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PEIXES DA CADEIA VITÓRIA – TRINDADE

ILHÉUS – BAHIA

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LIST OF FIGURES

LIST OF TABLES

SUMMARY

1. RESUMO

A Cadeia Vitória–Trindade (CVT) é um alinhamento de montanhas submarinas, com altura superior a 4000 m, e isoladas entre si e da margem continental por consideráveis distâncias (entre 50 e 250 km) e águas profundas (2.500 - 4.500 m). A CVT estende-se da margem continental para leste por cerca de 1.200 km, entre 20 e 21^{o}S, até o complexo de ilhas de Trindade e Martin Vaz. Juntamente com a margem continental adjacente, a região da CVT abriga a maior biodiversidade recifal do Atlântico Sul em uma zona de transição climática/biogeográfica. As expedições realizadas durante os últimos 15 anos promoveram um considerável nível de conhecimento da fauna de peixes recifais dos ambientes rasos (<30m) das ilhas. Estes sugeriram que a CVT facilita a conectividade da fauna recifal entre o continente e as Ilhas através das montanhas submarinas que, com seus topos na zona mesofótica, permitem o estabelecimento de populações isoladas e o fluxo de propágulos, funcionando assim como "trampolins" de conectividade (*stepping stones*). Essa hipótese foi aqui examinada com dados inéditos que compõe o primeiro inventário de espécies de peixes recifais dos topos das montanhas submarinas da CVT. Nossos resultados apoiam a sugestão de que as montanhas submarinas funcionam como *stepping stones* para algumas espécies. Já a distância geográfica, ou grau de isolamento, não é o fator mais crítico para a dispersão dos peixes recifais na região. Grande parte das espécies tidas como endêmicas das ilhas são encontradas amplamente distribuídas ao longo das montanhas submarinas. A composição da fauna de peixes recifais do topo das montanhas da CVT indica a existência de um fluxo bidirecional de propágulos. Desta forma, as montanhas submarinas atuam como verdadeiras ilhas funcionais às espécies recifais, podendo atuar tanto como fonte quanto como receptores de propágulos. Esse papel, no entanto, sofre influências combinadas do complexo hidrodinamismo, a disponibilidade de hábitats, as interações ecológicas, e as distintas características bioecológicas e da história de vida das espécies. A CVT funciona como um corredor regional de conectividade entre a margem continental e as ilhas, na região mais biodiversa do Atlântico sul. Portanto, uma região prioritária para a conservação, porém, atualmente bastante ameaçada pela sobrepesca e a mineração.

2. INTRODUÇÃO

Montanhas submarinas são feições originadas por processos de vulcanismo associados às intrusões magmáticas na litosfera oceânica (PITCHER et al., 2007). A distribuição destas feições ao redor do globo está relacionada a regiões de contato entre placas tectônicas (i.e. zonas de espalhamento do assoalho oceânico ou de subducção) ou a processos intra-placa (zonas de fratura) originados pela atividade de extravazamento das plumas mantélicas através dos pontos quentes - *hotspots* (WESSEL, 2007). Com uma área de aproximadamente 10 milhões de km², as montanhas submarinas representam um dos biomas mais representativos do planeta, existindo mais de 40.000 montanhas submarinas espalhadas ao redor do globo terrestre (KIM & WESSEL, 2011). Contudo, somente menos de 200 montanhas submarinas já foram amostradas biologicamente (ETNOYER et al., 2010).

Além da distância entre as fontes de propágulos, a conectividade entre montanhas submarinas pode ser influenciada por diversos fatores como pela disponibilidade e tamanho de habitats adequados aos adultos sesseis/demersais (e.g. tipo de substrato e profundidade), a hidrodinâmica regional (e.g. condições para dispersão e retenção larval) e pelas distintas capacidades dispersivas das espécies (FROESE & SAMPANG, 2004; MCCLAIN et al., 2009; ROWDEN et al., 2010; SCHLACHER et al., 2010; SHANK, 2010; HART & PEARSON, 2011; HOBBS et al., 2012; CLARK et al., 2012).

A maioria dos estudos sobre peixes em montanhas submarinas é baseada em métodos seletivos de amostragem que utilizam baiscamente os petrechos pesqueiros (FOCK et al., 2002; BERGSTAD et al., 2008; FOSSEN et al., 2008). Amostragens que utilizam das operações de mergulho são escassas e incluíram somente o estrato superior (até 60m) da zona mesofótica (GONÇALVES et al., 2004; SLATTERY et al., 2011). A zona mesofótica (PYLE, 1996), entre 30 e 200 m, é caracterizada pela transição eufótico-afótica (e.g. FRICKE & KNAUER, 1986; LIDDELL et al., 1997), abrigando tanto espécies características de ambientes iluminados quanto àquelas restritas a zonas de penumbra e escuridão (LESSER et al., 2009), representado, assim, um *hotspot* de biodiversidade (GRAHAM et al., 2007; SHANK, 2010). Contudo, por estar além do limite das operações com SCUBA, esta zona ainda é mal amostrada (KAHNG et al., 2010; HINDERSTEIN *et al.*, 2010; LOCKER et al., 2010). Todavia, o interesse em recifes mesofóticos é crescente, tanto pela presença de um grande número de espécies novas quanto por poderem exercer o papel de refúgio e fonte de propágulos durante períodos de condições ambientais adversas (hipótese do refúgio profundo) (BONGAERTS et al., 2010; SLATTERY et al., 2011). Tanto as montanhas submarinas quanto as zonas mesofóticas do Atlântico Sul permanecem pouco exploradas, tendo sido alvo de três estudos sobre peixes (FEITOZA et al. 2005; OLAVO et al., 2011; PEREIRA-FILHO et al., 2012). Nessa região, recifes mesofóticos da plataforma e do talude superior podem atuar como corredores de conectividade e refúgio, representando habitat essencial para espécies de peixes com interesse comercial e já sobre-explotadas em áreas rasas (FEITOZA et al., 2005; OLAVO et al., 2011).

Como são áreas de descontinuidade topográfica repentina sobre as planícies abissais, as montanhas submarinas oferecem condições para a ressurgência de nutrientes, sustentando, assim, uma elevada produtividade primária. Além disso, em comparação com as zonas oceânicas adjacentes, podem abrigar uma maior diversidade de espécies, principalmente aquelas associadas aos recifes (FROESE & SAMPANG, 2004; SAMADI et al., 2007; BO et al., 2011). O isolamento proporcionado pela carência de habitats adequados a fauna recifal nas vastas zonas oceânicas, confere às montanhas submarinas que possuem seus topos a relativas rasas profundidades uma função equivalente a de ilhas à manutenção da biota (HUBS, 1959 e MACARTHUR & WILSON, 1967), podendo então ser consideradas como ilhas funcionais (IF's) às espécies recifais (WESSEL, 2007; STOCKS & HART, 2007). As assembleias de peixes recifais possuem forte estrutura metapopulacional através da interligação entre as populações locais (SALE, 1991). Esta característica é devido ao complexo ciclo de vida das espécies com adultos que possuem pouca mobilidade, são associados à habitats fragmentados e mantém um estágio larval com grande potencial dispersivo (KRITZER & SALE, 2006). Desta forma, a estruturação das comunidades de peixes recifais resulta da interação, em distintas escalas espaciais e temporais, entre os processos de imigração, especiação, extinção e as relações intra e interespecíficas entre as espécies (RICKLEFS, 2004; EMERSON & GILLESPIE, 2008). Neste ínterim, o modelo de biogeografia de ilhas é uma das teorias mais influentes, pois esta determina que a riqueza de espécies em ilhas, ou manchas de hábitat, é diretamente relacionada à influência dos fatores geográficos (e.g. área, isolamento e idade das ilhas ou fragmentos de hábitat) e ecológicos (e.g. habitat adequado) atuantes sobre as espécies (MACARTHUR & WILSON, 1967; WHITTAKER & FERNÁNDEZ-PALACIOS, 2007; WHITTAKER et al., 2010). De acordo com o modelo, o número de espécies nas “ilhas” é uma função da interação entre os processos de imigração e extinção (MACARTHUR & WILSON, 1967). Por outro lado, a análise integrada dos padrões de diversidade e distribuição das espécies, proporciona indícios importantes sobre os fatores que, em longo prazo, influenciam a dinâmica e os padrões de diversidade local/regional (FLOETER et al., 2008; FATTORINI, 2010; CHIARUCCI et al., 2011; LUIZ et al., 2012). Neste ínterim, as influências dos processos e mecanismos estruturadores das assembleias também podem ser testadas pela variação na composição de espécies (diversidade beta) ao longo de sua região. Esta compreensão tem atraído crescente interesse de ecólogos da conservação, mas ainda permanece pouco explorada (e.g. FATORINI, 2010), especialmente em ambientes marinhos.

A Cadeia Vitória – Trindade (CVT), juntamente com a margem continental adjacente, constitui a região de maior biodiversidade recifal do Atlântico Sul (LEÃO, 2003; DUTRA et al., 2005). Na zona costeira estão presentes estuários, manguezais, banco de gramas marinhas, fundos consolidados e não consolidados, ilhas, recifes biogênicos e rochosos

(MOURA et al., 2013). Essas feições se estendem até a plataforma média e externa, onde também ocorrem recifes mesofóticos, cânions submarinos, buracas, bancos de rodolítos e planícies sedimentares (AMADO-FILHO et al., 2012; BASTOS et al., 2013). A região da CVT é considerada, pelo Ministério do Meio Ambiente, como área de extrema importância biológica e insuficientemente conhecida (MMA, 2002; ALVES & CASTRO, 2006), representando uma Área Marinha Ecologicamente ou Biologicamente Significativa (EBSA) para a manutenção da biodiversidade global (CDB, 2012).

