Template for Submission of Scientific Information

to Describe Ecologically or Biologically Significant Areas

*N.B. Please **DO NOT** embed tables, graphs, figures, photos, or other artwork within the text manuscript, but please send these as separate files. Captions for figures should be included at the end of the text file, however.*

Title/Name of the area:

NORTHEASTERN BRAZILIAN SHELF-EDGE ZONE

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Abstract (*in less than 150 words)*

The northeastern shelf-edge zone extends along the Brazilian outer shelf and upper slope, from depths of 40m to 200m and between parallels 3ºS to 16ºS, from south Bahia up to the Ceará states, where the Brazilian continental shelf is narrow and breaks abruptly at depths between 50 to 80m. The shelf width varies along the coast, reaching minimums of 8 km (off Bahia state), to over 80 km (north Ceará). The continental shelf-edge zone is a marine ecotone where different components of the demersal, benthic and benthopelagic communities of the continental shelf, upper slope and adjacent pelagic biota coexist in a narrow strip along the continental margin. This ecotone, characterized by high population densities and species richness, provides a concentration of diverse fishing resources over a relatively narrow area, easily accessible to local artisanal fleets and sustaining important traditional multispecific reef fisheries. Biogenic reef formations associated to outer shelf channels, ravines and deeper canyons represent important traditional fishing grounds. The northeastern Brazilian shelf-edge zone contains distinct habitats and unusual geomorfological features such as shelf-edge reefs that represent a last refuge for some rare or endemic reef fishes distributed across the continental margin, including threatened (UICN) commercial species of the snapper-grouper complex, currently depleted at the Brazilian EEZ jurisdiction. The shelf-edge harbor critical habitats for the life cycle of many sea turtles, whales, sharks and reef fish species, including migratory corridors and fish spawning aggregation sites that are extremely vulnerable to human pressures, such as intensive commercial and recreational fishing, shipping and offshore oil and gas exploitation, all activities currently expanding off the Brazilian coast. This region corresponds to a portion of the breeding ground of humpback whales (*Megaptera novaeangliae*) off the northeastern coast of Brazil. Also corresponds to an important habitat of various relatively low-density cetacean populations, including Bryde's whales (*Balaenoptera* cf. *edeni*), dwarf minke whales (*B. acutorostrata*), and bottlenose dolphins (*Tursiops truncatus*). The Assessment of the Sustainable Yield of the Living Resources in the Brazilian Exclusive Economic Zone Program (REVIZEE Program) has extensively sampled this zone indicated as EBSA. Results indicated great bottom heterogeneity of the shelf and slope, with the occurrence of important canyons, which provide structural complexity and varied micro-habitats, allowing a greater number of benthic species in the area. Recent studies reinforce de hypotheses of a faunal corridor for reef fish species associated with deep reef formations along the shelf-edge zone, in the South American continental margin, connecting the south-western Atlantic and the Caribbean.

Introduction

(To include: feature type(s) present, geographic description, depth range, oceanography, general information data reported, availability of models)

The continental shelf-edge zone is a marine ecotone characterized by the coexistence of different components of the demersal, benthic and benthopelagic communities of the continental shelf, upper slope and adjacent pelagic biota, in a narrow strip along the continental margin (Briggs, 1974; Spalding et al., 2007). The depth limits of this zone are situated between the shelf break and the beginning of the slope. Along the northeastern Brazilian continental margin, the shelf-edge limits may be defined from depths of 40m to 200m (Olavo et al., 2011). This ecotone, characterized by high population densities and species richness, provides a concentration of diverse fishing resources over a relatively narrow area, sustaining important multispecific reef fisheries in the Tropical Atlantic (Longhurst and Pauly, 1987; Polunin and Roberts, 1996; Costa et al., 2003, 2005; Frédou and Ferreira, 2005; Olavo et al., 2005).

Increasing attention has been given to the presence of reef formations located on the continental shelf break and upper slope, particularly in the north-western Atlantic (Parker and Mays, 1998; Sedberry et al., 2004; Martins, 2007; Olavo et al., 2007; Francini-Filho and Moura, 2008). The shelf-edge reefs harbour critical habitats for the life cycle of many sea turtles and reef fish species, including fish spawning aggregation sites that are extremely vulnerable to human pressures, such as intensive commercial and recreational fishing, shipping and offshore oil and gas exploitation, all activities currently expanding off the Brazilian coast.

