

Supplementary material

Reconstructing Kenya's total freshwater fisheries catches: 1950–2017

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Table S1. Data anchor points and sources used for reconstructing catches from Lake Victoria (Kenya) from 1950 to 2017

Item	Year(s)	Description	Sources
Catch and taxa	1948	Total catch for Lake Victoria	Ogutu-Ohwayo (1990)
	1958	Total catch & taxonomic composition, incl. illegal gear	Lake Victoria Fisheries Service (1959)
	1961	Total catch for Lake Victoria (Kenya)	Ogutu-Ohwayo (1990)
	1962	Total catch for Lake Victoria (Kenya)	Ogutu-Ohwayo (1990)
	1964–1966	Total catch for Lake Victoria (Kenya)	Greboval and Fryd (1993)
	1967	Total catch for Lake Victoria (Kenya)	Kenya National Bureau of Statistics (1972)
	1968–1973	Total catch & taxonomic composition for Lake Victoria (Kenya)	Committee for Inland Fisheries of Africa (1988)
	1974–1985	Total catch & taxonomic composition for Lake Victoria (Kenya)	Reynolds and Greboval (1988)
	1986–1994	Total catch & taxonomic composition for Lake Victoria (Kenya)	Christopher Aura (KeFS, unpubl. data)
	1995–2017	Total catch & taxonomic composition for Lake Victoria (Kenya)	Kenya Fisheries Service (1996, 1997, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2016, 2017)
Unreported catch	1982	Unreported, illegal catches	Coche and Balarin (1982)
	2003	Unreported and illegally caught Nile perch:	Cowx <i>et al.</i> (2003)
	2007	Weight & taxa of unreported bait for longline fishery (Tanzania)	Mkumbo and Mlaponi (2007)
	2020	Unreported and illegally caught Nile perch	Ian Cowx (Hull Fisheries Institute, pers. obs.) Paul Tuda (Leibniz Centre for Tropical Marine Research, pers. obs.)
Number of fishers	1950–1954	Number of licenced fishers	Geheb (1997)
	1956	Number of licenced fishers	Geheb (1997)
	1971, 1979, 1994, 1995	Number of licenced fishers	Bokea and Ikiara (2000)
	1973	Number of licenced fishers	Bokea and Ikiara (2000)
	1982–1991	Number of licenced fishers	Greboval and Fryd (1993)
	1996–2016	Number of licenced fishers	Kenya Fisheries Service (1996, 1997, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2016, 2017)
Fish consumption	1995	90 kg per person per year in fisher households	Bokea and Ikiara (2000)

Table S2. Anchor points used for reconstructing catches from Lake Turkana (Kenya) from 1950 to 2017

Item	Year(s)	Description	Sources
Catch and taxa	1951–1956	Total catch & taxonomic composition	Kolding (1995)
	1962, 1963, 1966	Total catch	Kolding (1989)
	1964	Total catch	Food and Agriculture Organization of the United Nations (1966a)
	1965	Total catch	Welcomme (2011)
	1967–1991	Total catch	Kenya National Bureau of Statistics (1972, 1974, 1977, 1980, 1982, 1985, 1987, 1990, 1991, 1994)
	1992–1994	Total catch & taxonomic composition	Christopher Aura (KeFS, unpubl. data)
	1995–2017	Total catch & taxonomic composition	Kenya Fisheries Service (1996, 1997, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2016, 2017)
Number of fishers	1962–1988	Number of licenced fishers	Kolding (1989)
	1996–2013, 2016	Number of licenced fishers	Kenya Fisheries Service (1996, 1997, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2016, 2017)
Fish consumption	1982	73 kg per person per year in fisher households	Kolding (1989)

Table S3. Anchor points used for reconstructing catches for Lakes Baringo and Naivasha from 1950 to 2017

