, and access to farming and herding resources appears to be on the decline. In such a context, fishers will continue to join the fishery, regardless of declining Catch rates per Unit of Effort (CPUEs) and despite associated dissipation of incomes. In this way, the lack of alternative employment serves to regulate fishing effort levels by augmenting them, and fishers will react to this increasing competition in one of several ways: by increasing the amount of hours they spend on the lake (intensification); by diversifying their means of production by either targeting several fisheries rather than just one, or by targeting fish stocks and size ranges which are hitherto un- or under-exploited; or, finally, by using the most efficient fishing gear available to them. In the event that efforts to gain competitive advantages fail, fishers may well resort to violence against one another to protect their access to these diminishing stocks. By identifying these trends within fishing communities, indications are also provided as to the state of the fish stock. Where competition is low and the availability of large fish high, fishers will be less likely to use violence as a means of controlling their access to fish stocks, and more likely to use larger mesh-sizes because it is cost effective to do so. Competition, as well as the cost effectiveness of using illegal mesh sizes, is further regulated by marketing variables.

6.7 The impact of marketing variables on Kenya's Lake Victoria fishery

The key factors which affect fish prices are as follows:

(a) *Seasonality*: seasons affect the supply of fish. The lowest catches are realised during the dry season (December to February), while the best are during the rainy seasons (March-June, August-September). The rainy seasons, then, are also low-price seasons given the generally higher availability of fish.

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[55]Interview no.155, Utajo, 13/11/94.

[56]Interview no.306, N'Gou, 25/3/95, and Interview no.314, N'Gou, 27/3/95.

(b) *The number of traders*: at large beaches, such as Usenge and Marenga, there are large numbers of traders and fishers may be able to exploit the competition between them to their own advantage. Because there are so many more traders than fishers, the price of fish may be driven up as fish traders compete for supplies.

(c) *Social factors*: at smaller beaches, many of those who buy the fish from fishers are either in-laws or the wives of the fishers themselves. Because of the relationship between fishers and their buyers at these beaches, social etiquette may prevent fishers from demanding higher prices. At N'Gou, Anyanga, Misori, Tako, Utajo, Nyagina and Kiumba, most, if not all the fish traders that fishers sold their fish to were relatives or wives.

(d) *Market monopolies*: fishers from Mfangano and Rusinga sell most of their Nile perch to trucks from the filleting companies awaiting at Mbita. The agents of the companies collude to offer the fishers a single price. The difference between this price and that offered by the filleting company is kept by the agent as payment. However, because the agents have a monopoly on the market, they are able to force fishers to accept virtually any price. These prices, fishers claimed, rarely reflected the supply of fish. As one observer commented, "[t]he entire lake is in the hands of wealthy entrepreneurs...the fish in the lake is sold even before it is landed.[57] Interestingly, Rusingan fishers rarely tried to exploit other markets elsewhere. Misori beach, which is not far from Rusinga, is also frequented by trucks, but fishers rarely sailed there to sell their fish. However, throughout the Kenyan sector of Lake Victoria, beaches commonly prohibit outsiders from selling their fish in an effort to protect their markets.

(e) *Proximity to markets*: in their negotiations with fishers, fish traders often argue that prices should be dropped because of his/her transport costs or because they know that the market is bad. Normally, fishers are unable to refute either claim, and sell their fish at the lower price. However, at those beaches where the main markets are close by, such as Dunga, Kichinjio and Tako, close to Kisumu, and Koginga, close to Homa Bay, fish traders cannot claim to be affected by transport costs (they walk to market), and fishers generally know what fish prices are at the markets because these are so close by. In addition, fish prices at the beach may be very different from those at the market. Thus, for example, catches at a beach may be poor, and the price of fish driven up as a consequence. However, on arrival at the market, traders may then find that it has been saturated with fish coming in from other parts of the lake, and hence make losses. Fish prices can only be judged on the day, and traders will rarely know what the going rate for fish is before they arrive at the market.

(f) *Other factors*: these include issues apparently unrelated to the fishery, but which nevertheless affect prices. As has already been mentioned, if the price of grain rises, then fish prices drop. Similarly, when school fees are due, fish prices will also drop. While market variations away from the beaches are born by the fish traders, any declines in prices at the markets necessarily affects household incomes in fishing communities, given that many traders are married to fishers. However, other factors may affect the price of fish on the beaches. For example, during April and May 1994, when bodies of Rwandan civil war victims floated down the Kagera River and into the lake. Concerns that the Nile perch ate these bodies resulted in price declines on the foreign markets, and Nile perch prices on the beaches at this time dropped from an average of some Kshs. 35/- a kilo for the year, to Kshs. 3-4/- a kilo.

Fish prices can vary considerably over the year. Thus, for example, the average lake-wide price for Nile perch over the study period was Kshs. 22.50/- per kilo.[58] Fishers were also asked to state the highest and lowest prices reached by perch in the year prior to the interview.

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[57]J. I. Ochieng Okach, Head of Fisheries Section, Lake Basin Development Authority, Kisumu, Interview no.102, 22/9/94.

[58]Author's data.

The average highest prices stated came to Kshs. 34.80/- per kilo, while the lowest average prices stated were Kshs. 10.10/- a kilo, a 71 per cent difference.[59] Prices for large 'troughs' of *omena* sold for an average of Kshs. 266.5/- over the study period; the highest prices were Kshs. 301.2/- a large 'trough', whilst the lowest were on average Kshs. 105.70/- a large 'trough', a 65 per cent difference.[60]

The most important variable affecting these price fluctuations is the fish supply. However, unlike other producers, fishers are not able to influence prices by trying to limit or increase supplies because they are unable to control how much fish they catch. In this way, fishers are 'price takers' and not 'price makers', because a significant component of their production is dependent on luck (Oduor Otieno *et al.* 1978). As discussed above, exploitation patterns in Kenya's Lake Victoria fishery are based on trying to minimise the chances of a zero catch on a given day. In other parts of the world, fishers may rely on institutional mechanisms to influence prices. They may have access to refrigeration facilities, and are able to withhold fish supplies until such a time that prices improve. In addition, because of the institutions of which they are a part, mainly co-operatives, they may secure loans and/or advances to tide them over this waiting period. Fishers in Kenya's Lake Victoria fishery do not have recourse to either facility. As we have seen earlier, co-operatives are treated with suspicion and few fishers benefit from their services. In addition, there are no refrigeration facilities available to fishers on the lake. As a consequence, fishers have few alternative income sources to which they can turn in the event of a zero catch, providing a powerful motivation for perpetually intensive fishing patterns.

Fishers will try to protect themselves against these market fluctuations by intensifying their fishing no matter what the state of the markets. Thus, when prices are low, fishers will catch as much as possible in the hope that the sheer bulk of fish sold may mitigate the impact of the low prices. When prices are high, on the other hand, fishers will maximise their fishing intensity so as to maximise profits. These tactics are, in large measure, a response to fishers's inability to control prices as well as the risks arising due to the 'luck factor'. However, it is by no means clear that if fishers could control prices they would alter their fishing tactics. They could, for example, try to catch less fish to drive prices up. However, fishers often claimed that if they were to try and reduce the amount of fish they caught, then someone else would catch them, a classic symptom of open-access, common property fisheries.

In this way, price variations provide fishers with incentives to use illegal nets. An additional motivation to using small mesh-sizes is that fish can be sold no matter what their size. As discussed in Chapter 4, most fish from Lake Victoria is sold by size rather than weight. On the markets, the larger the fish, therefore, the higher its price. Although this may mean that fishers are provided with motives for catching large fish, most consumers are unable to afford these, providing fishers with ample incentives to target small fish. In any case, the smaller fish size ranges are more plentiful than larger size ranges, so keeping the price for small fish low. For example, the market for juvenile Nile perch ('*apengo*' or '*tede*') is good. These fish have several attractions to both processors and consumers. Their small size means that they have a low fat content which makes them easier to process, while consumers claim that the smaller the perch, the 'sweeter' its taste. In addition, they are also cheaper than perch of over a kilo, being sold in 'troughs' and so having a negotiable price. Tilapia is a highly valued fish in Luo society, and widely seen as a delicacy. This means that tilapia can be sold virtually no matter what its size, but demand for small tilapia are highest because these have low prices. Lung fish and cat fish are also regarded as delicacies and so command consistently good markets, no matter how big they are. Finally, consumers and processors are indifferent to the size of *omena* - all *omena* is sold at the same price, regardless of size, and fishers have few incentives to catch large *omena*.

Fishers will seek to maximise their fishing intensity no matter what the state of the market.

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[59] n=55; Author's data.

[60] n=22; Author's data.

The reasons for this are a combination of several factors, including fluctuating prices, the ever present threat of a zero catch and high demands for small fish sizes. In this way, the nature of the market can affect exploitation patterns and, in this way, regulate the fishery.

6.8 The changing nature of lake-side fishing communities:

The nature of communities in the pre-colonial fishery has already been examined. As we have seen, the colonial era brought about considerable changes to community structures. These changes were further exacerbated by continuing change in the post-independence era, which influenced exploitation patterns considerably. As Nyanza's population has increased and access to resources has decreased, the demand for cash has risen, so as to make up for whatever resource deficiencies that households encounter. Community structures can be used by members as a means of achieving nutritional or income security. However, insofar as community structures represent social obligations to fishers, they may also represent constraints on their ability to achieve income and nutritional security. In this section, we examine this dual function of community relations from the perspectives of divisions of labour and migration, and how these have arisen as a result of decreased per capita resource availability.

Divisions of labour: contrary to some reports (Harris *et al.* 1995), many of those fishers who hire crew or work as casuals are related to the crew members. Nepotism, to most Luos, is a social obligation, and in the event that a community member manages, for example, to buy a boat, s/he is expected is to provide kinsfolk with employment on the boat if s/he is to be seen to be caring for their welfare (cf. Dykstra and Dykstra 1987). Of 155 fishers interviewed, 118 (76 per cent) either employed relatives or worked amongst relatives.[61] In this way Luo men and women are able to rely on their better-off kinsfolk to secure jobs for them, and the community structures within which Luos live may therefore be a means to gaining nutritional and income security.

However, this employment pattern may also give rise to divisions of labour. Employing kinsmen may fulfil some community obligations, but at the same time, it exposes the boat owner to the problems associated with his role within the community. In Section 6.3 above, social demands on an individual's wealth were discussed. Generally, those Luos who are able to accumulate some wealth may go to considerable lengths to ensure that their wealth is in some way hidden or not too obvious, so that it may be retained and further accumulated. The wealthier a person, the greater his responsibility within a community and, correspondingly, the greater the numbers of demands on his wealth he faces. If he fails to meet these demands, a wealthy man stands to face the repercussions of a jealous community who will try to redistribute his wealth without him noticing. Thus, for example, Jansen (1973) observes that the more successful a boat owner is deemed to be, the higher his chances of having fish stolen from him. Boat owners may also make themselves vulnerable to 'magic' and 'medicine' from jealous kinsfolk who object to their wealth. Thus, Luos must try and balance their means of production against communal obligations if they are to continue to accumulate wealth. One way of doing this is to carefully structure crews so as to fulfil communal obligations while, at the same time, minimising the chances of having fish or gear stolen.

At the head of every crew is the '*mathar*' ('skipper' or 'coxswain') whose role it is to summon together casuals, and decide when and where to fish. For this job, *mathars* are normally paid a little more than other crew members. This role is extremely important, and *mathars* are generally the most powerful members of a boat's crew. For this reason, respondents claim, it is better to have a *mathar* who is unrelated to the boat owner. Such a *mathar* will not demand of the boat owner the kinds of favours and attentions which kinsfolk do. A *mathar* who is a kinsman, on the other hand, can, by merit of his power within the crew, make considerable demands on a boat owner, and undermine the ability of the boat owner to control fishing, labour relations and even the theft of fish and gear.

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[61] Author's data.

For this reason, boat owners will normally appoint outsiders as *mathars*. In addition, boat owners will try to ensure that they have a special relationship with the *mathar*, delegating him with much responsibility and power, inviting him home and culturing him as a close, personal friend. In this way, the boat owner tries to win the *mathar's* allegiance, and attempts to ensure that no opportunity is opened for the *mathar* to set up close relationships with the rest of the crew, amongst which are the boat owner's kinsmen. In other words, a boat owner will try to create conditions in which a *mathar*'s interests coincide with his own. An additional advantage of employing a *mathar* from beyond the community is that whatever complaints or blame that the (related) crew might have tend to be levelled against the *mathar*, and not against the boat owner who has, after all, fulfilled his community obligations by employing them.

A boat owner may try to further weaken the power of the crew by dividing various responsibilities between them in an attempt to avoid any kind of unified action against him. Thus, for example, he will designate one person to set the net sinkers (the '*jachiko*' or '*ayombi*'), another to haul in the net sinkers (the '*japudhkidi*'), another to hold the net down with his feet in the water (the '*wiopara*') and so on. Each member of the crew is paid a little extra for each of these tasks, which serves to cement his relationship with the boat owner, but which also acts to set him against the other crew members. A wise boat owner will occasionally favour one crew member over others so as to reinforce the divisions, before he changes his attentions to another crew member. These competitive relations between crew members ensure that they all work hard, as each seeks to attract the favour and rewards of the boat owner.

These divisions of labour set crew and community members apart from one another as each competes in their own way for the attentions of the wealthy boat owner. These competitive relationships have a divisive impact on community structure, so that fishers's aspirations are not directed towards the well-being of the community as a whole, but towards their own, individual interests. This serves to disable any unified, community claim over the lake and its resources. In addition, it also distances the community from the resource base because the political control over the means of production is concentrated in the hands of a few, wealthy boat owners. In cases where the boat owner is absent, then control over the means of production is removed from the lake-side completely. The success of a fishing unit is increasingly based on the competitive relationships within it, and the ability of the boat owner to maintain and reproduce these. The boat owner, in this way, is able to minimise community claims on his wealth, while at the same time appearing to be a benefactor to the community by his fulfilment of nepotistic obligations.

