A REVIEW OF THE FISHERIES OF THE UGANDA WATERS OF LAKE ALBERT

East Africa, 1928–1965/66, with catch data mainly from 1953

by

D. A. CADWALLADR*

AND

J. STONEMAN

Uganda Fisheries Department
P.O. Box 4, Entebbe, Uganda

* *Former address :* E.A. FRESHWATER FISHERIES RESEARCH ORGANIZATION
P.O. BOX 343, JINJA, UGANDA

CONTENTS

	PAGE
INTRODUCTION	1
HISTORICAL	1
Growth of Fisheries	1
Fishing Methods	3
Nets	4
Canoes	5
CATCH DATA	6
Methods of Collecting Data	6
Total Annual Catch and Exports to the Congo	7
Seine-net Catches	10
Long Lines	10
Gill-nets	11
Annual Catches by Species	13
PRESENT-DAY FISH PROCESSING AND MARKETING	14
DISCUSSION	17
SUMMARY	18
ACKNOWLEDGMENTS	18
REFERENCES	18

LIST OF TABLES

1. Total annual catch, total weight of fish exported to Congo, and the percentage of exports to total catch 1935–1965 (1962 data not available).
2. Price per ton of cured fish exports paid in the Congo, 1938–1961.
3. Annual production (in tons) of the Congo waters of Lake Albert, 1950–1958.
4. Total annual catches by seine-nets, and percentages formed by these of total annual catch, 1953–1965.
5. Total annual catches by long lines, and percentage formed by these of the total annual catch, 1954–1965.
6. Approximate weight of fish (to nearest ton) caught in gill-nets of various mesh sizes, 1954–1965.
7. Percentage of total annual catch by weight caught in gill-nets of various mesh sizes, 1954–1965.
8. Percentage of total annual catch caught in gill-nets of 2½-inch to 4-inch mesh size, 1954–1965.
9. Percentage of total annual catch caught in gill-nets of 4½-inch mesh size and above, and on long lines, 1954–1965.
10. Approximate total weight (to nearest ton) of individual species landed annually, 1954–1965.
11. Methods of curing most commonly practised at the main landings.

LIST OF FIGURES

1. Annual total catch, exports to the Congo, and weight of fish consumed within Uganda, 1953–1965.
2. Map of Lake Albert region showing main fish landings, access roads to these and main markets of consumption.

LIST OF PLATES

1. A powered Kabalega canoe.
2. A Congo barque canoe.
3. A traditional dug-out canoe.

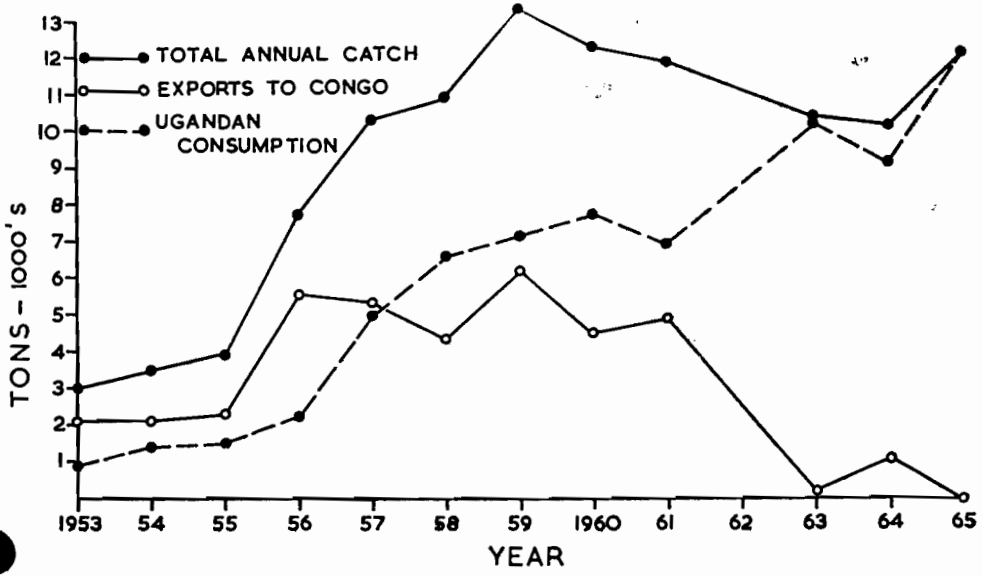

FIGURE 1.—Annual total catch, exports to the Congo, and weight of fish consumed within Uganda, 1953–1965.

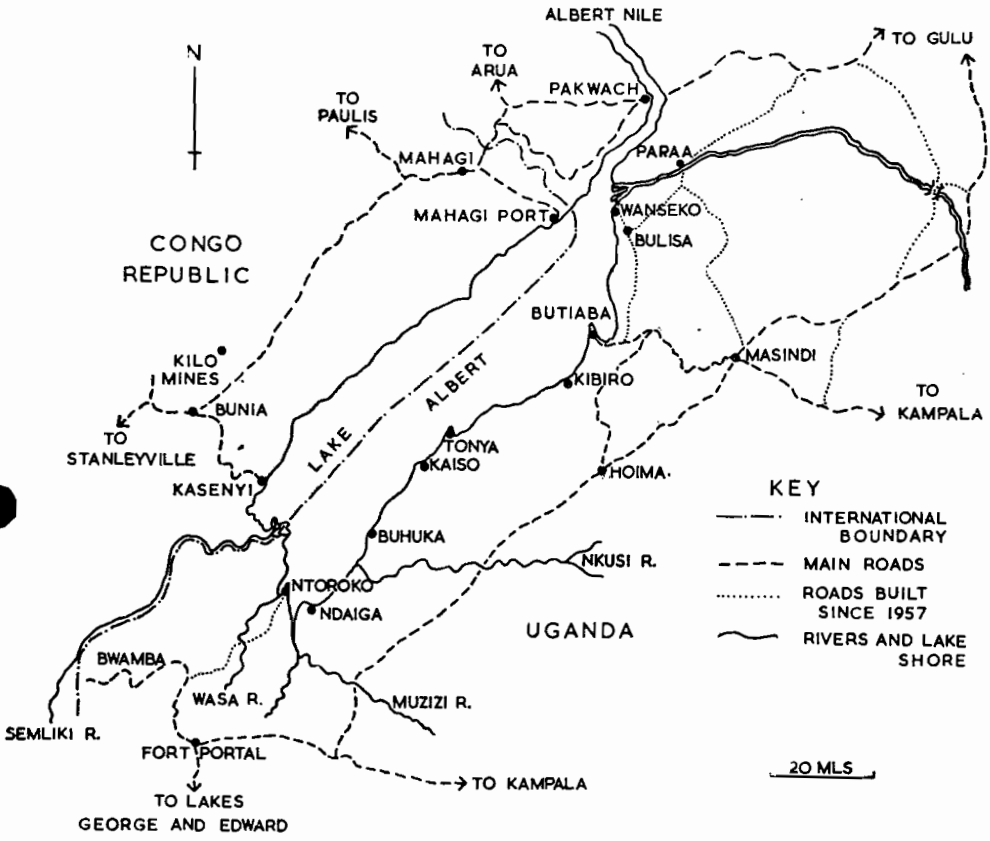

FIGURE 2.—Map of Lake Albert region showing main fish landings, access roads to these and main markets of consumption.

A REVIEW OF THE FISHERIES OF THE UGANDA WATERS OF LAKE ALBERT, EAST AFRICA, 1928–1965/66

INTRODUCTION

Although various surveys and reports have been made on the fisheries of Lake Albert, including the most recent by Holden[1], since the first major survey by Worthington in 1928[2], no account has been published of the expansion of the fisheries on a commercial basis since that time.

