

Fisheries monitoring in Babel: fish ethnotaxonomy in a hotspot of common names

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The lack of a long term, comprehensive and reliable fisheries statistics system is a major impediment to fisheries management in Brazil. Fishing is one of the main activities throughout the country's coast, with predominance of small-scale, artisanal, multigear, and multispecies captures that are landed in a pulverized network of coastal villages. Brazil is also a hotspot of common names, another feature that challenges artisanal fisheries' monitoring. We combined taxonomic and ethnobiological information to support the implementation of an artisanal fisheries' monitoring program under the co-management framework of a Marine Extractive Reserve in Bahia State, Northeastern Brazil. We surveyed 141 fishing landings, recording 86 fish species (43 families) and 52 correspondences 1:1 between local and scientific names. Broad folk categories had an average of 5.1 specific names, with "cação" (shark) being the category with more specific names (24 names to six biological species). With the exception of species that make up the bycatch captured by shrimp trawling, fisherfolks are able to identify commercially important species from both fresh specimens and photos. Common names can be reliably used in fisheries monitoring programs, and their usage facilitates the participation of fisherfolks in surveys based on voluntary or compulsory declarations of captures.

A falta de um sistema compreensivo e confiável de estatísticas pesqueiras em longo prazo é um dos maiores dificultadores da gestão pesqueira no Brasil. A pesca é uma das principais atividades ao longo da costa do país, com predominância de capturas artesanais de pequena escala, envolvendo múltiplas artes e espécies, além de desembarques realizados em uma rede pulverizada de localidades costeiras. O Brasil também possui grande riqueza de nomes comuns, outra característica que complica o monitoramento da pesca artesanal. No presente trabalho, combinamos informações taxonômicas e etnobiológicas para apoiar a implementação de um programa de monitoramento da pesca artesanal recifal e costeira sob o arcabouço de cogestão de uma Reserva Extrativista Marinha no estado da Bahia, Nordeste do Brasil. Foram amostrados 141 desembarques e registradas 86 espécies de peixes (43 famílias), com 52 correspondências 1:1 entre nomes locais e científicos. Categorias de nomes comuns genéricos tiveram uma média de 5,1 nomes específicos locais, com "cação" sendo aquela com mais nomes específicos (24 nomes para seis espécies biológicas). Excetuando-se as espécies capturadas como fauna acompanhante do arrasto-de-camarão, observamos que os pescadores são capazes de identificar as espécies comercialmente importantes tanto a partir de espécimes quanto de fotografias. Os nomes comuns podem ser usados com segurança em programas de monitoramento de pescarias de pequena escala, sendo que seu uso facilita a participação dos pescadores em levantamentos baseados em declarações de captura, sejam elas voluntárias ou compulsórias.

Key words: Bahia, Corumbau, Cumuruxatiba, Local Ecological Knowledge, Marine Extractive Reserve.

Introduction

Fishing is one of the main activities in rivers, reservoirs, and throughout the Brazilian coast, involving more than two million people (Diegues, 2002). Small-scale artisanal fisheries with both commercial and subsistence components are widespread, operating in a pulverized network of landing sites, with multiple gears and targeting a broad array of target species

– a combination of factors that challenges its assessment and monitoring (Vasconcellos *et al.*, 2007). As a consequence, public policies and subsidies are biased towards the better-reported industrial sector (Abdallah & Sumaila, 2007), and even the general state of the stocks targeted by artisanal fisheries is still poorly known (Okada *et al.*, 2005; Ruffino, 2008). Remarkably though, the total yields from the artisanal sector are higher than those of industrial fisheries, especially

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in the Northeastern coast (Paiva, 1997; IBAMA, 2010; Begossi, 2010).

Artisanal fisheries are associated with specific coastal territories held under a wide range of tenure arrangements (Cordell, 2007), some of which eventually becoming as Extractive Reserves for initiative of traditional populations. Besides particular modes of labour division across households and communities (e.g., Diegues, 1983, 2004), traditional fisheries comprise a relatively high level of fisherfolks' knowledge about the environment and the target species, which is transmitted over generations (Posey, 1987; Silvano & Valbo-Jørgensen, 2008; Begossi *et al.*, 2011). The identification of resources by names is one of the first steps in the construction and consolidation of Local Ecological Knowledge (LEK) (Wilson *et al.*, 2006), and a major constituent of traditional fishing territories (Farias Júnior, 2010; Vianna Júnior, 2010; Teixeira *et al.*, 2013).

Marine species targeted by fisheries receive different local names along the extensive, diverse and culturally heterogeneous Brazilian coastline. The national average is six common names for each biological species, but there are fish species with over 30 common names, besides higher-level taxonomic groups that include different families, genera and species that are referred to by a single common name (Freire & Pauly, 2005), such as in the case of rays ("raia" or "arraia" in Brazilian Portuguese). This variety of common names has resulted in low resolution assessments, as catch statistics are generally recorded only with common names, challenging stock assessments (Vasconcellos *et al.*, 2007) and the reconstruction of time series for several target species (Freire & Oliveira, 2007). Assessments of species sold as a single category, such as "red snapper" (e.g., Marko *et al.*, 2004), as well as of transboundary fish stocks (e.g., Collette *et al.*, 2011), are also hampered by the variety of regional names.