High rates of competition also exist between traders, and these may have an impact on community structures, and help to define divisions of labour. As discussed in Chapter 4, traders often make arrangements with fishers in order to guarantee supplies. As the numbers of traders increases, however, relationships between them are not always confined to competing for fish supplies. Instead, competition may become entrenched in the struggle to gain supply arrangements from fishers. It is these kinds of arrangements which increasingly determine the success of trading operations, and a failure to secure them may lead to many traders gaining inadequate supplies of fish or none at all. This means that the divisions of labour between traders is based along the lines of those who are able to forge such supply arrangements with fishers and those who cannot. This division is also, to some extent, characteristic of the economic divisions between traders, because it is normally only those traders with access to established wealth who are best placed to offer fishers the most enticing arrangements, such as 'soft' loans, gifts of nets and other gear. Wealthy traders deal in the largest bulk of fish, ensuring an uneven distribution of fish supplies, with a small number of wealthy traders controlling the largest section of the market.

Divisions of labour also exist between small-scale and large-scale fish traders. Ogutu (1992) suggests that fish traders are alienated from certain segments of the market by the filleting companies because the latter are able to offer far higher prices than traders. Indeed, unless Nile perch is 'rejected', traders and processors do not have access to Nile perch of over a kilo. In this case, the division of labour occurs between those who have access to capital with which to buy large supplies of fish and refrigerated vehicles to transport these supplies to market, and those without access to substantial capital reserves.

Lack of access to such capital reserves can be extremely damaging to small-scale traders, particularly in areas where fish supplies are poor. At Asat Beach, there are two private individuals with their own refrigerated trucks who visit the beach daily. The competition between the two of them has raised fish prices on the beach, and fishers are satisfied with this. But because these trucks also deal in tilapia, fish traders on the beach can only deal in various types of under-size fish and *omena*, supplies of which are erratic and poor. Given that women are almost solely responsible for the upbringing and education of children, this alienation may have had serious effects at the domestic level. Despite the fact that many of Asat's traders are married to fishers, the improved prices that fishers received were no guarantee that these benefits would pass into the domestic economy because many fishers do not make any contribution to household expenditures.

As the number of traders increase, and fish catches decline, the necessity to establish some kind of arrangement with a boat crew for secure supplies becomes more and more important, heightening competitive relationships between traders. Similarly, as the number of fishers increases, competition between them increases as each vies for the attention of the boat owner, or for declining per capita fish catches. This undermines the ability of the individual community to minimise the competitive relationships within it, and to increase the various demands made on the few, wealthier members of the community, restricting the latter's ability to accumulate capital. In this context, community relations of production become defined by individual efforts aimed at gaining and reproducing the competitive relations of production that provide short-term nutritional and income security. Because the success of regulations in the pre-colonial fishery were based largely on the absence of intra-community competition, and the relations of production were geared towards the reproduction of the community itself, then these competitive relationships within fishing communities in the 1990's contribute to the decline of traditional forms of fisheries regulation, as each individual member strives to reproduce their competitive advantage and the means to nutritional and income security.

The impact of these competitive relationships may be observed at several levels within Luo fishing communities. As mentioned in Section 6.2 above, the labour-sharing farming system of '*rika*' has largely disappeared from these communities, as farming becomes defined in terms of competitive relationships, and increasingly, farmers have to pay for labour in-puts with cash. Another example of this breakdown is the gradual disappearance of '*bira*'. *Bira* is free fish, and in the pre-colonial fishery, anyone could ask for *bira* from a fisher, who could be repaid for the fish in some other way later. This ensured that everyone within the community had access to fish regardless of their occupation. A similar term exists for free agricultural produce, '*suma*'. However, *bira* is no longer a reliable mechanism of distributing fish. While most fishers agreed that they did give *bira*, this was only conditionally, such as to close friends, the disabled or the elderly. Many feared to give out *bira*, because the recipient, jealous of the fisher's success, could have a spell placed on the fish which would render the fisher's nets useless. At Tako Beach, fishers wandering home from work in the evenings took a circuitous route, trying to avoid the homes of in-laws or relatives who might demand *bira*. These fishers said that *bira* demands could get so great that they had to return home with no fish at all. While *bira* is supposedly voluntary, those who fail to give *bira* are frowned upon by the rest of the community, and demands for it are difficult to avoid. At Tako, like at many other beaches, *bira* represents an example of a community obligation that can undermine a fisher's nutritional and income security. As catches have declined, granting *bira* to all who ask necessarily limits the amount of fish a fisher can sell, as well as that which he can take home for personal consumption.

The role of traditional social and cultural obligations remains strong in the fishing communities of the 1990's. However, the nature of these obligations and their role has changed since the pre-colonial period. Before the establishment of the cash economy, these community obligations served to redistribute fish within the community, and because such favours would be returned in some way later, they represented an informal type of intra-community barter. In the 1990's these obligations have come to represent a means to individual survival, invoked and retained for exactly this purpose.

Because of their continued potency within the community environment, it is difficult to avoid them, so that while they may still ensure the redistribution of fish to some extent, they may also undermine the ability of the fisher to keep some of his fish for personal consumption or sale.

In the pre-colonial fishery, political power within a community was often synonymous with an individual's wealth. The charitable demeanour of a wealthy man consolidated and legitimised his rights to political power within the community, established his modesty and kindness, and assured that he was regarded as a fair and good leader of his people. In this way, acts of charity and good will were comprehens[illegible] components of political life, and a means to demonstrating one's ability to lead competently. Crucially, such charity was *expected* of leaders. In the 19[illegible]'s, these expectations continue, and can be seen in the extent to which nepotism is anticipated from those who gain employment or access to cash. Because a man's charity is such an integral component of his political status within a community, few wealthy individuals can forgo the requirement that they provide employment, loans and help to kinsfolk. In this way, the ability of a wealthy individual to retain accumulated wealth, and, indeed, to protect his means of production, can be undermined by his need to fulfil his obligations towards the community. The role of these community structures, therefore, is double-edged, for while they assure some measure of income and nutritional security for those who exercise them, they undermine the ability to accumulate capital and derive nutritional security for those who are subjected to them.

The state of these community structures and the competitive relationships that characterise them, have important implications for fisheries management. On the one hand, they provide an indication of the strength of community-based controls over the resource base. As per capita access to resources decline, and subsistence livelihoods based on farming and/or fishing become and increasingly difficult means to achieving nutritional security, cash assumes greater importance as a means to survival, and competitive relationships become defined in terms of access to money. Where this is the case, traditional forms of regulation are difficult to maintain, and in Kenya's Lake Victoria fishery, this would appear to be so. On the other hand, the state of community relationships and structures will often determine how new, state-based regulations are received. As is the case with community-based regulations, state-based regulations may fail in an environment defined by inter- and intra-community competition for cash. In other words, if state-based regulations represent restrictions on an individual's access to cash, they are almost certain to fail. This has important implications for the communication of regulations.

As we have seen above, competitive relationships within fishing communities can and do define the way in which fishing is carried out, as fishers consistently try to maximise catches, invest in many and/or various types of gear, keep information about good catches and fishing spots secret, and ensure the reproduction of divisions of labour within communities in order to gain and/or maintain competitive advantages. Thus, changes in community structures are a result of decreasing access to resources, as well as increasing numbers of fishers and traders. Another response to these changing competitive relationships has been migration.

Migration. As we have seen, fishers face constant demands from kinsfolk for fish or any wealth they may have accumulated. Fishers argue that because of this, the accumulation of wealth and its investment in the means of production cannot be done successfully amongst their home communities. For this reason they must migrate to places where they are unknown: "Jealousy makes people leave their home beaches. It is frowned upon to make it rich at your home beach, and people very rarely do so. You have to leave the beach to make money, or else you will loose all your wealth to your relatives".[62] This was not the case in the pre-colonial fishery, where resources and access to them were fairly evenly distributed throughout the community, and where community members could rely on their families and kinsfolk in the event of bad luck. Furthermore, fishers in the pre-colonial fishery could rely on several sources for livelihood security.

[62]Interview no.305, N'Gou, 25/3/95.

However, as access to resources has declined, and demands for cash have increased, fishers may then be obliged to migrate, either in search of better fishing grounds or else to avoid the constant community demands placed on them.

Since most crew members are paid percentages of the catch value, migration becomes a means of securing the best possible income. If catches should drop at one beach, casuals are apt to move on quickly to find greener pastures. Similarly, boat owners will often sail their boats elsewhere if catches at the home beaches should decline. The need for this kind of mobility reflects, on the one hand, the increasing relative importance of fishing as a means to an income, as other resources, such as agriculture, decline; while on the other hand, it represents a transfer of capital resources away from beach communities to other, distant, communities. Migration, then, also represents a security mechanism that can be relied upon in the event that catches at the home beach decline. Catch fluctuations, however, may be seasonal rather than permanent, and the migration that arises from such fluctuations a product of the drive to maximise earnings.

Most fishers have, at some time in their lives, been casuals. However, they are normally temporary migrants, seeking out work at various beaches for several months and then returning home for a while before they set off again. These temporary migrants eventually return home to settle, normally with a sufficient amount of capital to not only invest in a secure and continuous income source, but also to cover the various demands made on them by kinsfolk and, possibly, to pay the dowry for a wife.

However, there are, also permanent migrants. At Utajo Beach, it was claimed that over 20 families had recently migrated to Uganda because fish stocks at Utajo had declined so far.[63] Nyagina beach on Rusinga Island is almost entirely inhabited by permanent migrants from Karichwonyo to the east of Kendu Bay. While temporary migration is symptomatic of fluctuating catches and a desire to avoid community responsibilities, permanent migration is symptomatic of declining overall catches per fishing unit in specific areas. If this is a lake-wide trend in Kenya, and should it increase, community structures may cease to exist as capital, knowledge and labour are transferred elsewhere.

Migratory trends also affect the spatial configurations of the fishery. As considered in Chapter 4, the apparent increases in Kenyan catch totals may not be the result of increased productivity from the Kenyan sector, but rather, that they are sustained by fish smuggled in from Ugandan and Tanzanian waters. These waters promise much greater catches than Kenyan waters, and so fishers will try to congregate in those areas along the shore that have the best access to them. Thus, most of the largest of Kenya's landing beaches, such as Marenga, Wichlum, Uhanya and Usenge, are located in the western part of the Gulf, in Siaya and Busia districts, and the western-most parts of South Nyanza District (Nyatike and Mbita Divisions). The concentration of boats in these areas is high, particularly if compared to boat concentrations in the eastern parts of the Winam Gulf, in Kisumu District and eastern parts of South Nyanza District (Rangwe and Kendu Divisions). In 1991, just 21 per cent (1,305) of the boats in the Kenya sector were based in these eastern areas (Hoekstra *et al.* 1991).

Registration numbers indicate the district in which a boat has been registered. In 1991, 676 boats were based in divisions and districts outside those where they had been registered; of these, 66.4 per cent (449) originated from Kisumu District (Hoekstra *et al.* 1991). Only 4.6 per cent (31) of these migrant boats were operating in the eastern parts of the Gulf, while all the other migrant boats were operating in the western part (Hoekstra *et al.* 1991). Fishing communities in eastern parts of the Winam Gulf, therefore, appear to have experienced high levels of out-migration to western waters with easy access to the open lake, and the better catches which are said to be found there.

This migration represents a breakdown in social structures contained in Luo communities and society.

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[63]Interview no.135, Utajo, 27/10/94.

In the pre-colonial fishery, these social structures and relationships represented a means to community survival and reproduction. However, in an environment defined by increasingly competitive relations of production, the relationship between community members and these structures has changed. On the one hand, some of these structures have been retained by community members because they improve their chances for survival in the competitive environment. On the other hand, however, these community obligations represent restrictions on the fisher to provide for his own needs, and it is for this reason that the fisher may be compelled to migrate.

Migration, therefore, is a way in which a fisher may mitigate variable catches and/or overall catch declines in certain areas. It also represents a mechanism by which a fisher can generate and accumulate wealth for himself. However, migration is also a source of community breakdown, for it represents the transfer of knowledge, wealth and labour away from home areas and into others (cf. Harris *et al.* 1995). The radical changes that have occurred to Luo community structures have direct implications on access to fish which have come to be partially defined in terms of an individual's relationship with his/her community and its structures. Access to fish in recent years has been further compounded by massive ecological change.

6.9 Ecological change and constraints

The fertility of tropical waters depends on the rate at which nutrients can be brought into solution. The influent rivers of Lake Victoria provide few nutrients to the lake in relation to its size. Because of this, it is thought that most of Lake Victoria's nutrients are locked up in lake-bottom deposits (Beauchamp 1954; Hickling 1961). By itself, this vegetative matter decays slowly. However, animal flesh decays considerably faster, and therefore the fertility of the lake is dependent on the rate at which these nutrients can be eaten by fish (Beauchamp 1954). Prior to the introduction of the Nile perch, there were over 300 species of fish in the lake. Most of these were cichlid species - tilapia and *Haplochromines* - which are known for their extraordinary ability to evolve rapidly to suit extremely localised and diverse environments, a characteristic termed 'evolutionary plasticity' (Goldschmidt *et al.* 1993; Fryer and Iles 1972). This ability has made the cichlid species of Lake Victoria an extremely successful fish. Prior to the Nile perch invasion, for example, *Haplochromis* species accounted for some 80 per cent of the fish biomass of the lake (Witte *et al.* 1992), an abundance which led Graham (1929) to believe that this species flock could support a trawler fishery of up to 200 boats. It also meant that Lake Victoria at one time boasted one of the most diverse fish environments on earth (Coulter *et al.* 1986). With such diversity, the cichlids of Lake Victoria managed to exploit virtually every food source available, including most detritus, zoo- and phyto-plankton (Goldschmidt *et al.* 1993).

The introduction of the Nile perch, which favoured *Haplochromis* as its prey, had a decisive impact on *Haplochromis* stocks, affecting both their abundance and diversity. It is believed that the contribution of this species flock to the fish biomass of the lake has decreased from 80 per cent to less than 1 per cent since the introduction of the Nile perch (Witte *et al.* 1992; Barel *et al.* 1991), and that some 65 per cent of the *Haplochromis* species were driven to extinction in the process (Goldschmidt *et al.* 1993), an event which "...may well represent the largest extinction event amongst vertebrates this century" (Goldschmidt *et al.* 1993: 1993). The decline in the *Haplochromis* species flock has been felt by fishers, particularly long-line fishers who fish it for bait. This event has had far-reaching and important consequences which not only affect the fishery at present, but may eventually contribute to its collapse.

