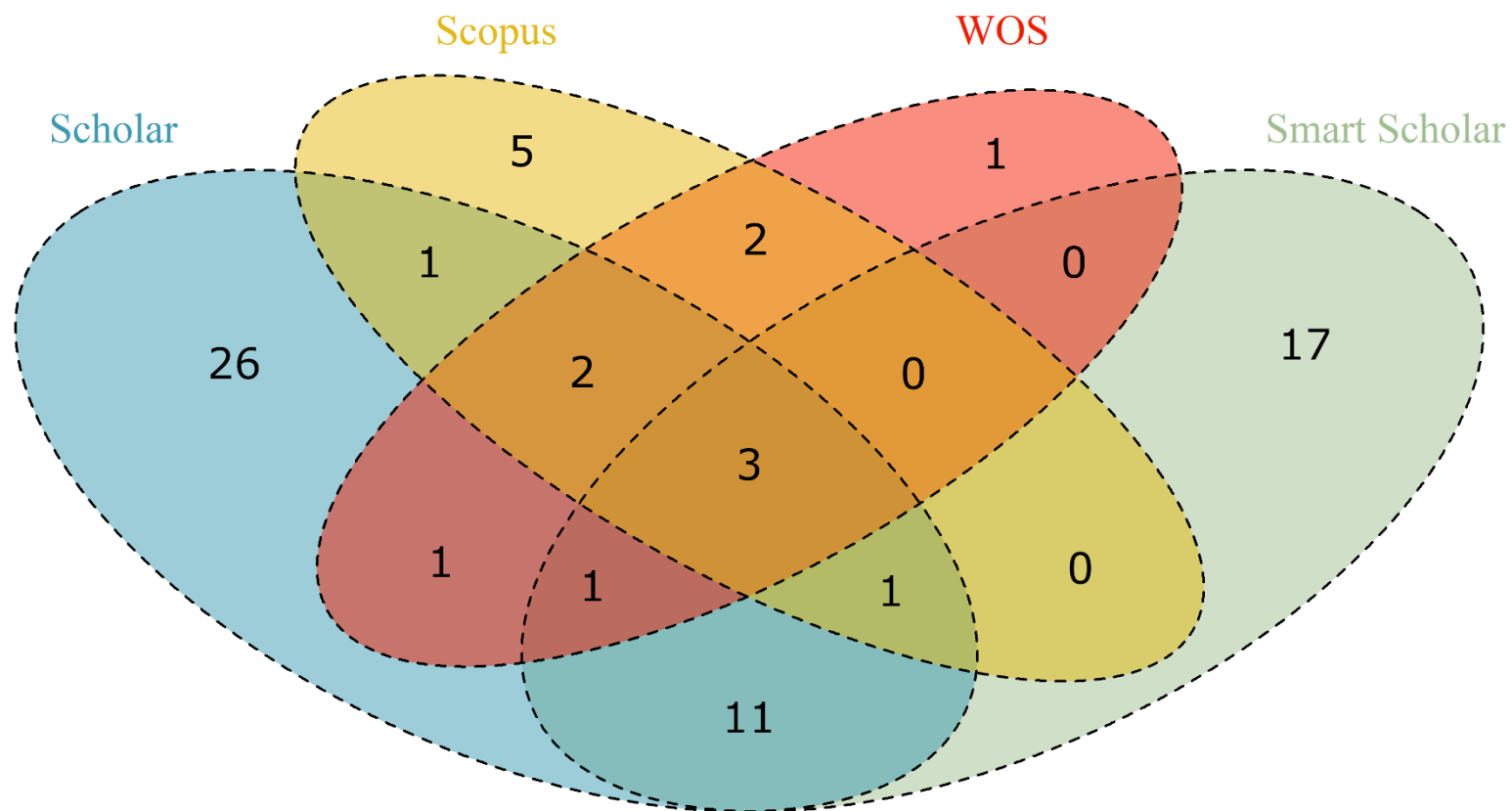