In a study about fish folk taxonomy in the Atlantic forest and the Amazon, Begossi *et al.*, (2008) found a great correspondence between the classification made by fisherfolks and the scientific names, but such matches may be much more variable along the coast (Freire & Pauly, 2005). Therefore, in the scope of a larger initiative aiming at the implementation of a fisheries co-management regime in the Marine Extractive Reserve of Corumbau (MERC) (see Moura *et al.*, 2007, 2009; Alves *et al.*, 2012), we developed and tested a protocol to match common and scientific names of fish species exploited by artisanal fisheries, combining taxonomic and ethnobiological information.

The study was carried out in Cumuruxatiba, the largest fishing village in the MERC, from where capture-related (e.g., Capture Per Unit Effort - CPUE) and biological information have been reported only under common names since 2001 (Alves *et al.*, 2012). Given the importance of artisanal fisheries in Brazil, the "ethnotaxonomy impediment" for fisheries monitoring must be disentangled with such small scale assessments, which can also

contribute to the consolidation of traditional fishing territories along the coast and in the major rivers, as common names are primary components of LEK and may be highly specific to circumscribed sections of the coast (Freire & Pauly, 2005).

Material and Methods

The Marine Extractive Reserve of Corumbau (MERC) is located in the southern coast of Bahia State, Northeastern Brazil, occupying *ca.* 900 km² (Fig. 1). In the late 1990's local fisherfolks, led by villagers from Corumbau and other six neighboring localities with strong Indigenous inheritance (Caraíva, Aldeia Barra Velha, Aldeia Bugigão, Veleiro, Cumuruxatiba, and Imbassuaba), claimed the establishment of an Extractive Reserve. Their main objectives included the exclusion of fishing fleets from other municipalities, improvements of life quality and protection of local culture (Moura *et al.*, 2009). MERC is located in the northern extreme of the so-called Abrolhos Bank, a region that encompasses Brazil's first network of Marine Protected Areas (MPA). Although there are several conflicts between local fisherfolks and MPAs in the Abrolhos Bank, fisherfolks from MERC have always had very limited interaction with the no-take MPAs. A more complete analysis of the MPA system and its conflicts is provided by Moura *et al.* (2013).

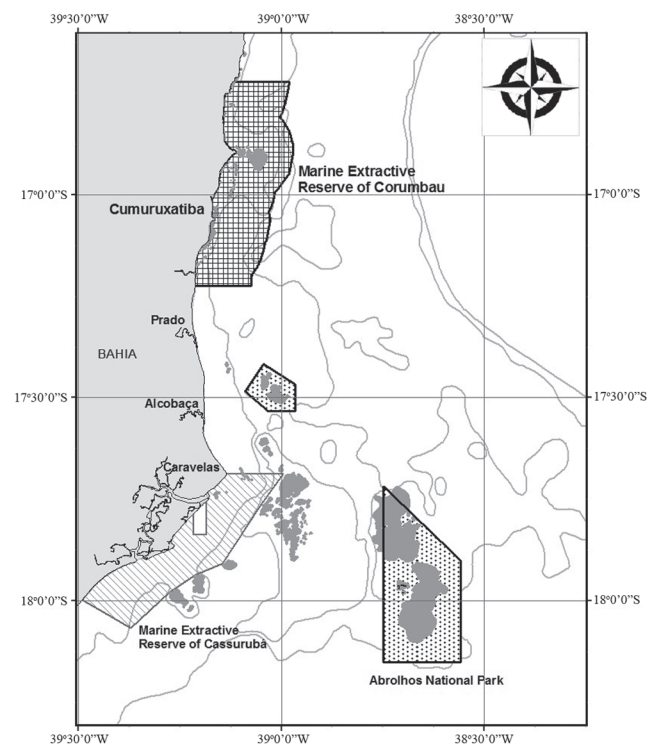


Fig. 1. Map of the study region showing the location of Cumuruxatiba within the Marine Extractive Reserve of Corumbau, Bahia, Northeastern Brazil.

Our study was conducted in Cumuruxatiba, Prado municipality, the largest MERC village, with an economy based on fishing (35 canoes and 25 motor boats) and tourism (Moura *et al.*, 2007; Di Ciommo, 2007). Most traditional fisherfolks from Cumuruxatiba are descendants of Pataxós Indigenous People (the major Pataxós' settlement, Aldeia Barra Velha, is one of the other six coastal villages of the MERC). Cumuruxatiba has one association devoted to communitarian issues, including fisheries, and there is a representative fishing community with 164 families, 45% of them also involved with tourism (informal employees of hotels and restaurants, housekeepers, trade of food and handicrafts, boat pilots) (Moura *et al.*, 2007, 2009; Di Ciommo, 2007). Cumuruxatiba fisherfolks use hook-and-line, longline, gillnets and spears over reefs, sand, and muddy bottom (Moura *et al.*, 2007), and remain at sea 3-13 days/month and catch 23-186 kg of fish/month (Alves *et al.*, 2012). The total MERC production for 2006 was estimated at 315-349 t, corresponding to 1% of the fish production in Bahia State in that year (Alves *et al.*, 2012).

