



LOCAL ECOLOGICAL KNOWLEDGE OF SEA TURTLE INTERACTIONS WITH FISHING CORRAIS IN NORTHEASTERN BRAZIL

CONHECIMENTO ECOLÓGICO LOCAL SOBRE AS INTERAÇÕES ENTRE TARTARUGAS MARINHAS E CURRAIS DE PESCA NO NORDESTE DO BRASIL

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Citação: DOS SANTOS, L. S. S.; CUTRIM, D. O.; DOS SANTOS, M. B.; DOS SANTOS, V. A.; SAUÁIA, S. J. A.; SANTOS, M. C. S.; SARMANHO, J. C. A.; MENKS, F. R.; RIBEIRO, L. T. G.; PEREIRA, T. G.; DE ARAÚJO, N. A.; & BARRETO, L. (2026). Local ecological knowledge of sea turtle interactions with fishing corrals in northeastern Brazil. *Revista Brasileira de Engenharia de Pesca*, 17(1), 606-622. <https://doi.org/10.18817/repesca.v17i1.4663>

Recebido: 20 August 2026

Revisado: 21 August 2026

Aceito: 01 October 2026

Publicado: 01 October 2026



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Resumo

O conhecimento ecológico local pode revelar interações entre a fauna e a pesca difíceis de documentar por monitoramento convencional. Investigamos como pescadores especializados em currais de pesca, os curraleiros, percebem as interações entre tartarugas marinhas e essa arte tradicional em Raposa, Maranhão, nordeste do Brasil. Foram realizadas entrevistas semiestruturadas com 17 curraleiros adultos selecionados por amostragem em bola de neve. A maioria relatou mais encontros durante a estação chuvosa (76,5%) e no período diurno (52,9%), enquanto 47,1% os associaram à lua cheia. Os pescadores descreveram tartarugas entrando nos currais ao seguir cardumes e sugeriram influência da turbidez e das marés. Não foram relatados danos aos currais, mas 58,8% perceberam redução da eficiência da pesca pela dispersão dos cardumes. Quanto à abundância, 64,7% perceberam aumento e 35,3% declínio. Todos relataram liberar as tartarugas sem ferimentos visíveis. Esses relatos não representam tendências populacionais nem taxas padronizadas de captura, mas fornecem conhecimento específico sobre essa arte de pesca e hipóteses para monitoramento direto e conservação local.

Palavras-chaves: Conhecimento ecológico local; Etnozoologia; Interações entre humanos e fauna silvestre; Pesca artesanal; Pesca de pequena escala.



Abstract

Local ecological knowledge can reveal wildlife–fishery interactions that are difficult to document through conventional monitoring. We investigated how fishers specialized in fishing corrals, known as *curraleiros*, perceive sea turtle interactions with this traditional gear in Raposa, Maranhão, northeastern Brazil. Semi-structured interviews were conducted with 17 adult *curraleiros* selected through snowball sampling. Most respondents reported more encounters during the rainy season (76.5%) and daytime (52.9%), while 47.1% associated encounters with the full moon. Fishers described turtles entering corrals while following fish schools and suggested that turbidity and tides may influence these interactions. No structural damage to corrals was reported, but 58.8% perceived reduced fishing efficiency due to fish-school dispersal. Regarding turtle abundance, 64.7% perceived an increase and 35.3% a decline. All respondents reported releasing turtles without visible injuries. These accounts do not represent population trends or standardized capture rates, but provide gear-specific ecological knowledge and hypotheses for direct monitoring and locally appropriate conservation.

Keywords: Artisanal fisheries; Ethnozoology; Human–wildlife interactions; Local ecological knowledge; Small-scale fisheries.



Introduction

Small-scale fisheries support food security, livelihoods, and cultural continuity in coastal communities worldwide while simultaneously creating complex interactions between fishers, fishing technologies, and non-target wildlife (FAO 2015; Silvano & Kurien, 2023). Understanding these interactions requires more than documenting encounters or incidental captures. It also requires examining how fishers perceive animal behavior, interpret environmental variation, classify species, and respond to encounters during fishing activities. Local ecological knowledge can provide such information because it develops through repeated observation and practical engagement with local environments (Gerhardinger et al., 2009; Thornton & Scheer, 2012).

Ethnobiology provides a framework for examining relationships between people, biota, and environments and for understanding how ecological knowledge is produced, transmitted, and applied in particular social and cultural contexts (Wolverton et al., 2014). In fisheries, local ecological knowledge has contributed information on species occurrence, behavior, habitat use, perceived abundance changes, and interactions with fishing activities. Importantly, such knowledge should not be treated simply as a substitute for ecological monitoring. Instead, it can complement scientific observations, reveal phenomena that merit investigation, and generate hypotheses that can later be tested through field-based approaches (Thornton & Scheer, 2012).

