

SPECIES COMPOSITION AND CONSERVATION STATUS OF SHARKS AND RAYS BY-CATCH IN KAKAP RIVER WEST KALIMANTAN

Komposisi Jenis dan Status Konservasi Ikan Hiu dan Pari Hasil Tangkapan Nelayan di Sungai Kakap Kalimantan Barat

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ABSTRACT

Production of shark and ray fisheries is still high from various locations in Indonesia. This condition can change the resource stock and its conservation status because it impacts decreasing the number of individuals in the population. Besides the main catch, shark production is also from bycatch, but this data still needs to be widely available. The research aimed to obtain data on the composition and current conservation status of the types of sharks and rays on the mainland of the Kakap River in West Kalimantan from bycatch. The survey method was used in this study by sampling for three months. The guidebook carried out data collection on sharks and rays for the data collection. Identifying samples was carried out directly in the field by collecting, grouping, and measuring the specimens' body parts, counting the number of individuals, weighing their weight, and determining their sex. The total number of individuals obtained was 1232, consisting of 700 sharks of four species and 532 rays of nine. The species conservation status consists of five vulnerable species; four endangered species; three near threatened species; and one species data deficient. Those species with conservation status still have the risk of extinction in the future.

Keywords: Conservation Status, Rays, Sharks, Species Composition

ABSTRAK

Produksi perikanan hiu dan pari masih tetap tinggi dari berbagai lokasi di Indonesia. Kondisi ini dapat mengubah stok sumberdaya dan status konservasinya karena berdampak pada penurunan jumlah individu dalam populasi. Produksi hiu selain dari hasil tangkapan utama juga dari tangkapan sampingan, namun data ini masih belum banyak tersedia. Tujuan penelitian untuk mendapatkan data komposisi dan status konservasi terkini jenis-jenis hiu dan pari yang di daratkan Sungai Kakap Kalimantan Barat dari hasil tangkapan sampingan. Metode survei digunakan dalam penelitian ini dengan melakukan sampling selama tiga bulan. Pendataan hiu

dan pari dilakukan mengacu pada buku panduan pendataan hiu dan pari. Proses identifikasi sampel dilakukan langsung di lapangan dengan mengumpulkan, mengelompokkan, dan mengukur bagian-bagian tubuh spesimen serta menghitung jumlah individu, menimbang bobot serta menentukan jenis kelaminnya. Total individu yang didapatkan sebanyak 1232 yang terdiri atas 700 hiu dari empat jenis dan pari sebanyak 532 individu dari sembilan jenis. Status konservasi jenis terdiri atas rentan 5 jenis; terancam punah 4 jenis; hampir terancam 3 jenis; dan kurang data 1 jenis. Jenis-jenis dengan status konservasi tersebut tetap akan memiliki resiko kepunahan di masa yang akan datang.

Kata Kunci: Hiu, Komposisi Jenis, Pari, Status Konservasi

INTRODUCTION

Trading sharks and rays has become issue international Because the production always highest compared to fish and marine biota other (FAO, 2022) which causes its population decrease (Dulvy *et al.*, 2021). Production sharks and rays results arrests in Indonesia continue increased and has become commodity important (Fahmi & Dharmadi, 2013). Indonesia is also one of the countries that has it amount type sharks and rays more of 200 types (38%) of amount types that exist in the world so will correlated with total production traded sharks and rays (Kleinertz *et al.*, 2022).

Population of these two groups of fish keep going decrease consequence arrest excessive so that causing its conservation status to change over the years final (Dulvy *et al.*, 2021). The types that have been including on the red list International Union for Conservation of Nature (IUCN) status no changed become more OK, because still often found caught in a lot place fish landings in various area. Arrest sharks and rays for interest consumption and industry because all part rays body such as meat, skin and bones can utilized for various needs (Purnomo & Apriliani, 2017) so that market demand will second this group of fish still tall. Condition the still become factor main cause its population keep going decrease (Clark-Shen *et al.*, 2023), so push Indonesian government for emit regulations about conservation and management fishery sharks and rays.

Other factors that cause its population prone to to extinction is characteristic the biology. Elasmobranchii fish including sharks and rays own fecundity low, age long maturation, growth slow, and ratio sex no balanced (Ebert *et al.*, 2021); (Last *et al.*, 2016), so population in nature keep going experience decline. That matter cause rate addition individual new in population far more slow from rate arrest. Intensity arrests also occurred become decider low growth population because lots individual caught on various level development, start from sapling until mature.