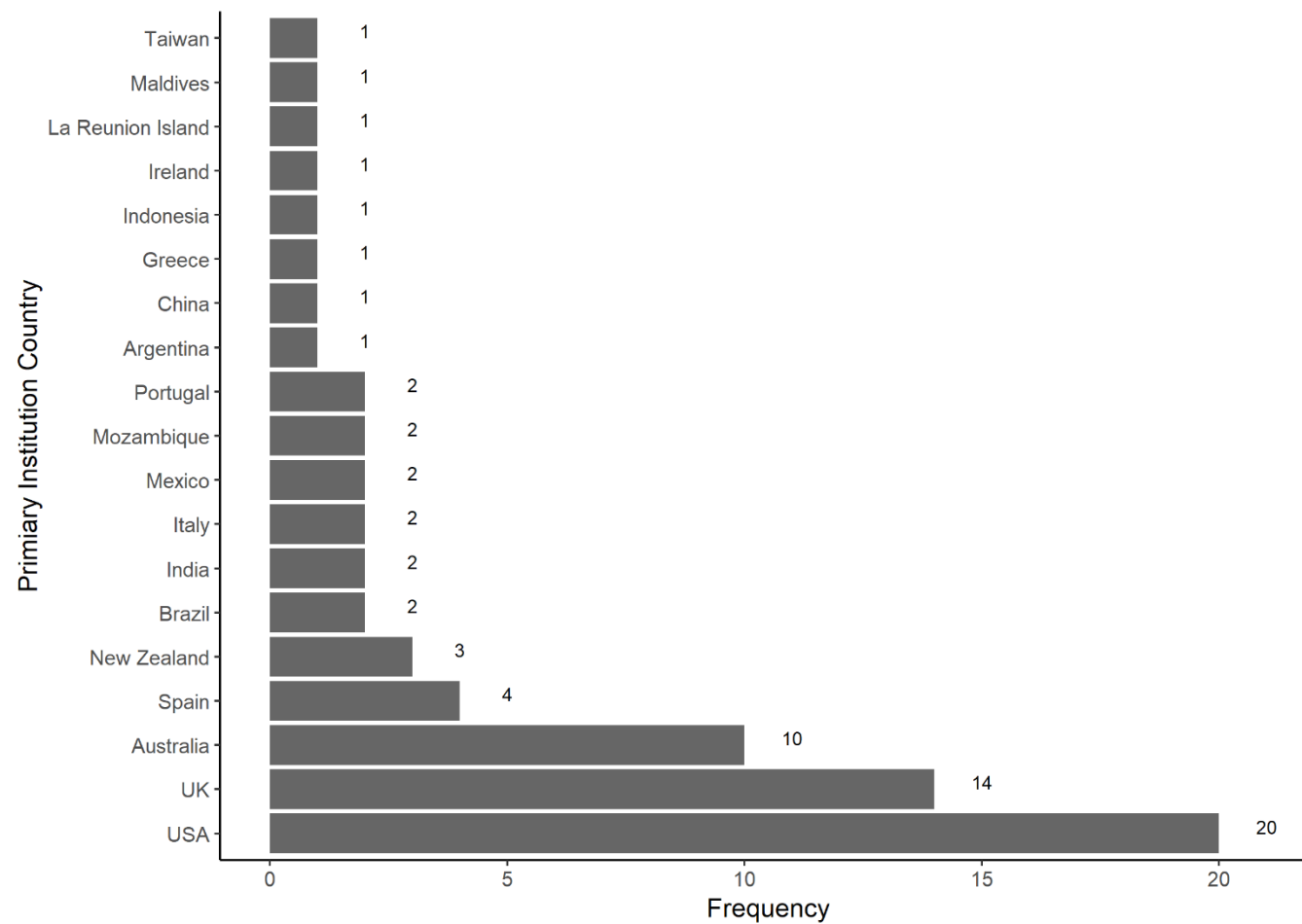