Recent developments in ethnobiology have also emphasized greater recognition of knowledge holders as active participants in research and conservation rather than merely as sources of biological information. This perspective encourages studies to situate ecological knowledge within the livelihoods, practices, and social contexts through which it is generated and to avoid generalizing the knowledge of specialized subgroups to entire communities (McAlvay et al., 2021). This consideration is particularly relevant to artisanal fisheries, where different fishing techniques may produce distinct bodies of ecological knowledge.

In northeastern Brazil, artisanal fisheries use diverse gears, including gillnets, handlines, traps, longlines, zangarias, manzuás, and fishing corrals (Piorski et al., 2009; Diniz et al., 2020; Lucena-Frédou et al., 2021). Fishing corrals are fixed structures constructed with wooden stakes and other materials in intertidal or shallow coastal environments. Their configuration guides fish into enclosed compartments, where they remain until fishers conduct the *despesca*, the removal of fish and other organisms retained inside the corral, usually during low tide (Piorski et al., 2009; Nascimento et al., 2016). Building and operating these structures requires practical knowledge of tides, currents, substrate, fish movements, and appropriate construction sites (De Araújo & Pereira, 2015). Fishers specializing in this activity are locally known as *curraleiros*.

The same structural characteristics that allow corrals to intercept fish may also result in incidental encounters with marine megafauna. Sea turtles are particularly relevant because the five sea turtle species recorded along the Brazilian coast—



Caretta caretta, *Chelonia mydas*, *Dermochelys coriacea*, *Eretmochelys imbricata*, and *Lepidochelys olivacea*—have been documented in Maranhão (Ribeiro et al., 2014; Cutrim, 2018; Ribeiro et al., 2025). Previous ethnobiological research in Brazil has documented fishers' knowledge of sea turtle interactions with gillnets and fixed fishing structures (Bahia & Bondioli, 2010; Brito et al., 2015; Zeineddine et al., 2018). However, interactions are strongly dependent on gear characteristics, local environmental conditions, and fishing practices. Consequently, patterns documented for one fishing method or region cannot necessarily be extrapolated to another.

This represents an important knowledge gap for Maranhão. Although sea turtle occurrence has been documented in the state, little is known about how fishers specialized in fishing corrals perceive turtle encounters, the environmental conditions associated with those interactions, or their responses when turtles enter corrals. Examining this specialized body of knowledge may reveal patterns not captured by occasional biological surveys and can identify questions for future direct monitoring.

We therefore investigated four questions: (1) What temporal and environmental patterns do *curraleiros* associate with sea turtle encounters in fishing corrals? (2) What knowledge do they report regarding turtle size, perceived life stage, behavior, diet, and species recognition? (3) How do they perceive the ecological and economic consequences of interactions between turtles and fishing corrals, and how do they respond to turtles encountered in these structures? (4) How can these observations contribute to hypotheses and participatory approaches for monitoring and reducing potentially harmful interactions between sea turtles and fishing corrals? By addressing these questions, we examine local ecological knowledge not as a proxy for direct population estimates, but as a socially situated source of ecological observations relevant to human–wildlife interactions and conservation.

Material and Methods

Study area

We conducted the study in the municipality of Raposa (2°26'24" S, 44°06'36" W), Maranhão State, northeastern Brazil, approximately 30 km from São Luís, the state capital (Figure 1). Raposa is located on Maranhão Island and had 30,839 inhabitants according to the Brazilian Institute of Geography and Statistics (IBGE, 2022).

The municipality lies within the Amazon biome and forms part of a macrotidal coastal system characterized by extensive mangrove forests, tidal channels, mudflats, sandbanks, and shallow marine environments. Mean annual temperature is approximately 26 °C, and rainfall is strongly seasonal, with distinct rainy and dry periods (Santos et al., 2011). Seasonal rainfall and freshwater discharge influence turbidity and other estuarine conditions along the Maranhão coast.

Raposa has a long history of artisanal fishing. Fishing, shellfish harvesting, small-scale commerce, and tourism represent important local economic activities. The present study did not sample the general population of Raposa or all artisanal fishers. Instead, it focused exclusively on the occupational subgroup of fishers who



construct, maintain, or operate fishing corrals and who are locally known as *curraleiros*. Consequently, all results and interpretations refer specifically to this subgroup.