Apesar desses atributos, informações biológicas sobre a CVT foram, até recentemente, restritas a amostragens com métodos seletivos (SÉRET & ANDREATA, 1992; ANDREATA & SÉRET, 1995; LAVRADO & INACIO, 2006; MARTINS et al., 2007; O´HARA et al., 2010; OLAVO et al., 2011). Os resultados destes estudos indicam que a distância da margem continental influencia a composição das assembleias de gastrópodes, algas e invertebrados ao longo da cadeia (LEAL & BOUCHET, 1991; O´HARA et al., 2010), mas a atenuação desse efeito pelas montanhas submarinas ainda é incompletamente conhecida. A disposição da CVT, com topos das montanhas submarinas em áreas relativamente rasas e a presença de um arquipélago com espécies tidas como endêmicas em seu extremo leste (FLOETER & GASPARINI, 2000; GASPARINI & FLOETER, 2001; FLOETER et al., 2008), fornece um contexto apropriado e interessante para investigar o funcionamento das montanhas submarinas como IF´s (CLARK et al., 2010; SCHLACHER et al., 2010; CLARK et al., 2012).

Comparações entre assembleias de grupos bentônicos da margem continental e a CVT não têm sido consistentes com relação ao possível papel das montanhas submarinas como “stepping stones” de conectividade (LEAL & BOUCHET, 1991; O´HARA et al., 2010). Além disso, o complexo de ilhas de Trindade e Martin Vaz era apresentado como uma área com baixos níveis de endemismo e riqueza de peixes recifais por sofrer influência do fluxo de propágulos ao longo CVT (FLOETER & GASPARINI, 2000, 2001; JOYEUX et al., 2001; FLOETER et al., 2008; CARREÑO & COIMBRA, 2012). No entanto, levantamentos recentes, juntamente com uma série de reavaliações taxonômicas (e.g. PINHEIRO et al., 2009, 2011, ROCHA et al., 2010; PEREIRA-FILHO et al., 2011b), apontam para quase 10% de endemismo em peixes recifais (SIMON et al., 2013), o que seria similar aos níveis de endemismo de outras isoladas ilhas oceânicas do Atlântico Sul.

Desta forma, a hipótese de conectividade por “stepping stones” foi aqui examinada com dados inéditos, os quais compõe o primeiro inventário de espécies de peixes recifais dos topos das montanhas submarinas da CVT. Examinamos a variação na composição da assembléia de peixes de recife a partir da margem continental ao complexo de ilhas, explorando os fatores ambientais que influenciam a diversidade beta, bem como os traços bioecológicos das espécies associadas aos seus distintos padrões de distribuição. Os principais objetivos deste trabalho foram: (1) descrever a composição de peixes recifais associados aos topos das montanhas submarinas, (2) para avaliar a relação entre a composição das assembleias e distância da margem continental, grau de isolamento, área do topo e da idade de cada ilha funcional, (3) determinar os fatores ambientais e as principais características bioecológicas das espécies que influenciam a composição das assembleias; (4) avaliar qual é a importância da região CVT para as comunidades recifais no cenário do Atlântico; (5) propor uma hipótese para explicar a atual organização das comunidades recifais e o possível papel da região como refúgio durante as últimas mudanças climáticas drásticas.

O manuscrito apresentado a seguir, redigido em inglês e nos moldes da revista PlosOne, compõe a parte central da dissertação e traz os principais resultados do projeto e suas consequências.

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2. FISHES OF VITÓRIA – TRINDADE SEAMOUNTS CHAIN

*****Estrutura do artigo seguindo o modelo para publicação na revista Plos One

ABSTRACT

The Vitória–Trindade Chain (VTC) is a 1.000 km west-east seamount chain in the Southwestern Atlantic (Brazil), comprised by large seamounts isolated from the continental margin and from each other by deep water (2,500-4,500 m) and moderate distances (50-250 km). The VTC culminates in the Trindade-Martin-Vaz Island Group (TMVIG) and, together with its adjacent continental margin, harbors the highest reef-associated biodiversity of the South Atlantic. The TMVIG reef-associated fauna is composed by both VTC endemics and more widely distributed species, and it has been proposed that the seamounts with mesophotic summits may facilitate connectivity between the islands and mainland trough the flow of propagules. Here we provide the first inventory of reef fishes across the VTC seamounts' summits and suggest that seamounts` summits may act as stepping stones for dispersal, although distance is not the most critical factor for regional sucess of colonizations. Most VTC endemics are widely distributed through the seamounts, indicating that seamount assemblages are structured from both mainland and insular sources of propagules. Seamounts function as functional islands that can act as either source or sink of propagules, depending on interactions between hydrodynamics and both bioecological characteristics and life history strategies of the species. We highlight the importance of assessing mesophotic areas for understanding processes and mechanisms that drove the evolution and biogeography of reef biota in the Atlantic, especially in the poor know Brazilian Province, as well as the conservation significance of the VTC region, which is currently therathened by overfishing and mining.

INTRODUCTION

Oceanic islands and seamounts are originated from magmatic intrusions through the oceanic crust [1], and their distribution relates to spreading centers, subduction zones and mid-plate hotspots through upwelling of mantle plumes [2]. With more than 40,000 seamounts and covering approximately 10 million km², this is one of Earth's most representative biomes [3], yet it remains poorly described and understood even regarding basic ecological and biogeographic aspects [4]. Globally, less than 200 seamounts have been biologically surveyed [3], and very few of those represent seamount chains [5].

As areas of abrupt discontinuity in the overall flat, soft and deep abyssal plain, seamounts often condition nutrient upwelling and higher primary production, and generally sustain greater diversity than their adjacencies [6-9]. They can also be considered as functional islands (FIs) for reef-associated species [2,10], playing equivalent roles to those of islands in the maintenance of terrestrial biota in isolated patches of suitable habitat [11-

12]. Recent research effort elucidated a general understanding of the processes and mechanisms that have ecologically structured the communities at seamounts [13]. Thus, first data and insights about how biodiversity, ecology, connectivity, biogeography and evolutionary aspects are ruled on seamounts were arisen [6,14-18]. Besides distance from mainland sources and other islands, connectivity between seamounts is influenced by the size of suitable habitats for sessile/demersal adults (e.g. bottom type and depth), regional scale hydrodynamics (e.g. conditions to larval dispersal and retention) and by the distinct dispersal capabilities of the species [15,19]. Accordingly, seamount chains may facilitate the dispersal of reef-associated species, acting as connectivity stepping stones that attenuate the biogeographic and evolutionary effects of isolation [11,19]. The longitudinal arrangement of the Vitória-Trindade Seamount Chain (VTC), with relatively shallow seamounts summits, provides an appropriate context to investigate the possible role of the seamounts as FIs, including their possible role in influencing species richness and endemism levels in the Trindade and Martin Vaz Island Group (TMVIG), located in the eastern extreme of the VTC [20-24].

However, it is still unclear what are the mechanisms and processes that shape the structure and connectivity of communities at different scales (i.e. seamounts, continental margins and abyssal plains) [24,30].Most studies about fish assemblages associated to seamounts were based on fisheries-dependent and highly selective sampling methods [31-33], including the two surveys so far carried out in the VTC: a 1987 Brazilian-French expedition [62-63] and a survey with midwater trawls and surface/bottom longlines [48,117]. Surveys based on diving operations are scarce and included only the upper mesophotic zone, within the limits of SCUBA [34-35]. The mesophotic zone, between 30 and 200 m, is characterized by the euphotic-aphotic transition [e.g. 37-38], harboring species from both zones and others that are exclusive to the mesophotic zone, representing a hotspot of marine biodiversity [16-39]. Interest in mesophotic reefs has been steadily growing because they host a remarkable number of undescribed species [36-37], and also because of their potential role as a more stable “deeper refuge” that provides propagules for shallow reefs subjected to more acute climatic and anthropogenic stressors [35,43].

In the Southwestern Atlantic, seamounts and mesophotic reefs remain among the least known places on earth [13,30,40,41,45-46]. However, along the tropical Southwestern Atlantic, mesophotic reefs within the outer shelf and upper continental slope may also function as a major connectivity corridor [47], being especially relevant as a critical habitat for large-sized reef fishes that are already over-exploited in shallower areas [48].

Community structure results from the interaction among processes operating at different spatial and temporal scales, such as immigration, speciation, extinction and intra and interspecific interactions [49-50]. Reef-associated assemblages may also have a particular strong metapolutation structure due to the dual life cycle of most species, which includes sessile or low mobility adults associated with patchy habitats and larval stages with greater dispersive potential [51-53]. While phylogeographic analyses are unavailable for most taxa, the integrated analysis of species diversity and distribution patterns provides important clues about the factors that influence long term dynamics and regional diversity patterns [23, 54-56]. Diversity and endemism levels within reef-associated organisms can be similar between continental margin and seamounts [15], but the mechanisms and processes that shape community structure and connectivity patterns at different scales remain poorly understood [24,30]. For instance, depth-stratified comparisons (100–4000m) between continental margins and seamounts, for a number of benthic taxa, evidenced both similar and dissimilar assemblages [14,25-29].