There is little doubt that *Haplochromis* played an important role in returning detritus and plankton back into solution (Kaufman 1992; Kaufman and Ochumba 1993; Goldschmidt *et al.* 1993). With some 80 per cent of *Haplochromis* species feeding off detritus, and equally capable of feeding off one another, they represented a tight, internal recycling system, moving nutrients and biomass both vertically and horizontally through the water column, and even out of the lake via predation by humans and terrestrial animals and humans (Kaufman 1992).

However, the removal of *Haplochromis* may have contributed to the increasing frequency of algal blooms (Goldschmidt *et al.* 1993; Ochumba and Kibaara 1989; Kaufman and Ochumba 1993), which may in turn be responsible for mass fish kills (Ochumba and Kibaara 1989; Wandera 1992).

Fishers were familiar with mass fish kills, but rarely blamed them on algal blooms. Instead, they blamed them on water spouts ('*nyakoi*') which frequent the lake from March through to May. It was said that fish kills always occurred after these had passed, and those Nile perch that were found dead in its wake had distended swim-bladders, a characteristic associated with sudden pressure changes in the water (Parker 1971). Fishers also blamed fish kills on the three Migingo Islands lying in the tri-point between Tanzania, Kenya and Uganda (Fig. 6.1). These islands are of volcanic origin, and are said to 'rumble' from time to time, at which point fish kills occur. These may be symptomatic of tectonic movements beneath the surface of the lake causing sudden and rapid pressure changes in the water and killing fish. Again, of the Nile perch killed in these events, many have distended swim-bladders. Such tectonic movements have been blamed for mass fish kills in Lake Albert (Parker 1971).

Finally, fishers blame fish kills on what they call 'hot water,' a feature that often killed bait rapidly. 'Hot water' was said to occur mainly on the lake bed, where fishers will sometimes set their long-lines and nets depending on fishing conditions. These may be currents of anoxic water which reportedly affects 50 per cent of the lake's bottom for prolonged periods of time (Kaufman and Ochumba 1993). This 'oxycline', below which no life can exist, may be symptomatic of the lake's eutrophication (Hecky 1993). The origin of this eutrophication is not clear, but could be the result of increased phosphate and nitrate deposition in the lake through a series of land-based events starting in the 1920's, with the clearing of land and vegetation through burning, and later through erosion by both water and wind (Hecky 1993). Needless to say, plankton may have responded well to this increased nutrient load, but without the *Haplochromis* species flock there to counter-balance the increased abundance of phytoplanktons, these blooms additionally contribute to eutrophic conditions. Indeed, it has been suggested that the presence of the *Haplochromis* species flock may have been able to mitigate the effects of eutrophication in the past (Kaufman 1992).

If the anoxic conditions along the bed of the lake should, in some way, be allowed to mix with the aerobic waters above, the consequences could be catastrophic: "...a large-scale fishery collapse from a major mixing event is a real possibility" (Kaufman 1992: 855). However, in the meantime, the introduction of the Nile perch has served to alter the nature of the fishery considerably. Current changes in Nile perch and tilapia landings appear to have been the direct result of intensive fishing, although *omena* landings do not seem to have been affected. The introduction of the Nile perch has served to change the fishery from a multi-species fishery to one which relies overwhelmingly on just three species: the Nile perch, *omena* and tilapia, and in this sense has contributed to the regulation of fishing activity. The presence of anoxic conditions and the apparent eutrophication of the lake will almost certainly serve to regulate the fishery in the future.

These changes represent a grievous threat to the fishery. In the meantime, the changes have also altered the nature of the fishery. Once the Nile perch had decimated the *Haplochromis* species flock, it turned to eating other species - *omena*, the fresh water shrimp *Caridina nilotica* and its own young (Achieng 1990; Ligtvoet and Mkumbo 1990). At the same time, and possibly in response to reduced predation by *Haplochromis* species, as well as increased detritus availability, *Caridina* populations appear to have increased (Goldschmidt *et al.* 1993). This was often commented on by *omena* traders, who said that the shrimp appeared in greatest numbers during the rains when it was caught along with the *omena*. The cost of a 'trough' of *omena* is the same regardless of the amount of shrimp mixed in with it. However, traders cannot sell the shrimp along with the dried *omena* product, and must separate it. The shrimp is then sold to animal feed buyers for prices well below the original cost of the *omena*. Traders resented this intensely.

Omena itself has also increased following the crash of the *Haplochromis* species flock. The *omena* is a zooplanktivore and, following the disappearance of zooplanktivorous *Haplochromis* competitors, the *omena* may have prospered in new-found nutritional abundance (Goldschmidt *et al.* 1993).

Catches of *omena* have increased substantially since the 1970's (Chapter 4), and fishers have responded to this increased availability. In 1987, some 25.7 per cent of the gear types in the fishery were purse seines, compared with 55.8 per cent gill-nets, 8.8 per cent beach seines and 9.7 per cent long-lines; by 1994 purse seines accounted for 60.1 per cent of the gear composition, while gill-nets accounted for 20.6 per cent, beach seines to 15.7 per cent and long-lines to just 3.6 per cent (Othina and Odera 1995). However, access to *Caridina* and *omena* for the Nile perch may be limited by the presence of the oxycline. Kaufman and Ochumba (1993) observed that both these species can survive beneath the oxycline for short periods of time. The Nile perch, however, does not tolerate anoxic conditions well, and cannot follow the *omena* there. The Nile perch appears not to have affected tilapia stocks. In other lakes where the Nile perch is common, it is thought to co-exist with the Nile tilapia (Kolding 1992; Balirwa 1992). However, anglers near Dunga regularly use juvenile tilapia as bait for the Nile perch.

A final concern to the ecological well-being of Lake Victoria is pollution. The temperature range in the Great African Lakes is between 22-30^{o}C. As temperatures increase, the capacity of water to retain oxygen decreases and its consumption increases (Coulter *et al.* 1986). As a consequence, the absolute amount of oxygen per unit volume of water is less in African lakes than it is in temperate-zone lakes, which make the Great African Lakes extremely vulnerable to pollution (Coulter *et al.* 1986). Furthermore, because these lakes (Lake Victoria included) loose some 90 per cent of their water to evaporation, retention times for any pollution in them are very long (Coulter *et al.* 1986). Thus, as industrial and agricultural development within the Lake Victoria basin continue to increase, pollution may also play a contributory, and regulatory, factor in the future fishery (cf. Achieng 1992; Bugenyi and Balirwa 1989; Coulter *et al.* 1986; Mitema and Gitau 1990; Wandera 1993; Kirugara and Nevejan 1996).

6.10 Conclusion

Fishers interviewed during this survey identified a series of problems which they consider to be the worst they face in the fishery. Most of these problems relate to access to fish, and therefore represent mechanisms which serve to regulate how and where fishers fish, as well as to determine per capita catch rates. This chapter has identified seven main reasons why these changes have occurred: the relationship between fishing and farming, investment limitations and capacity, theft, per capita catch declines, increases in fishing effort, the influence of marketing variables, changes in community structures and relationships, and, finally, ecological factors. Many of these changes are the result of a combination of several trends, including increased demands for cash as a means to livelihood fulfilment; population increases; declining urban job markets; the rising international market for Nile perch; large-scale investment in the fishery by commercial filleting factories; and, finally, the decline of traditional forms of regulation within the fishery. The net impact of these trends has been to increase the fishing effort, to reduce per capita catches, and, ultimately, to force fishers to follow certain exploitation patterns which may not, in the long run, be sustainable. Many of the trends that affect these exploitation patterns and production levels originate far from the lake. Effort levels, for example, are largely determined by trends in urban job-markets, while changes to the fish market may be determined by international demands for Nile perch. The fact that so many of these trends are exogenous to the lake and its communities suggests that control over the fishery is being transferred away from the lake shores, undermining the ability of lake-shore communities to regulate access to the resources on which they rely.

It is important to note that the exogenous trends that serve to determine exploitation within the fishery are not the product of any formal, state-based regulation. Indeed, these trends compound the ability of fisheries administrators to effectively manage the fishery. Furthermore, because many of these trends undermine the ability of fishing communities to meet certain livelihood needs and requirements, they ensure that few fishers can afford to obey formal fishing regulations.

Within this kind of environment, formal regulations may even hinder the ability of fishers to cater for their own livelihood needs. Conversely, the informal regulations that dominate exploitation patters in Kenya's Lake Victoria fishery may also, in the short-term, seriously threaten the ability of fishing communities to meet livelihood requirements. As has been discussed in this Chapter, many of these informal regulations have resulted in a much increased fishing effort which has compounded levels of competition within the fishery. They have also served to increase pressure on fish stocks, ensured that there is wide-spread use of illegal fishing gear; increased nutritional insecurity; and, finally, altered community structures. In this way, then, Kenya's Lake Victoria fishery has come to assume many of the characteristics associated with common-property, open access fisheries around the world (see Chapter 1).

This has meant that fishing within Kenya's Lake Victoria fishery has come to be defined by a series of coping and risk aversion strategies which are designed to mitigate the localised impact of the various exogenous factors that dominate the fishery. Under these types of conditions, fishers have no recourse to consider the long-term sustainability of the fishery. It is these coping strategies that have been largely ignored in the management of the fishery, and which must be understood if formal regulations are to work. Failing to do so necessarily means that the way in which regulations are communicated to fishing communities become distorted. Through the overwhelming biological and ecological biases inherent in most contemporary fisheries management models, the trends that affect the human populations that rely on fisheries, are side-lined and even ignored as management seeks to define 'efficient' production strategies and 'optimal' catch rates. As Gordon (1954: 133) comments, "[s]ince...regulatory policies are made by man, surely it is necessary that they be evaluated in terms of human, not piscatorial, objectives".

The failure of formal, state-based regulations in Kenya's Lake Victoria fishery are not only restricted to the inability of the Kenya Fisheries Department to enforce them (Chapter 5), but also due to the pressures that fishing communities face. It is necessary, therefore, to examine management alternatives which will not only improve the regulation and monitoring of the fishery, but which can also alleviate the resource access constraints which fishing communities have to cope with. Chapter 7 sets out to try and provide such options.

7 Options, directions and alternatives for the future regulation of Kenya's Lake Victoria fishery.

7.1 Introduction

In recent years, the riparian states sharing Lake Victoria have agreed to form an economic union, under which border controls will be removed. In anticipation of this, moves have been made to harmonise the regulations in force on Lake Victoria by the establishment a 'Lake Victoria Fisheries Organisation' (LVFO) to cover all the three nations that share the lake (Government of the Republic of Kenya *et al.* 1995). The role of the LVFO will be to determine and enforce regulations; to collect fisheries related data; collect funds for its own administration costs; and to co-ordinate and monitor the operations of co-operatives. It is expected that the types of regulations that the LVFO is set to impose are contemporary regulatory mechanisms, such as net mesh restrictions, closed seasons and so on. No facility has been included in the project proposal to evaluate the effectiveness and usefulness of these regulations. The project is expected to cost some US$ 8.5 million over a five year period, funded by the World Bank and the European Union (Government of the Republic of Kenya *et al.* 1995). Where funding will come from to sustain the LVFO after this period is not clear. The funding difficulties faced by centralised, state regulatory institutions, however, are only one of the many problems that the LVFO will have to face. Of equal concern is how the LVFO's regulations will fare in a fisheries environment where exploitation patterns are defined by detrimental coping mechanisms, which are the product of exogenous socio-political and economic trends, over which the LVFO will have little or no control. For these reasons, it is imperative that alternative management strategies should be considered, that not only alleviate funding, staffing and monitoring constraints, but which may also provide some measure of nutritional and income security for the fishing communities involved.

This chapter sets out to consider possible alternative forms of management that may be considered for use in Kenya's Lake Victoria fishery. It starts by examining the possibilities of establishing community-based boundary institutions, of which it explores Territorial User Rights in Fisheries (TURFs) and the creation of residency and limited access institutions. The Chapter considers the possibility that the implementation such alternatives may already coincide and build upon already existing community-based institutions regulate access to the fishery, and proposes an institutional framework into which such alternatives may be placed. Finally, the Chapter examines the possible role of the Kenya Fisheries Department (KFD) within this framework.

7.2 Options for TURF implementation:

In Chapter 1 it was suggested that the allocation of territorial user-rights to fishing communities may represent a means of establishing both the allocation of the resource base between community participants, but also as a means of conferring exclusivity of water resources upon users. In was suggested that these could be gained in several ways: by explicitly allocating aquatic resources to small-scale fisheries; by dividing these resources between small-scale fisheries; by regulating entry into the fishery and/or by encouraging exit from the fishery through the creation of alternative employment opportunities (Panayotou 1982). Furthermore, in order to avoid any kind of divergence between the rule institution and the allocation of such rights it is important that the manner in which this transfer of user-rights, and the way in which they are designed, compliment already existing social and cultural structures and perspectives. Of additional importance to the implementation of such rights is an understanding of whether or not such rights existed in the past, and the extent to which they prevail currently. In Kenya's pre-colonial fishery, TURFs were one of the most important components of fisheries regulation at this time.

However, as discussed in Chapter 3, these were primarily allocated on the basis of the fishing gear during this period. Thus, individually owned TURFs extended out to the maximum water depth in which a *kira* could be set.

TURFs, it should be noted, typically take the form of allocated boundary defined territories between fishing communities and fishing grounds. The explicit allocation of such TURFs in the current fishery would have to be based on four crucial factors: firstly, the extent to which fishers still identify with their sub-clans, which could be used as principal unit by which these TURFs are allocated; secondly, the extent to which these sub-clans still identify with water territories; thirdly, the potential for political problems and conflict that may arise between fishing sub-clans as a result of the implementation; and finally, the difficulties and costs that may be associated with the delineation of these TURFs.

There are several indicators of the current strength of sub-clan association. As shown in Chapters 4 and 6, for example, most fishers come from fishing sub-clans. In addition, although most young fishers will leave their sub-clans to gain experience and accumulate wealth elsewhere, they invariably return home after some time, hence demonstrating the strength of their community association. Many traditional socio-political relationships between sub-clans still remain. For example, during the pre-colonial period, community members were not allowed to marry within the clan itself, and spouses were drawn from other, unrelated clans. Clans often demonstrated political unity by establishing marriage rights between themselves. Members of Luo fishing communities still respect these laws. Most will marry outsiders from those clans with whom marriage rights were established many generations ago. This serves to consolidate community identity by drawing out historical differences and associations between sub-clans. In addition, various customs and rituals continue to be maintained by various sub-clans, which set them apart from others. As such, sub-clan association remains strong, and in the event that TURFs are allocated, could be further strengthened.