The protocol for matching common and scientific names consisted in a qualitative sampling of 141 landings, followed by interviews with all boat captains and local experts ($n = 6$). Local experts are individuals that were recurrently pointed out as such during 30 initial interviews with randomly selected fisherfolks. Local experts were interviewed about the common names for each of the most frequent names recorded in the fisheries monitoring database. Sampling was carried out intensively for two weeks in 2009, during which most landings were inspected, one week during the summer (February 28 - March 7, 2009) and another during the winter (July 15-22).

At least one specimen of each landed species was collected and had its common name recorded. Specimens were photographed soon after collection, preserved in 10% formalin and further transferred to 70% ethanol for identification under stereomicroscope with use of the artificial keys provided by Figueiredo (1977), Figueiredo & Menezes (1978, 1980, 2000), Menezes & Figueiredo (1980, 1985), Moura & Lindeman (2007) and Marceniuk & Menezes (2007). Vouchers are deposited at the Museu de Zoologia, Universidade de São Paulo (MZUSP) (Table 1). Boat name, fishing spot, gear, and total capture (kg) were also recorded, and a collector's curve was used to assess sampling sufficiency (Krebs, 1989). Richness of common names was further evaluated by counting up synonyms (number of species by common name) and homonyms (number of species associated with each common name) (Minelli, 1999).

In order to assess potential biases arising from the use of photographic catalogs, after six months we re-interviewed 14 of fisherfolks who were interviewed during the summer. In this second interview we showed one to twenty-eight photographs and asked for the common names (number of images was proportional to the amount of fish each fisherfolk captured during the summer).

Results

The summer survey (92 landings) yielded 67 fish species, while the winter survey (49 fishing landings) yielded 52 fish species, totaling 86 species belonging to 43 families and 12 orders. Twenty species represent new records for the MERC (Table 1). The most species and families were Sciaenidae (15 species), Haemulidae (9), and Carangidae (5) (Fig. 2). The collector's curve began to stabilize after 67 species were sampled in the summer (94 landings), but it also reveals that more sampling in the winter could have yielded more species (Fig. 3).

We recorded 102 common names and 52 correspondences (1:1) between scientific and common names (Table 1). Species with the largest variety of common names were caught with trawls (Fig. 4). There were more landings and higher species richness in captures with trawl and hook-and-line, in both seasons (Fig. 5).

Most fish species (67, or 77%) received a single common name, and most common names (74, or 80%) corresponded to only one species (Figs. 6a-b), with a total of 102 common names and an average of 1.5 common names per species (Table 1). Species that received the largest number of common names were *Ctenosciaena gracilicirrhus* (5 common names), *Harengula clupeiola* (4), *Paralonchurus brasiliensis* (4) and *Bagre marinus* (4). Common names with more correspondences to scientific names were "peixe-cascudo" (4 species), "maramassá" (4), and "peixe-branco" (4).

In the interviews with the six local experts, the mean number of specific common names for each generic common name was 5.21. Generic names with more specific names were "cação" (24), "bagre" (11), "raia" (10), "lagosta" (10), and "pescada" (10), while six generic common names ("carapeba", "garoupa", "grassari", "guaiúba", "salema", and "sauara") had only one name (Table 2).

A total of 89 photos were shown to the fisherfolks that were re-interviewed. Seventy-four percent of the identifications from photographs matched the initial assignments made six months earlier. Mismatches are mostly fishes captured as bycatch of shrimp trawling (*e.g.*, cangatã and bagre-branco; zoiuda and sardinha; miriquita and sardinha) (Fig. 7).

Discussion

Fishing represents the most important extractive activity in Brazil, with the larger fraction of the National yields coming from the artisanal sector (Vasconcellos *et al.*, 2007; Paiva, 1997; Begossi, 2010). Despite the engagement of more than two million people, legal frameworks and public policies for artisanal fisheries remain weak, resulting in an ever-increasing marginalization of traditional communities, as well as in a steady loss of culturally based Local Ecological Knowledge (Teixeira *et al.*, 2013).

In order to overcome the "ethnotaxonomy impediment" for fisheries monitoring of artisanal fisheries in Brazil, we

Table 1. Fish species landed in Cumuruxatiba, Bahia, with their corresponding common names and catalog number of vouchers deposited at MZUSP. * First record for the Marine Extractive Reserve of Corumbau.