Sharks and rays good pelagic nor demersal will so balancer growth populations of other biota as food. Disappearance these two fish as an internal predator ecosystem will cause imbalance other populations in net food so that ecosystem no can works with good. Function ecological sharks and rays this in a way direct contribute in guard health environment waters. Disruption and decline habitat quality such as pollution, waste and use material explosives too become factors external reason decline population sharks and rays.

West Kalimantan has potency resource sharks and rays, both from sea as well as fresh water. Type of ray river that has found in the province This is *Fluvitrygon signifier*, *F. oxyrhynchus* and *Urogymnus polylepis*, third type rays the its population decrease with conservation status protected (Fahmi & Dharmadi, 2013); Rusandi *et al.*, 2021). Snapper River is one of the included sub-districts in the Kubu Raya Regency area which has potency resource high fisheries, good fishery land nor sea and also become one location landing and trade sharks and rays in West Kalimantan (Dharmadi *et al.*, 2020).

Sharks and rays besides as the main target arrests were also made consequence catch side. Contribution production from catch this can significant impact on fisheries catch general

(Senko *et al.*, 2022) and reaches 70% in fisheries sharks and rays (Sadili *et al.*, 2015) Fisherman with a small fleet and duration arrest short and often get sharks and rays are not the main target (Sulaiman *et al.*, 2018; Fuad *et al.*, 2016). The resulting fish catch there are also more sides many not utilized (Novianto & Nugraha, 2016). Research result (Lindfield & Jaiteh, 2017) take notes that shark results catch side they find generally including in a type on the IUCN red list. These data also has a contribution important in for mitigation types of experience decline population (Doherty *et al.*, 2022) and conservation (Yulianto *et al.*, 2018).

Amount type nor individual sharks and rays from same location often different. Research data previously from results catch side fishermen on the Kakap River reported there are 7 types sharks and 14 types rays (Candramila & Junardi, 2008). These results constitutes 52% of results catch mainly on the Kakap River (Hidayat *et al.*, 2018; Parluhutan *et al.*, 2021), so the data from results catch side still required. Research purposes for obtain data and conservation status latest types sharks and rays landed in the Kakap River from results catch side. Results data study expected can become sources of data and information For complete the results data catch main as well as can used in the management program fishery sharks and rays.

METHODS

Sampling was carried out in October-December 2021 on site fish landing in the West Kalimantan Kakap River. Study This only take sample from One place proprietary fish landing individuals in the Kakap River area which is place commercial fishing previous general has conducted by Candramila & Junardi (2008). Fishing gear used form net shrimp (bottom gillnet) and trawl, so samples obtained is results side (by-catch). Sampling is carried out four times in One month based on duration arrest weekly.

The sampling method refers to the guide data collection sharks and rays from (Nugraha *et al.*, 2020). Identification process sample carried out in the field. Collected samples grouped based on type and count amount individual, measured length and weight as well as determined type her gender. Body length rays used is total body length, temporary rays used wide body (discus). Criteria size and weight body as well as stage development/maturity sexual referring to (Stehmann, 2002). Maturity sexual is known only in males use Mitotuyo digital calipers with accuracy of 0.01 mm as well condition claspers. Male determine level maturity sexual. Criterion I (young) with claspers small, not yet contain chalk, no hard and soft. Criterion II (adolescent) with clasper characteristics have containing substance chalk However Not yet hardened, size medium, still gentle. Criterion III (adult) with characteristic *claspers* long and has been harden completely. Measurement data the used carry out the identification process until level types and aspects its population.

Identification done until level type with follow guide identification from White *et al.* (2006), Last *et al.* (2016), Ali *et al.*, (2013), and Ebert *et al.* (2021). Conservation status type refers to the IUCN red list of threatened species and CITES in 2023. Decree of the Minister of Maritime Affairs and Fisheries (Kepmen KP RI) No. 1 of 2021, Republic of Indonesia KP Ministerial Decree No. 4 of 2014, Republic of Indonesia KP Ministerial Decree No. 18 of 2013, and Regulation of the Minister of Maritime Affairs and Fisheries of the Republic of Indonesia Number 26 of 2013. Data were analyzed in a way descriptive or just analysis give information, describe or make data summary (Nick, 2007) in study this data is displayed in table.