After its formation in 1920 the Uganda Game Department was responsible for fisheries work in the country, but little work was done until trained officers were recruited in 1947 as part of the then British Colonial policy. An officer was posted to Lake Albert in 1949, and there has been a continuous series of records and observations made on the fisheries since then.

The growing importance of the fishing industry throughout Uganda was marked by the formation of a joint Game and Fisheries Department in 1950, and of a separate, distinct Fisheries Department in July 1961. The fisheries today make a very important contribution to the economy of Uganda, with the 1965 total catch being valued at approximately £250,000 to the fishermen at the landings, and just over £1 million retail value.

As will be shown later the development of the fisheries was dependent upon and related to improvements in the type of gear and canoes, an increase in the number of canoes and outboard engines in use, improved marketing facilities and better means of road communications. The changes which occurred in the fisheries, and described in this paper mainly from 1953, are reflected in the large increase in annual production in the 12 years up to 1965 when it was over 12,000 tons (Fig. 1).

Earlier records consist of observations and surveys but since 1953 specific data has been collected daily on the fish landed, by weight, number and species, at selected fishing villages. The present figures and observations are based on these.

The main fish landings and villages on Lake Albert, access roads to these and main markets of consumption referred to in the text, are shown in Fig. 2.

HISTORICAL

Growth of the Fisheries

The expansion of the fisheries of Lake Albert proceeded in a similar way, but at a later date and at a faster rate to those of Lake Victoria. Gill-nets were first introduced on Lake Victoria in the Kavirondo Gulf in 1908, when the Uganda Railway first reached Port Elizabeth (later Kisumu)[3]. By 1928 a flourishing gill-net fishery was in existence, with cured fish being delivered to

places inland. Despite the demand for fish which existed in the 1920's and 1930's in eastern Uganda and western Kenya, and catered for to some extent by the Lake Victoria output[3], the increase in the Lake Albert fisheries was very slow at this time. The fisheries expanded more rapidly in the late 1940's with the increase in demand which occurred in the Belgian Congo (now Congo Republic) market, and which was associated with the greater use of gill-nets at that time.

At the time of Worthington's survey in 1928, the most abundant species landed was *Citharinus citharus* (local name—mpoi), and this was the species exploited by an 8-inch mesh gill-net fishery at Kasenyi in the Congo. As a result of his survey Worthington concluded that future gill-net fisheries should be directed at *C. citharus,* and he further recommended that gill-nets of a mesh size of less than eight inches be prohibited. In the early 1940's large (3,000 metre) beach seines were employed by Greek fishermen from the Congo, the catch going direct to Congo landings. Possibly as a result of this the catches of *C. citharus* fell to negligible proportions in these years (after 1942–1943[4]) and despite the subsequent legal prohibition of these large seine-nets the species has never regained its former importance. In more recent times the demand for other species of fish in western Uganda has provided fresh impetus to the expansion of the fisheries, and has offset to a large extent the loss of the Congo market from 1962 to the present time.

The market for Lake Albert fish was, and still is, poor in the eastern part of the country where the bigger markets exist. A factor contributing to this was the difference in acceptance in various parts of the country of fish cured by varying degrees of salting. Deep-salted fish, a heavily salted product, was always popular in the Congo, and a lighter salted variety, known locally as sun-dried, preferred in Acholi, whilst both forms were acceptable in West Nile, but unacceptable in eastern Uganda. The more abundant species of Lake Albert, such as *Alestes baremose* (ngara—this local name includes both *A. baremose* and *A. dentex,* but the latter species is rare and seldom caught by fishermen) and *Hydrocynus forskahlii* (ngassa), possess excessive body fat or are too large a size as in the case of *Lates niloticus albertianus,* nile perch (mputa), to be well cured in ways other than by salting. Because of this, salting remains the most common form of curing at the landings. The second smaller nile perch sub-species in Lake Albert, *L. niloticus macrophthalmus,* is rarely caught as it is a deep-water living form.

From the 1920's there was an increase in migrant labour from the more westerly parts of the country to the east along what was then the railways route to the coast. This was followed by an increase in the demand for the Lake Albert salted product in eastern markets, which was due in part to the example set by the newly settled migrant labour from areas where salted fish was acceptable. Garrod[3] also noted that a drift in labour after World War II from traditionally fish-eating tribes from the shores of Lake Victoria created new markets and a greater demand for fish in outlying areas.

The poor communications with the more accessible parts of the lake shore in the north, and the severe Rift Valley escarpment cutting off the south-east end of the lake from the rest of the country, also helped to prevent the sale of

fish to the east. It was reported in 1950 that small amounts of fish were being moved up the escarpment to Mubende and West Nile[5]. There were several reports made in the early 1950's of the poor and undeveloped market in Uganda for Lake Albert fish. Consumption in 1950 was described as "disappointingly small"[5], and again in 1951 the internal market was referred to as "negligible"[6]. In 1952 92 per cent of the total annual catch was exported to the Congo, and the home market was termed "poorly served"[7]. A demand for fish in Acholi was noted in 1952, but owing to the poor road communications and the high cost of transport very little fish reached the district to satisfy the demand[7].

Prior to 1956 the eastern shore of the lake was accessible by road only at Butiaba. The situation today is vastly improved with the opening in 1956 of the road from Butiaba to Ndandamire a few miles south of the delta of the Victoria Nile. This road was improved in 1965/66 into an all-weather one through to Paraa via Bulisa and the major fishing village of Wanseko. Another all-weather road to Ntoroko, ten miles east of the delta of the Semliki River, was built in 1961 and opened up the south end of the lake. Before this road was opened there was only a small landing at nearby Rwengara, from which it was extremely difficult, and often impossible in the wet season, to distribute fish to the adjacent Bwamba District along a poor track. The fishing villages of Kibiro, Tonya, Kaiso, Buhuka and Ndaiga at the foot of the steep escarpment to the south-east are still inaccessible by road, with only small quantities of fish being taken on foot up the escarpment into Bunyoro. Considerable quantities of fish, however, are taken from these villages to the road-heads at Ntoroko and Butiaba, and even as far north as Wanseko, Panyimur and Pakwach by the better type of canoe now in service on the lake.

With the increase in catch the emphasis in the fishery changed from mainly a seine-net fishery to almost totally a gill-net one. This was also due to a decline in the use of seine-nets because of the increasing cost of manufacture and employing porters to handle them. Gill-nets, simple to set by one person, became relatively cheaper and more readily available. There was an increase in the number of canoes operating gill-nets, and an improvement in the type of canoe in use.

Fishing Methods

Worthington[2], in the first fisheries study of Lake Albert, observed that the seine-net was the only European fishing gear in use along the Uganda shore in 1928. He reported, however, that gill-nets had been introduced at Kasenyi in the previous year. These gill-nets, which were of about 8-inch mesh size, soon led to the formation of a flourishing fishery in the hands of Greeks at Kasenyi. At this time one ton of dried fish per day was being delivered to the Kilomoto mines further inland. A year later at the time of Worthington's survey, supplies had fallen to half this amount. It was suggested that the decline in catch was due to a migration of fish away from the Congo side. Worthington, however, saw no reason why this should have been presumed, and suggested that depletion of stock by overfishing would account for the decline.

In 1928 the major fishing effort was one of traditional methods, used to provide a subsistence diet to the few inhabitants of the lake shore area. Worthington listed these methods, which included harpooning of the bigger species such as *Lates* sp., particularly in the lagoon at Butiaba. This method was last reported in 1949, when during one of the periodic, mass mortalities of nile perch, several large, moribund specimens were speared off Butiaba Island. Spearing of fish, particularly the cat-fish *Clarias lazera* (known as mbissa on Lake Albert, and mali on Lakes Victoria and Kyoga), is still seen today in swamps around Lake Victoria, the Malawa swamps of Lake Kyoga, near Tororo, Lake Salisbury and Lake Rudolf. The use of bows and arrows for spearing the larger species has also been reported on Lake Albert[8]. Another item in use at the time was a conical, woven reed basket which was placed over a fish in shallow water, the fish so trapped being lifted out through an opening in the top of the basket. Although this method is no longer in use on Lake Albert, it is still in declining use in less advanced fisheries of other areas, e.g. Lake Rudolf.

