Factors shaping decisions about sea turtle nest management in the Indian Ocean & Southeast Asia Region

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FLAME UNIVERSITY

UN environment

CMS

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Requested by IOSEA MoU Signatory States

IOSEA MoU WP 2020-24 Objective 1.2 Action 15 to "*Develop guidelines on the management of beaches for successful hatchling production, including management of hatcheries if and when required*".

Aim

To understand which factor(s) motivate nest management decisions.

Objective

Conduct a systematic review of factors affecting nest management decisions across the IOSEA region.

Nest Management Strategies

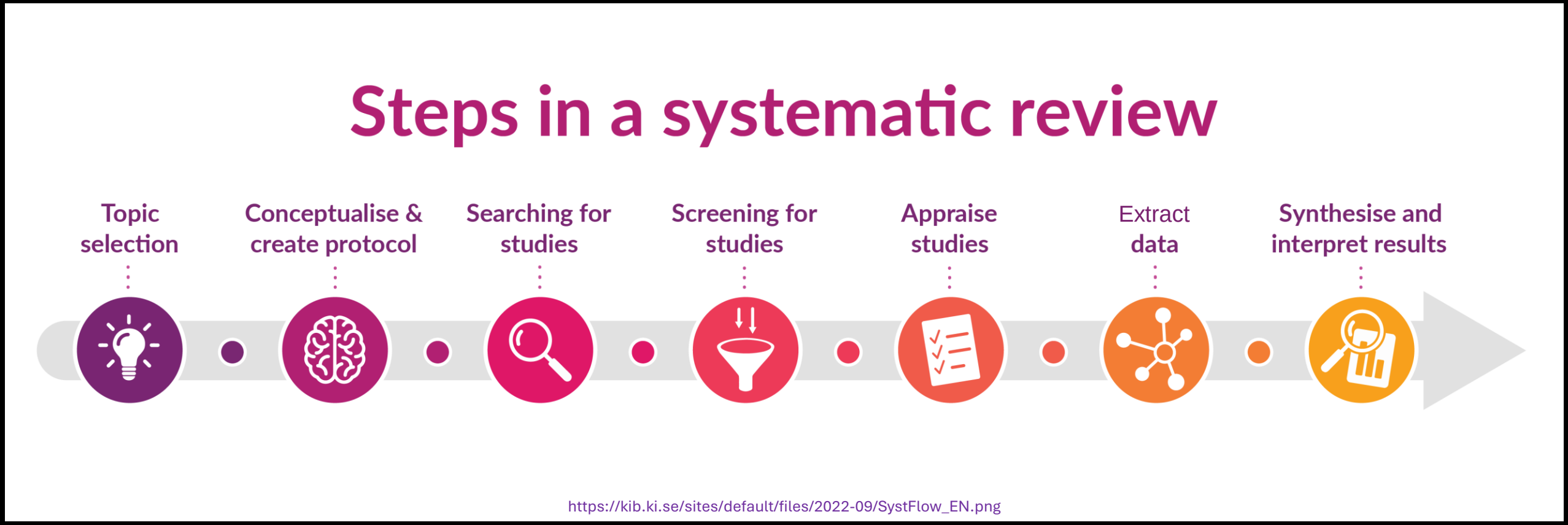
Unprotected *in situ*

Protected *in situ*

Clutch moved to a hatchery

Clutch relocated elsewhere on beach

Methods



https://kib.ki.se/sites/default/files/2022-09/SystFlow_EN.png

Methods

Search terms:

‘all marine OR ocean* AND sea AND turtle AND nest* AND management AND [Location]’

Locations:

- Indian Ocean (17,300 results)
- Arabian Sea (6,810 results)
- Red Sea (17,600 results)
- Arabian Gulf (4,270 results)
- Persian Gulf (16,500 results)
- Bay of Bengal (2,140 results)
- Southeast Asia (4,060 results)
- Australia (17,000 results)