It's an essential area for internesting, foraging and migration for three species of sea turtles: *Lepidochelys olivacea, Caretta caretta* and *Eretmochelys imbricata* (Marcovaldi et al. 2010, Da Silva et al. 2011, Marcovaldi et al. in press).

The REVIZEE Project "Assessment of the Sustainable Yield of the Living Resources in the Exclusive Economic Zone" has extensively sampled the outer continental shelf and slope of the Northeastern and Central Brazilian EEZ, in areas located in this zone indicated as EBSAs. Results of REVIZEE indicated the occurrence of a very rich benthic fauna on slope areas between 11^{o} S and 16^{o} S, mainly off Salvador City, up to 2000 m depth. It also indicated a great bottom heterogeneity of the shelf and slope, with the occurrence of canyons (close to Salvador City, Municipalities of Itaparica and Camamu), which provide structural complexity and varied micro-habitats, allowing a greater number of benthic species in the area (Lavrado, 2006).

Recent studies reinforce de hypotheses of a faunal corridor for species associated with deep reef formations along the shelf-edge zone, in the South American continental margin, connecting the south-western Atlantic and the Caribbean provinces (Colette & Rutzler, 1977, Feitoza et al., 2009; Moura et al., 1999; Olavo et al., 2011).

Location

(Indicate the geographic location of the area/feature. This should include a location map. It should state if the area is within or outside national jurisdiction, or straddling both. It should also state if the area is wholly or partly in an area that is subject to a submission to the Commission on the Limits of the Continental Shelf]

The northeastern shelf-edge zone extends along the Brazilian outer shelf and upper slope, from depths of 40m to 200m and between parallels 3ºS to 16ºS, off the states of Bahia to Ceará (Figura 1 - Mapa), where the continental shelf is narrow and breaks abruptly at depths between 50 to 80m. Biogenic reef formations associated to outer shelf channels, ravines and deeper canyons represent important traditional fishing grounds. Occurrence of reef fish spawning aggregations have been assessed between parallels 7ºS and 14ºS. Aggregations sites of several species of snappers, groupers and jacks are reported by fishers. In situ verifications were successful for the cubbera snapper in six locations, distant at least 60 miles apart, approximately (Ferreira et al., 2012). All the area is within national EEZ jurisdiction.

Feature description of the proposed area

(This should include information about the characteristics of the feature to be proposed, e.g. in terms of physical description (water column feature, benthic feature, or both), biological communities, role in ecosystem function, and then refer to the data/information that is available to support the proposal and whether models are available in the absence of data. This needs to be supported where possible with maps, models, reference to analysis, or the level of research in the area)

The continental shelf along the northeastern cosast of Brazil is shallow, the shelf-break occurring between depths of 40 and 80m (Franca, 1979). The shelf width varies along the coast. The narrowest sector is located between 12ºS and 15ºS, off Bahia state, reaching minimums of 8 km. Largest width is observed off north coast of the Ceara state, reaching width over 80 km.

The Brazilian outer shelf reef formations have been characterized by Leão et al. (2003). Kikuchi and Leão (1998) includes a first reference to the marginal or shelf-edge reefs, classified as oceanic reefs and described for the northern coast of Bahia State as structures that may reach 3 km in width, with a relief of up to 35m and the top of the reefs located at depths of 50 m. These marginal reefs may have begun their growth in the Holocene period, 8000 years BP, and building up during successive phases of changes in sea level. They are currently colonized by crustose coralline algae, calcareous sponges, rhodolithes and macroalgae.

The marine biota of the Area is under the influence of three distinct water masses. The Tropical Water mass (TW), warm and saline, dominates the region. The South Atlantic Central Water (SACW), cold and less saline, is found under the TW on the upper continental slope. The Coastal Water mass (CW), warm and of low salinity, predominates on the shallow continental shelf, while the shelf-edge is characterized by the TW and by events of vertical mixing between TW and SACW (Castro and Miranda, 1998).

Feitoza et al. (2005) have shown the importance of the deep outer-shelf reefs (30-70m) of north-east Brazil (at the hump of Brazil), as part of a marine corridor for the ichthyofauna on the South American continental margin, favouring connection between habitats of colder waters from the Brazilian south-east and south with the Caribbean region (Collette and Rutzler, 1977). Olavo et al. (2011) findings reinforce the hypothesis of a faunal corridor for species associated with deep reef formations along the shelf-edge zone (40–200m) and slope down (up to 500m) of the central regions of the Brazilian EEZ.

