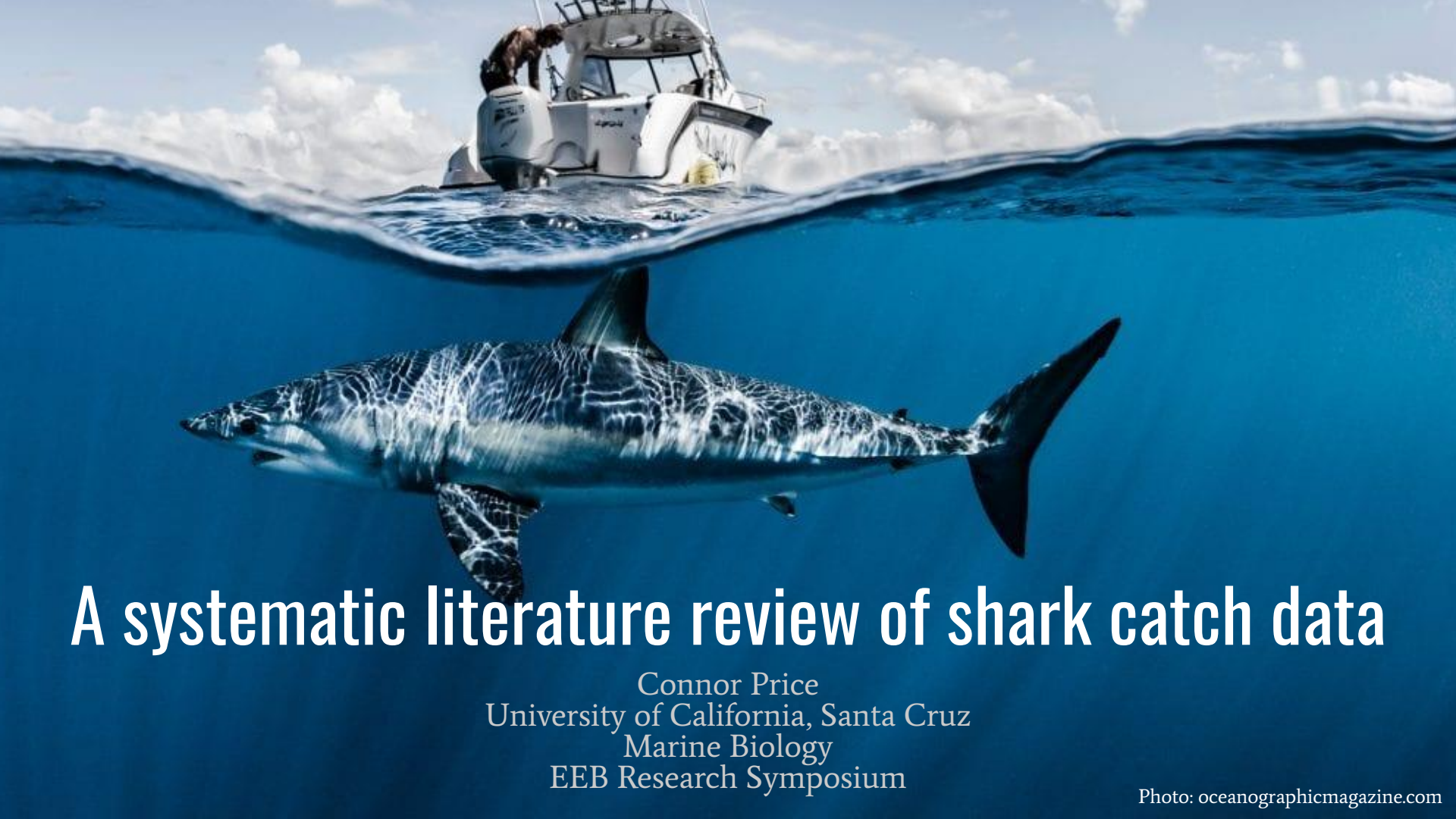

A systematic literature review of shark catch data

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Marine Biology
EEB Research Symposium