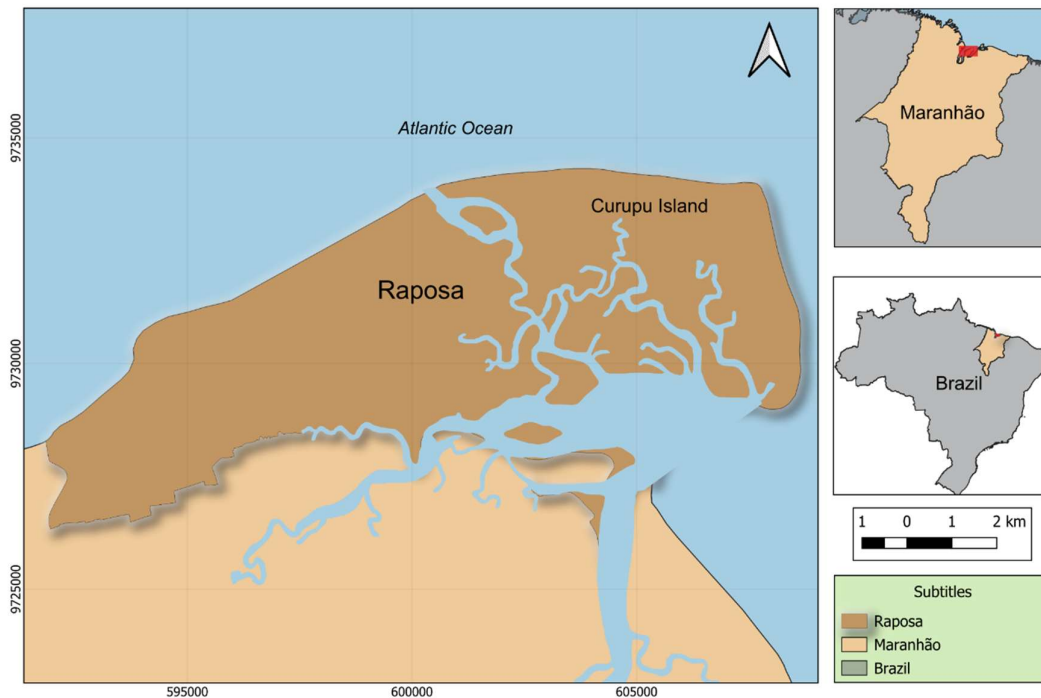


Figure 1. Map of the study area showing the municipality of Raposa, Maranhão, northeastern Brazil.

We used the individual *curraleiro* as the sampling unit. Eligible participants were adults aged 18 years or older who lived or actively fished in Raposa and had direct experience constructing, maintaining, or operating fishing corrals. We excluded children and adolescents, fishers who worked exclusively with other fishing gears, people without direct experience with fishing corrals, and individuals who did not consent to participate.

Participants were recruited using non-probabilistic snowball sampling (Biernacki & Waldorf, 1981), an approach suitable for identifying members of specialized occupational networks. Initial participants were *curraleiros* recognized locally for their experience with fishing corrals. At the end of each interview, participants were invited to indicate other eligible fishers.

The final sample comprised 17 *curraleiros*. The study was not designed as a census. No official registry of active *curraleiros* was available for Raposa at the time of data collection; therefore, the total universe of eligible individuals could not be reliably established. For this reason, the sample should not be interpreted as statistically representative of all *curraleiros* in the municipality. Our objective was instead to document and characterize knowledge and perceptions within this specialized occupational group.



Data collection

We conducted individual semi-structured interviews between February and March 2023 using a questionnaire adapted from Bahia & Bondioli (2010). Questions addressed participants' socioeconomic and fishing backgrounds, including age, education, place of birth, family size, years of experience, income sources, fishing areas, and organization of fishing corral activities.

A second group of questions examined local ecological knowledge of sea turtles. Topics included circumstances of turtle encounters, perceived frequency of encounters in corrals, seasonality, time of day, lunar phase, environmental conditions, turtle behavior, diet, estimated size and perceived life stage, and local nomenclature. Participants were also asked whether turtles damaged fishing structures, affected catches, sustained visible injuries, and how fishers responded when turtles were found inside corrals. Questions concerning perceived changes in turtle abundance were explicitly framed as perceptions rather than quantitative assessments of population trends.