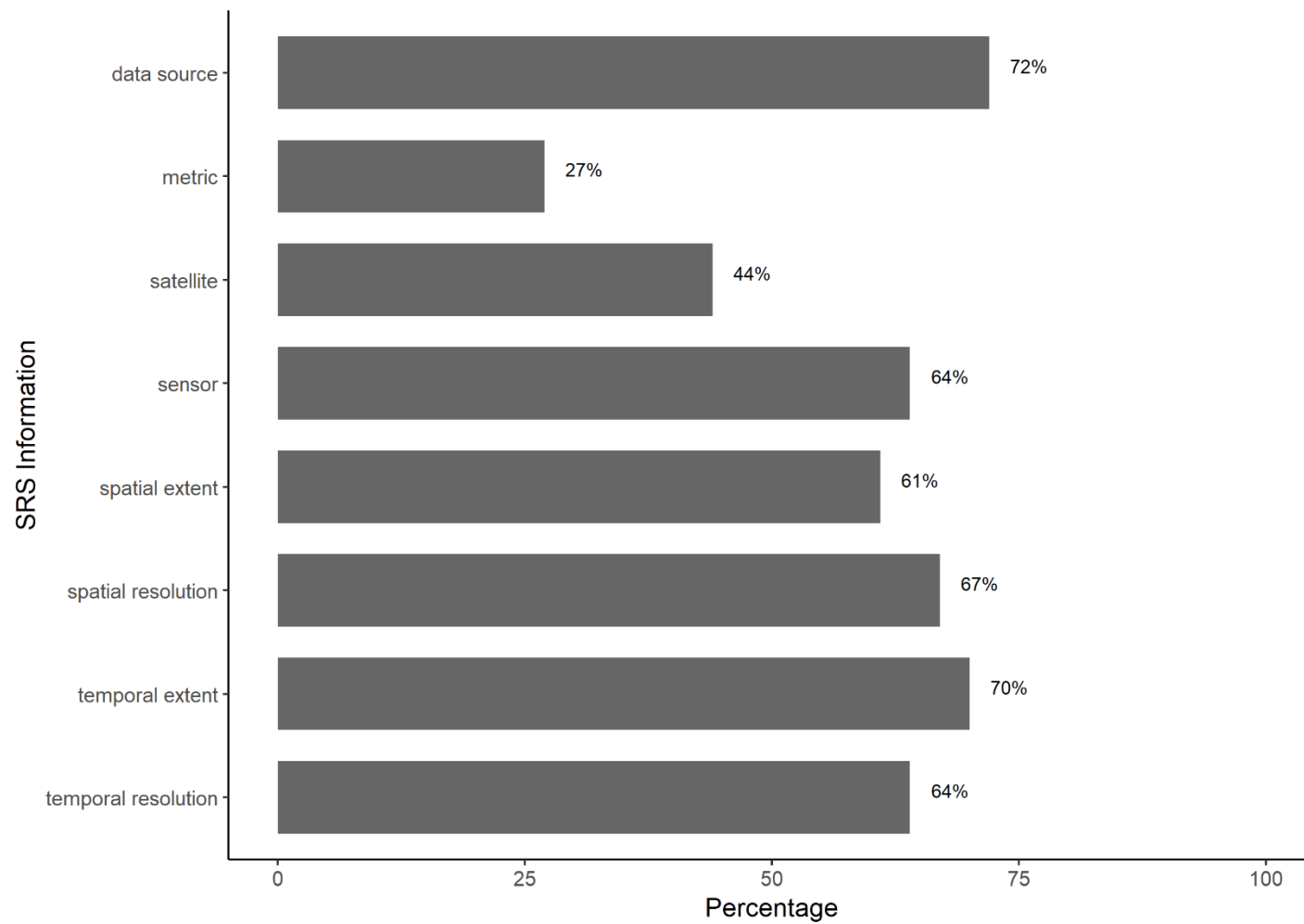
SUPPLEMENTARY FIGURE S1 | Flow diagram of the methodology for article selection in the systematic review process, adapted from Moher et al. (2015). Numbers obtained by each search are provided. *Due to the large number of results the first 205 (top 1%) papers were taken for Scholar searches.