Photo: oceanographicmagazine.com

Worldwide tuna catch has steadily increased the past 70 years

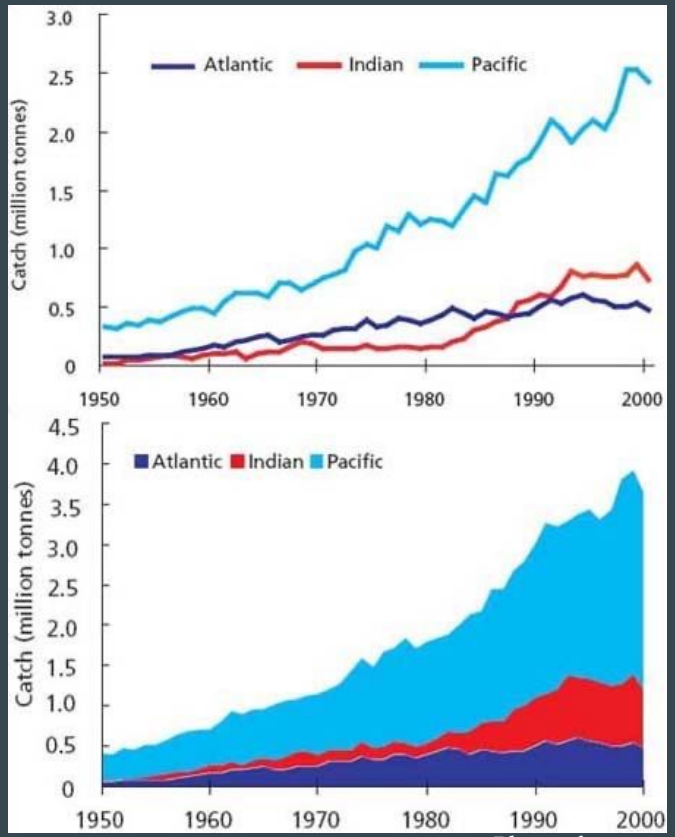
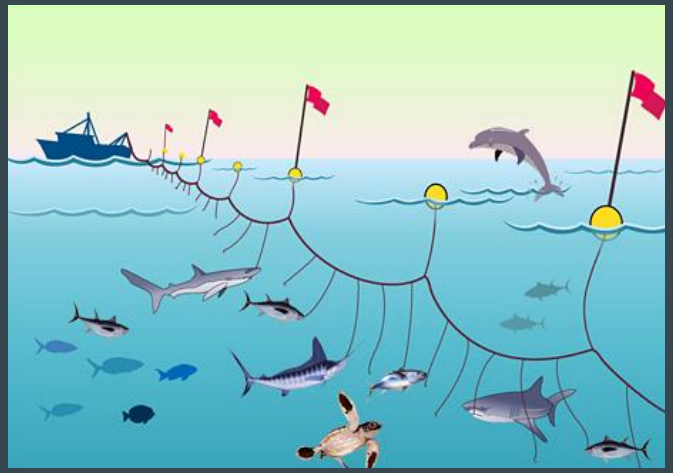


Photo: fao.org

- Fished tuna weight from all three major oceans reached 4 billion tonnes by 1999
- Common methods of capture in commercial fisheries are longline and purse seine

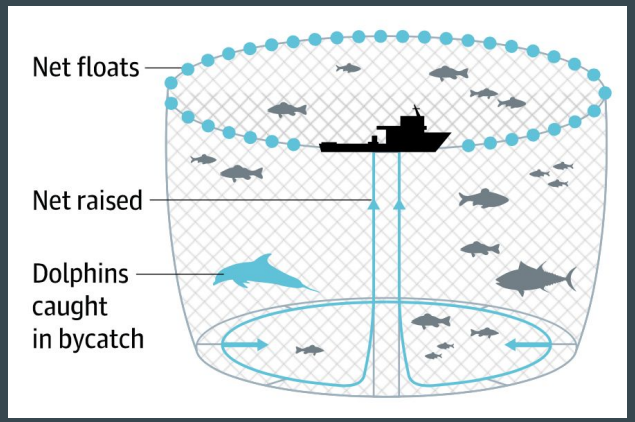
What is bycatch?

- Incidental capture of non-target species (eg. sharks, mobulids, seabirds, dolphins, and sea turtles)



Tuna and swordfish longline with turtle and shark bycatch
Photo: bluepeacemaldives.org