These reef formations at the edge of the continental shelf sustain numerous local fleets dedicated to artisanal hook and line fisheries established on the northeastern Brazilian coast, extensively studied in the area by nacional researchers (Fonteles-Filho, 1969; Fonteles-Filho and Ferreira, 1987; Paiva et al., 1996; Rezende et al., 1997; Costa et al., 2003; Frédou and Ferreira, 2005; Olavo et al., 2005; Martins et al., 2006).

Information from fishing surveys carried out by the REVIZEE Project is available for the outer shelf and upper slope reef fish fauna in the north-east and central Brazilian EEZ (Brasil, 2006; Costa et al., 2005, 2007; Fagundes-Netto et al., 2005; Martins et al., 2005, 2007; Olavo et al., 2007). Data from surveys employing bottom long-lines were analysed to characterize the diversity, assemblages and distribution patterns of demersal fish, between latitudes 13oS and 22oS, in depths up to 500m (Martins et a., 2005; 2007; Olavo et al., 2007, 2011). Multivariate analysis indicate distinct species assemblages separated primarily by depth (the 200m isobath) and secondarily by latitude (19^{o}S), suggesting a continual transition along the depth and latitudinal gradients in the area. Species richness was negatively correlated with depth.

Spawning aggregations have been assessed on the northeastern Brazilian shelf as part of a national effort to support management decisions and guide environmental licensing in the region (Projeto Pro-Arriba[1]). Aggregations at shelf-edge reefs, reported by fishers, includes several species of snappers (*Lutjanus cyanopterus, L. jocu, L.analis, L vivanus, Ocyurus chrysurus*), jacks (*Caranx bartholomeis, C. latus, C. hippos, Seriola dumerilli*) and groupers (*Epinephelus itajare, Mycteroperca bonaci*). Evidences included UVC observations, peaks of CPUE from landings and gonadal evidences of imminent or recent spawning

[1] Reproductive aggregation of reef fishes in Brazil: Grant to the Environmental Licensing of Activities of E & P (Pro-Arribada Project). Program Term Commitment to Marine Seismic - Case No. 02001.003030/2001-82 IBAMA. Fauna Brazil Portfolio / FUNBIO / ICMBIO.

(Ferreira et al., 2012).

This region corresponds to a portion of the breeding ground of humpback whales (*Megaptera novaeangliae*) off the northeastern coast of Brazil (Zerbini et al., 2004; Rossi-Santos et al., 2009). Also corresponds to an importante habitat of various relatively low-density cetacean populations, including Bryde's whales (*Balaenoptera* cf. *edeni*), dwarf minke whales (*B. acutorostrata*), and bottlenose dolphins (*Tursiops truncatus*) (Andriolo et al, 2010, Danilewicz et al., unpubl. data).

Satellite telemetry was an efficient tool for defining both migratory pathways and the extent of internesting and foraging areas of the tracked sea turtles.

Foraging areas of loggerheads where identified along the continental shelf of Ceará State, where turtles remained for extended periods (2 to 3 yr). Additionally turtles demonstrated fidelity to foraging areas after successive post-nesting migrations (Marcovaldi et al. 2010). Foraging areas of hawksbills and olive ridleys were located along the continental shelf and shelf-edge, between the coast of Ceará State and northern coast of Bahia State (Da Silva et al. 2011, Marcovaldi et al. in press).

During post nesting migrations satellite-tracked females of three species (loggerheads, olive ridleys and hawksbills) utilized the northeastern Brazilian shelf and shelf-edge as a migratory corridor (Marcovaldi et al. 2010, Da Silva et al. 2011, Marcovaldi et al. in press). Also during pre-nesting migrations loggerheads turtles used the same migratory corridor (Marcovaldi et al. 2010).

Internesting home range areas of olive ridleys were located along the continental shelf and shelf-edge of Sergipe State (depth: 1-420m) (Da Silva et al. 2011). Internesting areas of hawksbills and loggerheads were situated in the northern coast of Bahia State, along the continental shelf and slope of main nesting beaches (Marcovaldi et al. 2010, Marcovaldi et al. in press).

Feature condition and future outlook of the proposed area

(Description of the current condition of the area – is this static, declining, improving, what are the particular vulnerabilities? Any planned research/programmes/investigations?)