An additional factor that appears to reinforce sub-clan affiliation is access to resources. As discussed in Chapter 6, sub-clans in Kenya's Lake Victoria fishery appear to invoke water rights when their access to fish stocks decline. At one level, sub-clans may react to these declines by verbally abusing outsiders fishing in 'their' waters. At another level, however, the demand for controls over water territories may become so great that violence ensues between water territory 'owners' and outsiders. These efforts at excluding outsiders from water territories are unified actions involving the whole of a sub-clan's fishers, and suggests that when access to fish stocks becomes severely restricted, then the benefits to be gained from setting up temporary institutions of exclusion become perceptible. In this way, declining access to water resources not only provoke a rise in community consolidation and identity, but may also prompt fishing sub-clans to invoke traditional rights over water territory. This suggests that there is a basis from which TURFs can be implemented and that there is an institutional basis on which they might rest, and that fishing sub-clans have a clear idea of where 'their' waters are and the limit to which they extend. However, the imposition of TURFs may accentuate differences between sub-clans to such an extent that as fish stocks and per capita catches continue to decline, further violence may well erupt. Equally, while sub-clans claim to be able to identify which water belongs to them, delineating these territories could be extremely problematic, as each sub-clan tries to persuade independent delineators that their TURFs are larger than the actually are. If TURFs are to be regarded as a plausible option for the management of Kenya's Lake Victoria fishery, more research must be done to examine the extent to which sub-clans perceive rights to water territories, as well as to try and foresee the possible political conflict that might arise. As a result of these types of problems, a more viable management alternative may be to encourage fishing communities to establish institutions to control access to their fisheries as opposed to explicitly delineating fishing territories.

7.3 Options for restricted access implementation

Under this scenario, institutions are established whereby communities have the right to decide who can fish from their shores.

In this sense, then, sub-clans do not hold *per se* rights over the water, but do hold the right to exclude outsiders from their shores. In Chapters 3 and 6, the association between the Luo and their land was discussed. These associations currently have a political expression, in that sub-clan lands are generally embodied in sub-locations, and clan territory is expressed in terms of either locations or divisions within districts. This territorial delineation, indeed, plays an important role in defining sub-clan identity, and may form the basis on which restricted access rights can be established. Here, the sub-clan shore can be identified by that portion of a sub-location's boundary which is defined by the lake shore. The sub-clans that occupy this territory would then hold the rights to determining who can fish from their shores, although they would not be able to prevent outsiders from entering into 'their' waters by boat. Throughout this study, increasing effort levels have been cited as one of the greatest problems facing Kenya's Lake Victoria fishery. The sum effect of such quasi-property rights would be to control effort levels by denying members from non-fishing sub-clans, as well as other ethnic groups, the right to use the lake as a source of income. Although this means that income options for these latter population groups are restricted, the long-term benefits to be gained from such a strategy would mitigate the short-term difficulties that such population groups might experience (see Chapter 1). Most fishers are from fishing sub-clans in any case, and the movement of people from non-fishing activities into the fishery still appears limited. Because of this, the impact of such restrictions on communities who have not traditionally had access to the lake will probably be minimal.

The implementation of such access rights and controls would probably be acceptable to fishing communities for a number of reasons: firstly, such access rights existed within the pre-colonial fishery, and fishing communities are for this reason already familiar with them. Secondly, certain current trends suggest that the notion of access rights is prevalent amongst fishing communities. Thus, for example, non-resident migrant fishers arriving on beaches are obliged to introduce themselves to the beach leader, identify what gear and crew they have brought with them, and then to pay '*kanyaga*' ('trespass') fees to beach authorities. Some beaches already restrict who is allowed to fish and trade from them. At Misori Beach in Siaya District, for example, those fish traders who are not married to a resident fisher, or who are not related to a member of the beach community, are not allowed on to the beach. On the Utajo Peninsula on Rusinga Island, a number of private beaches exist. As was the case in Kenya's pre-colonial Lake Victoria fishery, these beaches are owned by those on whose land they are located. These land owners can determine who can fish from their shores, what kinds of gear are permitted, and when fishing can occur. Virtually all beaches along the shore of the Kenyan sector of Lake Victoria are owned by private individuals, although access to them varies. As a consequence, designating powers to these individuals and/or communities should not be a problem given that this institutional context already exists.

Along with access controls, fishing sub-clans can be allocated the right to decide what gear they permit to be used from their beaches. There is wide-spread dissatisfaction amongst fishers for what they see as 'destructive' gear, and many cite under-sized mesh sizes, beach seines and the *ochun* ('forcing') fishing methods described in Chapter 4 as being responsible for the 'destruction' of the lake. There is evidence to suggest that fishing communities are prepared to try and control the types of fishing gear used off their beaches. At Kaloka, beach leaders have complained to the KFD about the lack of controls on fishing gear. The KFD responded that they should create their own methods of controlling the problem. The fishing community leaders decided amongst themselves that the local sub-clan would ban illegal fishing gear, and gained support from the sub-clan elders and the area sub-chief. The location chief, however, intervened, saying that the local sub-clan could not take the law into their own hands, and that their plan would have to go through the 'proper channels.'[1] This example demonstrates the willingness of some fishing sub-clans to control the kinds of fishing gear used off their shores. The above example also demonstrates the ability of centralised controls to hamper community-based initiatives to improve livelihood conditions, and the desire to control access to their resources.

[1]Interview no.78, Kaloka Beach, 14/9/94.

The 'private' beaches along Utajo Peninsula also exhibit similar restrictions on gear, and throughout the fishery, many beaches will actively seek to prevent users of *ochun* fishing methods from fishing from their shores.

As discussed in Chapters 1 and 5, the costs of regulatory enforcement can be high. However, if fishing communities are allocated with powers to both control access as well as to regulate gear usage, then the costs of regulation are minimised as they are transferred from the state to the beach communities who do, in any case, appear to perceive benefits over and above the present *status quo* dominated by a lack of regulation and the prevalence of illegal gear types. The evidence presented above, furthermore, appears to indicate that fishers also perceive sufficient benefits from monitoring their waters, and hence providing an institutional basis for the regulation of the fishery. In addition, with lake-side communities holding such powers of regulation, not only will the monitoring of the fishery be more effective, but that the costs associated with such monitoring are also minimised (Johannes 1978; Panayotou 1982). The transfer of regulatory powers in this way may also remove the considerable divergence in perceived benefits between those associated with state regulations and those associated with communally enforced regulations. It was suggested above that as per capita access to fish stocks still appears to be on the decline and is increasingly acute, then the relative benefits to be gained from enforcing the rules associated with locally generated institutions increases. This may have to do with the problems outlined in Chapter 6, where it was suggested that as exploitation within the fishery is increasingly defined by risk aversion strategies and coping mechanisms designed to mitigate the impact of highly uncertain trends both within and without the fishery, then the consequences of divergence between state perceived benefits and community perceived benefits become increasingly clear. Under such conditions it is likely that communities will seize the initiative to create locally defined regulatory institutions, in order to mitigate the problems associated with uncertainty, and the sub-optimal outcomes associated with risk aversion and coping strategies. For example, if communities can control access to the fishery, then the impact of job market declines in urban areas may be minimised because communities will be able to prevent renewed entry into the fishery. Similarly, communities may influence investment patterns by prohibiting the use of certain gear types, or placing ceilings on the number of nets and/or boats that their members invest in. Controlling access could also minimise the problems associated with high levels of competition between fishers, or even make competition profitable, as non-community members are charged for fishing from shores which are not their own. Needless to say, if Kenya's Lake Victoria fishing communities are to utilise access rights as a means to curbing uncertainty, then uncertainties associated with institutional and rule creation must also be removed by ensuring that a community's rights over the resource base are legally defined within national statutes and provisions made for their protection.

7.4 Possibilities for community-based institutional design

The institutional context for the changes proposed above may be centred entirely on the sub-clans themselves, and these could be based on pre-existing co-operative society structures. However, as shown in Chapter 6, few fishers are members of co-operatives, and even fewer have ever received any benefits from them. The success of co-operatives appears to be based on three factors: the size of the catchment area from which the co-operative draws its membership; the level of ethnicity involved in its running; and finally. its level of 'openness' with regard to its members. 'Openness' implies that the co-operatives hold no secrets from their members, and information regarding transactions, bank statements, receipts and so on are readily displayed and available for scrutiny by members. In the following discussion, the success of two fisher's co-operative societies, Dunga and Bunyala, are compared in order to demonstrate that those co-operatives which have a small and localised membership catchment area, are 'open', and have a high degree of ethnic dominance within them appear to be more successful than those co-operatives who do not share these characteristics.

Dunga Fishermen's Co-operative Society was established in 1970, and currently has around 130 members, of whom approximately 80 are active within it (Intermediate Technology Group 1996).

Virtually all of the co-operative members are boat owners, and most of them come from the local Kolwa Sub-Clan of the Kisumo Clan, and are resident either on or near the landing beach. Its responsibilities include: providing its members with savings accounts; the collection of commission fees on all fish landed; the provision of health insurance to its members; and the determining of how fish marketing and sales are carried out on the beach and negotiating marketing deals with large-scale fish filleting plants, of which currently it has one with the Afro-Meat Co. The co-operative is extremely popular with its members, and Dunga had one of the highest rates of co-operative membership out of all the beaches visited during this survey. Most members had at some time received bonuses and/or loans for the purchase of additional gear and/or boats. The committee that runs the co-operative is composed almost entirely of wealthy members and elders of the local sub-clan. All society transactions, expenditure, fish sales, and cash deposits are openly displayed on the co-operative office walls, and all members are able to monitor its activities. In this way, the arrangement of the co-operative closely follows traditional power structures peculiar to the Kolwa Sub-clan. In addition, members are unlikely to be mislead or 'cheated' by the co-operative because they have the opportunity to examine all of its records. Finally, it is locally specific to Dunga Beach from where most of its members are drawn. Importantly, Kolwa Sub-clan is almost entirely dependent on fish for its income and nutrition, given that the sub-clan's land is almost completely covered with boulders, rocks, and swamp and cannot be farmed. Respondents from Dunga had the lowest rates of agricultural involvement of any beach visited during this study, and their success and relative wealth within the area is in large measure a reflection of the success of the co-operative. An additional feature of this co-operative is the manner in which it selects its members. Unofficially, people who are not from the Kolwa sub-clan stand little chance of being accepted as co-operative members, a feature that outsiders criticised it for. Nevertheless, even casual fishers with no form of collateral, were allowed to join it, provided they were members of the Kolwa Sub-clan.

Fishers from the Manyala Clan in Busia are represented by the Bunyala Fishermen's Co-operative Society based at Marenga. This co-operative is supposed to cover all of the beaches in the district. This means that those members who are not based at Marenga are unable to scrutinise the activities of the co-operative, and, conversely, the co-operative cannot collect membership dues from all of its 730 members (Republic of Kenya 1994a). It is widely regarded as being corrupt and dishonest, and the chairman of the co-operative committee was neither a fisher nor a Manyalan. The co-operative provided no services which the fishing community felt were beneficial, and dissatisfaction for the co-operative was so great that even those fishers based at Marenga ceased to pay their membership commissions. However, the co-operative had managed to continue its operations by cornering the Nile perch market on the beach. A great deal of Ugandan Nile perch is landed at Marenga, and the co-operative ensured that trucks from the filleting companies only bought Nile perch from its sales representatives. This forced fishers to sell their perch to the co-operative, which then charged the filleting companies a twenty per cent commission fee on every kilo of perch that it handled. In this way, the co-operative earned an annual income of some Kshs. 2.5 million. However, the chairman had received court summons to explain the disappearance of some Kshs. 3 million in co-operative funds, and at the time the beach was visited in January 1995, a new committee was due to take office.[2] This example serves to illustrate the kinds of tensions that may arise if multi-ethnic controls are imposed on a beach and if the co-operative does not openly inform members of its activities and financial accounts. An additional complaint from fishers at Marenga was that there are too many Ugandan fishers landing there, which they felt hampered their ability to impose controls on the beach. They argued that the Ugandan fishers came to Marenga to take advantage of its good markets, and yet they made it difficult for Manyalan fishers to fish in Ugandan waters. As the beach leader put it, "...it is difficult to get co-operation on this beach because there is such a variety of people here."[3] Similar ethnic tensions exist on Rusinga Island, where the Rusinga Fishermen's Co-operative Society is extremely unpopular with fishers because it is located at Mbita, far from most of the island's beaches.

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[2]Interview no.187, Marenga Beach, 25/1/95.

[3]Interview no.192, Marenga Beach, 27/1/95.

It is run by a multi-ethnic committee of non-fishers from both Wanyama and Waware Sub-Clans, and it was widely judged by fishers to be operating in its own interests rather than those of the fishing communities.

The above examples suggest that if co-operatives are localised and specific to local fishing sub-clans, are 'open' and ethnically dominated, not only can they serve as a node around which localised institutions can be created. They also present us with the problem of scale within institution building: In the case of the Bunyala Co-operative, little institution building occurred due to the physical distance separating most potential members from the co-operative society. In addition, ethnic diversity can serve to increase the risks associated with heterogeneity by making it difficult to create leadership structures around which institutions can form. Finally, by seeking to draw funds and membership dues from to large a catchment area, as well as suffering from problems of corruption, Bunyala Co-operative society undermined the possibilitie. of creating any perceived benefits to inspire members to invest in it. In this sense, Bunyala Co-operative created the very divergence which led to its failure. Conversely, Dunga Co-operative drew its membership from a fairly small catchment area, provided services to its members so creating the inspiration to invest within it, and, through it ethnic dominance, limited the potential effects of heterogeneity. In this way, co-operative societies can serve as the basis around which local regulatory institutions can be formed, particularly if they try to incorporate locally specific structures and authority within their administration.