SUPPLEMENTARY FIGURE S2 | Venn diagram depicting the four search engines used for the literature review, the numbers of articles found, and the overlap between search engines.



SUPPLEMENTARY FIGURE S3 / Frequency of articles by country based on primary institution



SUPPLEMENTARY FIGURE S4 | Proportion of studies that report SRS source information

SUPPLEMENTARY TABLE S1 | Specific search terms used for each search engine.

Search Engine	Search Terms
Google Scholar	shark (or elasmobranch AND ray) AND remote sensing AND (movement OR habitat OR ecology OR environment*)
Google Scholar: Smart Scholar	insubject:shark (or elasmobranch AND ray) AND remote sensing intitle:shark (or elasmobranch AND ray) OR remote sensing
Scopus	shark (or elasmobranch AND ray) AND remote sensing AND (movement OR habitat OR ecology OR environment*)
Web of Science	shark (or elasmobranch AND ray) remote sensing movement OR shark (or elasmobranch AND ray) remote sensing habitat OR shark (or elasmobranch AND ray) remote sensing ecology OR shark (or elasmobranch AND ray) remote sensing environment*

SUPPLEMENTARY TABLE S2 | Metadata used to characterize remote sensing for elasmobranch ecology, conservation and management studies in the database.

Category	Definition
Article type	Type of article (e.g., journal, book chapter)
Environmental variables	Environmental variables obtained by SRS used in the article
Elasmobranch data	How elasmobranch data was collected (e.g., tagging technologies, survey data)
Primary institution country	Institution country affiliated with the primary author
Repeat	Was an article unique to a specific search engine or found in multiple search engines
Satellite	Satellite platform used to collect the environmental variable(s) used in the article
Search engine	Search engine used to obtain the article
Sensor	Satellite sensor used to obtain environmental variable(s) used in the article
Spatial coverage	Area on the globe covered by the satellite sensor
Spatial resolution	Pixel size of the satellite sensor
SRS information	Presence of information provided in the article on the data source, metric, sensor, satellite, temporal extent and resolution, and spatial extent and resolution of the SRS dataset used
Study application	Theme of research applications of the article
Study location	GPS of study site(s) in the article
Taxonomic Order	Order of the elasmobranch species in the study
Temporal coverage	Date range of data available from the satellite sensor
Temporal resolution	Time elapsed between observations of the same point on the Earth's surface for the satellite sensor
Year published	Year of publication

SUPPLEMENTARY TABLE S3 | List of common acronyms of satellites and sensors

Acronym	Full Name	Acronym	Full Name
AATSR	Advanced Along-Track Scanning Radiometer	NSCAT	NASA Scatterometer
ABI	Advanced Baseline Imager	OCI	Ocean Color Instrument
ADEOS	Advanced Earth Observing Satellite	OCM	Ocean Color Monitor
AHI	Advanced Himawari Imager	OCTS	Ocean Color and Temperature Scanner
AMSR	Advanced Microwave Scanning Radiometer	OLCI	Ocean Land Colour Instrument
ASCAT	Advanced Scatterometer	POES	Polar Orbiting Operational Environmental Satellite
ATSR	Along Track Scanning Radiometer	QuikSCAT	Quick Scatterometer
AVHRR	Advanced Very High Resolution Radiometer	RocSat	Republic of China Satellite
CZCS	Coastal Zone Color Scanner	SAC-D	Scientific Application Satellite-D
DMSP	Defense Meteorological Satellite Program	SAR	Synthetic Aperture Radar
ENVISAT	Environmental Satellite	SeaWiFS	Sea Viewing Wide Field Of View Sensor
ERS	European Remote Sensing	SEVIRI	Spinning Enhanced Visible and InfraRed Imager
GCOM-C	Global Change Observation Mission - Climate	SGLI	Second-Generation Global Imager
GCOM-W1	Global Change Observation Mission - Water	SLSTR	Sea and Land Surface Temperature Radiometer
GOES	Geostationary Operational Environmental Satellite	SMOS	Soil Moisture Ocean Salinity
IASI	Infrared Atmospheric Sounding Interferometer	SNPP	Suomi National Polar Orbiting Partnership
IRS-P4	Indian Remote Sensing Satellite-P4	SSM/I	Special Sensor Microwave Imager
MERIS	Medium Resolution Imaging Spectrometer	TMI	TRMM Microwave Imager
METOP	Meteorological Operational Satellite	TRMM	Tropical Rainfall Measuring Mission
MIRAS	Multi Color Infra Red Alerting Sensor	VIIRS	Visible Infrared Imaging Radiometer Suite
MODIS	Moderate Resolution Imaging Spectroradiometer	WINDSAT	Wind Microwave Radiometer