Item	Year(s)	Description	Sources
Catch and taxa	1964	Total catch	Food and Agriculture Organization of the United Nations (1966b)
	1965	Total catch	Welcomme (1979)
	1967–1991	Total catch	Kenya National Bureau of Statistics (1972, 1974, 1977, 1980, 1982, 1985, 1987, 1990, 1991, 1994)
	1992–1994	Total catch & taxonomic breakdown	Christopher Aura (KeFS, unpubl. data)
	1995–2017	Total catch & taxonomic breakdown	Kenya Fisheries Service (1996, 1997, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2016, 2017)
Number of fishers	1982, 1985, 1986	Number of licenced fishers	Vanden Bossche and Bernacsek (1990)
	1996–2013, 2016	Number of licenced fishers	Kenya Fisheries Service (1996, 1997, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2016, 2017)
Other	1959	Start of commercial fishery (Lake Naivasha)	Hickley <i>et al.</i> (2002)
	1975	<i>Protopterus</i> spp. introduced (Lake Baringo)	Kimani <i>et al.</i> (2018)
	1984	<i>Protopterus</i> spp. listed in commercial catch	Kimani <i>et al.</i> (2018)

Table S4. Anchor points used for reconstructing catches for Lakes Kenyatta and Kanyaboli from 1950 to 2017

Item	Year(s)	Description	Sources
Catch and taxa	2006	Total catch & taxonomic composition	Kenya Fisheries Service (2006)
	2007	Total catch & taxonomic composition (Lake Kenyatta)	Kenya Fisheries Service (2007)
	2008–2017	Total catch & taxonomic composition	Kenya Fisheries Service (2008, 2009, 2010, 2011, 2012, 2013, 2016, 2017)
Number of fishers	2004	Number of licenced fishers (Lake Kanyaboli)	Kenya Fisheries Service (2004)
	2006–2013, 2016	Number of licenced fishers	Kenya Fisheries Service (2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2016)

Table S5. Anchor points used for reconstructing catches for Lake Jipe, Lake Chala and other water bodies in Taita-Taveta county from 1950 to 2017

Item	Year(s)	Description	Sources
Catch and taxa	1964- 1965	Total catch (Lake Jipe)	Food and Agriculture Organization of the United Nations (1966b)
	1982	Total catch (Lake Jipe)	Vanden Bossche and Bernacsek (1990)
	1983–1985	Total catch (Lakes Jipe and Chala)	Vanden Bossche and Bernacsek (1990)
	1992–1994	Total catch & taxonomic composition	Christopher Aura (KeFS, unpubl. data)
	1995	Total catch	Kenya Fisheries Service (1996)
	1996–2017	Total catch & taxonomic composition	Kenya Fisheries Service (1996, 1997, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2016, 2017)
Number of fishers	1965	Number of licenced fishers (Lake Chala)	Vanden Bossche and Bernacsek (1990)
	1985–1986	Number of licenced fishers (Lakes Chala and Jipe)	Vanden Bossche and Bernacsek (1990)
	1996–2013, 2016	Number of licenced fishers	Kenya Fisheries Service (1996, 1997, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2016)

Table S6. Anchor points used for reconstructing catches for the Tana River Dams from 1950 to 2017

Item	Year(s)	Description	Sources
Reported catch and taxa	1967	Annual catch from Kindaruma Dam	Mann (1969)
	1992–1994	Total catch & taxonomic breakdown	Christopher Aura (KeFS unpubl. data)
	1995 1996–2017	Total catch Total catch & taxonomic breakdown	Kenya Fisheries Service (1996) Kenya Fisheries Service (1996, 1997, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2016, 2017)
Number of fishers	1996–2013, 2016	Number of licenced fishers	Kenya Fisheries Service (1996, 1997, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2016)
Other	1967	First major dam on Tana River	Mann (1969)

Table S7. Anchor points used for reconstructing catches for the Tana River Delta from 1950 to 2017

Item	Year(s)	Description	Sources
Reported catch and taxa	1963	Total catch (lower stretches of river)	Mann (1969)
	1964	Total catch (lower stretches of river)	Mann (1969)
	1965	Total catch (lower stretches of river)	Mann (1969)
	1966	Total catch (lower stretches of river)	Mann (1969)
	2007–2009	Total catch	Kenya Fisheries Service (2007; 2008; 2009)
Number of fishers	2010–2017	Total catch & taxonomic breakdown	Kenya Fisheries Service (2010, 2011, 2012, 2013, 2016, 2017)
	2016	Number of licenced fishers	Kenya Fisheries Service (2016)