Catalog Number	Order	Family	Species	Common names
112178	Carcharhiniformes	Carcharhinidae	<i>Carcharhinus porosus</i> *	Lauê
112159	Rajiformes	Dasyatidae	<i>Dasyatis guttata</i>	Raia-cascuda, raia-couro-duro
112149		Gymnuridae	<i>Gymnura micrura</i> *	Raia-manteiga, raia-papel
112181		Myliobatidae	<i>Aetobatus narinari</i>	Raia-pintada
112137		Rhinobatidae	<i>Rhinobatos percellens</i> *	Raia-viola
112194	Albuliformes	Albulidae	<i>Albula vulpes</i>	Peixe-cutia
112197	Anguilliformes	Ophichthidae	<i>Ophichthus cylindroideus</i>	Corongo
112161	Clupeiformes	Clupeidae	<i>Harengula clupeola</i> *	Feijão-queimado, miriquita, sardinha, zoiuda
112147			<i>Odontognathus mucronatus</i>	Peixe-papel, raleza, realeza
112157			<i>Opisthonema oglinum</i>	Sardinha
112138		Engraulidae	<i>Anchoa spinifer</i>	Muja
112162			<i>Lycengraulis grossidens</i>	Sardinha, sardinha-boca-de-cancela
112151	Siluriformes	Ariidae	<i>Bagre bagre</i>	Bagre-vela
112125			<i>Bagre marinus</i>	Bagre-bagre, bagre-branco, bagre-cabeçudo, bagre-catinguento
112126			<i>Notarius grandicassis</i> *	Bagre-amarelo, caçari, calafate
112190	Ophidiiformes	Ophidiidae	<i>Ophidion holbrookii</i>	-
112156	Mugiliformes	Mugilidae	<i>Mugil curema</i>	Tainha
112130	Scorpaeniformes	Scorpaenidae	<i>Helicolenus dactylopterus</i> *	Mureatinha, pocomã
112128		Triglidae	<i>Prionotus punctatus</i>	Peixe-voador, voador
112200	Perciformes	Carangidae	<i>Caranx latus</i>	Xaréu
112131			<i>Chloroscombrus chrysurus</i>	Xixarro
112140			<i>Oligoplites saurus</i> *	Guaibira
112154			<i>Selene vomer</i>	Galo, peixe-galo
112118			<i>Caranx crysos</i>	Guaricema, xaréu
112191		Centropomidae	<i>Centropomus parallelus</i>	Robalo-branco
112139		Ephippidae	<i>Chaetodipterus faber</i>	Paru
112155		Gerreidae	<i>Diapterus rhombeus</i> *	Carapeba
			<i>Eucinostomus gula</i> *	Piratima
112196		Haemulidae	<i>Anisotremus surinamensis</i>	-
112133			<i>Anisotremus virginicus</i>	Frade
112188			<i>Boridia grossidens</i> *	Sauara
112158			<i>Conodon nobilis</i>	Curuvina-rajada, giruna
112152			<i>Genyatremus luteus</i>	Sauara
112187			<i>Haemulon aurolineatum</i>	Saquarati
112186			<i>Haemulon parra</i>	Binquara-branca, cain-cain
112170			<i>Haemulon plumierii</i>	Binquara, binquara boca-vermelha
112195			<i>Haemulopsis corvinaeformis</i>	Giruna
112136		Labridae	<i>Bodianus rufus</i>	Budião-bico-de-papagaio
112134		Lutjanidae	<i>Lutjanus jocu</i>	Ariocó, vermelho
112171			<i>Lutjanus synagris</i>	Ariocó
112119			<i>Ocyurus chrysurus</i>	Cioba, Guaiúba
112169			<i>Rhomboplites aurorubens</i>	Realito
112176		Mullidae	<i>Pseudupeneus maculatus</i>	Piau
112168		Polynemidae	<i>Polydactylus oligodon</i> *	Barbudo
112175			<i>Polydactylus virginicus</i>	Barbudo
112180		Pomacanthidae	<i>Pomacanthus paru</i>	Paru-preto
112203		Pomacentridae	<i>Abudefduf saxatilis</i>	Carapiaçava
112184		Pomatomidae	<i>Pomatomus saltatrix</i> *	Pixima-do-norte
112202		Priacanthidae	<i>Priacanthus arenatus</i>	Olho-de-vidro, zoio-de-vidro
			<i>Priacanthus</i> sp.	-
112177		Scaridae	<i>Sparisoma axillare</i>	Peixe-batata

propose that instead of following the Western trend of standardizing common names (e.g., Nelson *et al.*, 2004), the Brazilian hotspot of common names is comprehensively recorded and understood, and further incorporated in biological surveys and long term monitoring. Such approach would not only improve local participation, but will also help consolidate traditional fishing territories threatened by steadily increasing pressure from industrial fisheries and other sectors. Identification of natural

resources by local common names is an important constructive basis of LEK, and a major constituent of traditional fishing territories (Farias Júnior, 2010; Vianna Júnior, 2010).

Our study contributed to characterize the landings and fish ethnospecies' richness in a traditional fishing village in eastern tropical Brazil, but we acknowledge that some of our common name records seem to be generic (*i.e.*, they either refer to rare or poorly-known fishes, or to groups of

Table 1. cont. Fish species landed in Cumuruxatiba, Bahia, with their corresponding common names and catalog number of vouchers deposited at MZUSP. * First record for the Marine Extractive Reserve of Corumbau.