Critical habitats for the life cycle of sea turtles and and reef fish species at the shelf-edge zone, as migratory corridors and fish spawning aggregation sites, are particularly vulnerable to predatory fishing with illegal nets for lobsters, intensive unregulated recreational fisheries, and increase of oil and gas exploration offshore along the proposed EBSA.

The status of six lutjanids stocks exploited in the northeastern and central Brazilian EEZ was assessed by REVIZEE Project, based on data collected between 1997-2000, from landings of the hand line fishery (Brasil, 2006). In central EEZ, the two main species, the yellowtail snapper *Ocyurus chrysurus* and the vermilion snapper *Rhomboplites aurorubens*, was seriously overexploited. Two species was under suitable fishing mortality levels (*Lutjanus jocu* and *L. vivanus*), and the remaining ones exhibited moderate overexploitation (*L. analis* and *L. synagris*) (Kippel at al., 2005).

Abundance declines have been perceived by fishers. The local knowledge of artisanal hand line fishers is site specific, rich and detailed, as fishing during aggregations mean exceptional catches. Spawning sites are likely to be multispecific and several commercially important species are involved. Lack of management and enforcement, increase of oil and gas prospection, and development of technology powered recreational fisheries figure among current threats. Co-management through fisheries agreements for seasonal closures and/or protection of selected sites seems to be the better option under scenery of mounting pressure (Ferreira et al., 2012).

The northeastern coast of Brazil hosts major breeding and nesting areas of loggerheads (*C. caretta*), olive ridleys (*L. olivacea*) and hawksbill turtles (*E. imbricata*), of the Western South Atlantic, where aggregations of these species occur during the breeding season. This area also comprises important foraging grounds for the three species. Migrations of these species between breeding and foraging grounds occur along the shelf and shelf-edge (Marcovaldi et al. 2010, Da Silva et al. 2011, Marcovaldi et al. in press).

Despite their importance as a critical ecological area, shelf edge zone are not currently included in any marine protected area network in the tropical south-western Atlantic. Improving knowledge to implement adequate management strategies for conservation and sustainable use of fisheries resources are considered urgent needs.

Assessment of the area against CBD EBSA Criteria

(Discuss the are in relation to each of the CBD criteria and relate the best available science. Note that a candidate EBSA may qualify on the basis of one or more of the criteria, the boundaries of the EBSA need not be defined with exact precision. And modeling may be used to estimate the presence of EBSA attributes. Please note where there are significant information gaps.)

CBD EBSA Criteria (Annex I to decision IX/20)	**Description** (Annex I to decision IX/20)	**Ranking of criterion relevance** (please mark one column with an X)			
		Don't Know	**Low**	**Some**	**High**
Uniqueness or rarity	Area contains either (i) unique ("the only one of its kind"), rare (occurs only in few locations) or endemic species, populations or communities, and/or (ii) unique, rare or distinct, habitats or ecosystems; and/or (iii) unique or unusual geomorphological or oceanographic features			X	

Explanation for ranking

The northeastern Brazilian shelf-edge zone contains distinct habitats and unusual geomorfological features such as shelf-edge reefs at the scale of the East Brazil Shelf Large Marine Ecosystem. The shelf-edge reefs represents a last refuge for some rare or endemic reef fishes distributed across the continental margin, including threatened (IUCN) commercial species of the snapper-grouper complex, currently depleted at the Brazilian EEZ jurisdiction. Examples of rare and endemic commercial reef fishes include: *Lutjanus alexandrei* (endemic species), Warsaw grouper *Epinephelus nigritus*, Yellowedge grouper *Epinephelus flavolimbatus*, Tiger grouper *Mycteroperca tigris*, and Yellowmouth grouper *Mycteroperca interstitialis*.

REVIZEE Project results indicated a great bottom heterogeneity of the shelf and slope, with the occurrence of canyons (sampled close to Salvador City and Itaparica and Camamu), which provide structural complexity and varied micro-habitats, allowing a greater number of benthic species in the area (Lavrado, 2006).

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Special importance for life-history stages of species	Areas that are required for a population to survive and thrive.				X

Explanation for ranking

Area of special importance for the life cycle of significant long-lived and slow growth commercial reef fish species, including persistent spawning aggregation sites and critical habitats for cross-shelf ontogenetic migrations.