Table S8. Anchor points used for reconstructing catches for the Turkwel Dam from 1950 to 2017

Item	Year(s)	Description	Sources
Reported catch and taxa	2013–2017	Total catch & taxonomic breakdown	Kenya Fisheries Service (2013, 2016, 2017)
Other	1990	Dam construction completed	Renshaw <i>et al.</i> (1998)

Table S9. Anchor points used for reconstructing catches for water bodies assigned to the ‘Rivers’ category for 1950 to 2017

Item	Year(s)	River	Description	Source
Reported catch and taxa	1955	Nyanzan ^A	Total catch	Food and Agriculture Organization of the United Nations (1966b)
	1959	Sondu-Miriu	Total catch	Whitehead (1959)
	1959	Kuja	Total catch	Whitehead (1959)
	1959	Nzoia	Total catch	Whitehead (1959)
	1960	Athi–Sabaki	Total catch (lower river section)	Whitehead (1960)
	1964	Nyanzan ^A	Total catch	Food and Agriculture Organization of the United Nations (1966b)
	1964	Ewaso- Ngiro	Total catch	Food and Agriculture Organization of the United Nations (1966b)
	1965	Ewaso- Ngiro	Total catch	Food and Agriculture Organization of the United Nations (1966b)
	1986	Malewa	Total catch	Nzioka <i>et al.</i> (2017)
	1986	Sondu-Miriu	Total catch (lower river section)	Ochumba and Manyala (1992)
	1987	Malewar	Total catch	Nzioka <i>et al.</i> (2017)
	1987	Sondu-Miriu	Total catch (lower river section)	Ochumba and Manyala (1992)
	1990	Ewaso-Ngiro	Total catch (wetland section)	Christopher Aura (KeFS, unpubl. data)
	2017	Sondu-Miriu	Catch equivalent to 2017 subsistence levels	Julius Manyala (Jaramogi Oginga Odinga University, pers. obs.)
	Number of fishers	1992	Sondu-Miriu	Number of fishers

^AIncludes the Kuja, Sondu-Miriu and Nzoia rivers

Table S10. Total reconstructed catches (tonnes, Mg) for Kenya's freshwater fisheries from 1950 to 2017, separated by water body category and fishing sector