Catalog Number	Order	Family	Species	Common names
112165		Sciaenidae	<i>Ctenosciaena gracilicirrus</i>	Cascudo, João-torrão, peixe-curuvina, peixe-branco, peixe-cascudo
112167			<i>Cynoscion leiarchus</i>	Enxova, pixima, peixe cascudo
112129			<i>Cynoscion jamaicensis</i>	Cascudo, peixe-branco, peixe-cascudo
112127			<i>Cynoscion virescens</i>	Peixe-branco, pescada
112143			<i>Isopisthus parvipinnis</i>	Peixe-branco
112124			<i>Larimus breviceps</i>	Boca-torta
112148			<i>Macrodon ancylodon</i>	Samucanga
112163			<i>Menticirrhus americanus</i>	Joana, sametara
112140			<i>Menticirrhus littoralis</i>	Joana, sametara
112179			<i>Micropogonias furnieri*</i>	Peixe-curuvina
112183			<i>Nebris microps*</i>	Perna-de-moça
112145			<i>Ophioscion punctatissimus*</i>	Cara-suja
112123			<i>Paralonchurus brasiliensis</i>	Curuvina-rajada, papaterra, peixe-curuvina, peixe-rajado
112144			<i>Stellifer brasiliensis</i>	Cabeça-de-coco
112189			<i>Stellifer rastrifer</i>	Cabeça-de-coco, peixe-cascudo
112121		Scombridae	<i>Euthynnus alletteratus*</i>	Albacora, atum, avacora
112150			<i>Scomberomorus brasiliensis</i>	Avacora, sarda-sarda
112120			<i>Scomberomorus cavalla</i>	Sarda-cavala
112135		Serranidae	<i>Cephalopholis fulva</i>	Jabu, catuá, realito
112166			<i>Diplectrum formosum*</i>	Jacundá
112174			<i>Diplectrum radiale</i>	Jacundá
112172		Sparidae	<i>Calamus pennatula</i>	Peixe-pena
112160		Sphyraenidae	<i>Sphyraena guachancho</i>	Bicuda
112164		Stromateidae	<i>Peprilus paru</i>	Pampo-espinho-mole, pampo, capado
112185		Trichiuridae	<i>Trichiurus lepturus</i>	Peixe-espada
112199		Uranoscopidae	<i>Astroscopeus y-graecum*</i>	Pocomã
112198	Pleuronectiformes	Achiridae	<i>Trinectes paulistanus</i>	Maramassá
112146		Cynoglossidae	<i>Symphurus tessellatus</i>	Linguado
112122		Paralichthyidae	<i>Cyclopsetta chittendeni</i>	Maramassá
112192			<i>Etropus crossotus*</i>	Maramassá
112142			<i>Syacium papillosum</i>	Maramassá
112153	Tetraodontiformes	Balistidae	<i>Balistes caprisicus*</i>	Peroá
		Diodontidae	<i>Cyclichthys spinosus</i>	Baiacu, baiacu-de-espinho
112201		Monacanthidae	<i>Aluterus monoceros</i>	Peroá-tamanco
112182		Tetraodontidae	<i>Lagocephalus laevigatus</i>	Baiacu-ará

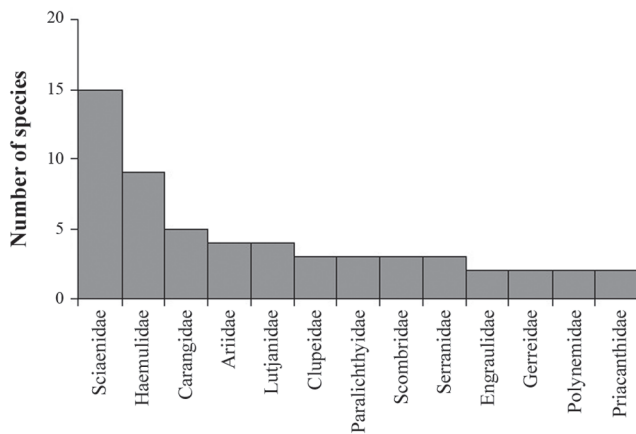


Fig. 2. Number of fish species recorded in each family in the artisanal landings of Cumuruxatiba, Bahia.

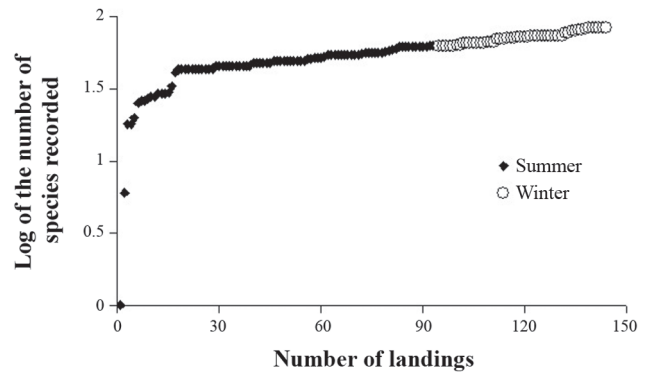


Fig. 3. Collector's curve: cumulative number of species according to the number of landings sampled in Cumuruxatiba, Bahia.