SUPPLEMENTARY TABLE S4 | Glossary

Glossary	
Data repository	Platform used to obtain environmental data from a data source.
Data source	Institution providing the environmental data
Temporal coverage	Date range of data available from the satellite sensor
Temporal resolution	Time elapsed between observations of the same point on the Earth’s surface for the satellite sensor
Spatial coverage	Area on the globe covered by the satellite sensor
Spatial resolution	Pixel size of the satellite sensor

SUPPLEMENTARY TABLE S5 | Details of the final articles selected for the systematic review.

Title	Reference	Source	Source Type	Search Engine
Spatial patterns of distribution and relative abundance of coastal shark species in the Galapagos Marine Reserve	Acuña-Marrero et al. (2018)	Marine Ecology Progress Series	Journal article	Smart scholar
Dynamics of whale shark occurrence at their fringe oceanic habitat	Afonso, et al. (2014)	PLOS One	Journal article	Scholar
From monsoons to mantas: seasonal distribution of <i>Manta alfredi</i> in the Maldives	Anderson et al. (2011)	Fisheries Oceanography	Journal article	Scholar
Environmental effects on swordfish and blue shark catch rates in the US North Pacific longline fishery	Bigelow et al. (1999)	Fisheries Oceanography	Journal article	Scopus; WOS; Scholar; Smart Scholar
Distribution, ecology, and status of the white shark, <i>Carcharodon carcharias</i> , in the Mediterranean Sea	Boldrocchiet al. (2017)	Reviews in Fish Biology and Fisheries	Journal article	Smart scholar
Movement patterns, habitat preferences, and fisheries biology of the common thresher shark (<i>Alopias vulpinus</i>) in the Southern California Bight	Cartamil (2009)	PhD Thesis	UC San Diego	Scholar
Spatial predictions of blue shark (<i>Prionace glauca</i>) catch rate and catch probability of juveniles in the Southwest Atlantic	Carvalho et al. (2011)	ICES Journal of Marine Science	Journal article	Scholar; Smart Scholar
First record of bigeye thresher shark (<i>Alopias superciliosus</i> Lowe, 1841) and new record of thresher shark [<i>Alopias vulpinus</i> (Bonnaterre, 1788)](Chondrichthyes, Alopiidae) from Argentina	Cuevas & García (2016)	Journal of Applied Ichthyology	Journal article	Smart scholar
Eyes in the sky: linking satellite oceanography and biotelemetry to explore habitat selection by basking sharks	Curtis et al. (2014)	Animal Biotelemetry	Journal article	Scopus