To assist species recognition, we presented photographic material representing the five sea turtle species recorded along the Brazilian coast and documented in Maranhão: *Caretta caretta*, *Chelonia mydas*, *Dermochelys coriacea*, *Eretmochelys imbricata*, and *Lepidochelys olivacea* (Ribeiro et al., 2014; Cutrim, 2018; Ribeiro et al., 2025). Participants were asked to recognize turtles represented in the photographs and to provide vernacular names used for the species they recognized. Thus, the exercise was constrained to a published regional species list rather than an unrestricted set of possible taxa. Participants could indicate that they did not recognize a species or were uncertain about an identification.

No sea turtles or other zoological specimens were captured, handled, collected, or deposited in a scientific collection as part of this research. Species information attributed to the interviewed *curraleiros* resulted exclusively from interviews and photographic recognition. Consequently, associations between vernacular names and scientific species are treated as interview-based identifications and not as voucher-confirmed species records.

During interviews, we also provided measuring tapes to help participants visualize and estimate turtle size. These measurements represent retrospective estimates supplied by fishers and were not direct morphometric measurements of individual turtles. We therefore use them only to characterize the reported size range and avoid treating them as precise biological measurements.

Data analysis

Questionnaire responses were entered and organized in Microsoft Excel 2016. The dataset was checked for transcription errors, missing responses, and consistency among response categories before analysis.

We used descriptive statistics because the study employed a non-probabilistic sample and was not designed to estimate population parameters for all fishers in Raposa. Closed responses are presented as absolute frequencies and percentages.



Unless otherwise indicated, percentages were calculated using the full sample of 17 respondents.

For numerical variables, including participant age, fishing experience, family size, and estimated turtle size, we calculated descriptive ranges when appropriate. Turtle sizes were retrospectively estimated rather than directly measured and are therefore interpreted only as reported size estimates.

We examined open-ended responses through categorical thematic analysis. Responses were read and grouped according to recurrent themes directly related to the research questions, including perceived encounter mechanisms, environmental drivers, turtle behavior, effects on fishing, explanations for perceived population changes, and release practices. Categories were derived from recurring content in participants' responses rather than assigned ecological validity a priori.

We did not use ethnobiological indices because the study did not seek to rank species according to cultural importance, use value, consensus, or citation frequency. Applying such indices would not provide a clear theoretical or methodological advantage for the questions addressed here.

Ethical considerations

The Human Research Ethics Committee of the Universidade Federal do Maranhão approved the study through Plataforma Brasil (CAAE: 21638619.8.000.5087). Before each interview, participants received information about the objectives of the research, the voluntary nature of participation, confidentiality, and their right to decline or discontinue participation. Interviews were conducted only after informed consent was obtained.

Dr. Naíla Arraes de Araújo authorized and supported the field activities associated with the study.

Results

Participants and the social context of corral fishing

We interviewed 17 male *curraleiros* aged 19–65 years. Their experience with fishing corrals ranged from 2 to 36 years, indicating that the sample incorporated knowledge derived from substantially different periods of engagement with the activity. Most participants were born in Maranhão (82.4%), whereas two were from Ceará and one from Piauí. Fishing was reported as an important source of household income, and two participants also reported income from small businesses.

Formal education was generally limited: 58.8% had incomplete elementary education, 11.8% had completed elementary education, 11.8% had incomplete high school education, and 17.6% had completed high school education. Fourteen respondents operated primarily in Carimã, whereas Curupu Island, Mangue Seco, and Croa Nova were each reported by one participant. Participants reported working in groups of two to four people during *despescas*.

These characteristics are important for interpreting the ecological knowledge documented in this study. The observations reported here were produced through practical engagement with a specialized fishing technology and should therefore be



understood as occupational ecological knowledge rather than as knowledge shared uniformly among residents of Raposa. Differences in years of experience may also contribute to variation among individual observations.

Table 1. Socioeconomic and fishing profile of *curraleiros* interviewed in Raposa, Maranhão, northeastern Brazil ($n = 17$).

Variable	Category	n	%
Sex	Male	17	100.0
	Incomplete elementary school	10	58.8
Education	Completed elementary school	2	11.8
	Incomplete high school	2	11.8
	Completed high school	3	17.6
	Maranhão	14	82.4
State of origin	Ceará	2	11.8
	Piauí	1	5.9
	1-3 members	7	41.2
Family size	4-7 members	10	58.8
	Carimã	14	82.4
	Curupu Island	1	5.9
Main fishing area	Mangue Seco	1	5.9
	Croa Nova	1	5.9

Perceived pathways and temporal patterns of turtle encounters

All 17 participants had observed sea turtles in the region. Seven (41.2%) reported seeing them only in association with fishing corrals, whereas ten (58.8%) had also encountered turtles in other situations, including strandings or nesting events. These results indicate sustained familiarity with sea turtles among the interviewed *curraleiros*, although familiarity should not be equated with standardized observation effort.