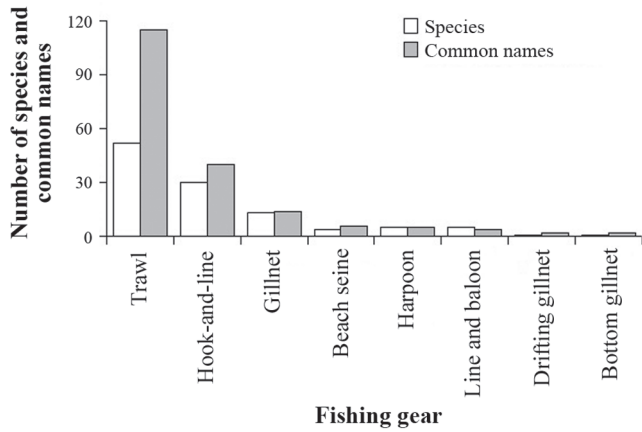


Fig. 4. Richness of common names by species for the main fishing gears utilized in Cumuruxatiba, Bahia.

similar species), and thus might not correspond to ethnospecies (e.g., “peixe-branco”). Although a comprehensive ethnoclassification of the fisheries resources (e.g., Oliveira *et al.*, 2012) was outside the scope of our work, we clearly demonstrate that local names can be reliably used in fisheries monitoring programs, corroborating Begossi *et al.* (2008) statements and pointing towards a broader application of common names to record fisheries yields, following adequate ethnoichthyology surveys.

We were able to identify 86 fish species and 102 common names, and to match scientific with local names. This study also added 20 species to the previous regional list of *ca.*

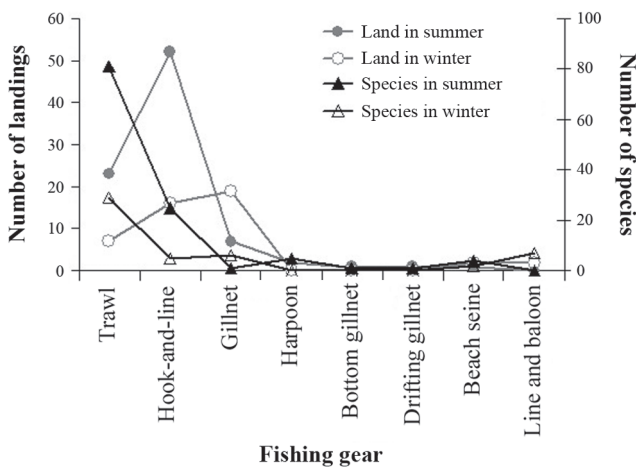
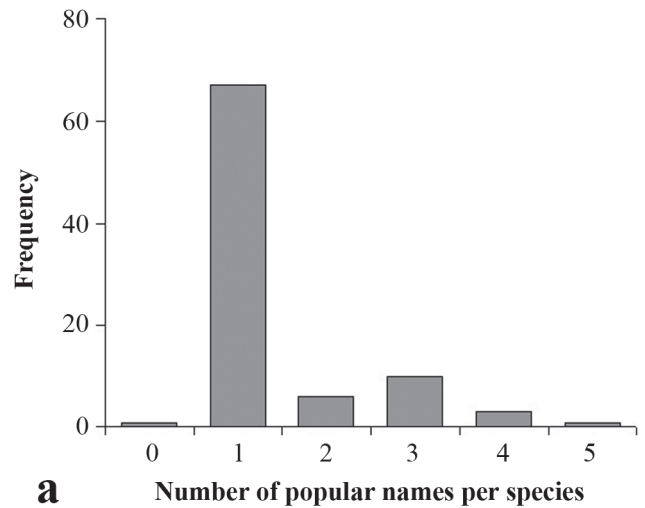
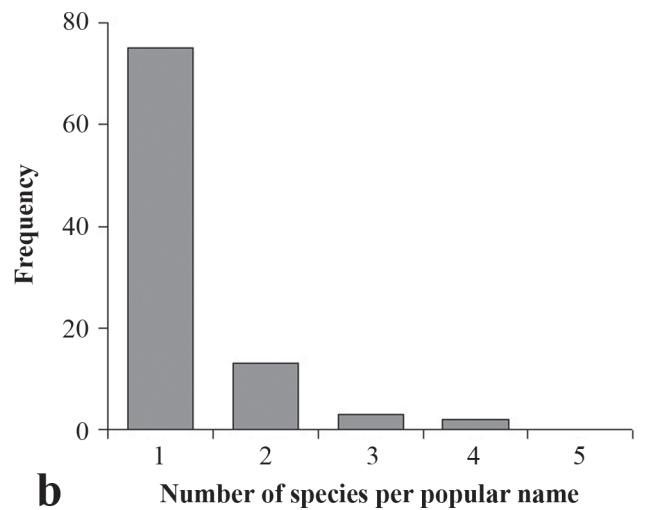


Fig. 5. Number of fish species captured by each fishing gear used by Cumuruxatiba fisherfolks (n = 141 landings).



a Number of popular names per species



b Number of species per popular name

Fig. 6. Richness of common names of marine species in Cumuruxatiba, Bahia. **a)** frequency of species with 0-5 common names, and **b)** frequency of common names matching 1-4 species.