Environmental effects on blue shark (<i>Prionace glauca</i>) and oilfish (<i>Ruvettus pretiosus</i>) distribution based on fishery-dependent data from the eastern Mediterranean Sea	Damalas & Megalofonou (2010)	Journal of the Marine Biological Association of the United Kingdom	Journal article	Smart scholar
The Northeastern Pacific White Shark Shared Offshore Foraging area (SOFA)	Domeier et al. (2012)	Global Perspectives on the Biology and Life History of the White Shark	Book chapter	Scholar; Smart Scholar
Regional population connectivity, oceanic habitat, and return migration revealed by satellite tagging of white sharks, <i>Carcharodon carcharias</i> , at New Zealand aggregation sites	Duffy et al. (2012)	Global Perspectives on the Biology and Life History of the White Shark	Book chapter	Scholar
Quantifying shark distribution patterns and species-habitat associations: implications of marine park zoning	Espinoza et al. (2014)	PLOS One	Journal article	Scholar; Smart Scholar
Movement, depth distribution and survival of spinetail devilrays (<i>Mobula japanica</i>) tagged and released from purse-seine catches in New Zealand	Francis & Jones (2017)	Aquatic Conservation: Marine and Freshwater Ecosystems	Journal article	Scholar
Spatial patterning of <i>Manta birostris</i> in United States east coast offshore habitat	Freedman & Roy (2012)	Applied Geography	Journal article	Scholar
Transatlantic migration and deep mid-ocean diving by basking shark	Gore et al. (2008)	Biology Letters	Journal article	Scholar; Smart Scholar
Habitat suitability and environmental factors affecting whale shark (<i>Rhincodon typus</i>) aggregations in the Mexican Caribbean	Hacohen-Domené et al. (2015)	Environmental Biology of Fishes	Journal article	Scholar
Spatial and behavioral ecology of the sand tiger shark <i>Carcharias taurus</i> in the north-western Atlantic	Haulsee (2017)	PhD Thesis	University of Delaware	Smart scholar
Tiger shark (<i>Galeocerdo cuvier</i>) movement patterns and habitat use determined by satellite tagging in eastern Australian waters	Holmes et al. (2014)	Marine Biology	Journal article	Scholar
Satellite tracking of juvenile whale sharks, <i>Rhincodon typus</i> , in the Northwestern Pacific	Hsu et al. (2007)	Fisheries Research	Journal article	Scholar

Environmental context explains Lévy and Brownian movement patterns of marine predators	Humphries et al. (2010)	Nature	Journal article	Scholar
A comparison between functional networks and artificial neural networks for the prediction of fishing catches	Iglesias et al. (2004)	Neural Computing and Applications	Journal article	Scopus
When giants turn up: sighting trends, environmental influences and habitat use of the manta ray <i>Manta alfredi</i> at a coral reef	Jaine et al. (2012)	PLOS One	Journal article	Scholar
Development and evaluation of species distribution models for five endangered elasmobranchs in southwestern Atlantic	Klippel et al. (2016)	Hydrobiologia	Journal article	WOS
Whale shark habitat assessments in the northeastern Arabian Sea using satellite remote sensing	Kumari & Raman (2010)	International Journal of Remote Sensing	Journal article	Scopus; WOS; Scholar; Smart Scholar
Bycatch of myliobatid rays in the central Mediterranean Sea: the influence of spatiotemporal, environmental, and operational factors as determined by generalized additive modeling	La Mesa et al. (2016)	Marine and Coastal Fisheries	Journal article	Scholar
Identification of large pelagic marine fish habitats and habitat utilization using 'pop-up' satellite archival tag and oceanic satellite remote sensing technologies and 'SODA' simple ocean data simulation model analyses	Laurs et al. (2016)	2006 IEEE US/EU Baltic International Symposium, BALTIC 2006	Conference proceedings	Scopus
Repeated, long-distance migrations by a philopatric predator targeting highly contrasting ecosystems	Lea et al. (2015)	Scientific Reports	Journal article	Scopus
Whale shark (<i>Rhincodon typus</i>) seasonal occurrence, abundance and demographic structure in the mid-equatorial Atlantic Ocean	Macena et al. (2016)	PLOS One	Journal article	Smart scholar