Year	Lake Victoria		Lakes, dams and TRD		Rivers		Reconstructed total	FAO reported
	Artisanal	Subsistence	Artisanal	Subsistence	Artisanal	Subsistence		
1950	22875	4533	571	222	1319	1319	30838	15000
1951	22882	4734	594	229	1395	1395	31227	15000
1952	22889	4955	584	237	1471	1471	31605	15000
1953	22895	5519	593	245	1547	1547	32343	15200
1954	22902	4443	651	252	1623	1623	31490	13500
1955	22909	4559	628	260	1699	1699	31749	27400
1956	22916	4674	665	267	1662	1662	31841	29900
1957	24853	4869	741	275	1625	1625	33983	21000
1958	24548	5063	818	282	1588	1588	33881	17400
1959	20057	4751	995	289	1551	1551	29189	18300
1960	13865	4438	1183	296	1402	1402	22579	8300
1961	9333	4123	1365	303	1253	1253	17623	8400
1962	4801	3806	1548	332	1103	1103	12686	13200
1963	12459	4843	2577	374	953	953	22150	15600
1964	13500	5142	2433	512	806	806	23219	15800
1965	14625	5449	2718	573	794	794	24945	17600
1966	17100	5905	3696	641	778	778	30171	21300
1967	17717	6153	3978	819	763	763	31461	21300
1968	16561	6203	4063	700	748	748	30294	22100
1969	19583	6714	6061	897	733	733	36040	25200
1970	18671	6787	7785	948	718	718	36910	25800
1971	16933	6767	5440	969	703	703	32765	21300
1972	18115	6658	5403	809	688	688	33577	22300
1973	18897	6503	6303	904	673	673	35138	25000
1974	19318	7117	7204	854	659	659	36962	25165
1975	18652	7608	5919	913	644	644	35498	22810
1976	21013	8427	6340	1078	629	629	39203	36852
1977	21740	9058	17364	1249	614	614	51717	38403
1978	26778	10147	17791	1601	599	599	58603	41726
1979	34309	11456	16288	1950	584	584	66269	47628
1980	30171	11249	15106	2653	569	569	61422	42101
1981	42394	12445	12783	2644	554	554	72487	51305
1982	67793	15285	14261	2647	539	539	102183	73897
1983	85688	16809	13298	2123	523	523	120180	90956
1984	79867	16369	11202	1079	508	508	110843	84798
1985	98527	18840	9928	913	493	493	130593	99647
1986	114706	20235	10062	907	487	487	148208	113465
1987	125999	20778	8586	899	459	459	158468	124180
1988	139305	20928	6991	719	446	446	170085	129819
1989	151084	24575	4261	750	433	433	182750	137989
1990	207613	30326	6069	783	419	419	246808	190993
1991	202559	32114	3865	816	408	408	241312	190305
1992	168379	26966	2652	850	396	396	200748	155644
1993	194629	29254	3888	884	385	385	230500	176435
1994	215952	31403	3862	919	374	374	253925	198805
1995	203006	31812	4882	954	362	362	242388	187241
1996	186048	29913	5740	1164	351	351	224545	174692
1997	169821	28486	5610	1072	339	339	206640	154955
1998	178510	29224	12630	1206	328	328	223311	165992
1999	225860	35180	8463	2253	316	316	273462	198653
2000	216044	34293	3969	2326	305	305	258211	210343
2001	171052	28998	5279	2475	293	293	209302	156763
2002	132484	32597	5396	2565	282	282	174568	137792
2003	122032	31424	4949	2751	270	270	162649	113221
2004	132721	26540	11717	2792	259	259	175169	119093
2005	153591	28990	4509	2812	248	248	191288	140199
2006	165899	32716	6819	1261	236	236	208105	151729
2007	136051	29539	7885	2789	225	225	177572	124327
2008	129504	28168	10178	1234	213	213	170592	127097
2009	127101	27892	11894	2793	202	202	171173	128036
2010	130740	28155	8742	2764	190	190	171757	131943
2011	155300	30885	5712	2796	179	179	195067	174356
2012	138570	28663	4436	2800	167	167	174814	150131
2013	145243	29390	6301	2799	156	156	184060	154257
2014	149915	29702	7087	2799	144	144	189853	159212
2015	128704	27835	14126	2798	133	133	173810	156468
2016	115515	26913	9649	2797	121	121	155128	127238
2017	109254	26236	6766	2793	110	110	145360	98579
Total	6031324	1192532	431850	91657	43745	43745	7871884	5966140

Table S11. Data reliability (uncertainty) scores separated by category and fishing sector
CWMS, catch weighted mean score

Time period	Lake Victoria				Lakes, dams and Tana River Delta				Rivers				Total reconstructed	
	Artisanal		Subsistence		Artisanal		Subsistence		Artisanal		Subsistence		CWMS	±%
	Score	±%	Score	±%	Score	±%	Score	±%	Score	±%	Score	±%		
1950–1969	2	30	1	50	2	30	1	50	1	30	1	30	1.7	34
1970–1989	3	20	1	50	2	30	1	50	1	50	1	50	2.5	27
1990–2009	3	20	1	50	3	20	1	50	1	50	1	50	2.7	25
2010–2017	3	20	1	50	4	10	1	50	1	50	1	50	2.7	25
Total													2.6	26

Methods

Filling in reported baseline gaps

Lakes, dams and the Tana River Delta

Catches for Turkwel Dam and Tana River Dams fisheries was assumed to be 0 tonnes (t, Mg) in the year before the first dam being constructed on these rivers, so as to account for the enhancement of fisheries that dam construction on rivers in Kenya is known to produce (Mann 1969). The years of dam completion were 1968 for the Tana River Dams (Mann 1969) and 1991 for Turkwel Dam (Renshaw *et al.* 1998). Catches were then linearly interpolated from 0 t in 1967 (for the Tana River Dams) and 1990 (for Turkwel Dam) to earliest available catch anchor points (Tables S6, S8). As no information was identified for the state of the fisheries in these rivers before initial dam construction, catches were not estimated for these fisheries before these dates to remain conservative. Several other dams were constructed on the Tana River following the construction of the first dam in 1968, and although these may have influenced catches, no information could be identified to help quantify these changes. This should be a focus of future research.