Reported frequencies suggested that turtle encounters in corrals were recurrent but not necessarily frequent. Seven respondents (41.2%) reported fewer than one encounter per month, five (29.4%) reported one to two encounters per month, and five (29.4%) reported three or more encounters per month. These categories represent fishers' recollections and should not be interpreted as standardized rates of incidental capture because fishing effort, number of corrals operated, season, and recall period were not quantified.

Thirteen respondents (76.5%) described turtles following schools of sardines or other fish toward the corral and subsequently encountering the guiding wall of the structure, locally called the *espia*. A similar mechanism has been reported for fixed fishing structures in Cananéia, southeastern Brazil (Bahia & Bondioli, 2010). This



convergence suggests a gear-mediated interaction pathway in which a structure designed to direct fish movement may also redirect non-target marine vertebrates.

Thirteen respondents (76.5%) reported more turtle encounters during the rainy season, whereas four (23.5%) reported more encounters during the dry season. In open-ended responses, reduced underwater visibility was mentioned as a possible explanation for the rainy-season pattern. This interpretation is ecologically plausible because rainfall and suspended sediments influence water transparency in Maranhão's macrotidal coastal environments (Cavalcanti et al., 2018; Delgado, 2019). Nevertheless, our interviews cannot determine whether turbidity causes increased turtle encounters. Instead, the fishers' observations generate a testable prediction: if turbidity contributes to corral encounters, standardized encounter rates should increase under lower-visibility conditions after accounting for fishing effort and seasonal turtle occurrence.

This distinction between observation and causal inference is important in ethnobiological research. Local ecological knowledge can reveal recurrent associations and mechanisms perceived by resource users, while direct ecological monitoring can subsequently evaluate whether those associations predict actual encounter probability.

Nine participants (52.9%) reported more encounters during daytime, five (29.4%) during nighttime, and three (17.6%) perceived no difference between periods. The greater proportion of daytime reports differs from observations previously documented for gillnet fisheries, in which nighttime captures have been associated with reduced visibility of submerged nets (Bahia & Bondioli, 2010). This contrast may reflect differences in the mechanisms through which fixed corrals and entangling gears interact with sea turtles.

Lunar and tidal knowledge

Eight respondents (47.1%) associated turtle encounters with the full moon, eight (47.1%) could not identify a lunar effect, and one (5.9%) reported no influence. The near-equal proportion of positive and uncertain responses argues against interpreting the full moon as an established driver of turtle encounters.

Nevertheless, the pattern provides another hypothesis for direct testing. Full and new moon periods generate spring tides with greater tidal amplitudes, and tidal movement directly affects the operation of fishing corrals. Previous studies have also reported perceived associations between lunar conditions and sea turtle encounters in fixed fishing structures (Bahia & Bondioli, 2010; Silva et al., 2010). Future monitoring should therefore record lunar phase, tidal amplitude, time of despesca, fishing effort, and environmental visibility simultaneously. Such an approach would allow researchers to distinguish effects of lunar illumination from effects mediated indirectly through tides.



Table 2. Perceived patterns of sea turtle encounters and interactions with fishing corrals reported by *curraleiros* in Raposa, Maranhão, northeastern Brazil ($n = 17$).

Variable	Category	n	%
Observation context	Only inside fishing corrals	7	41.2
	Fishing corrals and other contexts	10	58.8
Reported frequency of turtle encounters in corrals	Less than once per month	7	41.2
	One to two times per month	5	29.4
	Three or more times per month	5	29.4
Season with more reported encounters	Rainy season	13	76.5
	Dry season	4	23.5
Time of day with more reported encounters	Daytime	9	52.9
	Nighttime	5	29.4
	No perceived difference	3	17.6
Perceived lunar influence	Full moon	8	47.1
	Did not know	8	47.1
	No perceived effect	1	5.9

Turtles as ecological actors within the fishing system

No respondent reported that sea turtles physically damaged fishing corrals. However, ten fishers (58.8%) stated that turtles near or inside the entrance could disperse fish schools and consequently reduce catch efficiency. Similar narratives have been reported from fixed-trap fisheries in southeastern Brazil (Bahia & Bondioli, 2010).