The VTC and its adjacent continental margin encompasses the highest reef-associated biodiversity in the South Atlantic [57-59], but information about the seamounts' assemblages is restricted to samples obtained with fisheries-dependent selective sampling gear [20, 24, 48, 59, 62, 63]. The effect of the distance from the continental margin on the richness and species' distribution along theVTC has been evaluated for gastropods, algae and invertebrates, with variable support for the role of seamount summits as connectivity stepping stones [20,24], although both studies highlight the continental margin as the source of propagules.

When compared to other tropical Southwestern Atlantic oceanic islands, the TMVIG has been presented as an area with relatively low endemism levels for reef fishes, possibly due to the constant flow of propagules across the VTC [21, 23, 64, 66-67]. However, as more thorought inventories and taxonomic assessments are carried out [68-69, 71, 90], the known endemism level have increased to up to ~10%, being comparable to those of other Atlantic oceanic islands [72]. Here we provide the first inventory of reef fishes associated to the relatively shallow seamounts' summits across the VTC. We examined the variation in reef fish assemblage composition from the continental margin to the TMVIG, exploring environmental factors that influence beta diversity, as well as the species bioecological traits associated to their distribution patterns. The main objectives of this work were (1) to describe the composition reef fish assemblages associated to the seamounts' summits; (2) to assess the relationship between assemblages composition and distance from continental margin, degree of isolation, summit area and age of the summits; (3) determine the environmental factors and main ecological characteristics of species that influence assemblage composition; (4) evaluate what is the importance of VTC region to the reef communities in the Atlantic scenario; (5) propose a hypothesis to explain the current organization of the reef communities and the role of the VTC as a refuge during last drastic climatic changes.

METHODS

STUDY AREA

The study region is herein referred to as the “VTC region” and comprises the Trindade-Martin Vaz Island Group (TMVIG), the ten non-emerging seamounts along the Vitória-Trindade Seamount Chain (VTC) and the adjacent continental margin delimited to the north by the Abrolhos Bank and to the south by the Espirito Santo State shelf extending to Cabo of São Tomé.

The VTC lay along a fracture zone disposed transversely to the Mid-Atlantic Ridge over the South American Plate, between 19° and 21°S. Through this weakened old (Silurian-Devonian ~438 Mya) and thick lithosphere (~20 km) [73], the chain was formed by the activity of the Trindade hotspot mantle plume [74-77] as the plate moved westward at a rate of 23.1 km/My [78]. The VTC emerged during the Cenozoic, starting in the Tertiary (60 - 40 Mya) [79-80]. The oldest volcanic edifices are located near the continental shelf [81], while the most recent magmatic activity occurred at the TMVIG, just 5.000 years ago [78]. The same fracture zone that originated the VTC also delimits two different geological and sedimentological domains on the adjacent continental margin [86], the Barreiras deposits shaped by Plio–Pleistocene erosion to the north and the Precambrian crystalline shield to the south. The seamounts are isolated from the continental margin and from each other by deep water (2.500–4.500 m) and moderate distances (50-250 km), forming a 1.000 km west-east chain that culminates in the TMVIG (Figure 1).

Superficial circulation in the VTC region is dominated by coastal waters with riverine inputs and by the Brazil Current (BC), which flows south along the shelf from about 13 to 38º S [88]. Eddies, taylor cones, dynamical uplifts and amplification of tidal movements are common oceanographic features associated with seamounts [95-97]. Accordingly, the VTC topographical complexity induces upwelling driven by eddies [89-90], ekman pumping [91] and tidal currents [92] that promote the nutrient enrichment from the colder South Atlantic Central Water (SACW) located below the mixed layer [90, 93]. In addition, the presence of Doce river discharge brings nutrient inputs on region [94], highlighting high levels of productivity over adjacent continental margin and adjacent VTC seamounts summits [93,95]. Therefore, when flowing through the VTC the BC follows three different paths, either simultaneously or not [98]. The weakest branch flows between the Abrolhos Bank and Besnard Seamount, while the main branch flows between Besnard and Vitoria seamounts. The third path flows more offshore between Vitoria and Dogaressa seamounts (figure 2). After crossing the VTC, the BC tends to reorganize itself as a jet flowing south along the shelf break (figure 2), while at subpicnoclinic depths (around

600m on average) the Antarctic Intermediate Water flows in contrary direction toward the equator (Pimentel, unpublished data).

The VTC region corresponds to an ecological and biogeographic transition zone between tropical and subtropical marine biota [65,59,100,106-108,109,110-115], resulting in high biodiversity . Moreover, the continental margin adjacent to the VTC is highly complex and encompasses mangroves, estuaries, *Laminaria* beds, the largest continuous rodolith beds of the world, coralline and rocky reefs, and coastal islands [57,64,65,100,101,104]. Rodolith beds are found mainly at mesophotic depths (45-120m) and are remarkable as the predominant benthic habitat along the outer continental shelf and on the VTC seamounts' shallow summits (17-120m), and are generally predominantly covered by macroalgal canopies (Figure 3) [102,105].

At seamounts, benthic community structure is primarily related to depth, and is also strongly influenced by sediment and organic matter deposition conditioned by hydrodynamic flows [45]. The VTC seamounts present shallow (17-120m) and flat summits with sparse patches of more complex substrate [24,77,105]. Rhodolith beds on the flat portions of seamounts summits are formed by nodules with variable volume and diameter (greater on those nearest to mainland) [105] (Figure 3H) and are generally covered by macroalgae canopies (apparently more diverse assemblages at the nearest continental margin seamounts, figure 3F and G) with carbonate concretions shaped by variable fusions that form a complex tri-dimensional structure, similarly to the beds in the outer continental shelf [102,103] (Figure 3G). Sparse reef structures reaching heights of 20 to 30 m are also found at seamount summits, being predominantly covered by encrusting calcareous algae, sponges and corals (Figure 3I, J,K,L). At the TMVIG, the reefs comprise a mosaic of volcanic rock overgrown by coralline algal reefs or sand [69], ranging from tidepools to more complex mesophotic reefs near the insular slope (Figure 3A, B,C,D,E). Mesophotic reef structures on seamounts (Figure 3I, J,K,L) and islands (Figure 3D-E) are primarily built by calcareous algae and support at least 13 hermatypic coral species playing an important role as reef builders at mesophotic depths (*Agaricia humilis*, *A. fragilis, Madracis decactis, Montastrea cavernosa* (Figure 3E and G), *Mussismilia hartti*, *M. hispida, Millepora brasiliensis, Favia gravida, F. leptophylla, Porites astreoides*, *P. branneri, Scolymia wellsi* and *Siderastrea stellata*) [105,116].

FISH DATABASE

We built a fish presence/absence database based on both primary and published records (<120m depths). Primary data was acquired during three expeditions, one in 2009 (12-26 March) and two in 2011 (3-26 February and 1-18 April), covering the photic and upper mesophotic zones (17–120m) of twelve FIs, including the TMVIG and seamounts Almirante Saldanha, Vitória, Eclaireur, Jaseur, "Unnamed", Davis, Dogaressa and Columbia (Figure 1). Sampling included visual, video and photo records, as well as collection of specimens by divers using standard SCUBA (<40 m depths) and mixed-gas techniques (TRIMIX) in open systems or rebreathers (40-120m). Video footage from two remotely operated vehicles (ROVs) was used for habitat descriptions and provided extra faunal records (10 hours). Additional 3 hours of video footage recorded in 2010 was provided by “Pangaea Expedition”, covering the summits of Jaseur and Davis seamounts. Voucher specimens from two commercial fishery operations on Montague and Vitória seamounts in 2008 and 2010 were also added to the inventory. Informations about sampling effort and characteristics of sites surveys are provided on Table 1.

Bioecological traits of each fish species (rafting, spawning type, body size, depth range, distribution, habitat use, mobility, brackish water usage and conservation status) were compiled from [47,55,118-124] and were complemented by authors´ observations (Table S1).

DATA ANALYSIS

Regional distribution patterns of reef fishes

Statistical analyses were performed using the 40 fish families typically associated with reefs, following [21,125]. Each VTC seamount summit and island was considered an equivalent “functional island” (FI) [17,53]. In order to summarize assemblage composition relationships among sites we carried out cluster and Multidimensional Scaling (MDS) analyses (Jaccard similarity index and UPGMA) [126]. In order to mitigate the effects of FIs particularities (distance from the continental shelf, diversity of habitats, summit depth and sampling effort; Table 1) in the similarity analysis, sites were grouped into five groups: continental margin (mainland), 3 seamount groups at increasing distance from mainland (SG I: Vitoria, Eclaireur and Almte Saldanha; SG II: Jaseur, unnamed and Davis and SGIII: Dogaressa and Columbia) and islands (TMVIG).