Set baskets with non-return entrances, similar to those in use on Lake Victoria[9], were also used. They are still seen today in lagoons as at Butiaba, where the small amount of fish caught, mainly *Tilapia* sp., predominantly *T. nilotica* (ngege), and *Clarias* sp., provide a subsistence protein diet to local cultivators, with small quantities of the catch being sold in local markets. An arrangement sometimes seen at Butiaba is one where 4–6 baskets are placed with their entrances facing into a cone formed of woven reed and stick fences some 10 feet long and the height of the depth of water, usually 3–4 feet. Long lines, now in widespread use, were also in use in 1928 for catching *Bagrus docmac* (semutundu) and *Lates* sp. A further form of fishing described at the time was hand-lining in the lagoons for *Tilapia* and other small species, but this was always of minor importance.

Nets

Worthington[2], quoting Roscoe[10], showed that the seine-net was probably introduced on the lake before 1919. In 1928 seine-nets were by far the most important method of fishing in Uganda waters, there also being a few 5-inch gill-nets in use at the time. Records show that the seine-net remained the most important gear until the early 1950's. In 1949 there were 102 camps operating seine-nets, but only 13 camps from which 128 fishermen, some sharing canoes and not employing more than one assistant each, operated gill-nets[11]. There are no figures available for the catch of that year, but in 1952 an estimated 58 per cent of the total catch was landed by seine-net. In 1954 it was thought that seine-nets still accounted for the "bulk of the landings on the lake"[12], but a recent reassessment of the catch figures has shown that even earlier than this in 1953 seine-nets accounted for only 27 per cent of the total annual catch. Before the introduction of the nylon gill-net the commonly used nets were the 5-inch nets made of flax and known locally as Sesse nets, 3-inch nets, and 8-inch nets, made locally from the cord of motor tyres and sisal twine. Short lengths of 16-inch nets are made today from synthetic twine at Wanseko and Ntoroko to catch the larger *Lates* sp. of up to and over 200 lb.

The last year in which large numbers of crocodiles were destroyed by hunting was 1953, and after this time they were never abundant, "having been sadly depleted in most areas"[13]. Until this time crocodiles had caused much damage to set nets; it was reported in 1935 that "the Tonya and Kaiso lagoons both abound with fish in great variety, but the numerous crocodiles make fishing quite impossible"[14]. With the opening-up of Ntoroko fishing village in 1955/56, excised from the Toro Game Reserve in 1956, crocodiles were locally abundant in the mouths of the Wasa and Muzizi rivers and in Ndaiga lagoon. It was impossible to use gill-nets in these areas until trappers had reduced the population[15]. Nylon gill-nets were found to be unsuitable on their introduction by the Fisheries Department in 1952, due to their high cost of replacement counting against them in waters where extensive damage was to be expected from crocodiles[16]. Owing to the lack of hunting in recent years, damage to set nets by crocodiles is now once more proving a nuisance in the fishing grounds off Ntoroko.

Imported nylon nets were again tried in 1954 and this time quickly replaced the hand-made nets and those manufactured from other materials. In 1955 it was estimated that 41 per cent of the nets in use were made from nylon[17], but nylon nets were not readily available until 1958, which was at about the time they were introduced on Lake Victoria[3]. All present-day nets are nylon-made, and most are manufactured locally at competitive prices.

Canoes

No reliable figures are available for the number of canoes in use on the lake during the period under review. In a survey conducted in 1949; however, there were 128 fishermen operating gill-nets with not more than one assistant and often sharing canoes. Licensing of canoes first started in August 1950[18], and although licensing was never complete in any one year the large number of canoes licensed annually reflected the trends in the total number operating. There were 497 canoes licensed in 1951, which were in use south of Panyigoro at the extreme north-west end of the lake. Canoes licensed on the lake proper rose to 546 and 568 in 1952 and 1953 respectively, to 600 in 1954, 659 in 1955, and 700 in 1956. An aerial survey of the lake and Albert Nile in 1960 revealed 845 dug-out and 166 planked canoes, these figures being considered 10 per cent low at the time. A similar survey of this area in 1966 showed that numbers had risen to 90 Kabalega, 178 Congo barque and 1,235 dug-out canoes, with the usual small number of Sesse canoes. Of the total number of canoes recorded, 818 dug-outs and all the planked canoes, except for six on the Albert Nile, were counted on the lake.

The Kabalega canoe (Plate 1), named after the former Kabalega Technical School in Masindi (now transferred to Kichwamba outside Fort Portal), is based on the traditional planked Sesse canoe of Lake Victoria. The Kabalega, however, was designed for outboard motor propulsion and is built with a much wider beam, has a double chine, and the planks are copper-fastened on sawn frames[19]. A canoe of this description was first built in 1955, and they are now built by a number of progressive, trained boat-builders at Wanseko and Masindi. The Congo barque canoe (Plate 2) is a planked, flat-bottomed vessel



PLATE 1.—A powered Kabalega canoe at Wanseko, with West Nile escarpment in background.

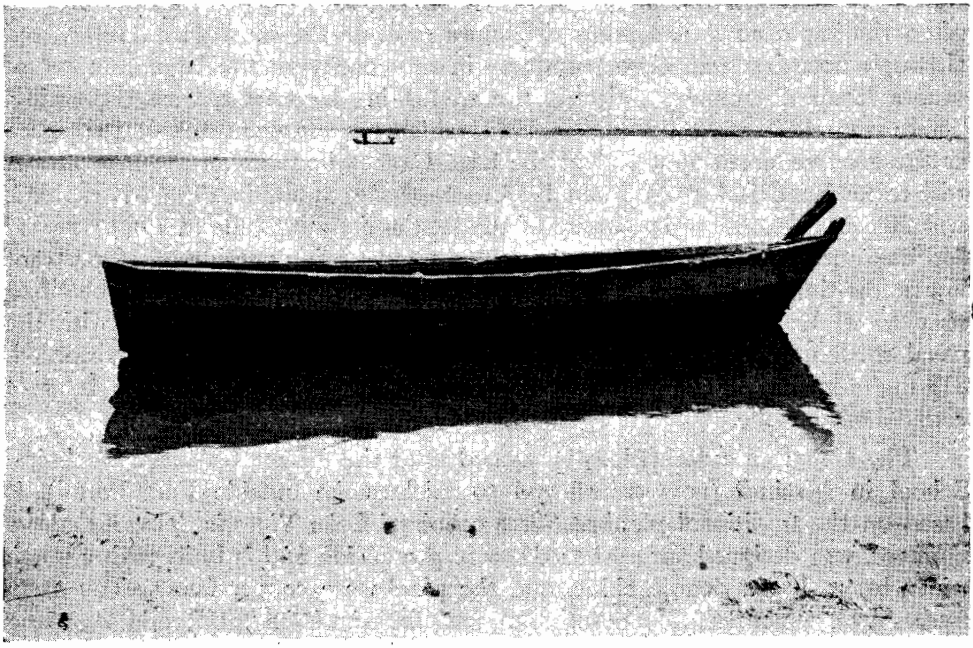

PLATE 2.—A Congo barque canoe.