Funds for these co-operatives could be raised through the imposition of '*kanyaga*' fees based on local fish availability, commission fees collected from members (both fishers and traders), taxes or commission imposed on fish buyers, and from fines imposed on those who disobey regulations and beach rules. Additionally, these community co-operatives should also provide saving facilities. In this way, fishers can either receive loans and/or draw on savings in the event that local catches should decline or are variable. As was discussed in Chapter 6, when catches are poor and/or variable, fishers may often respond by increasing their fishing intensity to try and mitigate these declines, or else migrate. These represent coping mechanisms designed for exactly these possibilities. However, if fishers have access to funds on which they can rely in the event that fishing is poor, an alternative basis for security would be created. If this were the case, fishers might be less inclined to migrate or fish intensely. Under these conditions fishers may not only be willing to remove their nets from the water, but also to save in the long run, rather than basing their expenditure on immediate and short-term needs. These are valuable considerations, given that fishers otherwise maintain constant fishing pressure and intensity, regardless of the state of the fish stock or the fish markets.

7.5 Future roles for the Fisheries Department

All of the above issues are of crucial importance to fisheries managers because of the potential they have for limiting access to Kenya's Lake Victoria fishery. However, this is not to suggest that the KFD would not have a role to play. In this section, the extent to which the KFD can play an 'adaptive management' in the administration of the fishery is examined. An important component in this regard is the way in which the KFD can help in (a) providing information and monitoring capabilities; (b) in assisting fishing communities with delegation and regulatory sanctions.

While fishers retain considerable amounts of knowledge about fish and fish migrations, the KFD can certainly retain an advisory role, providing information not readily available to fishers, such as recommending mesh-sizes, or information on the size of fish when they start to breed. Furthermore, through a monitoring capacity, the KFD may also be better placed than fishing communities to explain ecological and limnological changes within the fishery. All of these service could help to alleviate - to some extent - the appropriation problems outlined in Chapter 1, enabling fishers to gain access to important ecological and limnological information which can at least minimise the uncertainties often associated with this type of common property resource, and hence enable fishing communities to respond the changes as they occur. This ability to respond to changes is a necessary component in the construction of 'robust' institutions. The KFD could also play an important role in the alleviation of uncertainty in the fish markets.

As discussed in Chapter 6, fishers very rarely know the condition of fish markets, and respond by trying to fish as intensively as possible, regardless of market conditions. If the KFD were able to monitor the price of fish in markets far from the beaches, and pass on this information, fishers would be better placed to anticipate and prepare for price fluctuations. Similar services are provided for small-scale farmers, and are broadcast over the radio, an option the KFD could consider.

The role of the KFD could also include law enforcement. During this study, several examples of community-based 'justice' events were observed, where people who, in the eyes of the community, had broken some local law, and were publicly tried and punished. This implies that fishing communities not only maintain a sense of justice, but also notions of punishment for offenders. However, if such community systems of justice fail, then the KFD could intervene at the behest of the communities involved. Of all the crimes that occur on the lake, fishers regard piracy and the theft of fishing gear and boats to be the most severe, and it is in these areas that the KFD could play a useful role, by introducing patrols on the lake to help fishers protect their gear from theft, as well helping fishing communities to monitor the types of gear being used off their shores.

There are two other area in which the KFD might also play a useful role. Firstly, it could play an important role in defining the costs of fishing, and, hence, contribute to limiting effort levels. As discussed in Chapter 4, the KFD is efficient in ensuring that all fishers have licences, and that their boats are registered. However, while these regulatory mechanisms have the potential to ensure that effort levels are controlled, there is no evidence to suggest that they have been used in this way. Furthermore, the KFD has largely failed to control the widespread use of illegal mesh-sizes. If the KFD were to revoke licensing and registration regulations, and replace them with net licences, then some type of control over both effort and the use of illegal gear could be gained. Those nets above the stipulated mesh size may be charged low licensing fees, while those below it may be charged high ones, altering the Maximum Economic Yield (MEY) advantages to be gained from using smaller mesh sizes. In other words, by establishing net licensing rules, and allocating costs that proportionally increase with decreases in mesh size, then the smaller the mesh size used, the higher the cost. Communities could assist the KFD in this regard. The legal framework in which the fishery is set could stipulate that all community organisations must disclose the number of nets operating from their beaches, as well as their mesh-sizes. In order to provide fishing communities incentives for reporting such information, co-operatives should receive at least some of the revenue gained from licence sales. Furthermore, if fishing communities were to yield such information to the KFD an indication of effort sizes could be gained if this was based on the numbers of nets and the known life spans of the various mesh plys involved (see Table 4.4, Chapter 4). Since the KFD is so efficient at ensuring that all registration and fishing license fees are paid, there seems little reason why they should not be equally efficient at issuing net licenses. In addition, this plan would ensure that there would be no such thing as an 'illegal' net, so removing the basis from which Fisheries 'scouts' can extort bribes.

Finally, the KFD could play a vital role as an 'umbrella' organisation, informing fishing communities about what other fishing communities are doing, and attempting to co-ordinate activities between them. Within this capacity, it could also co-ordinate the integrated monitoring of other resource pools such as agriculture. As was argued in Chapter 1, and demonstrated in Chapter 6, farming conditions can play an important role in defining both effort increases and the rate to which these occur within the fishery. If they are available, it is vital that resource managers exploit alternative sources of employment and nutrition as a way of alleviating problems associated with high effort levels:

> "...[I]n the presence of terminal resource limitations and surplus labour in fishing communities, creation of supplementary or alternative employment (or gradual reallocation in the absence of such prospects) is a *sine quo non* condition for upgrading fisheries and uplifting depressed fishing communities" (Panayotou, 1982: 38).

This study found that there was limited awareness amongst Nyanza's fisheries administrators of trends in agriculture and alternative employment markets was limited. Similarly, agricultural administrators from the Nyanza region knew very little about trends within the fishery. The KFD, in conjunction with the various agricultural institutions of the region, could play a crucial role in redressing this imbalance, and contributing towards an integrated regional development plan.

7.6 Conclusion

The above proposals are intended to serve as possible options for consideration in the design of future management policies. Degnbol (1992: 220) has argued that in Lake Victoria, "[i]t is difficult to avoid being pessimistic about the possibilities for finding practical means of regulation that are acceptable by the fishery or even could work on a participatory basis [sic.]". This is by no means the case. It is one of the deficiencies of alternative fisheries management theory that community reactions to declining access to resources are not examined. In the case of Kenya's Lake Victoria fishery, as per capita access to fish stocks has declined, communities appear to have gone through some measure of consolidation, seeking to exert their influence and control over the resource bases on which they rely, through the establishment of certain institutions. If this is a general feature of small-scale fisheries throughout the world, it represents a means by which alternative management options can be founded.

This study has indicated that formal regulations have only ever worked in Kenya's Lake Victoria fishery if they are community-based. The success of both the Lake Victoria Fisheries Service and the KFD in implementing their own varieties of formal regulations have not been good, with the result that effort levels within the fishery have increased through time, and fish stocks have been harmed. Increasing effort levels, furthermore, have resulted in intense competition between fishers and fishing communities, with the result that the fishery has come to be a single component in a far greater effort to gain and guarantee livelihood requirements in the face of increasing per capita resource scarcity. It is therefore improbable that plans to implement similar regulatory mechanisms in the future will succeed. However, community-based responses to declining resource access, such as institutions that restrict access for outsiders, attempt to control water territories, and aim at limiting the use of illegal gears off beaches, may all represent a means around which future management alternatives can be designed. While community-based regulatory systems may not automatically result in the sustainable exploitation of the fishery (cf. Toulmin 1991; Wilson 1982), they do provide a viable option that fisheries managers can contemplate, given the failure of state-based formal regulations in the past, and the success of such community-based regulation in the pre-colonial period. Needless to say, these latter successes must not be regarded as a basis from which to expect success from the options presented above. However, given that such institutions have existed in the past indicates that there may be some remnant framework around which new institutions can be built. Furthermore, one of the greatest advantages to be gained from contemplating the options suggested above is that they result in the establishment of a dynamic management system that is both better able to monitor changes within the fishery, and capable of rapidly responding to and learning from these changes. It is important to reiterate the benefits to be derived from such community-based management systems, and these may be summarised as follows:

(a) Placing fishing regulations into the hands of fishing communities represents a transfer of the costs associated with the enforcement of these controls to the fishing communities (Panayotou 1982; Johannes 1978).
(b) Because fishing communities perceive benefits from controlling their resources, the monitoring of any fishing controls may be more effective if carried out by fishing communities themselves. Needless to say, given that fishing communities are located on the lake, and are aware of who is on the beach and where their members are fishing, regulation may be far more effective than if it is left in the hands of the KFD.

(c) Because many of the regulations proposed by alternative fisheries management theory have previously existed in some form or another in most of the world's small-scale fisheries, their implementation may be expected to be rapid, successful and their benefits soon realised (Panayotou 1982; Johannes 1981).

(d) The establishment of community-based controls can provide fishing sub-clans with a basis from which to derive incomes. These may be gained through charging outsiders who wish to fish from community shores, taxes on fish sales, commissions charged to community members, net licenses or, finally, from fines levied on offenders. If collection of such funds is based around a co-operative, in which fishers also save, funds could be made available to fishers at times when catches are low. Such funds may provide fishers with incentives to leave their gear out of the water, and reducing the intensity with which they fish.

(e) If community-based controls and management are based on ethnic identity, it would appear that these have a high chance of being both effective and efficient. In this way, community leaders can be internally monitored and regulated by sub-clan members. Utilising outsiders who are not part of any fishing community appears to result in ethnic tensions, distrust and the failure of fishing organisations, such as co-operatives. This locally specific way of establishing institutions may not only serve to limit problems associated with heterogeneity, but also limit any possibility of divergence as communities establish the kinds of rules they feel they will benefit from, and which they feel they are best able to monitor and implement.

The future of Kenya's Lake Victoria fishery hangs in the balance, and the failure to control effort increases, ecological change and associated damage to existing fish stocks necessitates that some kind of regulatory change must occur if the collapse of the fishery is to be avoided. The evidence presented in this study suggests that the use of formal, state-based regulations within the fishery will not prevent its collapse. As a consequence, any future managerial change must consider the options presented in this Chapter as possible alternative management strategies, for the failure to include fishing communities in the management process will necessarily result in the failure of any state-based formal regulation.

8 Conclusion: theory for fishing, fishing for theory: study findings and implications for the management of Kenya's Lake Victoria fishery

8.1 Introduction

This study commenced with an examination of 'regulation', and argued that this referred to any influence that might affect the manner in which a resource was exploited. It suggested that formal regulations were the product of broadly based policy prescriptions set in motion to gain some outcome. In the process of gaining such an outcome, the regulatory institution involved may utilise rules, which differ from regulations in that they are definitive influences that specifically state what participants in an institution can or cannot do. Chapter 1 also identified informal regulations, which it suggested were often the product of wide policy prescriptions which may have unforeseen influences on resource extraction. Such informal regulations may also be the product of resource user's relationships with other resource pools besides the one under examination.

Within this contextual framework, Chapter 1 set out to briefly examine the kinds of regulatory sets and their associated rules utilised in fisheries management. It identified those regulatory models which sought to influence extraction from a fishery by targeting the fish stock for protection, or else those models which seek to conserve fish stocks and control both the rate and level of production from the resource by bringing economic influences to bear upon resource users.

The study then set out to examine the efficacy of such formal regulations in the management of Kenya's Lake Victoria fishery through time. It has sought to show that state-based formal regulation have no meaning in this resource system. These problems are supply-side in origin, and appear as problems inherent within fishing regulations on the one hand, and the difficulties associated with regulatory implementation and enforcement on the other. In addition, the relationship that fishing communities share with these regulations are often distorted via the influences of informal regulations occurring at both the local and regional level. It has also tried to show that local, communally designed systems of regulation present managers with far more viable management options. This conclusion sets to examine the viability of these latter claims by reference to the initial objectives of the study. It summarises the findings of the study, and examines the implications of these findings. The chapter will also explore how these findings relate to our understanding of fisheries management systems in the 'developing' world.

8.2 Contemporary management models and Kenya's Lake Victoria fishery

The main findings of this study, and how these relate to the regulation of the fishery, are summarised in Table 8.1 below. The use of Maximum Sustainable Yield (MSY) and Maximum Economic Yield (MEY) in the history the regulation of Kenya's Lake Victoria fishery was examined in Chapters 3 and 5. The study found that these regulatory systems have been ineffective for the following reasons:

(a) The assumption of homogeneity: fishing communities are extremely diverse, not only as units of analysis, but also reveal high levels of heterogeneity within them. This ensures that the perceived benefits of communities as a whole, as well as benefits perceived by individuals within them, can and does affect the outcome of externally implemented and enforced regulations.

Period	Formal regulations	Informal regulations	Results
Pre-colonial (Chapt. 3)	TURFS; temporal and mesh-size restrictions during spawning times; spatial restrictions on spawning areas.	Access limited to members of fishing sub-clans; technological limitations; restricted markets area and low demand; restrictions on certain members of fishing communities; restrictions at certain times for members of fishing communities; area restrictions for mythological and/or religious reasons.	Fishery conserved; effort levels, production rates and levels controlled.
Colonial (Chapt. 3)	Introduction of LVFS; gear prohibitions; area and seasonal closures; mesh-size restrictions; licensing rules; minimum mesh-sizes.	Rise of cash-based market economy and increasing demands for cash due to hut and poll taxes, demand for consumer goods and desire to improve social status within communities; fishing efforts seek the creation of surpluses; technological improvement; effort increases; competition between fishing units; responsibility of lake transferred from fishing communities to the state, and traditional regulations undermined; political change.	Effort increases; illegal gear common; CPUEs decline; LVFS fails; exotic fish species introduced to prevent full-scale fisheries collapse.
1963-1980 (Chapt. 3)	None.	Rise of fisheries for *Haplochromis*, *omena* and new tilapia stocks; value of fishery increased; increasing effort levels; increasing competition between fishing units; urban/plantation job markets decline; population increases; increasing demands for cash.	Sequential exploitation; under-sized gear meshes common; declines in CPUEs; pressure on fishery sustained.
1980-1990 (Chapt. 3)	None until 1989 (see below).	Nile perch and *omena* populations explode; increased CPUEs; large-scale perch filleting factories established; market for fish expands; value of fishery increases; effort increases; employment markets elsewhere decline; domestic budgets decline.	Effort increases; shanty towns rise around major fish landings; decline of household budgets force many women into fishery.
1990's (Chapt.s 4, 5 & 6)	1989 Fisheries Act: mesh-size restrictions, licensing and boat registration rules; provision for area and seasonal closures.	Declines in agriculture, alternative job markets and relative importance of education; increasing regional population; cash demands increase as a result of agricultural and other resource deficits; effort increases; competitive relations of production established within fishing communities; migration; declines in CPUEs; market for juvenile fish expands; Nile perch of a kilo and over monopolised by the fish filleting factories; investment shifts from lake elsewhere; breakdown in community structures; markets variable; theft; investment limitations and capacities; ecological change.	Nile perch 'boom' ends; fish exports from Ugandan and Tanzanian waters increase; concentration of fishing units on western shores of Winam Gulf; effort levels continue to increase; coping and risk minimisation strategies common; violence between fishers.