Feeding habitat of the whale shark <i>Rhincodon typus</i> in the northern Gulf of Mexico determined using species distribution modelling	McKinney et al. (2012)	Marine Ecology Progress Series	Journal article	Scholar; Smart Scholar
Modeling environmental, spatial, temporal, and operational effects on blue shark by-catches in the Mediterranean long-line fishery	Megalofonou et al. (2009)	Journal of Applied Ichthyology	Journal article	Smart scholar
Frequent locations of oceanic fronts as an indicator of pelagic diversity: application to marine protected areas and renewables	Miller & Christodoulou (2014)	Marine Policy	Journal article	Scopus; WOS
Basking sharks and oceanographic fronts: quantifying associations in the north-east Atlantic	Miller et al. (2015)	Functional Ecology	Journal article	Scopus; WOS; Scholar
Quantifying the impact of environmental variables upon catch per unit effort of the blue shark <i>Prionace glauca</i> in the western English Channel	Mitchell et al. (2012)	Journal of Fish Biology	Journal article	Scholar; Smart Scholar
Sexual segregation of pelagic sharks and the potential threat from fisheries	Mucientes et al. (2009)	Biology Letters	Journal article	Scholar
Re-creating missing population baselines for Pacific reef sharks	Nadon et al. (2012)	Conservation Biology	Journal article	Scholar
White shark offshore habitat: a behavioral and environmental characterization of the eastern Pacific shared offshore foraging area	Nasby-Lucas et al. (2009)	PLOS One	Journal article	Scholar; Smart Scholar
Standardized CPUE of blue shark in Indonesian tuna longline fishery estimated from scientific observer data, for the period 2005–2016.	Novianto et al. (2017)	IOTC report	Report	Smart scholar
Optimisation of fishing predictions by means of artificial neural networks, ANFIS, functional networks and remote sensing images	Nuno et al. (2005)	Expert Systems with Applications	Journal article	Scopus; Scholar
Predicting occurrence of juvenile shark habitat to improve conservation planning	Oh et al. (2017)	Conservation Biology	Journal article	Smart scholar

First results from satellite-linked archival tagging of porbeagle shark, <i>Lamna nasus</i> : area fidelity, wider-scale movements and plasticity in diel depth changes	Pade et al. (2009)	Journal of Experimental Marine Biology and Ecology	Journal article	Smart scholar
Modelling sensitive elasmobranch habitats	Pennino et al. (2013)	Journal of Sea Research	Journal article	Scholar; Smart Scholar
A basking shark (<i>Cetorhinus maximus</i>) tracked by satellite together with simultaneous remote sensing	Priede (1984)	Fisheries Research	Journal article	Scholar; Smart Scholar
A basking shark (<i>Cetorhinus maximus</i>) tracked by satellite together with simultaneous remote sensing II: new analysis reveals orientation to a thermal front	Priede & Miller (2016)	Fisheries Research	Journal article	Scopus; Scholar; Smart Scholar
Short-term movements and diving behaviour of satellite-tracked blue sharks <i>Prionace glauca</i> in the north-eastern Atlantic Ocean	Queiroz et al. (2010)	Marine Ecology Progress Series	Journal article	Scholar
Spatial dynamics and expanded vertical niche of blue sharks in oceanographic fronts reveal habitat targets for conservation	Queiroz et al. (2012)	PLOS One	Journal article	Scholar
Oceanic adults, coastal juveniles: tracking the habitat use of whale sharks off the Pacific coast of Mexico	Ramírez-Macías et al. (2017)	Peer J	Journal article	Scholar
Movement, distribution and marine reserve use by an endangered migratory giant	Reynolds et al. (2017)	Diversity and Distributions	Journal article	Scopus; WOS
Trends in sightings and environmental influences on a coastal aggregation of manta rays and whale sharks	Rohner et al. (2013)	Marine Ecology Progress Series	Journal article	WOS; Scholar; Smart Scholar
Satellite tagging highlights the importance of productive Mozambican coastal waters to the ecology and conservation of whale sharks	Rohner et al. (2018)	Peer J	Journal article	Scholar