Island biogeography and beta diversity

To investigate the effect of FIs’ characteristics in the distribution of reef fishes and in the beta diversity, three hypothesis were tested: 1) “target-area-distance” (fish propagules flow from a mainland source and each FI with same area and distance from source have a similar ability to receive species), with an expected positive correlation between inter-FI beta diversity and inter-island similarity; 2) “stepping stones dispersal” (beta diversity is resulted from inter-FI faunal exchange, with species jumping from one island to the next), with an expected positive correlation between beta diversity and inter-FI geographic distance; 3) “age” (beta diversity is related to site age, as a result of the balance between the generation and extinction of species), with an expected higher similarity among sites of similar age.

Estimates of FI ages were compiled from [77] and distances between sites were obtained from the nearest 120m depth point. Island´s areas were also calculated up to the 120m isobath. Because distance (km) and area (km²) are expressed in different units we standardized them to Z-scores [Z= (raw score - mean)/standard deviation] and built Euclidean distances’ matrices of geographic distances and areas [127]. Correlation between matrices (beta diversity and independent variables) were evaluated with a Mantel test ran with software PAST 2.17. The beta diversity measure was taken by the differences (turnover) between species composition among sites [128]. In order to generate beta diversity matrices we utilized Jaccard (J) and Kulczynski 2 (K) coefficients [54,129].

Species traits and regional distribution patterns

Generalized linear model (GLM) analyses were used to investigate how bioecological traits are related with the regional patterns of reef fish distribution (Table S2). This method is adequate for analyzing binary data [130-131], and has already been used to assess drivers of reef fish distribution [56,132]. Distribution patterns considered were: 1) species restricted to the continental margin (mainland); 2) species found on the continental margin and seamounts, but absent in the islands (coastal and seamounts distribution); 3) species found on the continental margin and islands, but absent from seamounts (disjunctive distribution); 4) species found on seamounts and islands, but absent from the continental margin (FIs); 5) species found in the continental margin, seamounts and islands (wide distribution). Species restricted to the islands or to the seamounts were not analyzed due to the small sample size (N=7 each) (Table S2). Each distribution pattern was tested separately. The independent categorical variable “family” was included in all models to account for the possible effect of phylogeny upon the general traits and distribution of species. Only main effects were tested. All independent variables were included in the models and were removed in a backward procedure, where in each run the least significant trait was removed before re-running the model (“family” was left in all models). Pairwise post-hoc Bonferroni tests with sequential adjustment using estimated marginal means were done on significant variables in order to detect differences among categories.

RESULTS

Fish Assemblages

A total of 275 fish species were recorded on the VTC seamounts and islands (Checklist S1), 188 reef fishes (159 belonging to the 40 families typically associated with reefs) and 87 epi- or meso-pelagic or bathydemersal species. During underwater sampling we recorded 128 fish species in the VTC seamounts, which 110 (86% of the sightings) represented new records (geographic range extension).Fifty six species had their world known depth range record extended, four to shallower and fifty two to deeper waters (Checklist S1). These new records increased the VTC seamount fish richness by 53%. One hundred and forty nine reef fishes were recorded on seamounts' summits and 134 in the TMVIG. The VTC reef fish fauna shows a remarkable preponderance of Perciformes (23 families, 103 species), Anguilliformes (2 families, 14 species) and Tetraodontiformes (5 families, 19 species). Labridae was the most specious family (22 species), followed by Epinephelidae (17), Muraenidae (12), Scorpaenidae (9), Gobiidae (8) and Pomacentridae (8). The most specious genus was *Gymnothorax*, with 7 species, followed by *Halichoeres*, *Scorpaena* and *Sparisoma* (6 species each), and *Caranx*, *Chromis*, *Lutjanus* and *Mycteroperca* (4 species each).

Biogeographical Affinities of the reef fish fauna

The VTC reef fish fauna (159 species) includes 14 circumglobal or circumtropical species (8.8%), 74 species that are widely distributed in the Western Atlantic (46.5%), 39 species that occur at both sides of the Atlantic (24.5%) and 22 Brazilian Province endemics (13.8%). Eleven reef fishes (7%) are endemic to the VTC: *Entomacrodus* sp.n, *Hypleurochilus* sp.n, *Scartella poiti*, *Arcos* sp.n, *Tomicodon* sp., *Elacatinus pridisi* *Lythrypnus* sp. a, *Lythrypnus* sp. b, *Halichoeres rubrovirens*, *Sparisoma rocha*, *Malacoctenus brunoi*, six of which are recorded only at TMVIG (Checklist S1). Four species (2.5%) show a large disjunctive distribution, recorded just in the VTC and in the Caribbean Province: *Monopenchelys acuta*, *Pempheris poeyi, Pythonichthys sanguineus* and *Pseudomyrophis frio.* For the continental margin we compiled a checklist with 220 typically associated reef fish species (9 orders and 40 families). A total of 123 of which are widely distributed in the Western Atlantic (55.9%), 42 species occur in both sides of the Atlantic (19%), 39 species are Brazilian-endemics (17.7%), and 16 Circumglobal/tropical species (7%). Eighty-eight species are restricted to the continental margin (40%).

Regional distribution patterns

Only six reef fishes were recorded at all sites surveyed of VTC region: *Balistes vetula*, *Cephalopholis fulva*, *Coryphopterus thryx*, *Holocentrus adscencionis*, *Malacanthus plumieri* and *Stegastes pictus*. Sixty-nine reef fishes (28%) are widely distributed across the all VTC region. Twenty-seven (11 families, 11% of the reef fish fauna) occur exclusively in the IF´s, which seven of them are exclusive from seamounts, seven exclusive from islands (5 families, 3%) and 13 occurring in both seamounts and islands (7 families, 5%). Twenty-seven species (19 families, 11%) have a disjunctive regional distribution, having been recorded in the TMVIG and in the adjacent continental margin, but were absent in the seamounts. One hundred thirty-two reef fish species (32 families, 53%) were absent from the TMVIG, having been recorded only in the adjacent continental margin and seamounts (Table S2).

The cluster and MDS analyses evidence four groups of sites (Figure 4). The major group is composed by two sub-groups: the two mainland sites and the two islands together with the three larger and shallower seamounts. These two sub-groups are also characterized by greater species richness and higher habitat diversity (Figure 4). The second major group of sites is composed only by seamounts and has two sub-groups; the two easternmost seamounts, and the three seamounts that are closer to mainland. These other two sub-groups are characterized by smaller and deeper seamounts, by the lower diversity of habitats and the lowest species richness (Figure 4).

Seamounts, islands and continental margin sites were clustered in five groups. The similarity analysis between groups of sites shows that the continental margin (mainland) is most similar and shares a higher number of species with the TMVIG than with seamounts (Figure 5). On the other hand, the TMVIG presented a higher similarity with the seamounts, which decreased with the seamount distance from the islands (Figure 5). We also found a decreasing number of endemic species from TMVIG towards the continental margin (Figure 6).

Assemblage turnover along the VTC

The Mantel tests evidenced a positive correlation between beta diversity and inter-sites' geographic distances, corroborating the "stepping stones dispersal" hypothesis. However, the "target-area-distance" and "age" hypotheses were rejected (Table 2). When sites were analyzed independently as FI's, highest beta-diversity values were found between the Trindade Island and the Columbia Seamount, as well as between the adjacent continental margin (mainland) and the Vitória Seamount (Figure 7-A). However, regarding groups of sites, assemblage dissimilarity decreases with increasing distance from mainland (Figure 7-B).

Species traits and regional distribution patterns

Some bioecological traits were significantly related to regional distribution patterns. Phylogenetic affinities ("Family") and bioecological traits such as mobility, maximum depth, body size and rafting ability were significantly associated to the pattern of restricted coastal distribution (Table S4, Figure 8). When compared to other species, coastal-restricted species are more sedentary (57% vs 29%), dwellers of more shallow waters (47% vs 7,5%), smaller-bodied (48% vs 16%), and more rarelly use floating objects as rafts to facilitate dispersal (7% vs 14%) (Figure 8 and Table S2).

Spawning type, mobility, rafting ability and body size were associated to the disjunctive distribution pattern. This group includes a higher proportion of pelagic spawners (73% vs 61%), rovers (73% vs 71%), species that use rafts (16% vs 9%) and medium-sized species (62% vs 40%) (Figure G and Table S2). Maximum depth and habitat use characteristics were significant traits associated with the wide regional distribution pattern. This group includes a higher proportion of habitat generalists (found in more than one habitat; 67% vs 40%) and mesophotic dwellers (78% vs 48%), with no species that inhabits shallow waters (Figure 8 and Table S3).

DISCUSSION

In the Atlantic, the Caribbean region is recognized as a hotspot of diversity, with the presence of at least 770 reef fish species [133]. The Brazilian Province (sensu [151], with nearly 360 species, is regarded as a peripheral area in terms of diversity, but encompasses high endemism levels within several groups [133]. The VTC region, with ~306 reef fish species (85% of Brazilian reef fish fauna), including the seamount chain (188 species), the rocky reefs of Espirito Santo (300 species, [135]) and the Abrolhos Bank coralline reefs (265 species, 228), sustains one of the richest reef fish assemblages within the Brazilian Province. Reef fish endemism (7%) at VTC, including the six undescribed cryptobenthic species (*Hypleurochilus* sp.n, *Lythrypnus* sp b, *Lythrypnus* sp c, *Arcos* sp.n, *Tomicodon* sp.and *Entomacrodus* sp.n), is relatively high when compared to the Brazilian Province endemism level (18%) [133]. At the global scale, the species richness of the VTC is similar to that of shallow and mesophotic FI's of Caribbean Sea (231-270 species) [134-136], South-western Indian Ocean (263 species) [137] and higher than that found in the protected areas of the North-western Hawaii seamounts chain (103 species) [138].