Table 8.1: Summary of findings: the impact of formal and infomal regulations in the evolution of Kenya's Lake Victoria fishery, ca. 1490-1995.

In the case of Kenya's Lake Victoria fishery, fishing regulations implemented by the Lake Victoria Fisheries Service (LVFS) failed because they were at odds with the benefits that communities sought to gain from maximising catches in an attempt to reap the gains that a cash-based economy offered. The problem of homogeneity are best viewed in terms of scale. The kinds of regulations that the LVFS sought to impose were couched in far wider political, economic and social changes. In this sense, the LVFS regulations had an abstract quality to them that distanced them from the variable regulatory attributes inherent at the localised, community level. At this latter level, perceptions concerning the well-being of the entire lake focused on its inexhaustibility, a factor that was to legitimise the notion of maximising catches for maximum cash-returns, and hence creating a dichotomous perception of benefits to be gained from regulatory enforcement. The benefits the LVFS sought to create were at odds with those desired by the fishing communities, hence forcing divergence between the two. This divergence was further enhanced by the often brutal enforcement of regulations by the LVFS. This divergence, that existed between the state and the fishing communities in the colonial period, persists to this day. However, as argued in Chapter 6, the nature of the divergence has changed. The benefits to be gained from disobeying the regulations far outweigh those to be gained from obedience. This problem has been accentuated by increasing resource access problems that ensure that exploitation of the fishery is defined by a series of risk aversion strategies and coping mechanisms which seek to curtail the impact of wider economic, political and social changes, as well as trends within the resource system itself, characterised by dropping per capita catches and heightened levels of competition between fishers. The perceived benefits to be gained from such fishing strategies are certain levels of income and nutritional security. However, as per capita access to resource continue to decline, it may well be that the necessary repeated encounters with systems that do not minimise the uncertainties of this appropriation system and do not guarantee nutritional and income security will serve as the basis for local regulatory institution building.

(b) In-put restrictions: in both the case of the LVFS and the current day Kenya Fisheries Department (KFD), in-put restraints have undermined the ability of these institutions to fulfil the regulatory mandates with which they have been charged. In Chapter 5, it was argued that although the 1989 Fisheries Act does not specifically indicate its reliance on MEY and MSY models, the nature of the rules it contains suggest that it is dependent on these models as a management framework in which to operate. This leads to the second fundamental problem associated with the use of these models: In the application of MEY and MSY models, data relating to effort and stock sizes are crucial. In order for them to be continually effective, such data must be renewed on a regular basis. This study has found that such information is not readily available to fisheries managers on the Kenyan sector of Lake Victoria. Estimates of effort sizes vary considerably, depending on their source and no census of fishers has ever been carried out. This is necessary if MEY figures are to be generated. Of equal importance to MSY models, as well as MEY models, is information regarding fish stock sizes. The overwhelming amount of work carried out on Lake Victoria is of biological or ecological origin, but none of it has generated any information concerning the stock sizes of the various fish species of the lake. In addition, this work has only provided a small amount of information concerning the various fecundity and mortality rates of these species (see Chapter 5). Much of the biological/ecological literature on the lake considers the mass extinction of the endemic *Haplochromis* species flock. While there is little doubt that this is a lamentable decline, it is not clear how this information is of any relevance to fishing communities struggling to gain or maintain good catch rates and livelihoods. Nor does the literature on the subject relate how this decline is of any relevance to the broader management issues concerning the lake.

(c) While some of this work has considered the possibility that the *Haplochromis* species flock contributed to the mixing of nutrients up and down the water column, as well as the overall ecological efficiency of the lake, the extent to which this is actually true is contentious, and much discussion on the subject is conjectural (Kaufman 1992; Kaufman and Ochumba 1993; Goldschmidt *et al.* 1993). Nor is it clear that the decline of the *Haplochromis* species flock has contributed to the apparent eutrophication of the lake, particularly in the light of other evidence that suggests that this process may be occurring because of the burning of vegetation within the lake basin (Hecky 1993). Whatever the case, there can be little doubt that there is considerable change occurring in the aquatic environment of the lake, that fish stocks and populations are being affected as a result, and that a permanent oxycline appears have been established. These represent grave problems for the fishery and its management inthe future. How management is to deal with the possibility of eutrophication is not clear, and literature on the subject has not provided options in this regard. The fact that no MSY or MEY figures exist for this fishery suggests that the regulations operate within a vacuum, for they have no targets to meet and no parameters within which to maintain exploitation.

(d) Finally, the problem of externality: The transfer of responsibility of management of the resource base away from fishing communities and into the hands of centralised authority has served to undermine any nexus around which community-based institutional initiatives can occur. The strong sense of centralisation enforced by the KFD has resulted in community perceptions of the resource base being aligned with the perspective that it is only the state who can engineer changes to the overall resource procurement system.

The above factors all represent ways which have contributed to the divergence of interests - and therefore, a divergence in perceived benefits - between the authorities that are held responsible for the maintenance of the fishery and any basis from which communities can create their own institutions. It was the first objective of this study to demonstrate how these issues serve to undermine the effective regulation of Kenya's Lake Victoria fishery.

The second objective of the study was to show that those regulations which are held within the community context are more likely to work. In Chapter 3, the various local regulatory institutions that prevailed during the pre-colonial period were discussed. Following on from the theoretical discussion presented in Chapter 1, it was argued that one of the primary reasons behind the success of these regulations was the contextual alignment that they shared with the matrix of cultural, socio-economic and political trends that served to characterise fishing communities at this time. The institutions built during these period were not, on the whole, at odds with community desires for social reproduction, a range of localised beliefs and norms, and in this way served to meet community demands for the benefits they believed they would gain from adhering to such regulation. However, with the advent of the colonial period, the context in which these community-based institutions were held was altered, along with the benefits perceived to be gained from adhering to them. In this way, community institutions diverged with community perceptions of benefits. However, in more recent years, as discussed in Chapter 7, communities faced with increasingly difficult resource procurement conditions and high levels of competition have sought to generate locally-defined institutions which have, amongst other things, served to define community rights to certain aquatic territories and to limit access to these territories. Because these are community responses to specific resource procurement problems, it was argued, communities appear to have distinct perceptions about the benefits to be gained from creating such institutions. Furthermore, the ability of these institutions to monitor the resources for which they are responsible will be higher given the community investments in these institutions.

The benefits to be gained may be viewed in terms of declining levels of uncertainty given the defence of water rights; higher certainty given the proclaimed rights over fish stocks; income benefits gained from charging outsiders for the right to fish from community beaches; and, finally, the benefits to be gained by further institutional development, designed around existing co-operative society structures, such as guaranteed fish markets and other attractions.

In Chapter 1, a number of criteria for 'robust' institutions were presented. The first of these concerned clearly defined boundaries. This study has indicated that fishing communities will define fishing boundaries in order to protect their fishing grounds from outsiders. The study also indicated that in at least some cases, rules of residency have also been applied within communities in an attempt to regulate access to the fishery or the community's access to fish markets. The second criteria for the 'robust' institution concerned proportional equivalence between benefits and costs. No evidence was gathered to suggest that Kenya's Lake Victoria fishing communities have developed institutions specifying the amount of the fish stock that participants can procure. The third criteria referred to collective choice arrangements. It would appear that given the community-embracing nature of these forms of institutions that those who are affected by the regulations are more often than not also those involved in the creation of these regulations. The fourth criteria related to monitoring. Throughout this study, data has shown that the level of intimacy between fishing communities and the lake is high, and that fishers are typically aware of changes that occur within it. Indeed, fishers will even advance theories to explain why these changes have occurred. In addition, the level of tension between fishing communities over their water territories suggests that fishers can and do know who is in their waters, what gears are in use and, indeed, how much fish is being landed. In Chapter 7, the use of graduated sanctions - the fifth criteria - was alluded to. It presented evidence of community-based justice systems that relied on traditional systems of justice and structures of authority. These systems did suggest that they were graduated sanctioning systems - offenders could be caned publicly and banned from the beach. This, in turn, does suggest that communities do have conflict resolution mechanisms on which they are prepared to count and accept. At many beaches visited, public meetings were in progress frequently discussing all manner of beach and fishing related problems. The final criteria for the robust institution presented in Chapter 1, was the minimal recognition of the rights to recognise. As argued above, there is little to suggest that, firstly, the centralised authorities who are responsible for the fishery are willing to relinquish their legally-endorsed right to these controls, and, secondly, it would also appear that they are prepared to use this authority to disrupt attempts by communities to create their own regulatory systems, despite the apparently greater efficiency of the latter. This, of course, affects the extent to which communities can ensure that their enterprises are 'nested' in broader regional and national institutions.

Kenya's Lake Victoria fishing communities, therefore, have historically displayed the ability to create regulatory institutions. Indeed, as access to resources to fulfil income and livelihood claims, become accentuated, both the need and desire to create and strengthen these institutions increases. This is a valuable option which future management plans can focus upon. Indeed, as these resource access controls have augmented, so too have the conditions necessary for the creation of institutions to tackle such dilemma's. The problems that fishing communities typically face are often repetitive and occur under roughly similar circumstances. The communities, by their very existence and the nature of the competitive and trading relationships they have within themselves and with other communities, creates the information network on which they can draw. And, finally, the above evidence seems also to suggest that communities are both willing and able to monitor their resource bases.

The third objective of this study was to examine the changing nature of institutions regulating the fishery over time.

It was argued that by understanding how these have changed may provide information with which to design future regulatory institutions, as well as to provide clues as to why certain sets of regulations have failed while others have succeeded.

The data collected for and reviewed in this study suggests the following:

(a) Community-based regulatory systems have existed in the past. While it is clear that these same institutions cannot be recreated for present day purposes, they can be drawn upon as a form of social capital that may facilitate the creation and implementation of future managerial strategies.

(b) Community-based regulatory systems are extremely delicate. In addition, they are often dependent on communal perceptions of the benefits to be derived from adhering to them. These latter perceptions appear, in the case of Kenya's Lake Victoria fishery, to have been couched within a community framework defined by a matrix of socio-economic, political and cultural interactions, which ensured that there was a high level of convergence between the rule institutions involved within communities and their perceptions of the benefits to be gained from adhering to such rules systems. However, with the intervention of a colonial administration, the necessary communal matrix that upheld these systems changed as a direct result of changed perceptions of benefits. This implies that regulatory institutions and socio-economic structures may share a symbiotic relationship, with neither able to properly function without the other. However, under conditions of increasing per capacity resource scarcity, communities may seek to consolidate their structures, and utilise the same rules of exclusion and residency they practised in the past.

(c) Why Kenya's Lake Victoria fishing communities and state-based regulations appear to diverge has been discussed above. However, what is also clear from the data presented in this study is that state-based regulatory institutions have, throughout the history of the fishery, been at pains to ostracise themselves as far as possible from the very fishing communities they are supposed to serve. There was no evidence to suggest that either colonial or present day state institutions have ever attempted to create some form of collaborative managerial framework with fishing communities, a factor that may contribute to the perception held by fishing communities that the Kenya Fisheries Department (KFD) is not representative of their interests and no benefits can be derived from adhering the fishing rules that the latter advocates.

(d) The problems associated with low levels of funding and staffing, as well as shortages in technical and social knowledge appear to adversely affect the ability of state-based regulatory institutions to deliver services to fishing communities.

(e) The ability of local communities to create their own regulatory institutions persists. Given the wealth of local knowledge of the lake and the fish populations within it, as well as a localised awareness of who is fishing where and at what time, these community institutions present managers with a viable alternative form of regulation with which to manage this fishery. Needless to say, given its common property status, such alternatives would only be effective if they were applied at a lake-wide scale, so that community institutions are not undermined by the activity of other fishing communities elsewhere. In order to work, furthermore, these institutions must gain legal sanction and encouragement from the state.

The final objective of this study was to examine the impact of so-called 'informal regulations' on the activities of fishing communities. What these informal regulations represent was discussed above. The relationships between fishing communities and informal regulations, and how the latter affect the former, need to be understood if we are to understand why fishers perceive the need to carry out fishing in certain ways, and also so that we may be able to understand what benefits fishers perceive they will gain from fishing in certain ways.

There is little reason to suppose that fishers have chosen to fish in these ways because of state-based formal regulations. In addition, those community-based regulations that do exist within the fishery remain in their infancy, and unable to gain a large measure of control in the absence of a state endorsement. As a consequence, the fishing systems that have evolved in the fishery during the 1990's appear, in large measure, to be influenced and determined by informal regulations. As suggested in Chapter 1, common property resources are not - or only negligibly - affected by regulations and associated rules are often vulnerable to becoming open-access. This latter environment, it was suggested, is one in which only informal regulations dominate exploitation patterns. Individual fishers have responded to these by developing a series of coping mechanisms and risk aversion techniques which seek to minimise the effects of high levels of competition and decreasing per capita access to both the fishery and other resources. These risk aversion techniques and coping mechanisms appear to generate only sub-optimal levels of benefits to fishing communities. However, in an open-access environment, dominated by informal regulations, fishers have few alternative income or nutritional sources to turn to, such sub-optimal trends of overharvesting can be expected. Furthermore, because it would appear that responses to the kinds of problems that fishers face are undertaken on a purely individual level, the potential problems of heterogeneity in the formation of community-based institutions are enhanced, and fishers may often feel that they have no recourse open to them besides the overharvest of the fish stock. It is also noticeable that many of these individually generated decisions may not to any great degree result in a diminishment of the otherwise very uncertain common property environment in which these fishing communities operate. If the effects of such informal regulations are to be mitigated, then co-ordinated, and broad-based policy changes must occur which ensure that the relationship between fishing communities and other resource pools are understood and incorporated into state-based decision making systems. In addition, every effort should be made to encourage fishing communities to seize institution building initiatives in an attempt to help them consolidate their perceived benefits and augment the possibility that uncertainties are avoided.