RESULT

Sharks and rays results catch side generally use net gill base along with other demersal fish. Types of sharks found as many as 4 types and rays as many as 9 types from a total of 13 types found (Table 1). Sharks only found 3 genera of family Carcarhinidae while stingrays were found in 8 genera from 3 families namely Dasyatidae (6 types), Gymnuridae (2 types),

and Myliobatidae (1 type). Rays from Dasyatidae family more lots arrested because family with lots amount types and rays more many are demersal in nature so more lots the kind caught compared to shark. Types caught shark generally also demersal sharks. Composition type this is also determined by the type and type tool catch. Total individuals caught a total of 1232 individuals consisting over 700 individuals sharks and 532 individuals rays. Total individuals captured in the study this including tall for results catch side.

Table 1. Composition Type Sharks and Rays Results Catch Side of the Kakap River

Family	Species Name	October		November		December		Total	%
		J	B	J	B	J	B		
Shark									
Carcharhinidae	<i>Carcharhinus sealei</i>	0	0	0	0	2	0	2	0.28
Carcharhinidae	<i>Rhizoprionodon oligolinx</i>	12	10	34	25	6	11	98	14.0
Carcharhinidae	<i>R. acutus</i>	16	98	23	46	15	36	234	33.4
Carcharhinidae	<i>Scoliodon laticaudus</i>	30	52	90	133	37	24	366	52.3
	Total	58	160	147	204	60	71	700	
	Total per month		218		351		131		
	Total male				265				
	Total female				435				
Rays									
Myliobatidae	<i>Aetomylaeus nichofii</i>	2	3	0	0	2	0	7	1.3
Dasyatidae	<i>Brevitrygon walga</i>	0	4	16	8	6	34	68	12.8
Gymnuridae	<i>Gymnura zone</i> *	3	2	0	0	2	1	8	1.5
Gymnuridae	<i>G. poecilura</i>	0	0	1	0	0	0	1	0.2
Dasyatidae	<i>Himantura undulata</i> *	0	0	0	0	0	1	1	0.2
Dasyatidae	<i>Maculotabis gerrardi</i> *	0	3	0	0	0	2	5	0.9
Dasyatidae	<i>Neotrygon kuhlii</i>	5	12	0	0	3	0	20	3.8
Dasyatidae	<i>Pastinachus solocirostris</i> *	0	0	0	0	1	1	2	0.2
Dasyatidae	<i>Telatrygon zugei</i>	36	52	94	87	53	98	420	79.1
	Total	46	76	111	95	67	137	532	
	Total per month		122		206		204		
	Total male				224				
	Total female				308				
	Total shark + ray							1232	

Notes, J: male, B: female, *: Threatened species extinct

Size total body length used mark found range diverse between kind, fine shark nor rays (Table 2). Types some just found male or female just as well as only One individual so that No adequate or not discussed. Size and weight body shark female more big compared to with males found in *S. laticaudus*, *R. oligolinx*, and *R. acutus*. While in rays, females in some the kind caught own size and weight body more big like *B. walga* and *G. zonura* However type other found size and weight male more large in *A. nichofii*, *N. kuhlii*, and *T. zugei*. Research result This get shark small and medium, temporary rays found size small, medium and large.

Table 2. Size and Weight Body Sharks and Rays Landed in the Kakap River

Species Name	Total Length (cm)		Total Weight (kg)		Gender Ratio (J:B)
	Male	Female	Male	Female	
<i>Carcharhinus sealei</i>	73-74	0	3.0-3.1	0	-

Species Name	Total Length (cm)		Total Weight (kg)		Gender Ratio (J:B)
	Male	Female	Male	Female	
<i>Rhizoprionodon oligolinx</i>	30-51	25-51	0.1-0.6	0.1-0.5	1.1:1
<i>R. acutus</i>	33-38	34-52	0.2-0.3	0.2-0.6	0.3:1
<i>Scoliodon laticaudus</i>	32-43	34-50	0.1-0.3	0.2-0.5	0.7:1
<i>Aetomylaeus nichofii</i>	23-67	23-27	0.1-0.2	0.2-0.3	1.3:1
<i>Brevitrygon walga</i>	16-19	14-21	0.1-0.2	0.1-0.3	0.4:1
<i>Gymnura zonura</i>	40-51	40-70	0.5-0.6	0.5-2.6	1.6:1
<i>G. poecilura</i>	67	0	3	0	0.1:1
<i>Himantura undulata</i>	0	47	0	3	-
<i>Maculotabis Gerardi</i>	0	20-22	0	0.3-0.4	-
<i>Neotrygon kuhlii</i>	25-38	26-32	0.5-0.8	0.5-1.2	0.6:1
<i>Pastinachus solocirostris</i>	104	41	6.5	1.8	01:01
<i>Telatrygon zugei</i>	15-32	15-28	0.2-0.5	0.1-0.7	0.8:1