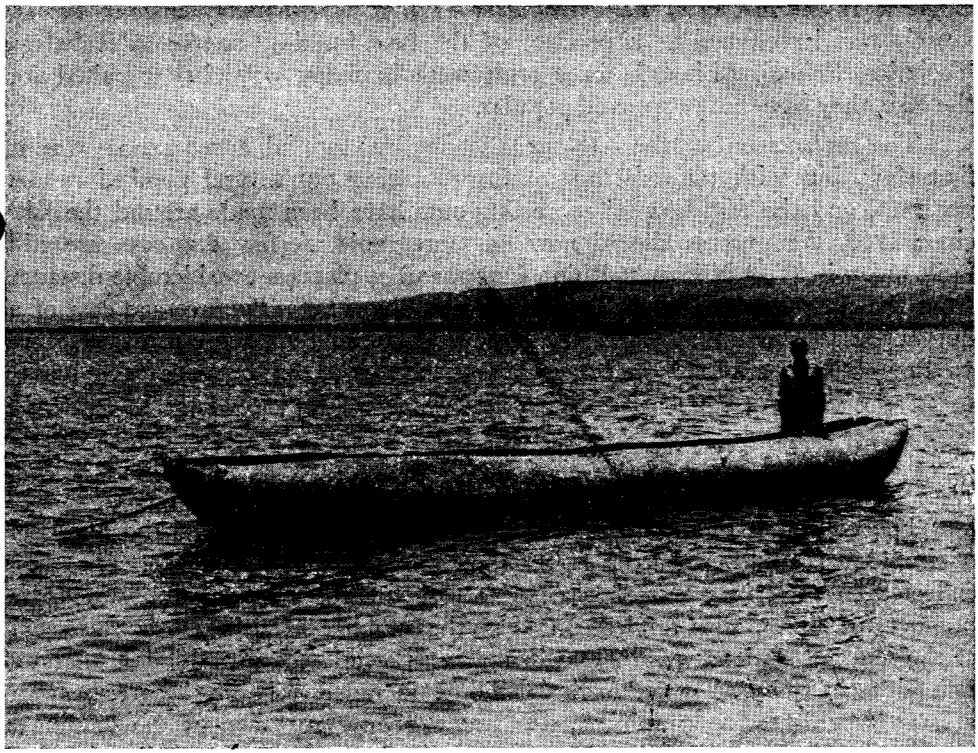

PLATE 3.—A traditional dug-out canoe.

fastened with iron nails, about 15–20 feet long, and was first sold to Uganda fishermen from Kasenyi for Shs. 300 to Shs. 400. This type of canoe soon proved popular as it was better suited to the rough conditions often encountered on the lake than a dug-out, and is far cheaper than a Kabalega or imported Sesse canoe. They are made today by itinerant carpenters at various points along the lake shore for Shs. 1,000 or more. The Sesse canoe was in use in the early 1950's by a colony of Baganda fishermen at Kibiro, but in early 1965 only a very small number were recorded in a few villages. The Sesse is sometimes made along the lake shore from local materials, and a canoe is imported occasionally from Lake Victoria. Soon after the introduction of the Kabalega canoe a 16–20 feet craft modelled after English west-country inshore fishing vessels was introduced as a product of the boat-building course at Kabalega Technical School. Although these craft were in many ways better suited for the lake, they have not yet proved popular.

The replacement of the dug-out (Plate 3) by more advanced canoes was at first slow, but with the existence of firms turning out several planked canoes per year, and the fact that no more dug-outs have been made around the lake since 1963, the process should now be more rapid. A few dug-outs are still built today in West Nile as at Rhino Camp, and at places a considerable distance from the river towards Arua for Shs. 600 to Shs. 1,000. The average cost of a dug-out in 1953 was Shs. 430[20]. The large trees suitable for dug-out manufacture are now difficult to obtain, and as a consequence fewer dug-outs are being made.

CATCH DATA

Methods of Collecting Data

The collection of data consisted initially of a daily count of the numbers of individual species in samples of known length and mesh size. The data collected in each year was then used to estimate the relative proportions, by number, of the species landed. In 1955 the number of fish-guards employed at the landing stations was increased, making possible the introduction of more refined techniques of catch analysis. These included weighing the fish from a large representative sample of nets and a greater coverage of the landings. It was then possible, using summarised daily data of percentage weight and abundance of the fish in the samples, to derive estimates of the total weight of each species landed from the total annual catch figure. The total annual catch was estimated from Customs' returns of cured fish exported to the Congo, mainly though Kasenyi and Mahagi Port, and which at one time involved the bulk of the catch. Reports from field staff and market surveys from time to time were used to estimate the remainder of the catch consumed within Uganda. The figures from 1955 relate to the total catch from the lake and Albert Nile to the border with Sudan at Nimule. The data in Tables 1–11 has been derived from records prepared from figures collected in the field and brought together in the Lake Albert Regional Fisheries Office, Masindi, and in annual reports, both published and unpublished. Whilst the data is open to error and is incomplete in places, as detailed by Holden[1], the trends shown by the figures from year to year are clear, and probably give a reliable comparative assessment of the annual state of the fisheries and the major annual fluctuations in catch.

Unfortunately, the collected, daily, statistical returns for 1962 from the landings were mislaid, and the data for that year was never worked up into final estimates of the catch. In all Tables, therefore, the 1962 data have been omitted.

In the following Tables a convenient conversion factor of 1:3 has been used to express the ratio of the weight of cured fish to its wet weight, as when the fish is landed fresh.

Total Annual Catch and Exports to the Congo

Table 1 shows that from 1935 to 1942 there was a gradual increase in the weight of cured fish exported to the Congo. The weight of exports then remained steady from 1942 to 1955, when there was a sharp rise to a maximum annual export of 6,200 tons in 1959, a year before Congo attained independence.

A factor which contributed to the marked increase in exports in 1956 was an increase in the number of outboard motors in use at the time. Motor propulsion facilitated easier and quicker exports to Mahagi Port, where the catch was sold mainly to Greek wholesale buyers. Before this time the majority of exports to Mahagi Port was taken by the lake steamer on its twice a week service. The increase in the number of outboard motors was related to the increase in the number of the heavier, planked canoes coming into use. In 1953 there were no outboard motors employed in the fishing industry, but by early 1956 and in 1957 there were seven motors and by June 1958, the number had risen to 30[21]. The present number in use has been estimated at 100, which whilst no longer used in the export of fish do facilitate the movement of fish from the more inaccessible landings to the main road-head villages. The earlier motors were also used for this purpose, moving fish along the lake shore to places where the highest prices prevailed at the time[21]. It was also in 1955 and 1956 that more canoes were brought into use (see earlier), and more fishermen started exporting their catches to the Congo in response to the all-time high prices prevailing there at the time (Table 2). Table 2 shows that, other than for 1952 and 1955, there was almost a proportional rise in prices from 1938 to 1960, and which probably added to the momentum of increasing exports in these years.

The increasing demand in the Congo in the 1950's is shown by figures for production from Congo waters, compiled by the "Service des eaux et forets (section chasse at peche)" of the Congo in 1959[22]. The annual production figures given in Table 3 show that in the nine years for which records are available there was a steady increase to a maximum in 1957. These production figures were collected only from returns submitted by the large Greek-owned fisheries at Kasenyi and Mahagi Port. The Belgians never attempted to assess the catch from the indigenous African fishery. The rising trend shown by the figures, however, probably reflects the growth in total production from Congo waters associated with the demand during these years.

After 1959 there was a decrease in the weight of fish exported to the negligible proportions recorded in 1963 and 1964, and the complete lack of exports in 1965. Exports of dried, salted fish, mainly *Tilapia* sp., and *Lates* sp., commenced once again at the beginning of 1966 from the south end of the

lake in the hands of licensed buyers. There is every indication that exports will exceed 2,000 tons (wet weight) in 1966 if the present rate of buying for the Congo market is maintained.

Before the maximum export level to the Congo was attained in 1959 there was an overall increase in the total annual catch in Uganda waters in 1957 (Table 1). Although the weight of fish exported still increased after 1957, there was a decline in the percentage which the exports formed of the total annual catch (Table 1). The faster rate of increase of total catch than that of exports was due to an increasing demand in Uganda, particularly in West Nile and Acholi. The relatively high annual production for 1957 compared with that of 1956 was also due to the sale of fish in West Nile and Acholi, and annual production from the Albert Nile, being assessed accurately for the first time[23]. Prior to 1957 Ugandan consumption had not been well documented, and there is reason to believe, therefore, that total production was not quite so low as shown by the records for the two or three years before 1957.