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Appendix 1: Interview schedules

Sheet 1: Fishermen
Personal Details
1) Name
2) Age
3) Place of birth/home
4) Clan/Sub-Clan; is your sub-clan a fishing sub-clan?
5) Married/single; how many wives?
6) What do/does your wife/wives do?
7) How many children do you have? Do they go to school?
8) Did you go to school? To what level? Why did you leave?
9) What did you father and mother do?
10) What did you grandparents do?
Farming
11) Do you own land?
12) What do you grow?
13) Do you sell your produce?
14) What did you earn from these sales last year?
15) Do you consider yourself more a fisherman/farmer/other?
16) Who tends your *shamba*?
17) Do you ever stop fishing to tend the *shamba?*
18) Do you think fishermen are spending more time on their farms now than they used to?
19) What are the main problems in farming?
20) If you were to get 100,000/-, how would you spend it?
21) Do you own any livestock?
Fishing
22) When did you leave school? What did you do then?
23) Would you opt for an alternative job?
24) Do you have any boats? Describe them.
25) Do you have any nets/long-lines? Describe them.
26) What do the Fisheries scouts say is the minimum mesh-size for gill-nets?
27) How many crew do you employ? Is there a high crew turn-over?
28) How do you pay them?
29) Is there theft here?
30) Where do you fish?
31) What are the best times of the year to fish?
32) How much do you think you earned from fishing last year?
33) How does the Fisheries Department help this lake?

Sheet 1. Continued.

34) How do you regard your relationship with the Fisheries Department?
35) If you were the Director of Fisheries, what would you do with this lake?
36) What are the main problems with the lake?
37) How do you see the future?
38) How long do you spend on the lake per day? Has this changed over time?
39) Is there less fish now than when you first started fishing? Why do you think this is?
40) Do you catch many large fish now?
41) Do you still find *mbuta* with fat and/or roe?
42) Have you ever fished from other beaches? Have you ever encountered trouble doing so?
43) Do you have a fishing license/boat registration/private mark?
44) How does the co-operative help you?
45) Who do you sell your catch to? How do prices vary?
46) Do you have any other incomes?
47) Do your neighbours expect *bira*?
Other
48) Are there places in the lake where you will not fish?
49) Are there times of the year when you will not fish?
50) Are there things that you fear in the lake?
51) Are there any fish you will not eat?
52) Can an *ajuoga* help fishing in any way?

Sheet 2: Fish Traders
Personal
1) Name
2) Age
3) Place of birth/home
4) Married/single; Do you still live with your husband?
5) What does your husband do?
6) What clan/sub-clan are you from? Is this a fishing sub-clan?
7) What clan/sub-clan is you husband from? Is this a fishing sub-clan?
8) How many children do you have? Do they do to school?
9) Did you go to school? Why did you leave?
10) What did your parents do?
11) What did your grandparents do?
Fish Trading
12) When did you leave school? What did you do then?
13) Where did you get the money to start this business?
14) Do you have any special arrangements with fishermen, other traders or customers?
15) What fish do you deal in?
16) How do you process the fish?
17) Where do you sell your fish?
18) How much do you buy your fish for? How much do you sell it for?
19) How much did you earn from this business last year?
20) What other costs do you have to cover?
22) Would you opt for an alternative job?
23) Are there more traders now than when you first started?
24) Do you own land? Do you stop trading to tend it?
25) Do you have a trade permit/medical certificate?
26) How do you see your relationship with the Fisheries Department?
27) What are the main problems in this business?
28) How do you see the future of this trade?
29) Are there prostitute-traders here?

Sheet 3: Elderly.
1) Name
2) Age
3) Place of Birth
4) How long have you been on this beach?
5) How many children do you have?
6) Have they gone to school? Did You go to school?
7) Married? If yes, how many wives do you have?
8) What did your father/grandfather do?
9) What did your mother/grandmother do?
10) When and why did you come to this beach?
11) Did you own boats/nets? How many?
12) Did all the men in the family fish and work together?
13) What other types of fishing gear did you use?
14) Did you ever use boats to fish before the *wazungu* came?
15) What kind of fish did you catch before the *wazungu* came?
16) Do you remember any of the first *wazungu* that came?
17) Did you give them names? If yes, why these names?
18) Can you remember when they came?
19) What did these *wazungu* do?
20) Did your father ever tell you about *wazungu* when you were young?
21) What were they called? What did they do?
22) Do you remember any Asians coming?
23) When you were young were there times when there was little/no fishing?
24) What did you do during harvest time?
25) When outsiders came to your village, did they have to seek permission to fish?
26) When an outsider wanted to move into your village what were the conditions for this?
27) When you were young, did women fish too?
28) Do you remember the Fishermen's Union? Were you a member?
29) Who was in the union? Who were its leaders?
30) When you were young, were you told that there were places one must not fish?
31) When you were young did *ajuoga* come to the beach a lot? If so, what for?
32) When you were young, what kinds of things did you fear in the lake?
33) Where do the spirits of those that die on the lake go?
34) Are their evil spirits in the lake?
35) Can *nam* stop you fishing? How can he do this?
36) What kinds of fish were said to be poisonous? What would happen if you ate them?
37) If land, where did you get it? Have you given your children any land/boats/nets?
38) Before the *wazungu* came, how far away was the nearest village to your own?
39) In your society, did you distinguish between fishing, farming and herding clans?

Appendix 2: Glossary of Luo, Luhya and Kiswahili terms used in this study

All words in the left hand column are in DhoLuo unless otherwise stated. Those in Kiswahili are noted as 'Kis.', and those in Luhya as 'Luh.'. Latin names for plant species are derived from Kokwaro (1972), while those for fish species are derived from Graham (1929) and Witte and van Densen (1995).

Abila	Literally, 'up keep' or 'livelihood'; in this study, it normally refers to a rudimentary dwelling provided by a boat owner for his casuals.
Aching	A beach seining technique, using a mosquito beach seine, and often used for the capture of *omena*.
Adel	A fish species, probably a juvenile *Barbus altianalis radcliffi*.
Aloo	At Utajo beach, an *aching* method beach seine.
Aore	A river.
Ariap	From the English, 'hurry up'; a technique used in *kindege*, where the crew will work as quickly as possible to complete their '*trip*'.
Agoa	A type of *kira* which does not extend on to the shore behind where it is set.
Agok	Literally, 'the back'. In a crew using lamps to fish with, one or two members are allowed to have their own lamps, the fish from which are theirs. These are the '*agok*', and they are charged something for the use of the net and boat, and will also contribute to the labour needs.
Agulu	A type of pottery pot, often used to store fish in.
Ajuoga	A person, normally possessed by a spirit, but who has learned to control it so that he/she is qualified to treat others possessed with spirits or with spirit-related illnesses. They can also administer spirit-related medecine.
Alan	A tilapia size-range; this one is large and only just below a *nyamami* in size; some 25 cm. TL.
Aliah	Meat preserved by drying and spicing.
Ambega	A mosquito beach seine.
Angwolo	A penis sheath used in the pre-colonial era.
Apengo	A Nile perch size range. Of those perch of under a kilo, this is the largest size.
Asala	A Nile perch size range. Of those perch of under a kilo, this is the medium size.
Asilo	An unknown fish species.
Askari (Kis.)	A watchman.
Ayombi	A position in a crew - he who sets the net.
Bedhe	A spear.
Bhang (Kis.)	Marijuana.
Bilo	'Foreseeance' - the quality of the future or of the past, which can be seen. May also refer to luck or destiny.
Bira	Free fish.
Bo	Cow peas.
Boma	A widely used Maasai term, used to refer to a homestead.
Boya	A float (attached to a net).
Busaa	Traditional Luo beer, normally considered illicit.
Bwana (Kis.)	Either 'Mister' or 'Sir'.
Bwandha	A channel cut into the shore or papyrus swamp, and designed to 'fool' fish into thinking that they are at a river mouth. Traps may be placed along it or across its mouth.
Changaa (Kis.)	A powerful, illegal alcoholic brew.

Chai (Kis.)	Tea, but may also refer to a bribe.
Chapati	A pancake of Indian origin, popular around the lake as a snack.
Chieng	The sun.
Chiko	To set; hence, '*tol machiko*', a set net.
Chuta	Free vegetable produce
Chuny	The middle (of something).
Chwiri	The long rains, when the first planting occurs (late March - mid-July)
Dagaa (Kis.)	See '*omena*'.
Dani	A grandmother.
Debbi (Kis.)	An empty 20 litre oil tin used as a measure.
Dina	Literally, to 'press down'; here, refers to a beach seine type, which, once hauled in and nearing the shore, the pouch is pressed down to prevent fish from escaping out of its mouth.
Dis	From the English, 'dish'. A small, plastic dish usually used as a measure.
Duri	Another name for the '*ndhira*'.
Fulu	Any fish of the *Haplochromis* species.
Fundi (Kis.)	A specialist, especially in mechanics or carpentry.
Fwani	A fish, *Barbus altianalis radcliffi*.
Garama	Budget.
Gera	Similar to a '*bwandha*'.
Ghee (Kis.)	Clarified butter.
Gogo	The generic term for a net.
Gogo mar togo	A pre-colonial fishing gear made from papyrus and used like a beach seines.
Goro goro	A used 2 kg tin of cooking fat ('Cow Boy' or 'Kimbo' brands) measure, used in the sale of produce.
Gwenge	A neighbourhood where most inhabitants share a paternal grandfather.
Harambee (Kis.)	A public meeting, normally for officials to give out advice or information, or a fund raising meeting.
Hoka	A small business of selling consumer goods such as soap, single cigarettes and so on.
Honini	Similar to '*hono*'; something mysterious, unexplained or unknown.
Hono	Something with is unknown or not understood.
Hoteli (Kis.)	From the English, 'hotel', but normally applied to small bars, cafes and eating houses.
Imbo	West.
Jabilo	A soothsayer or 'foreseer' - see '*bilo*'.
Jaboya	A benefactor - normally applied to permanent customers to boats.
Jachiko	The person in a crew who is responsible for feeding the net into the water from the boat.
Jadil	A person qualified or who has the power to exorcise things and/or places of evil.
Jaduong	A term of respect used to address males, normally elders and other old men.
Jajuok	A kind of nocturnally insane person, spending much of his/her time running about nude and scaring people. The *jajuok* are said to be able to control animals, particularly hippos and crocodiles, and can send these to kill people. They are also said to be able to control lightening.
Jalange	A person qualified to appease spirits.
Jamanyasi	An applier of '*manyasi*', a herbal medecine designed to remove evil or bad omens from things and/or places.
Janam	A person of a lake-side community.

Janawi	A person qualified to practise the medecine of death, using '*nawi*' medicines and powers. This skill used to be confined to warriors only.
Jandagala	One who knows the medecine of death.
Japudhkidi	The person in a crew who helps to pull in a net, and is responsible for pulling in the sinker side.
Jaramba	A person of the in-land communities; a non-fisherman; a person of a farming and/or herding community.
Jasasia	A practitioner of '*sasia*' medecine. See '*sasia*'.
Jateko	One who is able to bewitch others.
Jathieth	A herbalist.
Jela	From the English, 'jail', and refers to a compartment in a '*kira*' into which fish are funnelled.
Jomecho	A 'grabber' or 'robber'.
Jo oringi	A trader who travels from place to place on a bicycle. In this context, most *jo oringi* delivered fish from the beaches to markets.
Jolulu	Rain-makers.
Jopur	A farmer.
Jora	A roll of netting; a net as it is when it is bought rolled up.
Jua kali (Kis.)	Literally, 'hot sun', referring to artisans who often work in the open air.
Juogi	A spirit variety, normally a kind which can possess either people or boats.
Kabaka	A Bugandan king, or else a large, split-open and dried lung fish.
Kabunga	Pieces of smoked Nile perch fat.
Kadhi (Kis.)	A Muslim priest.
Kali (Kis.)	Dangerous, fierce.
Kamongo	The lung fish, *Protopterus aethiopicus*.
Kampi (Kis.)	A camp; from the English, 'camp'.
Kamuna	At N'Gou, a the smallest size-range of lung fish.
Kandhira	Kale.
Kanga (Kis.)	A colourful sarong-like garment, normally worn by women.
Kanjuele	Juvenile tilapia of any species.
Kanyaga (Kis.)	To tread or stamp upon, or to trespass. In this study it refers to trespass.
Kalwusi	A whirl wind.
Karia (Kis.)	Normally, a metal basin, but may also refer to a small 'trough'.
Karua	A type of boat, first introduced to the lake by Indian fishermen.
Karufu	Bribery.
Kasesse	A tilapia size-range.
Katurr	Literally, to 'reverberate' or 'echo'. A fishing technique similar to '*ochuado*' and, this case, a long, weighted pole is used to slap the water.
Kek	Or '*kik*', a stockade built across a river and into which fish traps are placed.
Kendo	Literally, an oven. The user digs a shallow hole in the ground in which wood or cow dung is placed and set alight. On a grate over the fire, fish are placed, and the whole sealed by a sheet of corrugated iron to produce a smoked-roasted product.
Kengere	A floating platform, normally made from ambach wood, made to place a pressure lamp on in *omena* fishing.
Kiboga	A sacrificial place.
Kik	See '*kek*'
Kinara	The border between the edge of a papyrus swamp and the water.