270 fish species that includes small, cryptic, and deep-dwelling species that are not captured by artisanal fisheries (Moura & Francini-Filho, 2005). Most commercially important fish species presented only one common name, and local experts indicated relatively few synonyms, much less than the National average of six (Freire & Pauly, 2005). Throughout the Brazilian coast “cação” (shark) and “pescada” (Sciaenidae - weakfish, croaker) represent 20 and 13 different morphologically similar species, respectively (Freire & Pauly, 2005). In Cumuruxatiba, we found the same order of magnitude of variation among the local experts that we interviewed, who were able to distinguish 24 different types of “cação” and 10 types of

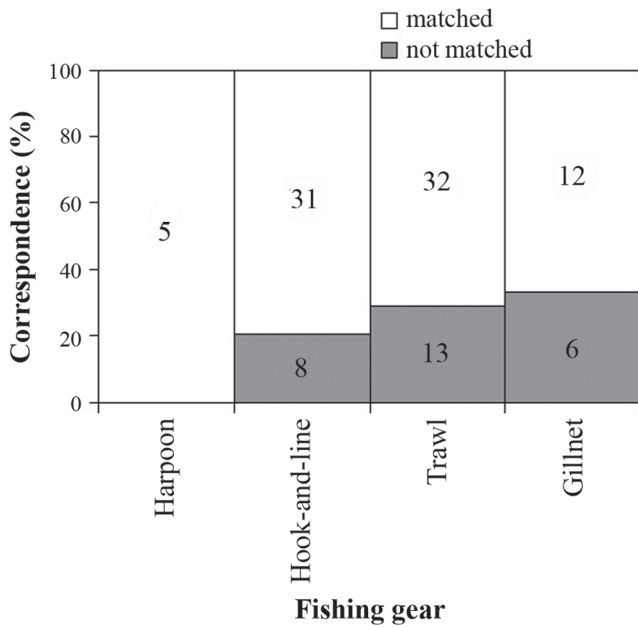


Fig. 7. Correspondence between the 89 names given by 14 Cumuruxatiba fishers to fresh specimen photographs’ shown six months later. Numbers represent the number of species.

weakfish (“pescada”). This richness of binomial common names can be applied to statistical fishing data, increasing the accuracy when registering common generic and specific names. From our results, we were able to highlight some pervasive biases in the official statistics, which are based only on common generic names. For instance, landings of 5,240 tonnes of “peroá” were recorded in 2010 (IBAMA, 2012), but throughout the Brazilian coast there are several species that can receive this same name. Only in the MERC area we recorded at least five specific common names for “peroá” (Table 2).

Although Silvano *et al.* (2006) propose that the LEK about migration and spawning seasons of several coastal fish species is loosely defined in the Northeastern Brazilian coast, the seasonal variation in the occurrence of some species is well perceived among Cumuruxatiba fisherfolks, and was a remarkable characteristic recorded in several opportunities during our fieldwork. For instance, the lower richness of fishes in the winter is a well-recognized pattern across the entire MERC area (“in the winter fish go away to the reefs, and we cannot catch them” – local fisherfolks quote). Begossi *et al.* (2011) argue that in a neighboring municipality (Porto Seguro, Bahia State), LEK about snappers’ reproductive behavior is restricted to older and more experienced fisherfolks. Our results

Table 2. Specific common names for each generic common name mentioned in interviews with local experts fisherfolks from Cumuruxatiba, Bahia. Numbers within parentheses correspond to the number of fisherfolks who cited such specific common name.