Criteria

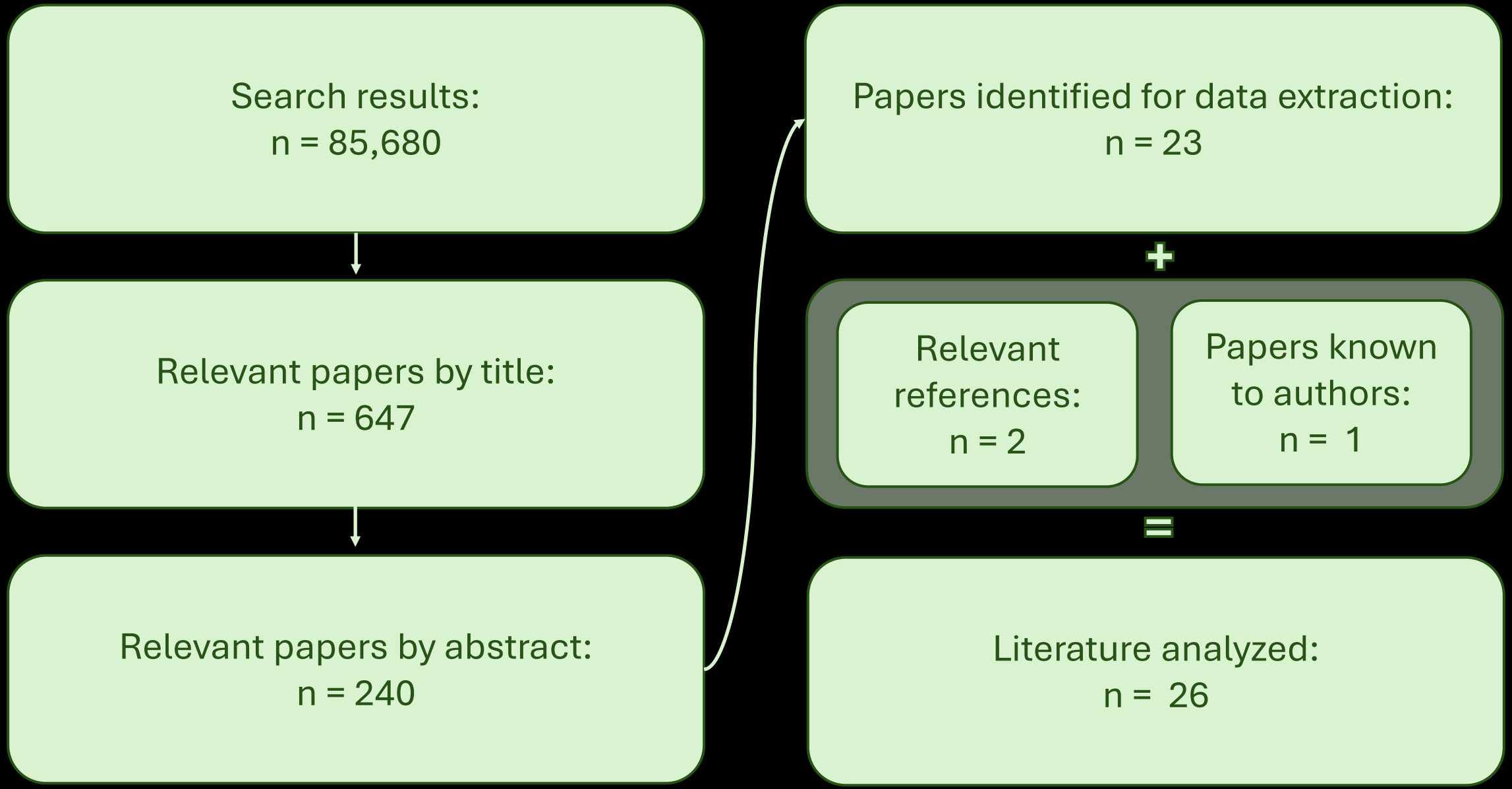
Inclusion

- Relevant to topic
- IOSEA region
- Study period 2010-2023
- Published in a
  - peer-reviewed journal
  - professional newsletter
  - conference proceeding
  - book
- All languages

Exclusion

- Review paper
- Report
- Research theses
- Managing threats to hatchlings but not eggs
- Unobtainable

Methods



Process of identifying literature relevant to the systematic review.