Distribution Patterns

Three distribution patterns were significantly related to the species bioecological traits and allow the exploration of the possible underlying mechanisms and processes:

Coastal restricted. This group is composed by the species that are restricted to the adjacent continental margin of the Espirito Santo and Abrolhos bank (e.g. many species of families Haemulidae, Labrisomidae, Lutjanidae and Sparidae). Such species are normally common, abundant and widely distributed in the western Atlantic, sometimes also present in distant locations such as in the eastern Atlantic (e.g. *Lagocephalus laevigatus* and *Alphesthes afer*), or at other Atlantic islands (e.g. *Pomacanthus arcuatus* and *Pomacanthus paru*) or even having a circumglobal distribution (e.g. *Antennarius striatus*) (Checklist S1).

Therefore, geographical distance not avoids colonization and population maintenance of these species, consequently, it is plausible the existence of physical and/or ecological barrier that prevent the maintenance of viable populations at VTC FI's. This restriction mechanism acts in synergy with main bioecological characteristics of the species: small body, inhabit shallow areas (ie <30m), low mobility and incapacity to disperse by floating objects (Figure 8), promoting a significant influence on the dispersal and settlement processes [56, 140] and potentializing an effective ecological barrier to the maintenance of these species in the FI's. For this mechanism of species restriction, we relate the following factors:

- The intense flow of the BC (surface) and SACW (subsurface) promotes the formation of a physical barrier that prevents the dispersal of propagules between the continental margin and the FI's [141].

- The absence of suitable habitats for species completes their life cycle at FI's.

- Intense interspecific competition exclusion for resource use [142-144]. For instance, we highlight several possibles cases of interspecific competition influence on distribution of sister species (e.g. Acanthuridae, Gobidae, Labridae and Pomacanthidae, see Checklist S1).

(**2) All VTC**. This group is composed by species that occurr along all VTC region. Wide regional distribution can be maintained through an efficient metapopulation interconnection [52] with a regular flow of propagules along the VTC. At the assemblage level, this distribution pattern may be potentialized by the ecological tolerance of the species inhabitants of a great range of depths (mainly mesophotic) and habitat types (Figure 8). The strategy of releasing pelagic eggs can also represent an important role for the maintenance of these populations at the individual level, because they facilitate the species dispersal and settlement; although was not significant in the GLM.

(3) Disjunct. This group is composed by species that have a disjunct distribution between the continental margin and TMVIG.These species have a wide distribution and are found on both sides of the Atlantic (e.g. *Epinephelus adscensionis* and *Priacanthus arenatus*) as well as other oceanic islands (e.g. *Abudefduf saxatilis*, *Acanthostracion quadricornis*, *Anisotremus surinamensis*, *Diodon hystrix*, and *Sparisoma axillare*) (Checklist S1). At the assemblage level, dispersal abilities play an important role in maintaining this separation (Figure 8), while the independence of estuarine environments to complete their life cycle and the use of specific habitats also constitute relevant traits at the individual level.

Species with disjunct distribution are forced to invest heavily in certain capacities (fitness) for their local maintenance, thus not performing great dispersal (> 1000km) [145-146]. Therefore, over time, a limited flow of propagules can promote the formation of distinct populations that are locally maintained through self-recruitment on TMVIG. Even though the genetic cohesion is maintained through a periodic flux of some individuals (e.g. occurrence of *Lutjanus jocu* at Trindade, Checklist S1), this does not significantly influence demographic processes [52-111]. Although sporadic dispersal may delay genetic isolation, the limited flux of propagules may allow accumulation of genetic differences leading to speciation [146], as well as significant changes in assemblage composition [136]. Even in short time scales, parapatric processes and natural selection fixing fast changes and may determine distinct evolutionary paths to these isolated populations [141-145). For instance, we highlighted the speciation of species found in tide pools (*Scartella poiti*; *Tomicodon* sp.n e *Entomacrodus* sp.n) and shallow waters of TMVIG [i.e. *Arcos* sp.n and *Malacoctenus brunoi*]. The inability of these species to use the seamounts as stepping stones, drives speciation by isolation from coastal lineages, and may guide the appearance of other distinct subspecies (e.g. *Stegastes trindadensis*, currently considered as a morph of *Stegastes fuscus*).

Disjunct distribution patterns of reef fishes are known in both the Atlantic [65, 63,144) and the Pacific oceans [147-148]. In the Atlantic, some species are found in the Caribbean and Southeastern Brazil, but are absent or rarely found in the North-eastern Brazilian coast (e.g. *Hyporthodus niveatus*, *Mycteroperca microlepis*, *Serranus phoebe*; 149). Similarly, four fish species were recorded only on the VTC and the Caribbean, a singular pattern already evidenced for eleven genera and thirteen coral species [112]. [149]

suggests that such cases are evidence of local extinction due to reef habitat loss during periods of rapid changes in sea level, a hypothesis that could be easily expanded toward explaining disjunct and partially-disjunct distribution on the VTC, with species historically holding a wider regional distribution as well as currently widely distributed ones. For instance, a few species are present on the continental margin and at one or few FI's (*Scarus zelindae* at Davis; *Stegastes fuscus* at Davis and TMVIG; *Lutjanus jocu* at unnamed seamount and single record at Trindade).

The absence on seamounts is evidence that this disjunct species cannot use the stepping-stones to dispersal. For instance, we highlight the case of the disjunct wrasse *Halichoeres brasiliensis*, common in the continental margin this species is absent from the other Brazilian oceanic islands and its presence at TMVIG was previously related as a result of increased connectivity promoted by the presence of chain [104]. In the meantime, disjunct regional distribution pattern on the VTC is an indication of the early stages of parapatric speciation driven by a low-sea level stepping-stones colonization, with gene flow occurring only between neighbor populations and decreasing with increasing distance [111,136,146]. Even as the local maintenance is a major factor to speciation of cases that previously believed to be western Atlantic disjunct [23,63,65], but actually considered sister species (e.g. *Halichoeres sazimai* x *Halichoeres bathyphilus* and *Sparisoma tuiupiranga* x *Sparisoma atomarium*), VTC disjunctive shallow water species coud be in the process of speciation has already fixed mutations and/or adaptations for survival at oceanic environments (e.g. *Abudefduf saxatilis*, *Halichoeres poeyi*, *Halichoeres brasiliensis*).

Species traits and regional distribution patterns

Different dispersive capabilities influence biogeographic patterns, but there might be a strong scale dependency attenuating its effects at sub-regional scales and particular habitats, depending of which mechanism are related within ocean basins [56,154]. However, dispersal abilities can also influence the reef species possibility to cross biogeographical barriers and the establishment of viable populations at the Atlantic (i.e. Mid-Atlantic and Amazon, 56] and Pacific [155]. In the VTC, previous studies that analyzed the relationship between distance from continental margin and the distribution of gastropods [20], algae and invertebrates [24] concluded that the different distribution patterns are related to the dispersive capabilities of each group. On the other hand, reef fish dispersive ability (mobility, body size, rafting and spawning strategy) does not seem to be an important predictor of widespread distributions along the VTC (Figure 8). Other ecological characteristics that could underly wider distributions include rafting ability [56], body size and mobility [18,56,157-158]. These last characteristics may confer greater competitive ability during settlement, longevity, faster growth, tolerance to environmental variability [158-159], effective utilization of resources [118] and evolutionary capacity (i.e. higher rate of nucleotide substitution) [159]. However, the larger ecological valence of species that inhabit deeper environments and utilize several types of habitats seems to be the most critical factor for species maintenance on the FIs of VTC. Seamounts with the highest richness and faunal similarity (Vitoria and Davis) are those with the largest summit area and habitat diversity (Figure 4) and not those closest to the continental margin as expected from a stepping-stones process. Higher availability of suitable habitat can be translated into a larger amount of resources, increasing the environment carrying capacity [161,162] and species richness [162-165].

Assemblages turnover along VTC

The geographical distribution of the species reveals the spatial structuring of the taxonomic diversity, where a direct link between the region and its localities is the spatial overlap of their populations [49]. Local (alpha), turnover (beta) and regional (gamma) diversity partitions represent a balance between speciation, extinction and interspecific relationships at different scales [49], on the other hand, this equilibrium drives the need for species investment in certain capacities (fitness). For instance, an increase in number of species at the regional pool followed by gain local competition shapes the investment in the local-maintenance and, consequently, limits species amplitude of distribution. Thus, local-maintenance investment can be evidenced by the increase in beta diversity between sites [49].

Thus, the lower beta diversity among FI's reflects greater faunal homogeneity and may indicate a continuous flow of propagules or, alternatively, the failure in the establishment of viable populations due to ecological limitation. Same support found to the higher turnover between the first group of FI's and continental margin, as well as regional disjunct distributions and the presence of endemic species at FIs closest to continental margin, which may related to ecological limitations (barrier) rather than to dispersal barriers. Among FI groups, increasing geographic distance from mainland is inversely related to beta diversity, highlighting that there is a gradient of species turnover as well as found on previous studies (Figure 7B), however, not related with dispersal ability limitation (Algae, 24). Nonetheless, we found a support for a stepping-stones dispersal mode, through the relationship between the beta diversity and degree of isolation (Table 2 and Figure 7) [55].