This finding illustrates why assessing wildlife–fishery interactions solely through direct gear damage can overlook forms of perceived economic impact. From the fishers' perspective, turtles may affect fishing indirectly by altering the behavior or spatial distribution of target fish. Whether turtles actually reduce catches requires independent evaluation, but the perception itself is relevant to conservation because attitudes toward wildlife can be influenced by perceived livelihood costs.

Seven respondents (41.2%) described hearing turtles surface and breathe inside or near fishing corrals. Such observations show how repeated presence at fishing sites enables fishers to recognize behavioral cues that may be missed during short-term scientific surveys. Only one respondent recalled observing a turtle consuming fish inside a corral. Regarding perceived diet, six respondents (35.3%) mentioned algae as a food item consumed by sea turtles, while five (29.4%) mentioned jellyfish. These frequencies are presented separately according to the food items reported by respondents.

These responses demonstrate uneven but ecologically meaningful knowledge. They also show why local classifications should not be evaluated solely as either scientifically “correct” or “incorrect.” Knowledge held by fishers is



structured around practical encounters and salient characteristics, whereas scientific dietary categories are constructed for different analytical purposes.

Perceived size, life stage, and ethnotaxonomic recognition

Among the 17 participants, 14 (82.4%) described the turtles encountered in fishing corrals as adults, one (5.9%) as juveniles, and one (5.9%) reported encountering both adults and juveniles. One participant (5.9%) did not provide a classifiable response regarding perceived life stage. Participants reported estimated turtle sizes ranging from 40 to 130 cm.

These size estimates should be interpreted cautiously. They were retrospective and supported by a measuring tape during interviews rather than obtained through direct measurements of individual turtles. Moreover, body size alone cannot reliably determine maturity across all five sea turtle species. The results therefore describe fishers' perceptions of turtle size and life stage rather than direct biological classifications.

Participants used several vernacular names for sea turtles, including *Aruanã*, *Vovô*, *Vaca*, *Bico-de-papagaio*, and *Tartaruga-de-couro*. Photographic identifications made by five participants (29.4%) corresponded collectively to four of the five species represented in the guide: *Caretta caretta*, *Chelonia mydas*, *Eretmochelys imbricata*, and *Dermochelys coriacea*. Uncertainty was also reported during photographic recognition, particularly for *L. olivacea* and *D. coriacea*.

Rather than interpreting this uncertainty simply as a deficit in taxonomic knowledge, it may reflect differences between vernacular classification systems and scientific species boundaries. Local names may refer to appearance, size, shell characteristics, or other locally salient features rather than correspond one-to-one with scientific taxa. Species encountered infrequently may also be less consistently differentiated in experiential knowledge. *D. coriacea*, for example, is uncommon in records from Maranhão compared with *C. mydas* (Cutrim, 2018).

For this reason, Table 3 should be interpreted as a comparison between vernacular categories and scientific taxonomic references rather than as validation or correction of local terminology.

Table 3. Vernacular names associated with sea turtle species by *curraleiros* from Raposa, Maranhão, northeastern Brazil, compared with vernacular names previously reported in the literature.

Species presented in the photographic guide	Vernacular names reported by <i>curraleiros</i> from Raposa	Vernacular names reported in previous studies	References
<i>Caretta caretta</i>	<i>Cabeça-grande</i> ; <i>Vaca</i> ; <i>Vovô-laranja</i> ; <i>Vovô</i> .	<i>Mestiça</i> ; <i>Tartaruga-amarela</i> ; <i>Tartaruga-cabeçuda</i> ; <i>Tartaruga-comum</i> ; <i>Tartaruga-de-casco-amarelo</i> ; <i>Tartaruga-manteiga</i> ; <i>Tartaruga</i> .	Bahia & Bondioli (2010); Steigleder (2011); Brito et al. (2015). Barboza et al. (2017); Awabdi (2019); Silva (2021)