The commercial fishery of Lake Naivasha began in 1959 (Table S3), therefore baseline catches were assumed to be 0 t from 1950 to 1958. Catches were linearly interpolated from 0 t in 1958 to the earliest catch anchor point to complete the catch time series. Thus, the only reconstructed catches for Lake Naivasha before 1959 were subsistence catches from fisher-households.

Rivers

The only data anchor point for the Athi–Sabaki river was for the lower portion of the river for 1959 (Table S9). Owing to the lack of information and to remain conservative, it was assumed that catches from the Athi–Sabaki river peaked in 1959. The lower portion of the Athi–Sabaki river is in the same province as the Tana River Delta (TRD). Thus, catches from the TRD were used as a proxy to estimate catches for the Athi–Sabaki river as no other information was available. The rate of decline of TRD catches from their peak in 1966 to 2017 was 1.5% year⁻¹. This value was used to produce a time series of catches for the Athi–Sabaki river from 1959 to 2017 based on the 1959 catch anchor point.

Fisheries data for the Sondu-Miriu river were not available after 1987, however, catches were known to be equivalent to subsistence levels in 2017 (Julius Manyala, Jaramogi Oginga Odinga University of Science and Technology, pers. comm.). The number of fishers was available for 1992, which was used to estimate the

number of fishers in 2017 based on human population density changes in the Kisumu and Homa Bay counties (Table 1). Total subsistence catch for 2017 was estimated using the number of fishers, the average number of people per household and the 73 kg year⁻¹ fish consumption rate for people in fisher-households from Kolding (1989). Catches were then linearly interpolated from the 1987 catch anchor point to the 2017 value to produce a completed catch time series.

Fisheries data for the Malewa, Kuja, Ewaso-Ngiro and Nzoia rivers were not available after 1990 (Table S9). The Kuja and Nzoia rivers are in the same province as the Sondu-Miriu river and are of comparable length. Owing to the lack of information, changes in catch from the Sondu-Miriu was used as a proxy for estimating catches for the Kuja and Nzoia Rivers after 1990. Changes in catch from the Sondu-Miriu were also used as a proxy to estimate catch for the Ewaso-Ngiro and Malewa rivers, as the lengths of these rivers are closer to that of the length of the Sondu-Miriu, as opposed to the Tana River for which catch data are available after 1990. The rate of decline in catches from the Sondu-Miriu river from 1959 to 2017 was derived (assuming conservatively that the 1959 anchor point was the peak of catch), which gave a rate of decline of ~1.5% per year. This rate of decline was applied to the latest (i.e. closest to 2017) anchor point for each river and used to produce a full time series of catch to 2017.

All catch estimates produced for water bodies in the 'Rivers' category using these methods resulted in declining catches from the earlier anchor points to 2017, therefore these are likely minimum estimates.

Catch totals and taxonomic composition of catch

Reported catches and the taxonomic composition of catches fluctuated greatly from year to year for many water bodies, without following a distinct long-term trend of decline or increase. This was assumed to be the result of water level fluctuations in these water bodies, which is often a major predictor of freshwater fisheries catches (Gownaris *et al.* 2016). No continuous water-level data spanning 1950–2017 were available for any water bodies examined in this study. To account for this natural variability in water level, the ratio of consecutive five year mean catches to population density was used to approximately estimate catches back to 1950 using changes in population density as a proxy. This resulted in 'smoother', average catch times series than likely occurred. For example, if the earliest (i.e. closest to 1950) catch anchor points available for a water body were from 1965 to 1969, the catch to population density ratio would be calculated for each of these five years and then the mean ratio over these five years would be derived. This 5-year mean ratio would be used to estimate catches from 1950 to 1964 based on the changes in population density in the province or county in which the particular water body is located. Several water bodies did not have five consecutive years of catch anchor points available for this purpose, in these cases, two, three or four-year catch to population density ratios were derived and used instead. To account for the intra-annual variability in taxonomic composition, the five-year mean of the taxonomic composition proportion for each species was calculated, where sufficient data were available, and then applied to all catches preceding it back to 1950.