In his report of a market survey in the area in 1957/58, Crutchfield[24] recommended that holding stores should be built at Wanseko, Panyimur and Arua to encourage the distribution of cured fish in West Nile. These stores which were eventually constructed between 1960 and 1962, led directly to increased sales in West Nile, and formed the basis of present-day wholesale marketing as distribution points, particularly from Arua.

The increase in consumption of fish in the districts adjacent to Lake Albert continues at the present time, and fortunately for the fishing industry, has fully compensated for the loss of the Congo market since 1962. Table 1 shows that the total catch in 1964 was only 3,308 tons less than the maximum catch of 1959, despite exports being as much as 5,200 tons lower, whilst in 1965 when no fish were exported, the total catch was only 1,000 tons lower than in 1959. Although the maximum weight of fish was exported in 1959, the highest proportion of the catch was exported in 1956, indicating that consumption in Uganda started increasing in the latter year (Fig. 1). Finally, consumption in Uganda has risen eleven-fold in the decade since 1955.

TABLE 1

Year	Total Annual Catch	Total Weight to Congo	Percentage of Catch exported
	Tons	*Tons*	
1935	Not known	6	
1936	,,	0	
1937	,,	0	
1938	,,	12	
1939	,,	195	
1940	1,200	642	
1941	Not known	1,116	
1942	,,	1,407	
1943	,,	1,266	
1944	,,	1,875	

TABLE 1—*continued*

Year	Total Annual Catch	Total Weight to Congo	Percentage of Catch exported
	Tons	*Tons*	
1945	Not known	1,782	
1946	,,	1,566	
1947	,,	1,344	
1948	,,	1,563	
1949	,,	2,781	
1950	,,	2,448	
1951	,,	3,384	
1952	,,	2,127	
1953	3,000	2,097	69·9
1954	3,500	2,100	60·0
1955	4,245	2,745	64·7
1956	7,766	5,466	70·4
1957	10,348	5,358	51·8
1958	10,989	4,389	39·9
1959	13,350	6,200	46·4
1960	12,300	4,511	36·7
1961	11,878	4,928	41·5
1963	10,268	150	1·5
1964	10,042	1,000	10·0
1965	12,032	Nil	Nil

Total annual catch, total weight of fish exported to Congo, and the percentage of exports to total catch, 1935–1965 (1962 data not available).

TABLE 2

Year	£'s	Year	£'s	Year	£'s
1938 ..	21	1946 ..	45	1954 ..	85
1939 ..	23	1947 ..	74	1955 ..	108
1940 ..	23	1948 ..	63	1956 ..	96
1941 ..	28	1949 ..	65	1957 ..	78
1942 ..	36	1950 ..	65	1958 ..	79
1943 ..	53	1951 ..	77	1959 ..	61
1944 ..	47	1952 ..	112	1960 ..	91
1945 ..	57	1953 ..	89	1961 ..	60

Price per ton of cured fish exports paid in the Congo, 1938–1961.

TABLE 3

	1950	1951	1952	1953	1954	1955	1956	1957	1958
Annual Production	1,794	2,500	3,240	4,092	6,167	7,770	8,943	11,674	9,061

Annual production (in tons) of the Congo waters of Lake Albert, 1950–1958.

Seine-net catches

Table 4 shows that the maximum catch from seine-nets was landed in 1957, but since then there has been a marked decrease in the weight of fish landed by this gear. After being the most important gear for over 20 years the annual catch from seine-nets was still good in 1951, but was beginning to decline[25]. Although it was recorded in 1954 that seine-net catches formed the bulk of all landings[12], Table 4 shows that only one-quarter of the total annual catch was in fact landed by this gear. Although the annual catch by the gear increased by 23·4 per cent between 1955 and 1956, the percentage which the seine-net catch formed of total annual catch still fell by 12·5 per cent (Table 4). This was because of the relatively large increase in gill-net catches of 1956 over those of 1955 (Table 6).

TABLE 4

Year	Annual catch by seine-nets	Percentage of total annual catch
	Tons	
1953	566	27·0
1954	879	25·1
1955	1,630	38·4
1956	2,011	25·9
1957	3,425	33·1
1958	2,055	18·7
1959	2,163	16·2
1960	2,534	20·6
1961	1,069	9·0
1963	216	2·1
1964	341	3·4
1965	241	2·0

Total annual catches by seine-nets, and percentage formed by these of total annual catch, 1953–1965.

The increasing catch by seine-nets continued until the maximum catch from the gear in 1957 (Table 4) which accounted for one-third of the total annual catch of that year. There has been a marked decline in catches from this time to the minimum catch of 1965. The low catches after 1961 were caused by a reduction in the number of seine-nets in use, the number being reduced to four in 1964. This was due to the flooding of the beaches suitable for seining by a rise in lake level, which started with the heavy rains of 1962. Towards the end of 1965 the water level had fallen by several feet, and the number of seine-nets in use on the uncovered beaches rose to twelve. The increase in number of seine-nets in 1965, however, occurred too late in the year to have produced an increase in catch over that of 1964.

Long lines

Other than for a high catch in 1957, and a relatively low one in 1963, the level of long line catches has remained fairly constant over the last twelve years. The previous stability in the long line fishery is shown in a report in 1951 that the "quality" of the catch had not fallen off since the time of Worthington's survey[6].

There was no increase in long lining with the expansion of the fisheries as a whole, as is shown by the decrease in the percentage which the catch of this gear formed of the total annual catch (Table 5). There was, however, a relatively large increase in the long line catch in 1965, when a little over 500 tons of the catch consisted of nile perch. Table 10 shows that the total annual catch of nile perch in all gears was three times more than in 1964, and this was related to an increased demand in West Nile for heavily-salted slices of this species.

TABLE 5

Year	Annual catch by long lines	Percentage of total annual catch
	Tons	
1954	459	13·1
1955	616	14·5
1956	544	7·0
1957	1,190	11·5
1958	396	3·6
1959	587	4·4
1960	504	4·1
1961	451	3·8
1963	205	2·0
1964	392	3·9
1965	650	5·4

Total annual catches by long lines, and percentages formed by these of the total annual catch, 1954–1965.

Gill-nets

Prior to 1963, data from 2½-inch to 4-inch, 4½-inch and 5-inch, and 6-inch to 8-inch mesh size nets were grouped together under three headings. Thus in Tables 6 and 7 the increase in the number of nets of various mesh sizes shown is due to a change in the form of tabulating the data, and not to any change in the mesh sizes of nets in actual use in the fisheries.

TABLE 6

Mesh size (inches)—	1954	1955	1956	1957	1958	1959	1960	1961	1963	1964	1965
18 ..	—	—	—	—	—	—	—	—	—	—	48
16 ..	—	—	—	—	—	—	—	—	—	211	650
12 ..	—	—	—	—	—	—	—	—	—	—	72
9 ..	630	687	699	10	66	40	25	404	—	5	24
8 ..	469	399	854	1.159	1,165	654	480	915	62	8	12
7 ..	—	—	—	—	—	—	—	—	10	10	36
6 ..	—	—	—	—	—	—	—	—	5	30	—
5 ..	357	437	1,429	993	1,780	2.176	1,316	1,105	41	171	12
4½ ..	—	—	—	—	—	—	—	—	82	171	265
4 ..	—	—	—	—	—	—	—	—	133	110	180
3½ ..	—	—	—	—	—	—	—	—	21	3	12
3 ..	707	475	2,229	3,570	5,529	7,730	7,442	7,931	8,625	6,387	7,327
2½ ..	—	—	—	—	—	—	—	—	914	2,209	2,503

Approximate weight of fish (to nearest ton) caught in gill-nets of various mesh sizes, 1954–1965.