In the VTC region, we found that the TMVIG provides propagules trough a reverse path (Figure 6), meaning that the continental margin is not the exclusive source, contrasting with previous studies focused on other taxonomic groups [20, 24] and the general hypothesis to other world seamounts assemblages structure [7,27,29,45,140,166]. Therefore, all the FI's can act as a source or sink of propagules [15] of species that seem to be adapted to oceanic environments. A pattern that varies according to set of interactions among factors such as physical dynamics, ecological and life history strategies of the species [15]. In the meantime, the continental margin is the biodiversity hotspot of VTC region, but peripheral habitats, such those present in seamounts, produce and can export species in a possible biodiversity feedback process, as happen at global macroscale [149].

The Refuge Hypothesis

The biogeographic analysis linked to historical events and species interactions provides an understanding of the reef biota evolution [23,65,165,169-170]. In the Atlantic scenario, some particularities promoted the isolation of biota (since the Oligocene), guiding a single evolution and biogeography [65,149,162,171-172]. However, the Southwest Atlantic puzzle remains partly understood [65,172].

The latest global climate change (during the Pliocene-Pleistocene ~5.3 m) promoted rapid environmental changes that have shaped the evolution and biogeography of the biota [167-168]. At this moment, an abrupt drop in the average of surface temperature formed a ice layer along several regions of the northern Atlantic hemisphere [173-175], triggering dramatic changes in tropical marine reef ecosystems that caused extinctions and species replacement [162, 169,171,177-179), mainly on the west side of the Atlantic [159,167,170]. Regressions of sea level (90% of the Pleistocene time, 175) exposed extensive areas of the continental margin, eliminating suitable habitats for shallow reef species that remained restricted to vertical and steep environments of the continental slope [168,172].

In this scenario of climatic instability, species migrated from Caribbean Sea south in a survival mechanism to local extinction [167,169-170,180-183). However, at the tropical Brazilian province just two places had areas of large continental shelf (i.e. shallow habitat availability) around the Amazon River discharge (reefs Manuel Luiz) and 2300 km south on the VTC region. Nevertheless, at that moment an intensification in the effectiveness of the Amazon barrier and weakening of the north component of the Brazil Current and Equatorial Current [184] promotes there adverse conditions of suitable environments for surviving species [56,66,172], which allowed an effective vicariant barrier [172,185] and genetic divergences between reef fishes populations of the Caribbean and Brazilian province (Lastrucci et al., unpublished).

In this scenarios, the VTC region likely represent the main refuge for reef species due to its extensive shallow area (~100,000 km²), nursery habitats (e.g. estuaries and tide pools), mild temperatures (i.e. in comparision of southeast Atlantic continental margin, [169,186]) and environmental conditions similar to that currently found in the Caribbean (i.e. clear waters of the warm BC). Possible evidence of this refuge can be linked to:

(1) Reef species with disjunct distribution between Caribbean vs Brazilian Province that are only found at the VCT region [57,116, our records].

(2) The greatest similarity between reef fish assemblages found between Trindade and the Caribbean compared to Trindade and the Brazilian continental margin [21,133].

(3) The presence of relicts species in the region of VTC that has its closest kin just on the Pacific ocean (e.g. endemic Halichoeres rubrovirens [70] and a genus of gastropod, 183]), as well as Brazilian endemic coral species relicts from the Carribean (e.g. *Mussismilia brasiliensis* fossil occurrences, 187]), that may were once widely distributed and just recently restricted to Brazilian province.

The oscillation between isolation (during regression, 188) and connectivity (during transgression, 170 172]) have been reported to promote speciation, divergence between lineages, changes in composition and distribution of many reef groups [153,162,167, 172,189,190, 191,192,193], persisting the genetic evidences in the present days (e.g. 194,195,191]. In strong contrast to the increased isolation brought in the Atlantic during marine regressions [188], connection increased in the VTC as a line of emerged islands was formed. During transgression events, species unable (i.e. ecologically and physiologically) to persist in environments that were quickly changing underwent local extinction but on shallowest seamounts (e.g. *Stegastes fuscus*; *Acanthurus bahianus* and *Scarus zelindae*) and TMVIG (i.e. current disjunctives). We suspect that the large number (52) of depth range extensions for reef fishes that we detected on seamounts results from adaption to deeper as well as clearer waters distant from nursery habitats on the continental shelf shore.

Evolutionary process already evidenced for coral species which adapted yourself to use deeper and less luminose environments [196] of mesophotic zone [197] in a survival subterfuge [198]. This understanding gave light to[199] and [116], that from their evidences (e.g. great number of depth range extensions, [116] suggest the species of the Brazilian province remained preserved thanks to the refuge provided by the VTC region.

In addition, several studies of terrestrial groups have demonstrated the existence of phylogeographic breaks between populations on the latitude of VTC (20º S) [200-206], suggesting the existence of a refuge and allopatric barriers that promote the diversification of many groups in the region, in allusion to a joint evolution of terrestrial and marine biota, as recently reported for the Indo-Pacific [162]. As marine evidence of an identical process, we mention the genetic divergence of fish species along the VTC region [207, Almeida, unpublished]. Similarly to the Indo-Pacific center of global marine biodiversity (162), it is plausible that VTC functions both as centers of accumulation and center of origin through genetic coding for adaptation or by learning preferences in the use of habitats. The latter is crucial in the evolution of species (mostly close relatives) with more frequency than previously thought [208].

CONSERVATION HEADLINES

The VTC marine biota is under strong economic development pressure and needs urgent effective conservation strategies. This scenario further aggravated by two major threats to the biodiversity:

Pressure from dredging of mesophotic biogenic reefs and rhodolith beds to exploit calcium carbonate (as fertilizing, 209; for the first time reported to seamounts, 24), manganese deposits at deep slopes [210] and fishing, including local fleets (surface and bottom longline, hand lines and trolling) and foreigners (trawl and longline vessels) fishing boats [48,113,211-212]. Fishing activity has a direct influence on the reproductive cycle of many VTC region populations, promoting earlier sexual maturation (i.e. reproduction with smaller size and age) in areas where greater effort is employed (e.g. *Cephalopholis fulva*, 213). Among the signals that fishing pressure over the seamounts biota has already altered the natural balance of fish regional populations is the smaller body size [15] of the seamount biota compared with the coast (i.e. due to the abundance of large carnivores such as groupers and barracudas). In adiction, no apex predators (carnivorous sharks) were sighted by divers in the seamonts, evidence which confirming that there is an imminent risk of stocks overfishing in the region.

Indeed, a high number of endangered species (33 species, 12%) is recorded on the VTC habitats (Checklist S1). Most of these species are large carnivorous, mainly sharks and groupers barely sighted during dives activities, but that still being catch as fishing resources in the region. Oceanic islands and seamounts are known by the fragility to fishing activities [214-215] and, thus, programs and actions for an immediate monitoring, evaluation and management of fishing effort in the VTC region are urgent [48]. On applicable alternative regards the Brazilian National Satellite Tracking Project (PREPS), which monitors fishing boats over 15 m in Brazilian waters. This program should be better disseminated and applied, adding all fishing boats greater than 12 m, commonly sighted in the seamounts and TMVIG [212].

On the other hand, some VTC seamounts are situated outside Brazilian jurisdiction, being open to indiscriminate exploitation of fisheries resources by national and international fishery fleets. In fact, globally, most seamounts (52%) are outside national jurisdictions, challenging the management of fisheries and mineral resources. In this scenario, international management politics, such as the Regional Fisheries Management Organizations (RFMOs), could be an alternative, as occur in oceanic areas of the Southeastern Atlantic [216]. Additionally, the increasing exploration and production of hydrocarbons in the region figures among the major threats to the regional biodiversity [217]. Impacts from this activities represent the greatest threats to the seamounts ecosystems [13,218-219]. These, through a synergic and cumulative effect, drive imminent risk of severe and irreversible impacts, involving several biologic levels such as ecosystems, communities, populations, genetic variability, ecological functions and habitats loss [27,220-224].

Although economic activities noted above has caused negative effects on maintenance of VTC biodiversity, is possible and necessary articulate a negotiation between the segments. Finally, an effective management tool is the creation of a network of protected areas where destructive activities are prohibited or largely mitigated. [220,225]. This mosaic of marine protected areas, from continental margin until VTC FI's, aims the conservation and sustainability of natural resources [225] by maintaining connectivity between the fragments of habitat [219] which favor greater resilience and quicker regeneration of the biota [226]. This enables the persistence of sensitive local populations that cannot be balanced by new immigrants from continental margin (i.e. endemic, relicts and isolated) [227]. In the meantime, a policy of partnership between the Brazilian Navy and environmental managers can leverage this initiative. However, it is of emergency action the creating of a MPA unit around the TMVIG, in order to save the populations of sharks and groupers who are at imminent risk of local extinction [71,212], as occurred in other oceanic island under Brazilian jurisdiction [215].