Aggregations reported by fishers include several species of snappers (*Lutjanus cyanopterus, L. jocu, L.analis, L vivanus, Ocyurus chrysurus*), jacks (*Caranx bartholomei, C. latus, Seriola dumerilli*) and groupers (*Epinephelus itajara, Mycteroperca bonaci*). In situ verifications were successful for the cubbera snapper *Lutjanus cyanopterus* in six locations. Spawning evidences include UVC observations, peaks of CPUE from landings and gonadal evidences of imminent or recent spawning (Ferreira et al., 2012; Olavo et al, in press). Other species were observed aggregating in the same sites, especially carangids. The black grouper (*M. bonaci*) non-reproductive aggregation known as "correção" (Texeira et al, 2004). The intensively targeted event was recorded three times in the last 10 years (Ferreira et al., 2012).

The cubbera snapper *Lutjanus cyanopterus* is one of the largest snapper in the Atlantic ocean. Historical decline in adult productivity seems to be due to intensive fishing during aggregations at spawning sites, and to fishing with illegal nets for lobsters during cross-shelf migrations, including breeding (local or regional) movements along the shelf-edge zone. Since 2003, persistent annual (january-march) spawning aggregations of hundred to thousand individuals have been documented along shelf-edge reefs off Bahia state.

The Area are also a migratory zone for threatened sea turtles (*Caretta caretta, Eretmochelys imbricata* and *Lepidochelis olivacea*) connecting reproductive coastal areas and feeding areas, from Bahia to Ceará States.

This region corresponds to an importante habitat of various relatively low-density cetacean populations, including Bryde's whales (*Balaenoptera* cf. *edeni*), dwarf minke whales (*B. acutorostrata*), and bottlenose dolphins (*Tursiops truncatus*) (Andriolo et al, 2010, Danilewicz et al., unpubl. data).

The area are also a migratory zone for threatened sea turtles (*Caretta caretta, Eretmochelys imbricata* and *Lepidochelis olivacea*) connecting reproductive coastal areas and foraging grounds from Bahia to Ceará' (Marcovaldi et al. 2010, Da Silva et al. 2011, Marcovaldi et al. in press)

Importance for threatened, endangered or declining species and/or habitats	Area containing habitat for the survival and recovery of endangered, threatened, declining species or area with significant assemblages of such species.				X

Explanation for ranking

Area containing critical habitats for the survival and recovery of endangered, threatened or declining sea turtles, sharks and reef fish species, particularly of significant assemblages of large species of the snapper-grouper complex. This region corresponds to a portion of the breeding ground of humpback whales (Megaptera novaeangliae) off the northeastern coast of Brazil (Zerbini et al., 2004; Rossi-Santos et al., 2009). This species is still considered vulnerable by the government of Brazil (ICMBio, 2011).

Main snappers (Lutjanidae) species includes (regional IUCN classification / REVIZEE assessment): Southern red snapper *Lutjanus purpureus* (EN, Overexploited); Cubera snapper *Lutjanus cyanopterus* (VU); Mutton snapper *Lutjanus analis* (NT, Overexploited); Silk snapper *Lutjanus vivanus* (NT, Threatened); Vermilion snapper *Rhomboplites aurorubens* (NT, Overexploited); Dog snapper *Lutjanus jocu* (NT, Threatened); Lane snapper *Lutjanus synagris* (NT, Overexploited); Yellowtail snapper *Ocyurus chrysurus* (NT, Overexploited)

Main groupers (Serranidae) species includes (global IUCN classification): Warsaw grouper *Epinephelus nigritus* (CR); Red grouper *Epinephelus morio* (NT); Black grouper *Mycteroperca bonaci* (NT); Tiger grouper *Mycteroperca tigris* (NT); Yellowedge grouper *Epinephelus flavolimbatus* (VU); Snowy grouper *Epinephelus niveatus* (VU); Yellowmouth grouper *Mycteroperca interstitialis* (VU)

Main sea turtles species: (global IUCN classification): *Caretta caretta* (EN); *Eretmochelys imbricata* (CR); Lepidochelys olivacea (VU) (IUCN 2011). National classification: *Caretta caretta* and *Lepidochelys olivacea* (EN), and *Eretmochelys imbricata* (CR) (Castilhos et al. 2011, Marcovaldi et al. 2011, Santos et al. 2011)

Main sea sharks species: *Ginglimostoma cirratum*; *Rhincodon typus*

Vulnerability, fragility, sensitivity, or slow recovery	Areas that contain a relatively high proportion of sensitive habitats, biotopes or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery.				X

Explanation for ranking

Area containing a relatively high proportion of sensitive species of large reef fishes, with slow recovery and highly susceptible to habitat degradation and depletion by human activity at the northeastern Brazilian shelf

edge. This species includes long-lived and slow growth snappers and groupers that exhibit transient spawning aggregation behavior (*sensu* Domeier & Colin, 1997).