Photo: Eliott Norse, ocean.si.edu

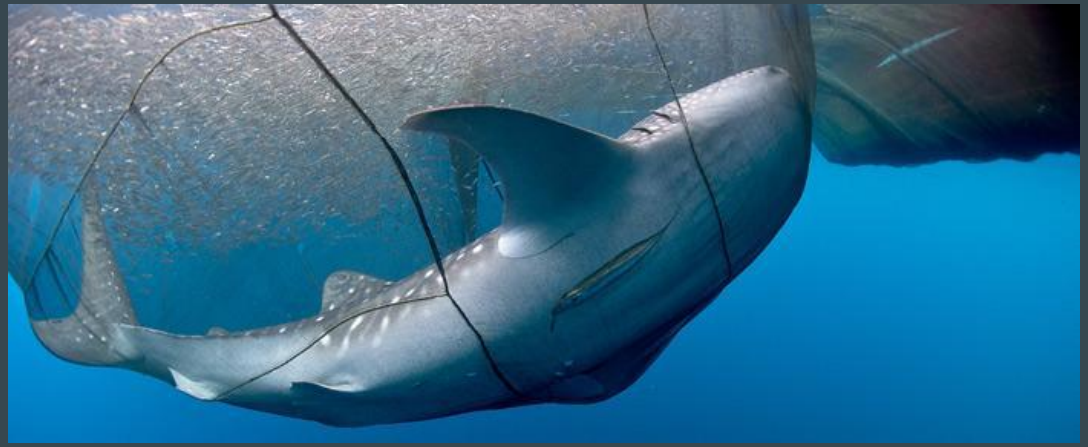


Purse seine; Photo: theguardian.com

Large, migratory species are vulnerable to overfishing

- Most at-risk bycatch species are migratory, slow-growing, and low-fecund
- Many pelagic species are difficult to study, making bycatch data one of the only ways to gather information on populations

Salmon shark bycatch; Photo: Rocky Yao, seachoice.org



Whale shark caught in a purse seine; Photo: blueplanetsociety.org

Conducting a survey and analysis of shark catch data

Hawaii longline tuna fishery temporal trends in standardized catch rates and length distributions and effects on pelagic and seamount ecosystems

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Effect of hook design on longline catches in Lakshadweep Sea, India

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ABSTRACT

Tuna longlining is considered as an ecofriendly, economical, species-selective and size-selective fishing technique suitable for harvesting sparsely distributed large predatory fishes. Many non-targeted and protected species like marine turtles, seabirds, cetaceans and sharks are also caught as bycatch in the pelagic longline gear. Investigations were undertaken to

- Conducted a systematic literature review of worldwide shark catch data by searching WebofScience using the keywords “sharks”, “tuna”, “fisheries”, and “bycatch”
- Papers dated between 1991 to 2021

Table 1
Catch composition, total catch (*N*), capture per unit of effort (CPUE), relative fishing mortality at haulback (in percentage), and mortality per unit of effort (MPUE) for selected species caught in pelagic longline fishery with circle hooks (CH) and J-style hooks (JH).

Species	*N*	CPUE		Mortality (%)		MPUE	
		CH	JH	CH	JH	CH	JH
Carcharhinus signatus	33	6.41	2.05	100	100	6.41	2.05
Prionace glauca	32	5.64	2.56	27.2	70	1.54	1.79*
Carcharhinus falciformis	14	2.31	1.28	22.2	80	0.51	1.03*
Carcharhinus longimanus	12	2.31	0.77	22.2	66.6	0.51	0.51*
Sphyrna lewini	11	0.77	2.05	33.3	87.5	0.26	1.79
Carcharhinus obscurus	10	1.79	0.77	28.5	100	0.51	0.77
Galeocerdo cuvier	8	1.54	0.51	16.6	50	0.26	0.26
Isurus oxyrinchus	6	1.28	0.26	20	100	0.26	0.26
Ginglymostoma cirratum	6	1.28	0.26	0	0	0.00	0.00
Carcharhinus leucas	2	0.26	0.26	0	100	0.00	0.26

* Significant differences ($P<0.05$) between hook types regarding fishing mortality.

Alfonso et al. (2011), “Fishing gear modifications to reduce elasmobranch mortality in pelagic and bottom longline fisheries off Northeast Brazil”