The marbled lungfish (*Protopterus aethiopicus*) was introduced into Lake Baringo in 1975 and first appeared in catches in 1984 (Kimani *et al.* 2018). The proportion of catches from Lake Baringo that this species accounted for was assumed to be 0% in 1983 and increased linearly to the next anchor point in 1992. The introductions of

Nile perch and Nile tilapia into Lake Victoria are accounted for in reported data. No taxonomic compositions of catches were available for water bodies in the ‘Rivers’ category, therefore all catches were categorised as ‘Freshwater fishes not elsewhere included.’ Detailed studies on the taxonomic composition of catches in various freshwater systems besides Lake Victoria are urgently needed for Kenya.

Quantifying fully unreported catch components

Fisher-household catches

First, a time series of licenced fishers was produced for all nine water bodies by linearly interpolating between anchor points (Tables S1–S7). Several water bodies only had data available from the 1990s to 2017, therefore, to estimate the number of fishers back to 1950, it was assumed that the number of fishers would change at the rate of change of population density for the county or province in which these water bodies were located. Second, the total number of people in fisher-households associated with each water body from 1950 to 2017 was estimated by multiplying the annual average household size by the number of licenced fishers for each year. Population density and average annual household sizes were taken from historical Kenyan censuses (Kenya National Bureau of Statistics 1957, 1967, 1974, 1982, 1994, 2002, 2012, 2019), with figures from each census year linearly interpolated to create a full time-series from 1950 to 2017. Average household sizes were not available for certain provinces or counties for earlier periods, therefore the earliest available numbers were used, and assumed to be constant for all years back to 1950.

Illegal catches

The 1958 anchor point for Lake Victoria (Lake Victoria Fisheries Service 1959) included catch from illegal gear, which was not included in any other total baseline catch anchor points for Lake Victoria. To account for this and to remain conservative, it was assumed that this catch included the 25% illegal unreported catch applied to all taxa from Lake Victoria catches from 1950 to 1982. To estimate the ‘reported’ portion of catch for this year, the total original figure of 25 488 t was divided by 1.25, giving a baseline catch of ~20 390 t from legal operations and ~5098 t from illegal and unreported operations for 1958. Linear interpolation was performed between this ‘legal’ catch for 1958 and the closest 1948 and 1961 anchor points to complete the time series.

Bait catches

Based on the method used in Mkumbo and Mlaponi (2007), it was assumed that bait catches were proportional to the number of longline hooks in Kenya’s portion of Lake Victoria, with number of longline hooks from 2000 to 2016 taken from Lake Victoria Fisheries Organization (2017). Thus, the number of longline hooks reported for Kenya’s portion of Lake Victoria from 2000 to 2016 (Lake Victoria Fisheries Organization 2017) was used to estimate unreported bait catches from 2000 to 2016. There were no longline hook data available for 2017, and thus it was assumed that the proportion of bait catch to total reported catch remained the same from 2016 to 2017. Longline hook data were only available for Tanzania’s portion of Lake Victoria from 1992 to 2000, thus the ratio of longline hooks in Kenya’s portion of Lake Victoria to those in Tanzania’s portion of Lake Victoria for 2000 was used to estimate the number of hooks over this period. Owing to a lack of information and to remain conservative, it was assumed that the longline Nile perch fishery began in 1981 (i.e.

unreported bait catches were 0 in 1980), as this was when reported Nile perch catches first saw a major increase (Greboval and Fryd 1993). To complete the bait-catch time series from 1981 to 2017, linear interpolation was used to estimate catch between 1981 and 1992, and any other years from 1992 to 2016 where there were no longline hook data available.

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