If each group of gill-nets in Table 6 is considered as a whole, the general trends in the fishery over the time the data was recorded may be noted. There was a very marked increase in the total weight of fish landed in the 2½-inch to 4-inch group of nets in the twelve years of the Table. There was a marked decrease in the catch of the 4½-inch and 5-inch nets, and a lesser decrease in the larger size nets. These changes are better shown when the weight of fish landed per year from the various mesh sizes of gill-nets is expressed as a percentage of the total annual catch of all gears, as in Table 7.

TABLE 7

Mesh size (inches)—	1954	1955	1956	1957	1958	1959	1960	1961	1963	1964	1965
18 ..	—	—	—	—	—	—	—	—	—	—	0·4
16 ..	—	—	—	—	—	—	—	—	—	2·1	5·4
12 ..	—	—	—	—	—	—	—	—	—	—	0·6
9 ..	18·0	16·1	9·0	0·1	0·6	0·3	0·2	3·4	—	0·1	0·2
8 ..	13·4	9·4	11·0	11·2	10·6	4·9	3·9	7·7	0·6	0·1	0·1
7 ..	—	—	—	—	—	—	—	—	0·1	0·1	0·3
6 ..	—	—	—	—	—	—	—	—	0·1	0·3	—
5 ..	10·1	10·3	18·4	9·6	16·2	16·3	10·7	9·3	0·4	1·7	0·1
4½ ..	—	—	—	—	—	—	—	—	0·8	1·7	2·2
4 ..	—	—	—	—	—	—	—	—	1·3	1·0	1·5
3½ ..	—	—	—	—	—	—	—	—	0·3	—	0·1
3 ..	20·2	11·2	28·7	34·5	50·3	57·9	60·5	66·8	84·0	63·0	60·9
2½ ..	—	—	—	—	—	—	—	—	8·9	22·0	20·8

Percentage of total annual catch by weight caught in gill-nets of various mesh sizes, 1954–1965.

The main reason for the change in emphasis from the larger to the smaller size group of nets was the change in preference of kind of fish, and form of curing accepted, which occurred with the change in the main market from the Congo to Uganda. The most acceptable fish to the Congo market were those which had been heavily salted, particularly slices from nile perch caught in the larger mesh size nets. When Uganda began to take the majority of the catch, between 1956 and 1958, it was found that heavily-salted fish in general were not acceptable in Acholi and Bunyoro, but lightly salted or sun-dried *Alestes baremose* and *Hydrocynus forskahlii* were well favoured in all districts. These species are small in size, between 26 cm. and 59 cm. in length[26], and are selected for by the group of nets of smaller mesh size. Consequently, as the demand increased for these smaller species, a greater number of the smaller mesh size nets were used. With the change-over from the larger to the smaller nets there was a percentage increase in the weight of fish caught in the smaller nets from year to year (Table 8).

The decrease in weight of fish caught in the 4½-inch and 5-inch nets was probably due to a decline in the catch of *Tilapia* sp., and of other species of similar size caught in these nets (Table 10).

The increase in percentage catch shown for the smaller nets in Table 8 is reflected in the decrease in percentage weight of fish caught in nets of 4½-inch mesh size and larger, and on long lines, Table 9.

TABLE 8

Year ...	1954	1955	1956	1957	1958	1959	1960	1961	1963	1964	1965
% ...	20·2	11·2	28·7	34·5	50·3	57·9	60·5	66·8	93·9	86·8	83·3

Percentage of total annual catch caught in gill-nets of 2½-inch to 4-inch mesh size 1954–1965.

TABLE 9

Year ...	1954	1955	1956	1957	1958	1959	1960	1961	1963	1964	1965
% ...	54·7	50·1	45·4	32·5	31·0	26·0	18·9	24·3	4·0	9·8	14·7

Percentage of total annual catch caugth in gill-nets of 4½-inch mesh size and above, and on long lines, 1954–1965.

When the Congo market was at its peak most of the fish exported was sold in bulk to estates, mines and institutional organisations, which could handle larger portions of fish as cut from nile perch. Also, buying in Uganda was and still is done on the basis of individual fish of a size suitable for a family meal (noted also by Garrod[3]). When the Congo market was flourishing the larger mesh size nets were used for the larger species, particularly nile perch, to cater for the demand described above. These nets were eventually superseded by the smaller mesh sizes for smaller species (Tables 8 and 9) to cater for the demand in Uganda when the Congo market collapsed. Another factor which contributed to this change-over was the high incidence of net thefts at the time, the smaller nets involving a lower capital investment by the fishermen. The effect of net thefts on a fishery has also been noted in the decline of the *Labeo victorianus* (ningu) fishery of the Nzoia River of Lake Victoria, where the cost of replacing nets caused fishermen to leave the fishery[27].

Annual Catch by Species

When the figures for total catch are broken down to weight of individual species landed annually it is seen that the weight of *Alestes* sp. (mainly *A. baremose*) has been increasing steadily up to the present time (Table 10). In 1954 this species formed only 15·1 per cent of the total catch, in 1959 the species formed almost 50·0 per cent of the catch, whilst in 1964 and 1965 it formed 81·3 per cent and 60·9 per cent respectively. Table 10 shows also that *Lates* sp. after reaching a maximum catch in 1960 decreased to a low level in 1963 and 1964, before recovering once more to a relatively high catch in 1965. It was in 1965 when the market for salted slices of this species in West Nile improved.

The figures for *Labeo horie* (karuka) show that increasing weights of the species were landed up to 1960, which were followed by a decrease in catch in the following years. After an increase in the weight landed annually, the maximum catch of *Synodontis schall* (wahrindi) occurred in 1959 and this was followed by a decrease in the weight landed up to the present.

As described earlier, the *Citharinus citharus* fishery never recovered from the intense fishing by seine-nets in the 1940's. Table 10 shows that even since 1954 the annual catch of the species has been in decline to the present time, with only nine tons landed in 1965. The apparent decline shown by the figures, however, may also be accounted for by a decrease in the number of large mesh

nets in use, as well as a decrease in actual population numbers of the species. In an attempt to protect the inshore breeding stocks of *C. citharus* and other species of similar habitat preferences, legislation was introduced in 1950 restricting the maximum length of seine-nets to 250 yards.

TABLE 10

	1954	1955	1956	1957	1958	1959	1960	1961	1963	1964	1965
Alestes sp. ..	530	169	2,034	2,768	4,585	6,601	6,800	6,715	9,230	8,164	9,419
Lates sp. ..	1,212	1,126	1,775	2,314	1,423	2,625	2,859	2,043	344	526	1,515
Hydrocynus forskahlii ..	148	88	239	1,258	1,294	1,113	595	1,234	271	567	321
Tilapia sp. ..	339	465	854	600	175	592	76	278	242	313	153
Labeo horie ..	—	36	101	158	528	508	223	104	31	82	120
Distichodus sp.	306	386	438	235	387	97	108	171	23	33	88
Clarias lazera	19	11	22	—	—	75	25	23	38	138	110
Protopterus aethiopicus	—	—	—	24	19	—	—	8	16	29	6
Mormyrus sp.	—	—	—	—	119	5	—	27	10	11	12
Synodontis schall ..	53	59	260	210	662	807	305	156	15	82	150
Citharinus citharus ..	287	243	192	24	98	5	33	—	13	26	9
Bagrus bayad	—	—	—	—	298	132	360	273	10	22	27
Auchenoglanis occidentalis	—	—	—	—	—	—	—	—	9	5	6
Barbus bynni	28	36	258	74	64	—	—	—	6	8	37
Labeo coubie	—	—	—	227	—	—	—	17	3	2	4
Hydrocynus vittatus ..	—	—	61	—	—	—	—	—	2	4	22
Bagrus docmac	—	—	71	262	150	—	29	10	6	8	33

Approximate total weight (to nearest ton) of individual species landed annually, 1954–1965.