CONCLUSION

In conclusion, this study has filled a gap in our understanding of seamounts community ecology, biogeography and diversity by analysing the first inventory of reef fishes across the VTC. Our results show that seamount summits may act as stepping stones for reef fishes dispersal throughout the South Atlantic, although distance is not the most critical factor for species dispersal. Most species endemic to the VTC are widely distributed through the seamounts, supplanting the hypothesis that seamounts assemblages were structured from the mainland as a single source of propagules. Seamounts and islands of VTC function as recifal functional islands that can act as either source or sink of propagules, the function will vary according to interactions between factors related to hydrodynamic aspects, ecological and life history strategies of the species. The VTC region represents an ecological corridor of connectivity that may maintained the marine biodiversity working as refuge during last drastic climatic changes. The VTC marine biota needs urgent effective conservation strategies due two major threats the dredging and fishery.

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CONCLUSÕES GERAIS

As montanhas submarinas e ilhas da CVT sustentam elevada diversidade e biomassa de peixes, exercendo o papel de áreas de elevada produtividade em meio às águas oceânicas e oligotróficas dos oceanos profundos do Atlântico sudoeste. Nossos resultados demonstram que os peixes recifais possivelmente utilizam os topos das montanhas submarinas como *stepping-stones* à dispersão, no entanto, a distância geográfica não representa um fator crítico à manutenção das populações ao longo da região. Muitas espécies endêmicas da CVT possuem ampla distribuição através das montanhas submarinas, suplantando a hipótese de que as asssembleias das montanhas são estruturadas a partir da margem continental como única fonte de propágulos. Desta forma, as montanhas da CVT funcionam como ilhas funcionais que podem atuar como fonte ou receptoras de propágulos, função esta que varia de acordo com as interações entre os fatores relacionados aos aspectos da hidrodinâmica, ecológicos e estratégias da história de vida das espécies. Este estudo ressalta a importância da exploração das zonas mesofóticas para um acurado conhecimento dos processos e mecanismos que dirigem a evolução e biogeografia da biota recifal do Atlântico, especialmente para a província brasileira. A região da CVT representa um corredor ecológico de conectividade que manteve a biodiversidade marinha ao atuar como refúgio durante as últimas drásticas mudanças climáticas. Apesar da importancia apresentada pela biodiversidade marinha, a região da CVT ainda permanece insuficientemente conhecida, precisando de estratégias de conservação urgentes e eficazes.

FIGURES

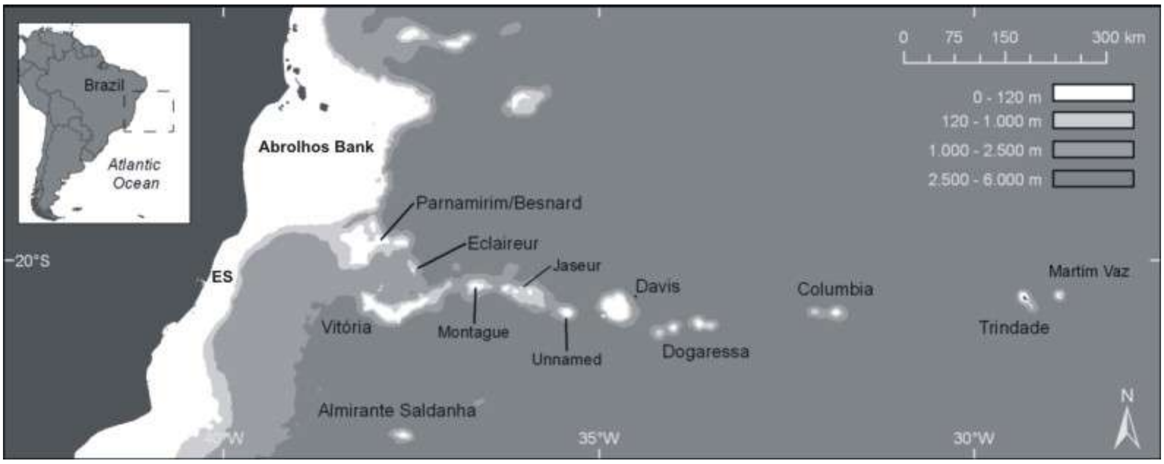

Figure 1: The Vitoria-Trindade Chain (CVT) region, from the continental shelf of Espírito Santo (ES) and the Abrolhos Bank to the Trindade and Martin-Vaz Island Group. The ten larger seamounts of the CVT are shown.

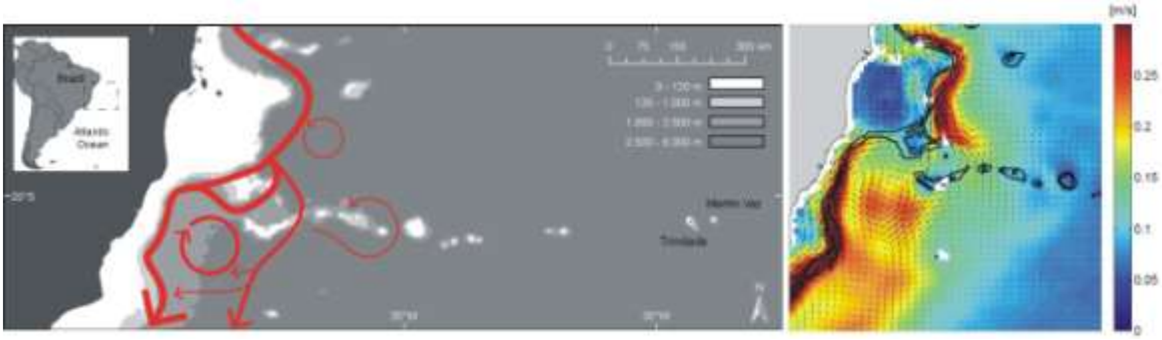

Figure 2: The BC passage through VTC region, modified from Pimentel (unpublished data). (left) CB paths around VTC region, line thickness is the flux intensity and (right) average of current velocity in the mixing layer (between 2004 -2009).

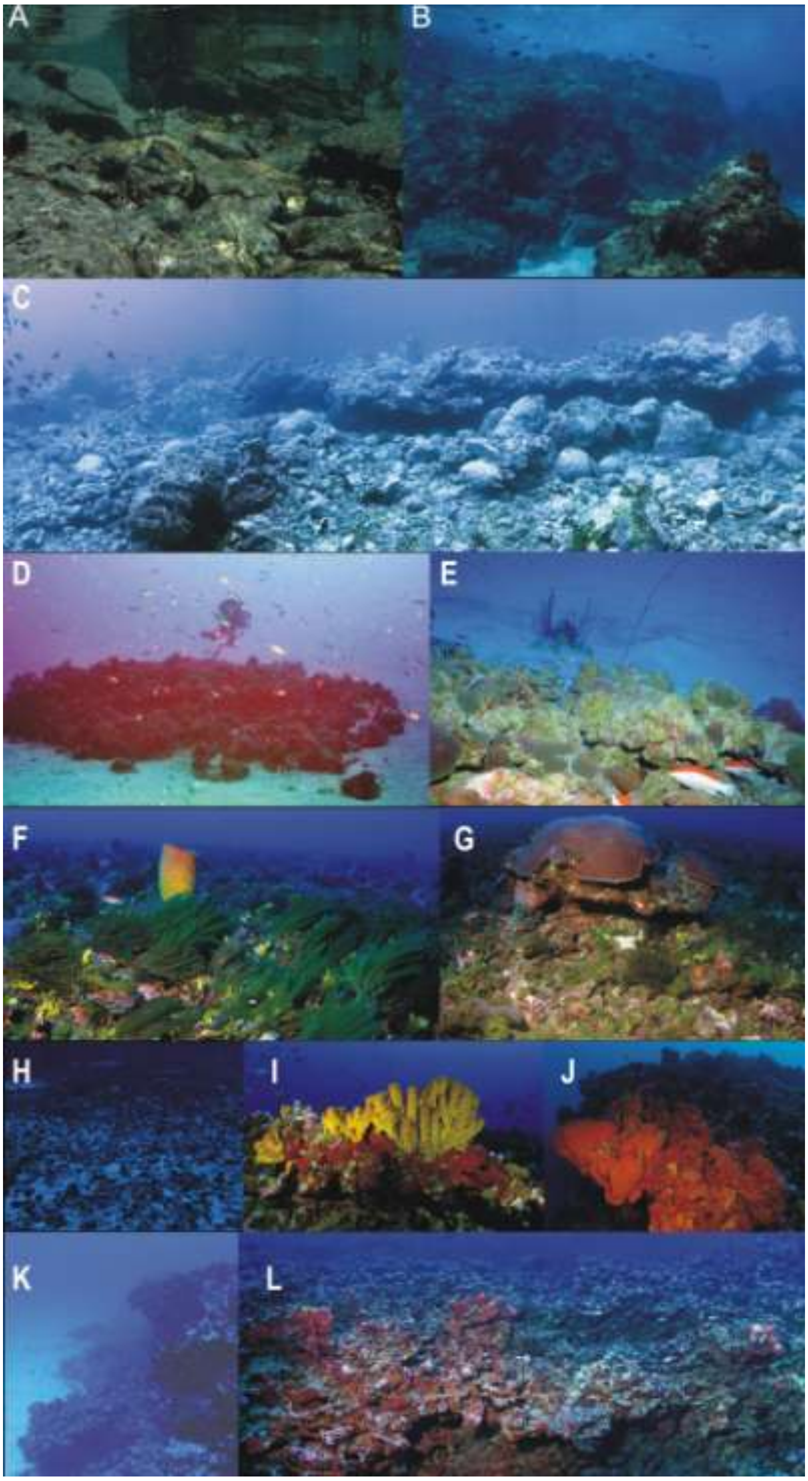

Figure 3: Diversity of structural habitat features along VTC region. (A) Tide pools and (B) rock reefs at Trindade Island; (C) rocky reefs at Martin - Vaz Island; (D-E) Mesophotic patch reef at Trindade island with high reef coral cover; (F-G) Rhodolith beds with high algae cover and complex tri-dimensional structures at Vitoria Seamount; (H) Classical rhodolith beds at Davis seamount; (I-L) Reef structures constructed by calcareous algae with diverse cover of sponges and corals at Davis seamount; (K-L) calcareous algae composing a complex structure that reach heights of 30 m at Davis seamount. Photos, in order of appearance, by: R.M. Macieira, R. Francini-Filho, R.L.Moura, H.T.Pinheiro, PANGEA frame and R. Francini-Filho.