<i>Chelonia mydas</i>	Aruanã; Aruanã-normal; Uruanã.	Aruanã; Pea; Tartaruga-cinza; Tartaruga-cinzenta; Tartaruga-comum; Tartaruga-pequena; Tartaruga-pretinha; Tartaruga-verde; Tartaruga-vinho; Vovô.	Bahia and Bondioli (2010); Steigleder (2011); Brito et al. (2015); Barboza et al. (2017); Awabdi (2019); Silva (2021).
<i>Eretmochelys imbricata</i>	Bico-de-papagaio; Legítima; Tartaruga.	Legítima; Papuda; Preta. Tartaruga-cor-de-vinho; Tartaruga-de-escama; Tartaruga-de-pente; Tartaruga-pequena; Tartaruga; Vovô.	Bahia and Bondioli (2010); Steigleder (2011); Brito et al. (2015); Barboza et al. (2017); Awabdi (2019); Silva (2021).
<i>Dermochelys coriacea</i>	Aruanã-de-couro; Tartaruga-de-couro; Tartaruga-preta;	Sete-quilhas; Tartaruga-caixão; Tartaruga-de-couro; Tartaruga-gigante; Tartaruga-preta; Tartaruga-três-quilhas; Tartaruga.	Bahia and Bondioli (2010); Steigleder (2011); Brito et al. (2015); Barboza et al. (2017); Awabdi (2019).
<i>Lepidochelys olivacea</i>	Aruanã; Vovô-marrom; Vovô; Ximinga; Ximirra.	Aruanã; Casco; Comum; Pea; Tartaruga-oliva; Tartaruga-pequena; Tartaruga-verde-escura; Tartaruga; Uruanã.	Bahia and Bondioli (2010); Steigleder (2011); Brito et al. (2015); Barboza et al. (2017); Awabdi (2019); Silva (2021).

Note: Vernacular associations were based on participants' responses to photographic material representing the five sea turtle species recorded along the Brazilian coast and documented in Maranhão. These associations should not be interpreted as voucher-confirmed species records, and vernacular categories do not necessarily correspond one-to-one with scientific species.

Perceptions of change and the limits of retrospective abundance information

Eleven respondents (64.7%) perceived an increase in turtle abundance, whereas six (35.3%) perceived a decline (Table 4). Among respondents perceiving an increase, the most frequent responses were decreased intentional killing and uncertainty about the underlying reason (36.4% each). Among those perceiving a decline, pollution and intentional killing were reported equally (50.0% each; Table 5).

These perceptions provide insight into how *curraleiros* interpret changes in their environment, but they cannot be treated as evidence of demographic trends. Sea turtle abundance is shaped by survival across multiple life stages, reproductive output, migration, habitat conditions, fisheries mortality, and conservation measures operating across broad spatial and temporal scales. Consequently, local observations of greater or lower encounter frequency may reflect actual population change, redistribution, changes in fishing effort, environmental variability, or differences in individual experience and recall.



The ethnobiological relevance lies partly in these explanatory models themselves. Fishers connect perceived abundance with intentional killing, fishing pressure, pollution, reproduction, and predation. These narratives reveal which ecological and human-related processes are locally considered important and can help identify subjects for conservation dialogue.

Table 4. Reasons reported by *curraleiros* for perceived increases or decreases in sea turtle abundance in Raposa, Maranhão, northeastern Brazil. Percentages refer to respondents within each perception group.

Perceived population trend	Valid n within trend group	Explanation cited	n	%
Increase	11	High number of eggs laid	1	9.1
		Perceived lack of natural predators	1	9.1
		Decrease in fishing activity	1	9.1
		Decrease in intentional killing	4	36.4
		Did not know the reason	4	36.4
Decrease	6	Pollution	3	50.0
		Intentional killing	3	50.0

Note: Percentages were calculated separately among respondents who perceived an increase ($n = 11$) and those who perceived a decrease ($n = 6$). Reasons represent participants' perceptions and were not independently evaluated as causes of changes in sea turtle abundance.

Release practices, coexistence, and opportunities for participatory management

Twelve participants (70.6%) reported never having consumed sea turtle meat, while five (29.4%) recalled having consumed it in the more distant past. Historical consumption of sea turtles has been documented in several Brazilian coastal communities, sometimes in association with food or medicinal practices (Pupo et al., 2006; Bahia & Bondioli, 2010).

All respondents reported releasing turtles and stated that the animals showed no visible injuries at the time of release. Fishers described turtles remaining within the corral until the despesca, after which they were released. These accounts suggest an interaction different from that occurring in entangling gears such as gillnets, in which submerged turtles may be prevented from surfacing and may drown (Carvalho et al., 2020).

However, the absence of visible injuries should not be equated with absence of biological effects. Our study did not directly evaluate retention duration, handling, physiological stress, concealed injuries, or post-release survival. We therefore cannot classify fishing corrals as harmless or quantitatively lower-impact fishing gear on the basis of interview data alone.

What the interviews do demonstrate is an existing behavioral basis for collaborative mitigation: respondents reported releasing turtles rather than intentionally keeping them for consumption or other purposes. Training focused on safe handling, minimizing retention time, appropriate release procedures, and standardized reporting could therefore build on practices already described by *curraleiros* rather than imposing an entirely external protocol.



