

Supplementary Material

Status and characteristics of sharks and rays impacted by artisanal fisheries: potential implications for management and conservation

Kennedy E. Osuka, Melita A. Samoily, Peter Musembi, Clare J. Thouless, Clay Obota Joshua Rambahiniarison. 2025. Marine and Fishery Sciences 38(1). DOI: <https://doi.org/10.47193/mafis.3812025010101>

Table S1. Summary of fishing gears used to capture elasmobranchs in Kenya, including their sample sizes. Not all gear dimensions were available.

Gear	Sample	Mesh size (inch)/ hook size	%	Net Length (m)	Net Depth (m)
Gillnets	95	2.5	26.3	200	2-20
		3.5	10.5	120 - 200	20-50
		4.0	23.2	50 -120	3-50
		4.5	36.8	120	40-50
		5.0	2.1	120	50
		7.0	1.1	NA	NA
Monofilament gillnets	39	2.5	20.5	120	50
		3.0	17.9	120	50
		3.5	61.5	120	50
Handline	12	4	75.0		NA
		8	25.0	NA	NA
Long line	19	2	5.3	NA	NA
		4	94.7	NA	NA
Speargun	44			NA	NA

Table S2. The dissimilarity in both abundance (a) and biomass (b) of shark species across four different fishing gears (gillnets, monofilament nets, handlines, and longlines) based on their contribution percentages to the overall dissimilarity.

Taxon	Average dissimilarity	Contribution %	Cumulative %	Gillnet	Monofilament net	Handline	Longline
a) Shark abundance overall average dissimilarity = 78.0%							
<i>Sphyrna lewini</i>	25.6	32.8	32.8	2.1	1.0	0.7	0.4
<i>Carcharhinus falciformis</i>	23.7	30.4	63.2	1.3	0.7	0.0	1.0
<i>Carcharhinus amblyrhynchos</i>	12.2	15.6	78.8	0.5	0.8	0.7	1.4
<i>Carcharhinus leucas</i>	9.2	11.8	90.6	0.3	0.9	0.0	0.4
<i>Carcharhinus melanopterus</i>	4.0	5.1	95.7	0.1	0.3	0.0	0.6
<i>Carcharhinus sorrah</i>	2.3	3.0	98.7	0.0	0.1	0.0	0.1
<i>Squatina africana</i>	0.7	0.9	99.6	0.0	0.1	0.0	0.0
<i>Rhincodon typus</i>	0.3	0.4	100.0	0.0	0.0	0.0	0.0
b) Shark biomass overall average dissimilarity = 81.1%							
<i>Carcharhinus falciformis</i>	28.1	34.7	34.7	3.4	1.8	0.0	5.9
<i>Sphyrna lewini</i>	21.8	26.9	61.6	5.2	1.6	6.2	0.8
<i>Carcharhinus leucas</i>	11.5	14.2	75.8	0.4	2.0	0.0	5.5
<i>Carcharhinus amblyrhynchos</i>	9.9	12.2	88.0	0.3	1.6	0.5	4.3
<i>Carcharhinus melanopterus</i>	4.4	5.4	93.4	0.2	0.7	0.0	2.1
<i>Carcharhinus sorrah</i>	4.4	5.4	98.8	0.3	0.1	0.0	5.0
<i>Squatina africana</i>	0.7	0.9	99.7	0.0	0.1	0.0	0.0
<i>Rhincodon typus</i>	0.3	0.3	100.0	0.0	0.0	0.0	0.0

Table S3. The dissimilarity in both abundance (a) and biomass (b) of ray species across five different fishing gears (gillnets, monofilament nets, handlines, longlines, and spearguns) based on their contribution percentages to the overall dissimilarity.

Taxon	Average dissimilarity	Contribution %	Cumulative %	Gillnet	Monofilament net	Handline	Longline	Speargun
a) Rays abundance overall average dissimilarity = 84.4%								
<i>Aetobatus ocellatus</i>	21.1	25.0	25.0	0.3	0.6	0.6	0.8	0.4
<i>Rhynchobatus djiddensis</i> *	14.7	17.4	42.4	0.3	0.2	0.7	0.0	0.4
<i>Taeniura lymma</i>	14.1	16.7	59.1	0.1	0.2	0.1	0.0	0.6
<i>Neotrygon kuhlii</i>	10.4	12.3	71.4	0.0	0.1	0.8	0.0	0.4
<i>Himantura uarnak</i>	9.8	11.6	83.0	0.2	0.4	0.0	0.6	0.1
<i>Mobula mobular</i>	5.2	6.2	89.2	0.1	0.0	0.1	0.2	0.0
<i>Taeniurops meyeri</i>	3.7	4.4	93.6	0.1	0.0	0.0	0.2	0.1
<i>Myliobatis aquila</i>	2.6	3.1	96.7	0.0	0.0	0.0	0.0	0.1
<i>Rhina ancylostoma</i> *	1.7	2.0	98.7	0.0	0.0	0.0	0.1	0.0
<i>Pristis</i> spp.	0.7	0.9	99.6	0.0	0.0	0.0	0.0	0.0
<i>Rhinoptera javanica</i>	0.3	0.4	100.0	0.0	0.0	0.1	0.0	0.0
b) Rays biomass overall average dissimilarity = 89.5%								
<i>Aetobatus ocellatus</i>	30.8	34.4	34.4	4.7	6.9	7.8	13.1	5.8
<i>Rhynchobatus djiddensis</i> *	11.2	12.5	46.9	2.4	7.2	0.0	9.0	0.2
<i>Taeniura lymma</i>	10.9	12.2	59.1	2.1	0.8	9.3	0.0	1.2
<i>Neotrygon kuhlii</i>	9.1	10.2	69.2	0.2	4.8	0.1	0.0	2.1
<i>Himantura uarnak</i>	8.7	9.7	78.9	12.8	0.0	1.6	7.3	1.1
<i>Mobula mobular</i>	7.1	7.9	86.8	3.5	0.0	0.0	8.6	3.2
<i>Taeniurops meyeri</i>	4.5	5.1	91.9	0.0	0.7	1.4	0.0	0.5
<i>Myliobatis aquila</i>	2.4	2.7	94.5	0.3	0.0	0.0	1.8	0.0
<i>Rhina ancylostoma</i> *	2.2	2.5	97.0	0.0	0.0	0.0	0.0	1.3
<i>Pristis</i> spp.	1.7	1.8	98.9	4.1	0.0	0.0	0.0	0.0
<i>Rhinoptera javanica</i>	1.0	1.1	100.0	0.0	0.0	1.6	0.0	0.0