Kindege	A fishing method used in the capture of '*omena*', where the net is arranged in a circular fashion around the fish, and hence hauled in.
Kingo	To put a spell on something.
Kipande (Kis.)	An identification card.
Kitambe	The wick or mantle of a pressure or paraffin lamp.
Kokorro	A name for a beach seine.
Koyo	Any disease whose symptoms cannot be seen on the skin.
Lang'o	A type of spirit in the '*nyawawa*' group.
Liedo	A ceremony performed on the bereaved involving the shaving of the head. It occurs three days after the death on men, and four days after the death on women, and indicates that the bereaved are in mourning.
Lihudu	The rainbow.
Likira	A term used by both Luhya and Abasuba to refer to a '*kira*'.
Lolwe	That which is big, unending or gigantic. Often used to refer to the open lake beyond the Winam Gulf: '*nam lolwe*'.
Lueru	A type of mosquito beach seine.
Lunyu	A large smoking oven for fish, built from mud around a wooden frame, and normally utilising wood fuel.
Mach	Fire.
Madongo	Large.
Magasia	A type of paddle.
Magendo (Kis.)	Corruption.
Mandazi (Kis.)	A deep-fried dough balls, often sold from road or beach-side stalls.
Manedire	Medium.
Manila	A heavy ply twine, normally used for the construction of beach seines.
Manyasi	Medecine used for cleansing; see '*jamanyasi*'.
Matatu (Kis.)	A form of public transport, privately owned, and no larger than a mini-bus.
Mathar	The skipper of a boat. This term probably originated from the Gujarati term for foreman, '*jamadar*', and used by Indian fishermen on the lake from the 1920's through to the 1950's.
Matindo	Small.
Mbiru	Originally, a tilapia species, *Oreochromis variabilis*; now used as a tilapia size-range - a medium-sized tilapia.
Mbuta	The Nile perch, *Lates niloticus* Linnaeus.
Mfuko (Kis.)	Literally, 'a pocket'. In this study, it refers to a large pouch woven in to the centre of a beach seine.
Miaha	A newly married man.
Migondho	A long-line.
Migongo	The keel of a boat.
Migongo wasi (Kis.)	Literally, 'open shoulder'; refers to Nile perch carcasses stripped of their flesh.
Mikiyu	A hardwood, probably *Olea cape* (*Welw*).
Mikono (Luh.)	An *osadhe* in Luhya.
Minam	The mother of the lake.
Misambwa (Luh.)	The generic name for a spirit.
Misokhe (Luh.)	The Luhya name for a water spout.
Mitoo	See '*mto*'.

Mondho	The swim bladder of a fish. This organ is filled with air, and allows a fish to float when it is stationary. In some fish, such as the tilapia, it is a sealed organ, and the amount of air within it cannot be regulated. However, in the Nile perch, it is linked to the outside of the fish, and the amount of air in it can be regulated, depending on the depth in which the fish is.
Monye	At N'Gou, the name given to a lung fish.
Mto	Or '*mitod*', a food crop, *Crotolaria brevidens* var. *intermedia* (*Papilionaceae*); the leaves of this plant are used as vegetables, and have a bitter taste.
Mudho	The period - some 21 days - between the point at which the moon sets and its return as a full moon.
Mudho hala	The opposite of '*mudho*', the time when the moon is full.
Muganga (Kis.)	A traditional healer.
Mula	A piece of cat fish, often processed (for sale).
Mumi	A cat fish, *Clarias mossambicus*.
Mvuli (Kis.)	A hard wood tree, *Milicea excel*; known in Dholuo as '*olua*'.
Musemenao	A traditional, Luo saw.
Mzee (Kis.)	An old man. Can also be a term of respect.
Mzungu (Kis.)	A European; a white person.
Nam	The lake.
Ndhira	A juvenile cat fish ('*mumi*').
Ngech rachar	A large, white (sic.) tilapia.
Ngege	Originally specific to one of two indigenous tilapia to Lake Victoria, *Oreochromis esculenta*; now, normally a generic term for all tilapia species, but may also be used to describe a tilapia of a certain size-range.
Nger	A water current.
Ningu	A fish, *Labeo victorianus*.
Nundu	Either one of the most important of the lake spirits; or else small pox or measles, which are said to be brought by '*nyawawa*'.
Nyakoi	A water spout which, in Luo mythology, is a giant snake, and often seen as one of the wives of '*nam*', the lake.
Nyama choma (Kis.)	Literally 'burned meat' - meat roasted over a fire.
Nyamami	A tilapia size-range, normally the largest.
Nyamrecha	A person, normally a woman, responsible for cleansing the lake of evil.
Nyamrerwa	A guardian.
Nyang	A crocodile.
Nyangidi	The name of a known python, thought to have great spiritual powers.
Nyar nam	Daughter of the lake; a term normally applied to fish traders.
Nyar ramba	A woman of an in-land farming and/or herding community.
Nyawawa	Roaming groups of spirits, often said to be those of those who died in pain, and which are said to be extremely noisy. They are responsible for bringing small pox and measles.
Nyolworro	Literally, something that goes around. In this study, it refers to a revolving credit system often used by traders.
Nyoyo	A Luo dish, comprising maize and beans.
Obambola	Fish, gutted, de-scaled, slit down the stomach and spread out to be smoked or sun-dried. Refers to any species processed in this fashion.
Obalal	Dried fish.
Obobo	A fish, probably *Gnathonemus longibarbis*.

Obongobongo	An agama lizard.
Obudi	A tilapia size-range - one of the smallest.
Ochong'a	The small, fresh-water shrimp, *Caridina nilotica*.
Ochuado	A fishing technique: one end of a long, large-mesh gill-net is attached to the shore and the remainder strung out, parallel to the shore, forming an enclosure with the shore on one side and the net on the other. From a boat in the mouth of the enclosure, and beats the water to scare fish into it.
Ochun	Literally, 'to force'; also a name given to a beach seining technique using long lines of gill-nets.
Odeso	A type of raft, used in the colonial and pre-colonial periods to check nets set off shore.
Odhero	A flat, shallow wicker-work basket or tray.
Odundu	A cane-like water reed used in the building of *kira* and other traps: *Phragmites mauritianus* (*Gramineae*).
Ofunga	See '*Ohunga*'
Oganyi	Unknown fish species.
Ogogo	A fish, probably of the *Synodontis* species.
Ogongolo	Snails
Ogono	A type of non-return basket trap.
Ohunga	Or '*ofunga*', a conical-shaped basket trap used to catch fish and may be set in a *kek*, or plunged down in front of the user as s/he wades through the water.
Okoko	A fish of the *Synodontis* species.
Okunga	An eel-like fish, *Caecomastacembelus frenatus*.
Oloo	Hook.
Olua	See '*mvuli*'.
Olukhwira (Luh.)	A '*Kira*'.
Ombara	A fish species, possibly of the *Brycinus* species.
Ombe	At N'Gou, the name for a fish of the *Mormyrus* species.
Omena	A small sardine-like fish indigenous to Lake Victoria: *Rastrineobola argentea*.
Omogo	Unknown fish species.
Ondiek	Hyena.
Ondilo	A Nile perch size-range, this being the smallest; also known as '*onyutu*'.
Onera	A tree-type, often used for timber: *Treminalia brownii* (*Combretaceae*).
Onuna	Another name for the lung fish.
Onyuta	See '*Ondilo*'.
Opat	Also '*opato*', a tilapia size-range, normally fairly small, some 15 cm. TL.
Opato	See '*opat*'.
Opetu	A bull frog.
Opok	Papyrus swamp.
Opon	The short rains, when the second planting occurs (late August - September).
Oporo	A tilapia size-range.
Orega	One haul of the beach seine.
Orindi	A type of raft, similar to, although larger than, the '*odeso*'; the name refers to the wood type used to make it, *Aeschynomene elaphroxylon* (*Papilionaceae*).
Orundu	A small vegetable garden.
Oro	The dry season (November - late February).
Osadhe	A non-return, conical fish trap.
Oseru	A small basket used for scooping fish out of a net.

Osiri	A non-return, conical fish trap, similar to, but smaller than, an *osadhe*.
Oso	To cleanse.
Osoga	A fish, of the *Brycinus* species (*B. jacksonii* or *B. sadleri*).
Otenga	A kite, normally the black kite.
Otinda	A fish, *Mormyrus kannume*.
Oyuayo	A variation on the '*seke seke*' method.
Oyusu	The head of a papyrus stem.
Panga (Kis.)	A machete.
Ponyoka	A cast net.
Podho	Normally, owned land, but may also be applied to 'owned' water.
Polo	'Up', 'sky' or 'lightening'. In the context of this study, it is used to refer to lightening.
Puocho	Food.
Radasi	A scoop-net.
Rao	The hippopotamus.
Rapurr	A traditional hoe of the Luo.
Rawa	At Kiumba, the name for a '*sire*'.
Rech	A fish, of any kind.
Reuwo	A smoking-roasting technique where fish are placed in wood-shavings, and the whole set alight.
Rika	A system of labour exchange, where a group of farmers come together to help one of their colleagues, who, in return, will help all the others in the group. Also known as the '*saga*' system.
Reyo	See '*Reuwo*'.
Rimba	A type of beach seine.
Ruaoth	A bull, or the most senior person in a community, similar to a chief.
Saga	See '*rika*'.
Sam	A lake fly, often seen in huge, dense swarms flying across the lake.
Sao	To scoop.
Sasia	A medecine which serves to disunite people.
Sejo	The time fish spawn.
Sehoho	The power derived from being bewitched.
Seke seke	A fishing method; a gill-net is placed in a circular fashion, and the fishermen wade into its centre, ferreting fish out from beneath rocks.
Sendo due	The start of the '*mudho*'.
Set	A fishing technique similar to the '*seke seke*'.
Sewandha	A hole, cut into papyrus, through which hooks are lowered to catch lung or cat fish.
Sewo	A fish species, *Bagrus docmak*.
Shamba (Kis.)	A farm or a farmed plot of land.
Shambok (Afrikaans)	A short whip normally made from hippo hide.
Siecho	A arrangement between two people, where the one has a boat and few or no nets, and the other has nets but no boat, so they team up.
Sienyo	A fishing technique reserved for women. Here, a small, conical-shaped basket, open at both ends, is plunged in front of the user as she wades through the water. Fish caught are extracted via the hole in the top of the basket.
Sigol	A cage for keeping quail in.
Sika nyodha	A type of algae, often found floating in mats, suspended close to the bed of the lake.

Sikri nawi	A mythological beast said to be the mother of all fish and extremely dangerous should it be encountered in the lake.
Singo	Literally, to hoe, where a hoe is used to dig (or hoe) through the papyrus swamp in search of lung fish.
Sire	A fish, *Schilbe mystus*.
Soyo	To fish for the lung fish with a spear, by prodding it through the papyrus swamp.
Sukuma weeki (Kis.)	Kale.
Suli	A tilapia size-range.
Sulwe	A star
Suma	A fish, *Mormyrus kannume*.
Taff (Luh.)	A tilapia size-range, this being the largest.
Tanga (Kis.)	A sail.
Tede	At N'Gou, a juvenile Nile perch.
Teng'o	Literally, 'to herd'. Here, it is used to refer to a fishing technique where the users form a semicircle around set traps, and then move towards the traps, splashing and agitating the water in front of them, thus 'herding' the fish towards the traps.
Tol machiko	A set net.
Trip	In *kindege* fishing, when used with lamps, a string of some 5-6 lamps are set on the lake. The fishermen fish the first, the second and so on. The process from the first and back to it is one '*trip*'.
Tupa tupa (Kis.)	A cast net.
Ugwe	The east.
Unga (Kis.)	Maize meal.
Uwayo gogo	A position in a crew. Where the '*kindege*' method is used in shallow water, the '*uwayo gogo*' holds the net down to the bed of the lake with his feet; also known as a '*tie gogo*'.
Wananchi (Kis.)	Those of the republic; the masses.
Wapenja	Don't ask me.
Waro	To repossess.
Wath	A beach.
Wahindi (Kis.)	Plural of '*mhindi*'.
Wawang'o	A type of spirit.
Wazungu (Kis.)	Plural of '*mzungu*'
Wiopara	When using '*kindege*' in shallow water, the '*wiopara*' holds the net upright.
Yamo	The wind. It is also used to refer to a condition whose symptoms resemble an allergy, such as rashes. However, some say *yamo* also results in boils.
Yie	A boat.
Yugni	A constellation, said to fall from the sky once a year. The descent occurs in two cohorts, the first being the male *yugni* in early May, followed by the female *yugni* two weeks later. The males render the water cool, while the females make it distinctly cold, driving fish into deeper waters. Fishing at this time is said to be poor, and those fish caught have a milky film over their eyes.
Zili	A tilapia size-range.

Glossary of fisheries terms used in this study:

Anadromous (fish)	A fish which migrats up-stream in order to spawn.
Community	A group of people who see themselves as belonging together with interactive relationships and who have some common, defined goal they seek to achieve (Harris, 1992). This goal is normally the survival of the community and the reproduction of its relations of production.
Effort	Sum of units used in fishing. Effort can be measured in terms of boats, fisher-men or nets. In this thesis, effort refers exclusively to the number of fishermen.
Fishing Unit	The fishermen and all the gear he uses to catch fish. May include nets, fishing lines and/or boat.
Formal Regulation	Any institutional factor which deliberately sets out to conserve a resource base by influencing access to it.
Informal Regulation	Any non institutional trend or factor which serves to affect access to a resource, and which may not result in the conservation of the resource. May include economic, cultural, political, social, religios or ethnic factors.
Fisheries Management	Intitutionally based initiates aimed at either conserving a resource base or to increase the production of a resource base.
Maximum Economic Yield	The point at which the cost of fishing equals the value of the catch caught per fishing unit.
Maximum Sustainable Yield	The point at which mortality within a fish stock equals reproduction
Means of Production	The sum of technological, knowledge and exploitation tactics which results in the production of some good, and which may lead to the accumulation of capital.
Mortality	In a fish stock, the loss from that stock due to death. Normally includes the impact of fishing.
Oxycline	In a water body, a depth below which there is exists little or no oxygen in solution.
Quasi-property rights	Here, rights of access are conferred on certain users without actually giving them property rights over the resource. Thus, if fishing communities are given rights to determine who can fish, they gain some measure of ownership in this way, but no property rights *per se*.
Regulation	Any factor which serves to affect access to a resource
Relations of Production	This refers to the sum of technological, social, political, economic and cultural relationships and structure which result in the production of some good or the exploitation of some resource.
Snood	Short pieces of twine with hooks attached, fastened at regular intervals along a long line.
Standard Length	The length of a fish from it upper lip to the base of its caudal fin.
Swim bladder	An organ in most fish species which is filled with air, and which keeps the fish bouyant should it stop swimming.