PRESENT-DAY FISH PROCESSING AND MARKETING

Despite improvements in communications and marketing facilities in recent years, which have led to a greater proportion of the annual catch being distributed easily throughout the area, the Lake Albert fisheries may still be considered as one unit. Current practices in the fisheries, such as the methods of curing and the form of marketing, are specific to it and related to the physical, social and economic environment of the area. Two of the most important factors contributing to the fisheries remaining distinct are the salt cure, which is the most common form of curing practised, and the preference for salted fish in the area. This virtually restricts the distribution of salted fish to areas adjacent to the lake, due to its unacceptibility in other parts of the country.

Crutchfield[24] suggested that although these regional preferences were the results of conditioning of taste, to species readily available and the traditional forms of curing, they were prejudices which could be broken down easily by lack of the accustomed species, and by re-education. He concluded, however, that these prejudices were still important in any study of the distributive aspect of the industry with a view to expanding the area of marketing of the fish of any lake.

Sun-dried and salted fish, mainly *Alestes* sp. and *Hydrocynus* sp. which form the bulk of the catch (Table 10), remain in good condition for up to one and two months respectively. These forms of curing are therefore suited to, and

form the basis of, present-day marketing. In the salting process the fish, mainly *Hydrocynus* sp. and some *Alestes* sp., are cut open along the mid-dorsal line, starting from the tail and cutting forward through the head. The viscera are then removed, and the exposed flesh liberally covered with salt. The treated fish are stacked open, one on top of the other, 2–3 hours before being laid out individually on papyrus or straw mats, and sometimes raised forms, for a further 3–4 days for an adequate cure. Sun-dried fish as they are named locally are mainly *Alestes* sp. and are in fact lightly salted when cut open as in the salting cure. In Ntoroko salting is also done in a strong brine bath, in which the fish are immersed for three hours before removal and drying in the usual way to give a product similar to the normal salted product. This method stems from an identical process popular in Kasenyi[15]. The brined product, however, discolours rapidly to a dark shade, and is not popular in Uganda as a result. The relative proportions of salt used in the curing is approximately 2:1 for salted to sun-dried. The salting process is obviously the more expensive, fish cured in this way costing 5 cents more wholesale than if cured by sun-drying. There is no true comparison for *Alestes* sp., however, as only the smaller specimens are salted, and which consequently sell for far less than the larger sun-dried specimens.

Smoking of *Tilapia* sp., *Clarias* sp., and *Bagrus* sp., although now restricted by shortage of wood supplies in the area, has been done traditionally at most landings, the cured product lasting for 2–3 weeks. *Hydrocynus* sp., and *Alestes* sp. possess excessive body fat to be cured adequately in this way, the flesh remaining moist and limp instead of taking on the dry and hard form of the well-cured product, and deteriorates within a few days. In 1964, however, Jaluo fishermen from the Kisumu area of Lake Victoria introduced at Wanseko, and later at Tonya, a method which involved grilling the fish, mainly *Alestes* sp., over hot charcoal to remove excess body fat before smoking in the conventional manner. The grilled/smoked product has a marketing life of 2–3 weeks. This product is now popular, with small quantities being distributed regularly to the main markets in Bunyoro, Acholi and West Nile as soon as possible after curing, and retailing at about Shs. 1/40 per fish.

The form of curing carried out at the landings depends upon the preferences of the area in which the fish is to be distributed. Table 11 gives the methods of curing most practised at the bigger landings.

TABLE 11

Salting	Sun-drying	Smoking	Grilling
Panyimur Wanseko Ntoroko (also by brine bath)	Wanseko Butiaba Kibiro Tonya Kaiso Buhuka Ndaiga Ntoroko	All landings	Wanseko Tonya

Methods of curing most commonly practised at the main landings.

When catches are good at Panyimur and Wanseko the current practice is for wholesale fishmongers to buy only fresh *Alestes* sp., for sun-drying by porters, paying approximately 40 cents per fish. The wholesalers nearly always buy the larger specimens of this species, which are generally those caught in 3-inch nets. The smaller *Alestes* sp., caught in the 2½-inch nets, and *Hydrocynus* sp., caught in 2½-inch and 3-inch nets are cured by deep-salting by the fishermen themselves, and sold to fishmongers in bundles. Each bundle contains approximately 115 small *Hydrocynus* sp., or 80 larger specimens, or 95 small *Alestes* sp. Large nile perch caught at Wanseko and Panyimur are cured either by wholesalers or fishermen by cutting each fish into approximately six slices, each slice about ½-inch thick, which are lightly salted and sun-dried in the usual way. The slices are cut in equal portions of 1 lb.–2 lb. each, which works out about Shs. 6 per slice at the price the wholesaler pays for the whole fish. The slices are sold for Shs. 12 each to the Alur people in markets mainly in the Okoro area of West Nile.

A very small part of the catch is sold fresh to retail fishmongers for limited distribution around the landings at the following prices: *Alestes* sp., 33–40 cents each; *Hydrocynus* sp., 25 cents each; Sh. 1 for 4–5 small *Tilapia* sp., and 20 cents per lb. for nile perch. There is also some movement of fresh fish at times of demand from Wanseko to Panyimur, when big *Alestes* sp. bought for 40 cents each are sold at Panyimur for 60 cents each for salting. Again depending on the demand which varies with the availability of money during the cash crop picking seasons, sun-dried *Alestes* sp. sell to the public for Sh. 1 to Sh. 1/50.

At Ntoroko the fishermen and their porters cure the total catch, most of the cured fish being sold to about ten wholesalers from nearby Bwamba. The wholesalers take the fish to Bundibugyio for further sale and distribution in Bwamba by retail fishmongers. A little of the Ntoroko catch, mainly *Tilapia* sp., *Clarias* sp., and *Bagrus* sp., is smoked for sale in the Fort Portal area, where the main market is for such cured fish from Lakes George and Edward. The catch from the landings between Ntoroko and Wanseko is nearly all sun-dried by the fishermen and is taken by them, or by wholesalers buying in bulk, by canoe to Wanseko, Panyimur, Pakwach and sometimes Ntoroko, depending on where the demand is creating the highest prices at the time. Some of the fish from these landings is taken by retail fishmongers up the escarpment for sale in Bunyoro; Biseruka being the main market for Tonya fish, Kigorobya for Kibiro, Kyangwali for Buhuka, and Muhoro for Ndaiga fish. Nearly all the heavily-salted fish from Wanseko and Panyimur is sold to the Lugbara people of West Nile. The Wanseko fish reaches West Nile either through Panyimur and Pakwach, or by road via Paraa and Pakwach. Most of the sun-dried fish of Wanseko is sold in Acholi, but some is sold to the Alur people of West Nile, and a little is taken to Kampala by wholesalers. At times when the Bwamba market is poor, salted fish is brought from Ntoroko for sale in West Nile via Wanseko and Panyimur. In a recent example of this (1965), bundles of salted *Hydrocynus* sp., approximately 44 lb. each, were bought at Ntoroko for Shs. 12 to Shs. 15 per bundle, resold at Wanseko at Shs. 14 to Shs. 16 and at Panyimur for Shs. 17 to Shs. 25 per bundle, later selling at Arua market to retail fishmongers at Shs. 25 to Shs. 30 per bundle, and sold to the public at cents 35–40 per fish.

The wholesalers at Panyimur and Wanseko take their fish to Arua and Gulu respectively, where the fish is either retailed by them or sold to retail fishmongers. The retail fishmongers sell a little of the fish in the towns, but most of it is distributed in the area by bicycle and bus, through Adumi and Kaya from Arua, and Kitgum, Palabek and Patongo from Gulu. Fish is also distributed directly from these landings into West Nile and Acholi by several retail fishmongers, mainly through Parombo, Goli and Paidha in West Nile, and Gulu in Acholi. Fish is also distributed throughout Bunyoro by the smaller retail fishmongers.