Sex ratios

Sphyrna lewini

A total of 258 individuals of *S. lewini* were captured by the artisanal fishery comprising more females (58% n = 143) than males (42% n = 105) but the sex ratio did not differ significantly ($X^2 = 6.0082$, $p > 0.05$). The total length ranged between 14 cm and 165 cm with a mean of 57.1 cm (± 14.8 SD). The mean length for female individuals was 48 cm while males was 40 cm.

Carcharhinus falciformis

A total of 163 individuals of *C. falciformis* were recorded comprising 55% female individuals (n = 91) and 44% males (n=72). The total length ranged from 68 cm to 101 cm with a mean of 79.1 cm. Males were generally larger than females with a mean length of 82.4 cm compared to 72.6 cm for female individuals.

Carcharhinus amblyrhynchos

A total of 101 individuals of *C. amblyrhynchos* were caught with comprising 63%, (n = 63) females and 37% (n = 38) males. The total length ranged between 10 cm and 131 cm with a mean of 69.9 cm (± 29.6 SD). Males were generally larger with a mean total length of 57.6 cm compared to females that recorded a mean length of 55.6 cm.

Rhynchobatus djiddensis

A total of 27 individuals of *R. djiddensis* were caught by artisanal fishing gears comprising 71% (n = 20) females and 29% (n = 7) males. The size ranged from 13 cm to 153 cm with a mean of 69.9 cm (± 29.6 SD).

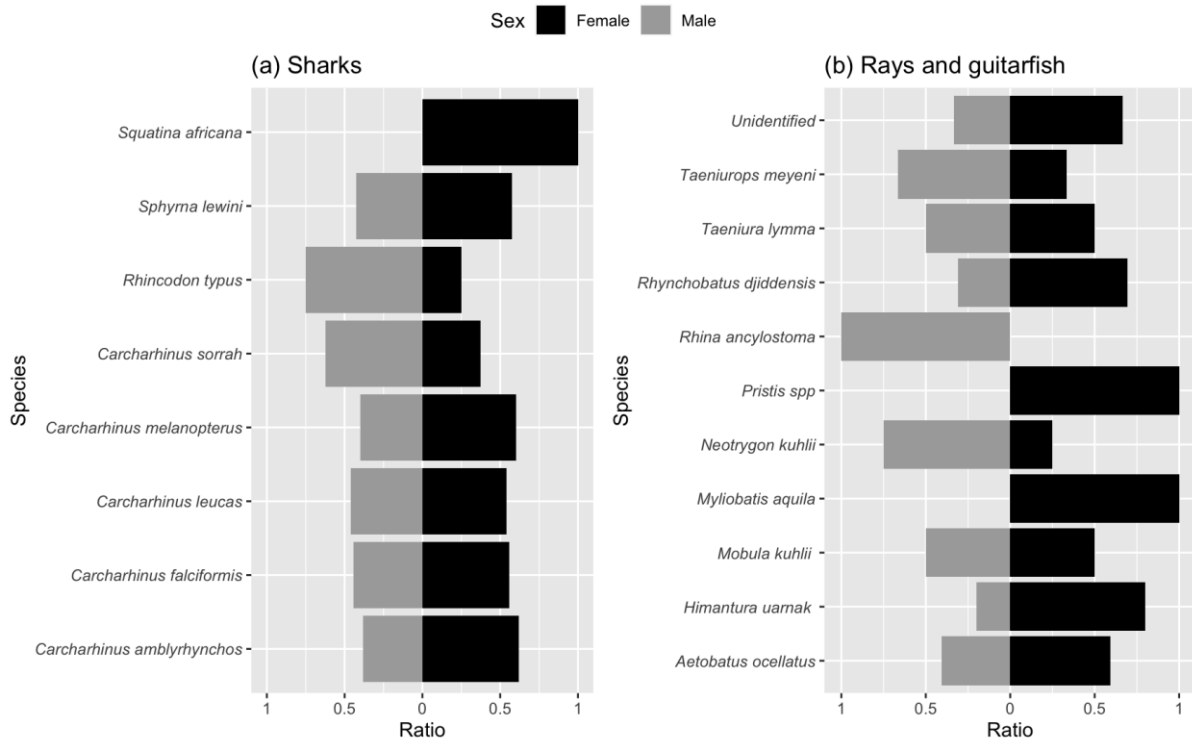


Figure S1. Sex ratios of elasmobranch species landed in Kenyan artisanal fishery.