Ratio sex will determine continuity population. Ratio sex sharks and rays generally close to 1:1 only a number of type male the amount more A little compared to female like pilus shark (*R. acutus*), ray miser (*B. walga*). Temporary, rays bats (*G. poecilura*) and rays flag (*P. solocirostris*) quantity the individual little so that not worthy calculated ratio gender (Table 2). Ratio sex can changed depending on quantity captured individuals so that can different between location and time arrest.

Maturity sexual used for get description condition in population. Measurement and observation results to claspers in individuals male obtained caught sharks and rays it's in everyone level start from youth, teenagers, and adults every type and month (Table 3). Individual male caught adults will reduce opportunity happen addition individual new in population.

Table 3. Maturity Level Sexual Sharks and Rays Male Landed in the Kakap River

Local Name	Species Name	Maturity Sexual		
		October	November	December
Cucut lanjaman	<i>Carcharhinus sealei</i>	-	-	III
Hiu pisang	<i>Rhizoprionodon oligolinx</i>	III	I, II, III	II
Hiu pilus	<i>R. acutus</i>	III	II	II
Hiu kejen	<i>Scoliodon laticaudus</i>	III	II	II
Pari burung	<i>Aetomylaeus nichofii</i>	I	-	I
Pari kikir	<i>Brevitrygon walga</i>	-	II	II
Pari payung	<i>Gymnura zonura</i>	II	-	II
Pari kelelawar	<i>G. poecilura</i>	-	III	-
Pari macan	<i>Himantura undulata</i>	-	-	-
Pari bintang	<i>Maculotabis Gerardi</i>	-	-	-
Pari kodok	<i>Neotrygon kuhlii</i>	II	-	II
Pari bendera	<i>Pastinachus solocirostris</i>	-	-	III
Pari toka-toka	<i>Telatrygon zugei</i>	III	I, II	I, II

Information: I: young, II (juvenile), III (adult), sign (-): no only there is female / no there is sample

Lots of it individual, frequency catch, size and weight body as well as stages development is factors important that will determine conservation status. Results of the study of the conservation status of each type sharks and rays from study This presented in Table 4. Conservation status type consists on susceptible (VU) 5 species; threatened extinct (EN) 4 species; almost threatened (NT) 3 species; and lacking data (DD) 1 species.

Table 4. Conservation Status Sharks and Rays Landed in the Kakap River

Local Name	Species Name	Conservation Status		
		IUCN	CITES	Regulations National
Cucut lanjaman	<i>Carcharhinus sealei</i>	VU	-	Not protected
Hiu pisang	<i>Rhizoprionodon oligolinx</i>	NT	-	Not protected
Hiu pilus	<i>R. acutus</i>	VU	-	Not protected
Hiu kejen	<i>Scoliodon laticaudus</i>	NT	-	Not protected
Pari burung	<i>Aetomylaeus nichofii</i>	VU	-	Not protected
Pari kikir	<i>Brevitrygon walga</i>	NT	-	Not protected
Pari payung	<i>Gymnura zonura</i>	EN	-	Not protected
Pari kelelawar	<i>G. poecilura</i>	VU	-	Not protected
Pari macan	<i>Himantura undulata</i>	EN	-	Not protected
Pari bintang	<i>Maculotabis Gerardi</i>	EN	-	Not protected
Pari kodok	<i>Neotrygon kuhlii</i>	DD	-	Not protected
Pari bendera	<i>Pastinachus solocirostris</i>	EN	-	Not protected
Pari toka-toka	<i>Telatrygon zugei</i>	VU	-	Not protected

Information: DD: Data Deficient, EN: Endangered, NT: Near Threatened, VU: Vulnerable

DISCUSSION

Arrest location generally from waters around Pontianak, Kubu Raya, and North Kayong, so results study This can compared to with study previously. Amount type sharks and rays results study This more A little compared to with results research by Hidayat *et al.* (2018) who noted there are 40 types than 12 months observation from results catch fisherman special sharks and rays. Temporary, Candramila & Junardi (2008) found 21 species for 4 months observation from results catch side. Difference amount type found influenced by differences sampling duration.