The number of fishmongers licensed in the districts around the lake gives some indication of the way in which the distributive side of the industry has developed. In 1965 there were 334 fishmongers licensed in Arua, and a further 643 fishmongers licensed to trade outside the town in West Nile District. There were 77 fishmongers licensed in Gulu, and 335 licensed to sell in Acholi District outside the town, whilst 270 fishmongers were licensed in Bunyoro District and the towns of Hoima and Masindi. A further 60 licences were issued in Toro District to fishmongers operating out of Ntoroko and in Bwamba.

DISCUSSION

As a result of a Belgian survey of Lake Albert from 1952 to 1954 a tentative figure of 15,000 tons was given as the optimum annual production of fish from the Uganda waters of the lake[28]. The actual production in 1959 and 1960 came very near this upper limit (Table 1), and there was every indication at the time that the fisheries was still expanding. In 1961 and 1962 a survey was carried out to determine the potential resources of the lake in order to estimate the total, sustainable annual yield of the Uganda waters as accurately as possible. The aim of the survey was to determine how near the fishing effort of that time was to overfishing the stocks, and whether any further legislation was necessary to prevent overfishing by placing restrictions on the numbers of nets and canoes in use. The conclusions made from the study include an estimate of 11,000 tons total sustainable yield per annum from the south end of the lake in both Uganda and Congo waters, adjacent to the Semliki River delta. It was also estimated that the sustainable yield of *Alestes baremose* in the Wanseko area is about 6,000 tons per year. The data also suggested that overfishing of *Hydrocynus forskahlii* had started at Wanseko, and that there had been a fall in recruitment of *Citharinus* sp., *Distichodus* sp., *Labeo horie, Lates* sp., *Barbus bynni* and *Protopterus aethiopicus*. It was also indicated, however, that there had been an increase in recruitment of *Bagrus bayad* (lanya) and *Clarias lazera,* which would result eventually in increased catches of these species.

It is estimated that approximately 73 per cent of the estimated total catch of 4,656 tons landed in 1965 at Wanseko and Panyimur was made up of *Alestes baremose*. This catch of *A. baremose* of an estimated 3,400 tons is well below the 6,000 tons estimated by Holden[1] as the maximum sustainable yield for the species for the Wanseko area. There is very little danger, therefore, of overfishing the species in the area for the moment. Most of the catch from the Uganda

waters of the south end of the lake is landed by canoes fishing out of Buhuka, Ndaiga, Ntoroko and Rwengara. It is estimated that the total catch at these four landings in 1965 was approximately 4,000 tons. In view of the figure of 11,000 tons given by Holden as the maximum sustainable yield of Uganda and the Congo waters at the south end of the lake, it appears that even in the event of the Congo waters being fished at the same intensity as the Uganda waters there is no danger of overfishing at the moment.

SUMMARY

An historical account is given of the development of the Lake Albert fisheries since Worthington's survey in 1928. It is noted that the development of the fisheries was related to, and dependent upon, improvements in the type of gear and canoes, an increase in the number of canoes and outboard engines in use, improved marketing facilities and better road communications. Summarised data, collected mainly since 1954, has been analysed and tabulated to show annual exports to the Congo, total annual catches and annual catches of individual species. A change in the relative abundance of the various species in the annual catches is described. It is noted that this change was caused by a change-over from large to small mesh size gill-nets, and that it was associated with an increased demand within Uganda for the smaller species of fish, such as *Alestes baremose* and *Hydrocynus forskahlii*.

A brief description of fish processing and marketing in the Lake Albert region is given, which emphasises the suitability of salt-cured fish to the social and physical environment of the area. Finally, a summary of a recent survey of the potential fish resources of the lake is given in the discussion, and estimates of the 1965 catch at the north and south ends of the lake are compared with the findings of the survey. This showed that there is little danger of overfishing the *Alestes baremose* stocks of the Wanseko area at the 1965 rate of exploitation of the species, and that the total catch for 1965 at the south end of the lake was well below the estimated annual sustainable yield from the area.

ACKNOWLEDGMENTS

We have been allowed access to much of the data in the course of our work in the Uganda Fisheries Department, and we are grateful to the Ministry of Animal Industry, Game and Fisheries for permission to collate and publish the material.

REFERENCES

1. HOLDEN, M. J. (1963).—Report on the fisheries of Lake Albert *Mimeo., Fisheries Laboratory, Lowestoft.*

2. WORTHINGTON, E. B. (1929).—*A report on the fishing survey of Lakes Albert and Kyoga.* London, Crown Agents.

3. GARROD, D. J. (1961).—The history of the fishing industry of Lake Victoria, East Africa, in relation to expansion of marketing. *E. Afr. agric. for. J.*, xxviii. 2, 95–99.

4. UGANDA GAME AND FISHERIES DEPARTMENT, *Annual Report* (1952).—Government Printer, Uganda, P. 63.

5. *ibid* (1950).—P. 73.

6. *ibid* (1951.)—P. 54.

7. *ibid* (1962).—P. 60.

8. UGANDA GAME DEPARTMENT, *Annual Report* (1949).—Government Printer, Uganda, P. 42.

9. WHITEHEAD, P. J. P. (1958).—Indigenous river fishing methods in Kenya. *E. Afr. agric. for. J.*, xxiv. 2, 111–120.

10. ROSCOE, J. (1923).—*The Bakitara or Banyoro*. Cambridge University Press.

11. UGANDA GAME DEPARTMENT, *Annual Report* (1949).—Government Printer, Uganda, P. 46.

12. UGANDA GAME AND FISHERIES DEPARTMENT, *Annual Report* (1954–55).—Government Printer, Uganda, P. 101.

13. *ibid* (1954–55).—P. 96.

14. UGANDA GAME DEPARTMENT, *Annual Report* (1935).—Government Printer, Uganda, P. 52.

15. STONEMAN, J.—Personal observation.

16. UGANDA GAME AND FISHERIES DEPARTMENT, *Annual Report* (1952).—Government Printer, Uganda, P. 61.

17. *ibid* (1955–56).—P. 97.

18. *ibid* (1950).—P. 70.

19. STONEMAN, J. (1965).—Problems affecting the introduction of improved fishing craft in Uganda (*F.A.O. Technical meeting on fishing boats, Goteburg, 1965*).

20. UGANDA GAME AND FISHERIES DEPARTMENT, *Annual Report* (1953).—Government Printer, Uganda, P. 70.

21. *ibid* (1957–58).—P. 57.

22. *Anon* (1959).—Apercu sur la peche lacustre et fluviale au Congo belge et au Ruanda Urundi. *Bull. agric. du Congo Belge et du Ruanda Urundi*, 50 (6) 1665-1690.

23. UGANDA GAME AND FISHERIES DEPARTMENT, *Annual Report* (1957–58).—Government Printer, Uganda, P. 60.

24. CRUTCHFIELD, J. (1958).—A report on the structure of fish marketing in Uganda, *Mimeo., F.A.O., Rome.*

25. UGANDA GAME AND FISHERIES DEPARTMENT, *Annual Report* (1951).—Government Printer, Uganda, P. 53.

26. GREENWOOD, P. H. (1958).—*The fishes of Uganda*. The Uganda Society, Kampala.

27. CADWALLADR, D. A. (1965).—The decline in the *Labeo victorianus* Blgr. (Pisces: Cyprinidae) fishery of Lake Victoria and an associated deterioration in some indigenous fishing methods in the Nzoia River, Kenya. *E. Afr. agric. for. J.*, xxx. 3, 249-256.

28. STONEMAN, J.—Personal communication with M. Capart, leader of survey.

GPUG—P. 307—250—11-66.