From local ecological knowledge to testable conservation questions

The principal contribution of this study is not an estimate of the magnitude of incidental sea turtle capture, but rather the identification of a gear-specific knowledge system through which *curraleiros* interpret turtle encounters in fishing corrals. Their accounts converge on several potentially testable relationships, including a possible increase in turtle encounters during the rainy season, a role of reduced water visibility in facilitating entry into corrals, and the influence of fish-school movements on turtle presence within these structures. Fishers also suggested that tidal amplitude may partly explain the perceived association between encounters and lunar phases, and that the presence of turtles may affect fishing efficiency by altering the behavior of fish schools. In addition, the structural characteristics of fishing corrals may allow retained turtles to surface and breathe, potentially allowing them to avoid the immediate drowning mechanism associated with prolonged forced submergence in entangling gears.

These hypotheses illustrate how ethnobiological research can guide ecological monitoring. A future field study could record individual despesca events, turtle encounters, fishing effort, tidal amplitude, lunar phase, turbidity, species, body measurements, retention duration, handling duration, and condition at release. Comparing these observations with the patterns reported here would allow researchers to evaluate the correspondence between experiential knowledge and standardized ecological measurements.

The study also demonstrates why management should distinguish among fishing technologies rather than treating artisanal fisheries as a homogeneous category. *Curraleiros* acquire knowledge through repeated interaction with a particular gear, environment, and set of target and non-target organisms. Conservation measures developed without accounting for these differences may overlook locally important mechanisms or impose recommendations poorly matched to fishing practice.

Participatory monitoring therefore represents a particularly appropriate next step. Such programs could involve *curraleiros* in recording turtle encounters and environmental conditions while simultaneously providing training in handling and release. This approach would recognize fishers as knowledge holders and collaborators in conservation while generating quantitative information required to evaluate the actual ecological consequences of interactions with fishing corrals.

Conclusion

The local ecological knowledge of *curraleiros* in Raposa reveals a distinctive set of observations concerning interactions between sea turtles and fishing corrals. Participants associated turtle encounters with seasonality, visibility, fish-school movements, time of day, and lunar or tidal conditions; described vernacular classifications and behavioral cues; perceived indirect effects on fishing efficiency; and consistently reported releasing turtles encountered in the gear.

These findings should not be interpreted as quantitative estimates of incidental capture, mortality, or population trends. Their principal value lies in



identifying recurrent observations and locally generated explanations that can be transformed into testable ecological questions. In particular, the reported associations with rainy-season conditions, turbidity, tides, and fish movements provide clear hypotheses for future field monitoring.

The study also shows that ecological knowledge within coastal communities is not necessarily uniform. The information documented here belongs to a specialized occupational subgroup whose knowledge develops through repeated engagement with a particular fishing technology. Recognizing this specificity avoids inappropriate generalization and helps conservation initiatives address interactions at the scale at which they actually occur.

Future research should combine direct monitoring of despesca events with participatory data collection to quantify encounter rates, identify species, obtain body measurements, characterize demographic composition, evaluate environmental predictors, record retention duration and handling duration, and assess condition at release. Building such programs collaboratively with curraleiros could both improve ecological evidence and strengthen locally appropriate sea turtle conservation in small-scale fisheries of northeastern Brazil.

Acknowledgments

We thank the Maranhão Foundation for Research and Scientific and Technological Development (FAPEMA) for financial support. We also thank the *curraleiros* from Raposa for generously sharing their time, knowledge, and experiences, which made this study possible. We are grateful to Dr. Naíla Arraes de Araújo for authorizing and supporting the fieldwork. We conducted this research with approval from the Human Research Ethics Committee of the Universidade Federal do Maranhão through Plataforma Brasil (CAAE: 21638619.8.000.5087).

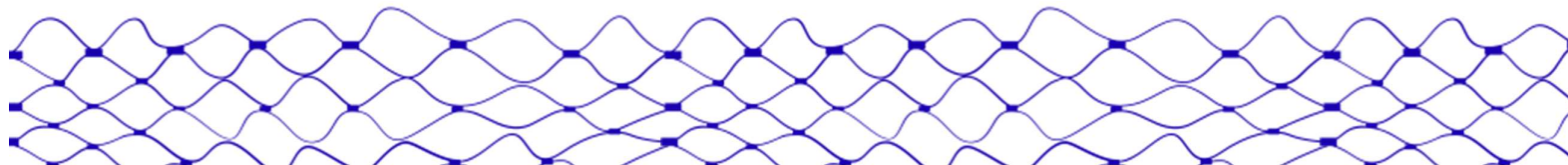
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