Generic Names	Specific Names
Cação	Cação-baleia (1), c.-barriga-branca (1), c.-buchechedo (1), c.-caneta (1), caciripora (1), galha-preta (2), espadarte (3), c.-ferro (4), c.-costa-verde (1), lauê-morisco (3), lauê (1), c.- lixa (5), c.- verde (2), c.- viola (2), c.- martelo (2), c.- mourisco (1), panã (1), c.-peru (3), c.-pintado (1), c.-sombreiro (1), tubarão (1), c.-tintureiro (1), c.-veiad’água (2), lauezinho (1).
Bagre	Bagre-amarelo (7), b.-azul (3), bagre (1), b.-branco (4), b.-bravo (1), b.-cabeçudo (4), b.-caçari (3), calafate (3), b.- cangatã (3), b.-do-mangue (1), griamã (2)
Raia	Raia-cachorro (1), r.-couro-duro (3), r.-cascuda (3), r.-carimbo (1), r.-jamanta (1), r.-manteiga (6), r.-morcego (2), r.- pintada (3), r.-roxa (3), r.-jamanta (1)
Lagosta	Lagosta- amarela (2), l.- branca (2), l.- cabeçuda (1), lagosta (1), l.- preta (4), l.- rosada (1), l.- sapateira (4), l.- tucano (2), l.- verde (2), l.- vermelha (4)
Pescada	Pescada-bicuda (1), escamuda (3), olhuda (3), pescada (2), pescada-amarela (2), pescada-branca (2), pescadinha (4), pixima (2), pixima-do-norte (1), samucanga (1)
Badejo	Badejo (6), garoupa (1), peixe-gato (1), b.-preto (1), mero (1), b.-pintado (1), mero-gato (1)
Robalo	Robalo-bapeba (1), r.-boca-redonda (1), r.-branco (5), r.-caramurupinho (1), r.-furão (5)
Baiacu	Baiacu-ará (5), b.-de-espinho (5), b.-de-rio (1), b.-pinima (2), b.-pintado (1), b.-tingo (1), b.-verde (1)
Tubarão	Cabeça-chata (1), costa-de-quina (1), galha-preta (1), panã (1), peru (1), tintureiro (1)
Peroá	Peroá-branca (1), p.-chato (1), p.-preto (5), p.-roxo (1), p.-tamanco (2)
Sarda	Barracuda (1), sarda-cavala (4), s.-pequena (1), sarda (5), sororoca (1)
Binquara	Binquara-amarela (1), b.-boca-vermelha (3), b.-branca (6), b.-preta (3)
Peixe pena	Pargo-pena (2), peixe -pena (1), pena (3), rajado (1)
Ariocó	Ariocó (6), ariocó-amarelo (1), a.-branco (1)
Guaricema	Guaricema-grande (1), guaricema (4), g.-mirim (1)
Pescadinha	Pescadinha (1), samucanga (3), pixima (1)
Pixima	Pixima-daqui (1), pixima-do-norte (1), pixima (4)
Sametara	Sametara-branca (1), sametara (4), s.-suja (1)
Xaréu	Cabeçudo (1), grassari (1), xaréu (7)
Bonito	Bejupirá (1), bonito (5)
Curuvina	Curuvina-grande (1), c.-mirim (1)
Samucanga	Pescadinha (1), samucanga (1)
Carapeba	Carapeba (1)
Garoupa	Garoupa (6)
Grassari	Grassari (4)
Guaiúba	Guaiúba (5)
Salema	Salema (2)
Sauara	Sauara (1)

are convergent, and we remark that our interviews were directed mainly to local experts who, in general, are the older fisherfolks with more extensive experience. Local Ecological Knowledge has a considerable potential as a reliable, rapid and low cost information source, but it is frequently challenged due to the lack of scientific validation and to the multiple and poorly understood biases deriving from measurement and analytical errors, as well as from political and cultural sources (Teixeira *et al.*, 2013).

Correspondence between ethnospecies and species identified through standard taxonomic methods seems to be greater for fish species captured by hand-line or harpoon. Besides being large-bodied (*i.e.*, easier to identify from morphology – except for sharks) and bearing greater utilitarian value, it seems that the several generation's relationship with these species facilitates their recognition by fisherfolks. On the other hand, shrimp trawling is a relatively new fishing technique, introduced in the late 1970's in the MERC region, and the recognition of the smaller-sized bycatch fish species that are generally discarded at sea tend to be less accurate. For instance, although MERC fisherfolks had a clear perception of reproductive cycles of lutjanids (snappers) that are traditionally captured with hand-lines (see Freitas *et al.*, 2011), they believed that juvenile penaeid shrimps captured with trawls (mostly *Xiphopenaeus kroyeri*) were egg-bearing carids that are commonly found in shallow warm waters of the study region (authors' unpublished data).

Ethnoecological methods commonly involve showing photographs, maps and drawings to local people, although such two-dimensional and small-size representations may introduce bias in the identifications of species, habitats and behaviors (Begossi *et al.*, 2008; Silvano *et al.*, 2008; Silvano & Valbø-Jorgensen, 2008). However, we found that the use of photos in interviews with fisherfolks can be reliably used, with few mismatches that generally correspond to smaller species that compose shrimp-trawling bycatch.

Our results emphasized that participatory fisheries monitoring shall start with ethnotaxonomy studies to gather to output reliable species-level data. Aggregation of species under meaningless or standardized (lumped) common names may mask serial depletion, when more valuable and generally less resilient species are overexploited first, followed by the overexploitation of less valuable species with the same generic name (*e.g.*, Kaprov *et al.*, 2000). In this case, only when the whole group is fully depleted (*e.g.*, sharks), landings would decrease. Ecosystem effects of fishing may be assessed using indicators measured in the catches, such as richness and diversity, size of specimens and fisheries capacity (Link, 2010), but these are dependent on species-level discrimination. Thus, collections of local specimens coupled with databases of common names can substantially improve the catch data to be used in fisheries management, also allowing for direct participation of user groups in the decision-making process.

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