Biological productivity	Area containing species, populations or communities with comparatively higher natural biological productivity.		X		

Explanation for ranking

Occurrences of events of vertical mixing between TW and SACW improving local primary production had been reported by REVIZEE Program to the proposed Area (Brasil, 2006). Evidences of local upwelling also have been observed in spawning aggregation sites identified by the Pro-Arribada Project.

Biological diversity	Area contains comparatively higher diversity of ecosystems, habitats, communities, or species, or has higher genetic diversity.				**X**

Explanation for ranking

As a marine ecotone, the continental shelf-edge zone is characterized by comparatively high population densities and species richness due by the coexistence of different components of the demersal, benthic and benthopelagic communities of the continental shelf, upper slope and adjacent pelagic biota, providing a concentration of diverse fishing resources over a relatively narrow area (Olavo et al., 2011).

Results of REVIZEE indicated the occurrence of a very rich benthic fauna on slope areas between 11^{o} S and 16^{o}S, mainly off Salvador, up to 2000 m depth. It also indicated a great bottom heterogeneity of the shelf and slope, with the occurrence of canyons (close to Salvador City, Itaparica and Camamu), which provide structural complexity and varied micro-habitats, allowing a greater number of benthic species in the area (Lavrado, 2006).

Naturalness	Area with a comparatively higher degree of naturalness as a result of the lack of or low level of human-induced disturbance or degradation.			**X**	

Explanation for ranking

The northeastern Brazilian continental shelf is narrow, the access and concentration of fishing effort on reef resources in the shelf-edge zone is particularly notable in the Area. The reef formations at the edge of the this continental shelf sustain numerous local fleets dedicated mainly to traditional artisanal hook and line fisheries and bottom longline fishing, with thousands boats dedicated to this activity (Fonteles-Filho and Ferreira, 1987; Paiva et al., 1996; Costa et al., 2003; Frédou and Ferreira, 2005; Olavo et al., 2005; Martins et al., 2006).

The origin of historical fishing exploitation of the northeastern Brazilian shelf-edge reefs refer to a secular development of the "Jangada do Alto" tradition to high seas fishing, during colonial times in Brazil (Cascudo, 1964). Despite this historical use of northeastern Brazilian shelf-edge reefs, the Area remains with a comparatively higher degree of naturalness as a result of relatively low levels of human-induced disturbances or degradation, when comparing higher disturbances and degradation of adjacent inner continental shelf habitats.

Illegal lobster fishing using long and non-selective gill nets ("rede caçoeira") upon the outer shelf reef and rubble habitats is another growing regional threat for habitat integrity. Reef fishes captured are not commercialized or consumed, but retained as bait in the nets, to attract more valuable lobsters.

Lack of management and enforcement, increase of oil and gas prospection, and development of technology powered recreational fisheries figure among current threats.

Sharing experiences and information applying other criteria (Optional)

Other Criteria	Description	Ranking of criterion relevance (please mark one column with an X)			
		Don't Know	**Low**	**Some**	**High**
Sociocultural importance for traditional comunities of artisanal fishers.	Areas containing habitats or natural resources required for human traditional populations to survive.				**X**

The integrity of the proposed Area sustain important fishing grounds and ensure the material basis for the survival and cultural reproduction to thousands fishermen families and artisanal communities dedicated to hand line fisheries, particularly to tradicional populations of northeastern Brazilian "Jangadeiros" (Formman, 1967; Maldonato, 1993).

The local knowledge of artisanal hand line fishers is site specific, rich and detailed. Incorporate traditional knowledge and management practice, with the involvement of traditional fishing communities from the planning to the implementation phases of fisheries management plans seems to be the better option to improve social inclusion and promote co-management through fisheries agreements (Diegues et al., 2008).

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(e.g. relevant documents and publications, including URL where available; relevant data sets, including where these are; information pertaining to relevant audio/visual material, video, models, etc]

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