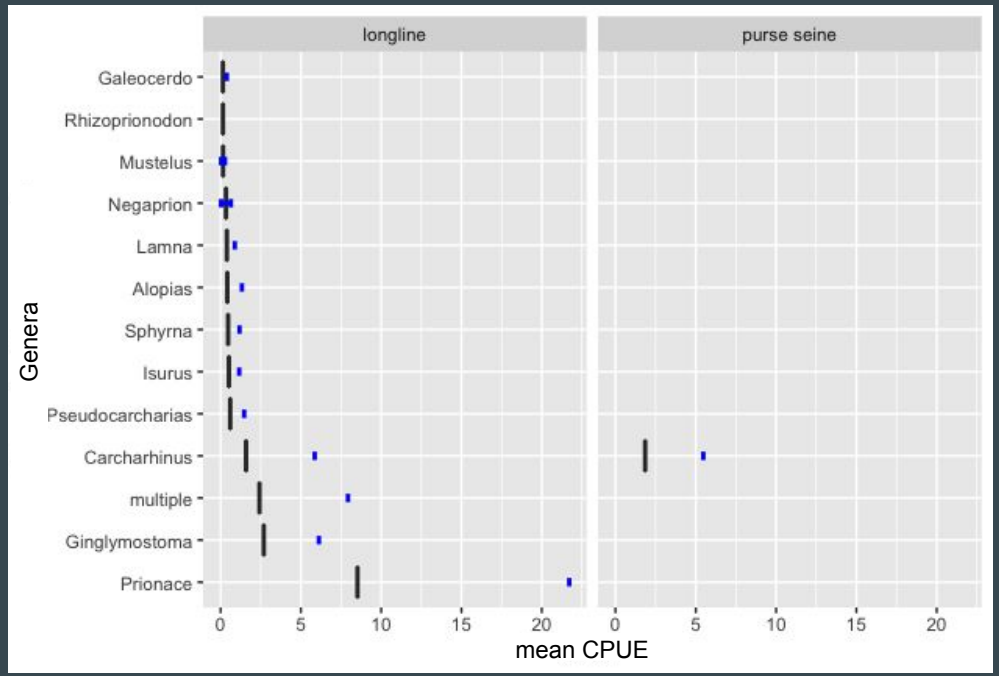
Methods: Recording CPUE and species

- For each paper, I recorded species, bycatch total, effort, % of total catch, retention rates, and catch per unit effort (CPUE) (individuals or tonnes per 1,000 hooks)
- 165 papers yielded 768 CPUE values
- Categorized species by genera

Authors	Article Title	Country/Region	Fishery	Target species	Species	Gear type	Retention	Total bycatch	Fishing effort	Effort unit	BPUE	BPUE type
Cerutti-Pereyr	Artisanal longline fishing	Galapagos Islands	artisinal longline fishery	tuna, swordfish	blacktip reef	longline		88	42007	hooks	2.0949	calculated
Huang, HW; S	Influence of hook type or	tropical Atlantic Ocean	Taiwanese commercial tuna	tuna	blue	longline		611	407677	hooks	3.0000	reported
Huang, HW; S	Influence of hook type or	tropical Atlantic Ocean	Taiwanese commercial tuna	tuna	blue	longline		564	407677	hooks	2.7600	reported
Afonso, AS; S	Shark bycatch and morta	southwestern equatorial At	commercial fishing vessel	tuna, swordfish	blue	longline		77	17000	hooks	4.5300	calculated
Afonso, AS; S	Shark bycatch and morta	southwestern equatorial At	commercial fishing vessel	tuna, swordfish	silky	longline		24	17000	hooks	1.4100	calculated
Afonso, AS; S	Shark bycatch and morta	southwestern equatorial At	commercial fishing vessel	tuna, swordfish	oceanic whitetip	longline		11	17000	hooks	0.6500	calculated
Afonso, AS; S	Shark bycatch and morta	southwestern equatorial At	commercial fishing vessel	tuna, swordfish	crocodile	longline		11	17000	hooks	0.6500	calculated
Afonso, AS; S	Shark bycatch and morta	southwestern equatorial At	commercial fishing vessel	tuna, swordfish	Alopias	longline		9	17000	hooks	0.5300	calculated
Afonso, AS; S	Shark bycatch and morta	southwestern equatorial At	commercial fishing vessel	tuna, swordfish	shortfin mako	longline		4	17000	hooks	0.2300	calculated
Afonso, AS; S	Shark bycatch and morta	southwestern equatorial At	commercial fishing vessel	tuna, swordfish	Sphyrna	longline		3	17000	hooks	0.1800	calculated
Afonso, AS; S	Shark bycatch and morta	southwestern equatorial At	commercial fishing vessel	tuna, swordfish	tiger	longline		3	17000	hooks	0.1800	calculated
Domingo, A; F	Circle Hook Performance	Uruguay	pelagic longline fleet	tuna, billfish, shark	blue	longline		933	19911	hooks	46.8580	calculated
Domingo, A; F	Circle Hook Performance	Uruguay	pelagic longline fleet	tuna, billfish, shark	shortfin mako	longline		39	19911	hooks	1.9590	calculated
Domingo, A; F	Circle Hook Performance	Uruguay	pelagic longline fleet	tuna, billfish, shark	porbeagle	longline		8	19911	hooks	0.4020	calculated
Domingo, A; F	Circle Hook Performance	Uruguay	pelagic longline fleet	tuna, billfish, shark	night	longline		27	19911	hooks	1.3560	calculated
Domingo, A; F	Circle Hook Performance	Uruguay	pelagic longline fleet	tuna, billfish, shark	multiple	longline		9	19911	hooks	0.4520	calculated

High variability in mean CPUE between genera

- Overall mean CPUE was found to be 1.596 (SD 5.249)
- Greatest mean CPUE went towards blue sharks (8.523) in longline fisheries
- Shark retention was recorded in some fisheries
- Purse seine data was not as sufficient as longline data



Thank you for your interest!

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