Data Extraction & Coding

Country, Location, Latitude, and Longitude

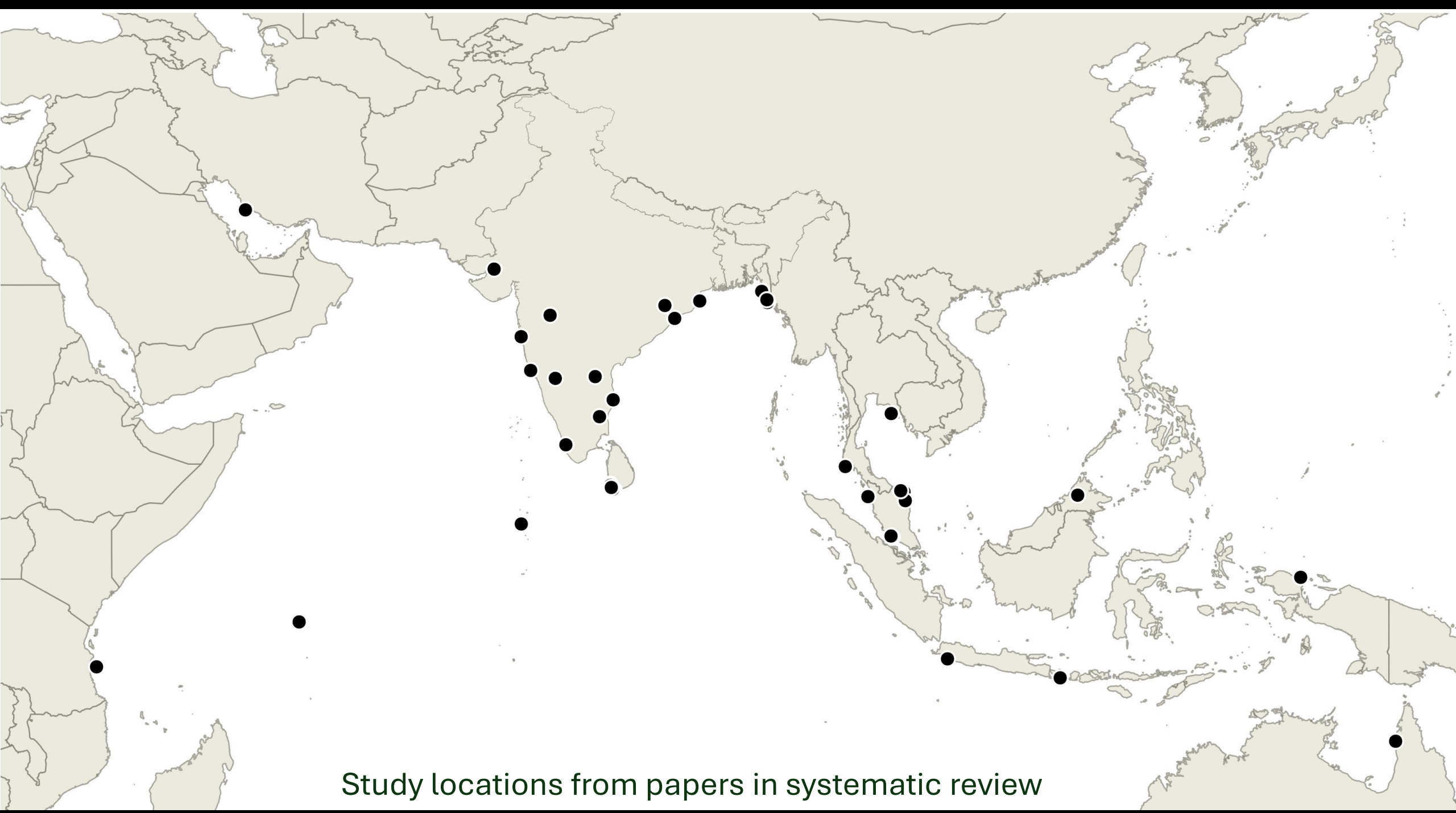
Primary, Secondary, and Tertiary Decision Maker

Proportion of Nests

Sea Turtle Species and RMUs

Primary and Secondary Nest Management Decisions

Ecological, Economic, Sociocultural, and Institutional Factors



Study locations from papers in systematic review

Results & Discussion

Percentage of sea turtle species, RMUs and MUs. Totals exceed 100% if multiple sea turtle species, RMUs and MUs were present at study sites.