Winter migration and diving behaviour of porbeagle shark, <i>Lamna nasus</i> , in the Northeast Atlantic	Saunders et al. (2010)	ICES Journal of Marine Science	Journal article	Smart scholar
Characterisation of blue shark (<i>Prionace glauca</i>) hotspots in the South-West Indian Ocean	Selles et al. (2014)	10th IOTC Working Party on Ecosystem and Bycatch, Yokohama, Japan	Conference proceedings	Smart scholar
Predicting current and future global distributions of whale sharks	Sequeira et al. (2014)	Global Change Biology	Journal article	Scopus
Ocean-scale prediction of whale shark distribution	Sequeira et al. (2012)	Diversity and Distributions	Journal article	Scholar; Smart Scholar
Seasonal movements and behaviour of basking sharks from archival tagging: no evidence of winter hibernation	Sims et al. (2003)	Marine Ecology Progress Series	Journal article	Scholar
Habitat-specific normal and reverse diel vertical migration in the plankton-feeding basking shark	Sims et al. (2005)	Journal of Animal Ecology	Journal article	Scholar
Selective foraging behaviour of basking sharks on zooplankton in a small-scale front	Sims et al. (1998)	Nature	Journal article	Scholar; Smart Scholar
Encounter success of free-ranging marine predator movements across a dynamic prey landscape	Sims et al. (2006)	Proceedings of the Royal Society of London B: Biological Sciences	Journal article	Scholar
Oceanographic and atmospheric phenomena influence the abundance of whale sharks at Ningaloo Reef, Western Australia	Sleeman et al. (2010)	Journal of Experimental Marine Biology and Ecology	Journal article	Scopus; WOS; Scholar; Smart Scholar
Biophysical correlates of relative abundances of marine megafauna at Ningaloo Reef, Western Australia	Sleeman et al. (2007)	Marine and Freshwater Research	Journal article	Scholar
To go or not to go with the flow: environmental influences on whale shark movement patterns	Sleeman et al. (2010)	Journal of Experimental Marine Biology and Ecology	Journal article	Smart scholar
Fishery forecast using OCM chlorophyll concentration and AVHRR SST: validation results off Gujarat coast, India	Solanki et al. (2003)	International Journal of Remote Sensing	Journal article	Scholar

Seasonal space-use estimates of basking sharks in relation to protection and political-economic zones in the North-east Atlantic	Southall et al. (2006)	Biological Conservation	Journal article	Scholar
Essential pelagic habitat of juvenile blue shark (<i>Prionace glauca</i>) inferred from telemetry data	Vandeperre et al. (2016)	Limnology and Oceanography	Journal article	Smart scholar
Long-term satellite tracking reveals region-specific movements of a large pelagic predator, the shortfin mako shark, in the western North Atlantic Ocean	Vaudo et al. (2017)	Journal of Applied Ecology	Journal article	Smart scholar
A short note on the horizontal and vertical movements of a whale shark, <i>Rhincodon typus</i> , tracked by satellite telemetry in the South China Sea	Wang et al. (2012)	Integrative Zoology	Journal article	Smart scholar
Unique sequence of events triggers manta ray feeding frenzy in the southern Great Barrier Reef, Australia	Weeks et al. (2017)	Remote Sensing	Journal article	Scholar
Migration of an upper trophic level predator, the salmon shark <i>Lamna ditropis</i> , between distant ecoregions	Weng et al. (2008)	Marine Ecology Progress Series	Journal article	Scopus; WOS; Scholar; Smart Scholar
Whither the whale shark wanders: Tools and methods for modelling whale shark movement	Wickham (2011)	PhD Thesis	PhD thesis	Smart scholar
Basking sharks (<i>Cetorhinus maximus</i>) schooling in the southern Gulf of Maine	Wilson (2004)	Fisheries Oceanography	Journal article	Scholar
Accuracy and precision of archival tag data: a multiple-tagging study conducted on a whale shark (<i>Rhincodon typus</i>) in the Indian Ocean	Wilson et al. (2007)	Fisheries Oceanography	Journal article	WOS; Scholar