Types of sharks with individual more Lots caught is the kejen shark (*S. laticaudus*), while type lots of rays caught is Toka-toka ray (*T. zugei*). Many types captured in research this is also different from study previously. Candramila & Junardi (2008) noted shark *Chiloscyllium punctatum* more Lots caught whereas lots of rays caught is *M. gerardi*. Hidayat (2018) research results were also noted different types, for shark type *Carcharhinus brevipinna* and rays from *Rhynchobatus australiae* which amount the individual more Lots caught. Difference results this general obtained because difference time research and existence dynamics populations of each type in nature. Amount captured individuals can also guess stage development of each type through approach size and weight body of each type.

Type *S. laticaudus* lots caught because own behavior grouping (schooling) in the waters beach near with estuary river big in the area tropical with food form crustaceans and small fish from (White *et al.*, 2006; Ebert *et al.*, 2021). Ray *T. zugei* once caught dominant from type rays others in West Kalimantan waters at a depth of 10-30 meters (Yusuf *et al.*, 2018). On research This amount the individual more dominant Because food main type This is shrimp and small demersal fish. According to from White *et al.* (2006) and Last *et al.* (2016), rays this more often caught from catch side. The fishing gear used is also special form net gills and and net shrimp (trammel net) so possible for get individual *T. zugei* in large amount.

Based on size and weight bodies, sharks and rays caught including individual small (<100 cm) for shark whereas size (50 cm) include size small, medium (50-100 cm) and large (>100) for rays (Oktaviyani *et al.*, 2020). This data will become material consideration for effort management resources and conservation sharks and rays because rate subtraction individual not comparable with rate addition individual in population so that will factor main reason decline population. Arrest November more lots captured individuals good shark nor rays, temporary based on amount type, December more lots compared to month other. The results

of other studies show amount type sharks and rays diverse every month (Yusuf *et al.*, 2018).

Banana shark (*R. oligolinx*) during study caught start from young until mature. This shark more often caught because the distribution relatively more wide start from beach until sea in the area tropical use net gill base from (White *et al.*, 2006). Temporary, rays toka-toka (*T. zugei*) was also caught on all level maturity Sexuality is also related with wide distribution in waters shallow with depth not enough from 40 m and live demersal from (White *et al.*, 2006). Study more carry on important done in the second type sharks and rays the related with exists similarity between the care area (nursery ground) and the search area eat (feeding ground). Caught bird rays (*A. nichofii*) only individual young. This research is also needed more carry on for ensure location arrest is the area of his care. Other types of sharks and rays caught in juveniles and adults like *S. laticaudus* apparently more related with behavior look for feeding and distribution in habitat.

Conservation status types can changed every years (Dulvy *et al.*, 2021) so up-to-date data is required from results catch. Shark type *C. sealei* changed its conservation status from almost threatened 2019 will be prone to 2023. The same thing was also found in *R. acutus* of risk status low 2019 will be prone to 2023. Banana shark *R. oligolinx* also status moment threatened extinct that changes from almost threatened 2021. Changes in conservation status also occur for species rays changed its conservation status including rays star *M. gerrardi* and *G. zonura* from prone to in 2019 (Oktaviyani *et al.*, 2020) it became threatened extinct year 2023.

Sharks and rays with conservation status threatened extinct (endangered) has risk more tall for changed its conservation status because caught on all level maturity sexual (White *et al.*, 2006). Internal factors such as fecundity low will also become factor important to change in conservation status. Another type comes in in this status is rays parasol (*G. zonura*), ray tiger (*H. undulata*), rays stars (*M. gerrardi*), and rays flag (*P. solocirostris*) is common own fecundity low (<5 tillers) once reproduction dangan reproductive period more from 2 years will becomes very risky for changed its conservation status going to extinction if no there is regulations and plans conservation. Types of sharks and rays from results study this, though not yet enter in cites appendix and not protected based on regulations from Indonesian government, however types the still own risk extinction high in the future come.

CONCLUSION

Sharks and rays in research found a total of 1232 individuals, consisting over 700 individuals shark from 4 species and 532 individuals rays of 9 species. Size, weight, ratio gender, and level maturity sexual, sharks and rays showing individual results catch sides are also possible become factor reason decline population. Conservation status type caught sharks and rays consists on susceptible 5 species; threatened 4 species extinct; almost 3 species threatened; and missing 1 species of data.

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