Turtles	%
Olive Ridley	66.70
Green	56.30
Hawksbill	39.60
Leatherback	18.80
Loggerhead	12.50
Flatback	2.10

RMU or MU	%
LO_47_PAC_W	62.50
LO_46_IND_NE	50.00
CM_14_IND_NW	27.10
CM_16_IND_E_SEA	25.00
LO_45_IND_W	20.80
EI_34_IND_NE	18.80
DC_26_IND_NE	16.70
EI_36_PAC_SEA	12.50
CC_07_IND_NE	12.50
EI_33_IND_SW	6.30
CM_15_IND_SW	6.30
EI_32_IND_NW	4.20
DC_27_PAC_W	2.10
ND Araf	2.10

Results & Discussion

Percentage of primary, secondary, and tertiary decision-makers for nest management strategies. Totals exceed 100% if multiple decision-makers occupied a position (e.g., primary, secondary, and/or tertiary).

Color Scale Legend	
Most Common	
Second Most Common	
Third Most Common	

Entity	Primary Decision Maker (%)	Secondary Decision Maker (%)	Tertiary Decision Maker (%)
NGO	25.00	25.00	2.08
Government	37.50	4.17	2.08
Community	8.33	6.25	0.00
Academic	8.33	10.42	2.08
For profit business	25.00	0.00	2.08
Other	8.33	0.00	0.00
Not mentioned	4.17	62.50	95.83

Results & Discussion

Primary and secondary nest management strategies and proportion of nests. Totals exceed 100% if multiple strategies were used.

Primary	%
Moved to hatchery	89.58
Unprotected in situ	29.17
Relocated on beach	16.67
Protected in situ	4.17

Proportion of Nests	%
Most	56.25
Not described	20.83
All	16.67
Some	6.25

Secondary	%
Holding hatchlings	35.42
Assessing hatching and emergence success	25.00
Tourism	22.92
Monitoring nest temperature	20.83
None mentioned	18.75
Mitigating high temperature – shading	16.67
Other (e.g., morphology)	14.58
Secondary protection in hatchery	6.25
Determine hatchling sex ratio	4.17
Mitigating high temperature – watering	4.17

Results & Discussion

Ecological reasons for nest management decisions. Totals exceed 100% if multiple reasons motivated nest management strategies used.

Ecological	%
Depredation	77.08
None or not described	20.83
Tidal wash	16.67
Erosion (cause unknown)	6.25
Root intrusion	2.08
Habitat features (e.g., beach topography)	2.08
Freshwater inundation	2.08
Other	2.08

Results & Discussion

Economic reasons for nest management decisions. Totals exceed 100% if multiple reasons motivated nest management strategies used.

Economic	%
None or not described	60.42
Tourism – Livelihoods	25.00
Illegal take for egg trade - Domestic	6.25
Tourism – Infrastructure and equipment	4.17
Tourism – Incentive for conservation	2.08
Industry – Pollution	2.08
Industry – Nest disturbance	2.08

Results & Discussion

Sociocultural reasons for nest management decisions. Totals exceed 100% if multiple reasons motivated nest management strategies used.

Sociocultural	%
None or not described	58.33
Illegal take for own food/nutrition	35.42
Nest disturbance (e.g., recreational activity)	2.08
Lighting that disorients hatchlings	2.08
Recreational pollution	2.08
Traditional practice	2.08

Results & Discussion

Institutional reasons for nest management decisions. Totals exceed 100% if multiple reasons motivated nest management strategies used.

Institutional	%
Current policy/practice	54.17
None or not described	27.08
Research	27.08
Education	20.83
Monitoring scale of threats	12.50
Training	10.42
Outreach/Engagement	10.42
Tourism	8.33
Human resources	8.33
Precautionary principle	4.17
Historical policy/practice	2.08

Suggestions

Multilingual guidelines to best practices, accessible to all stakeholders

- Mitigation of common ecological threats (e.g., depredation)
- Turtle friendly tourism
- Holding hatchlings

Understand the reasons for illegal take, example sociocultural or few alternatives for nutrition

Facilitate community involvement in nest management decisions

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