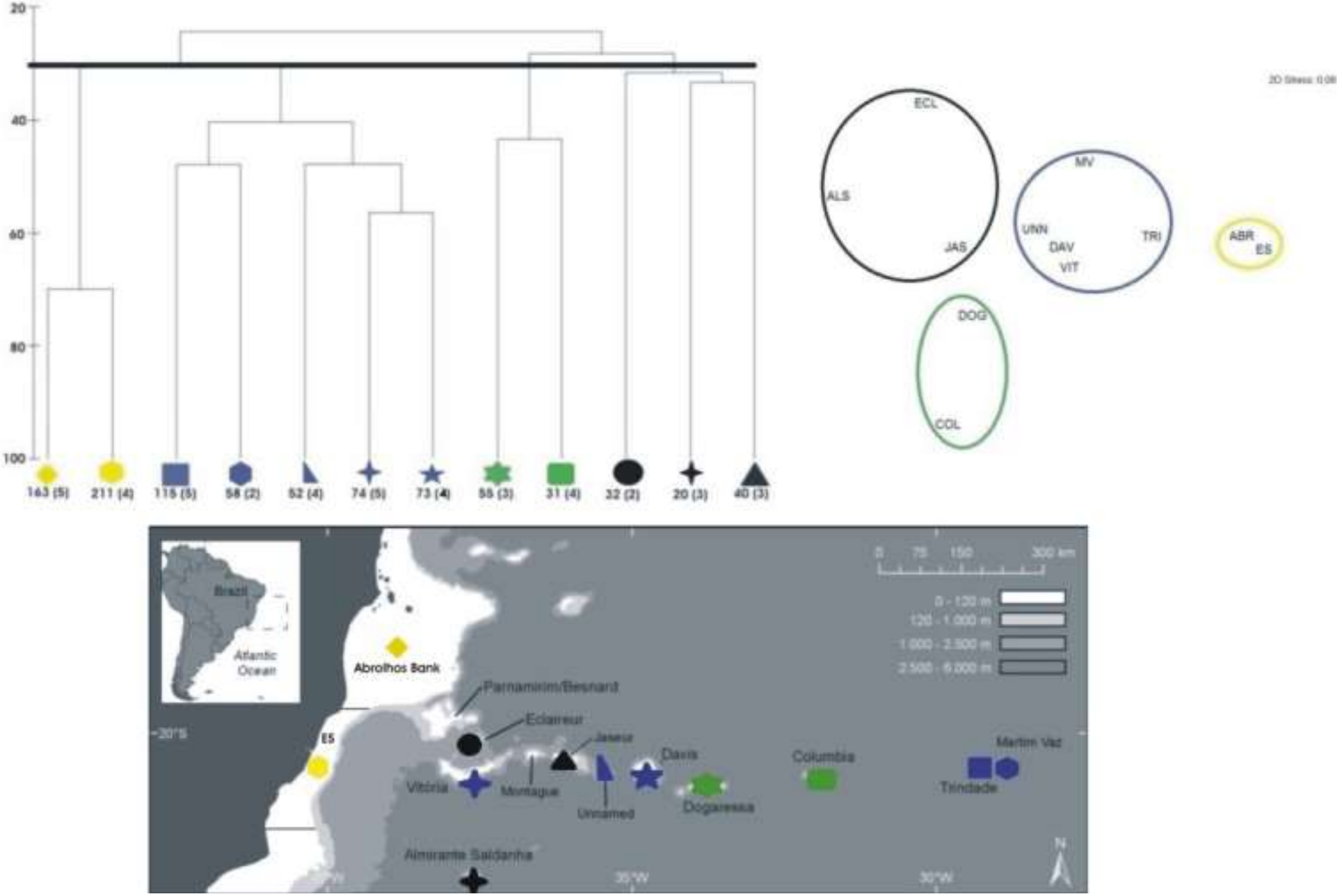

Figure 4: Cluster analysis (Jaccard Coefficient, UPGMA) and MDS diagram built with reef fish composition data showing similarities among sites sampled in the study region. The number of species per sites is given at each end of the cluster diagram, followed by the number of habitat types in parenthesis. The four groups of sites highlighted by distinctive colouring: Yellow (Mainland), Blue (the two islands together with the three bigger and shallower seamounts), Black (the three seamounts that are closer to mainland.) and Green (the two easternmost seamounts).

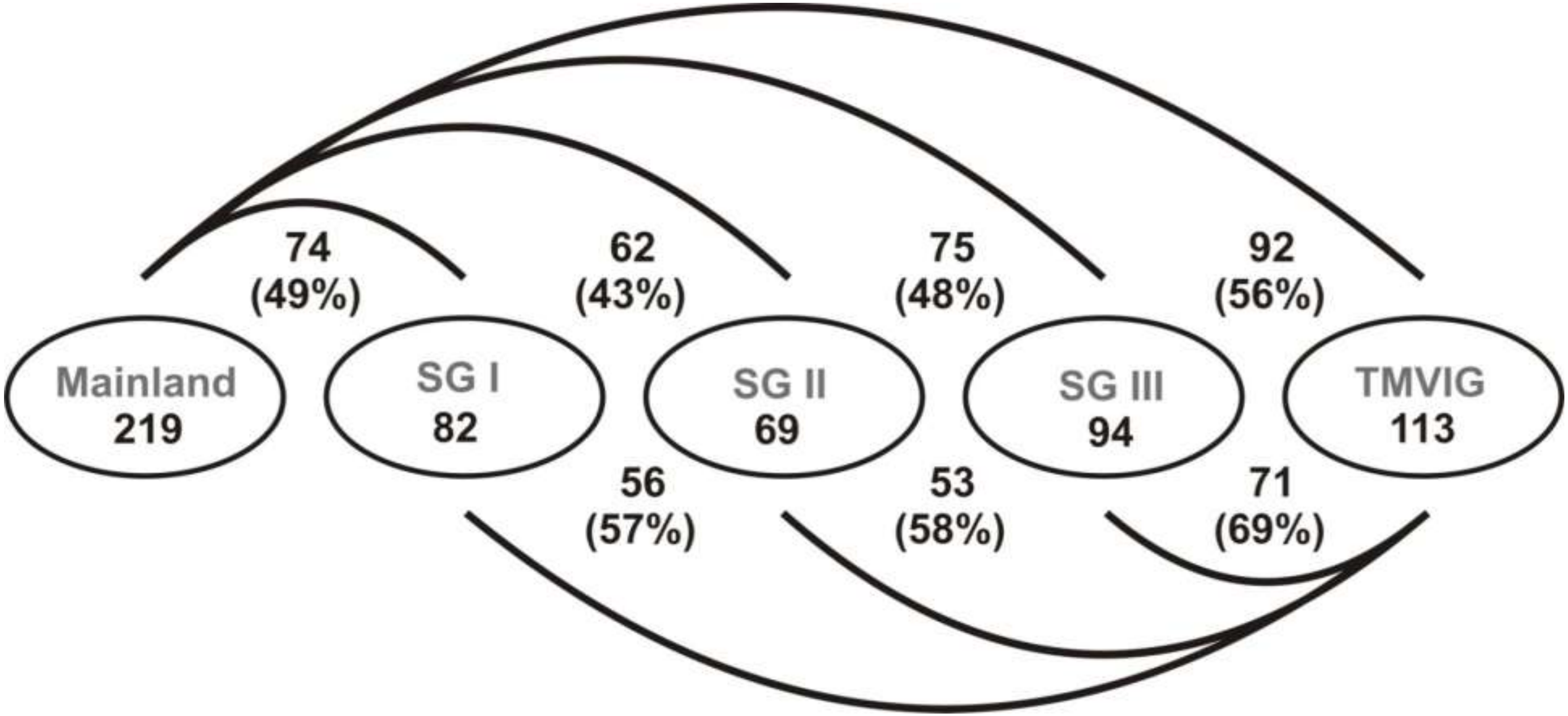

Figure 5: Similarity among areas within the study region, evidencing five groups of sites. Numbers inside the symbols refer to reef fish richness in each area, while numbers and proportions outside the symbols refer to the number and proportion of species shared adjacent areas.

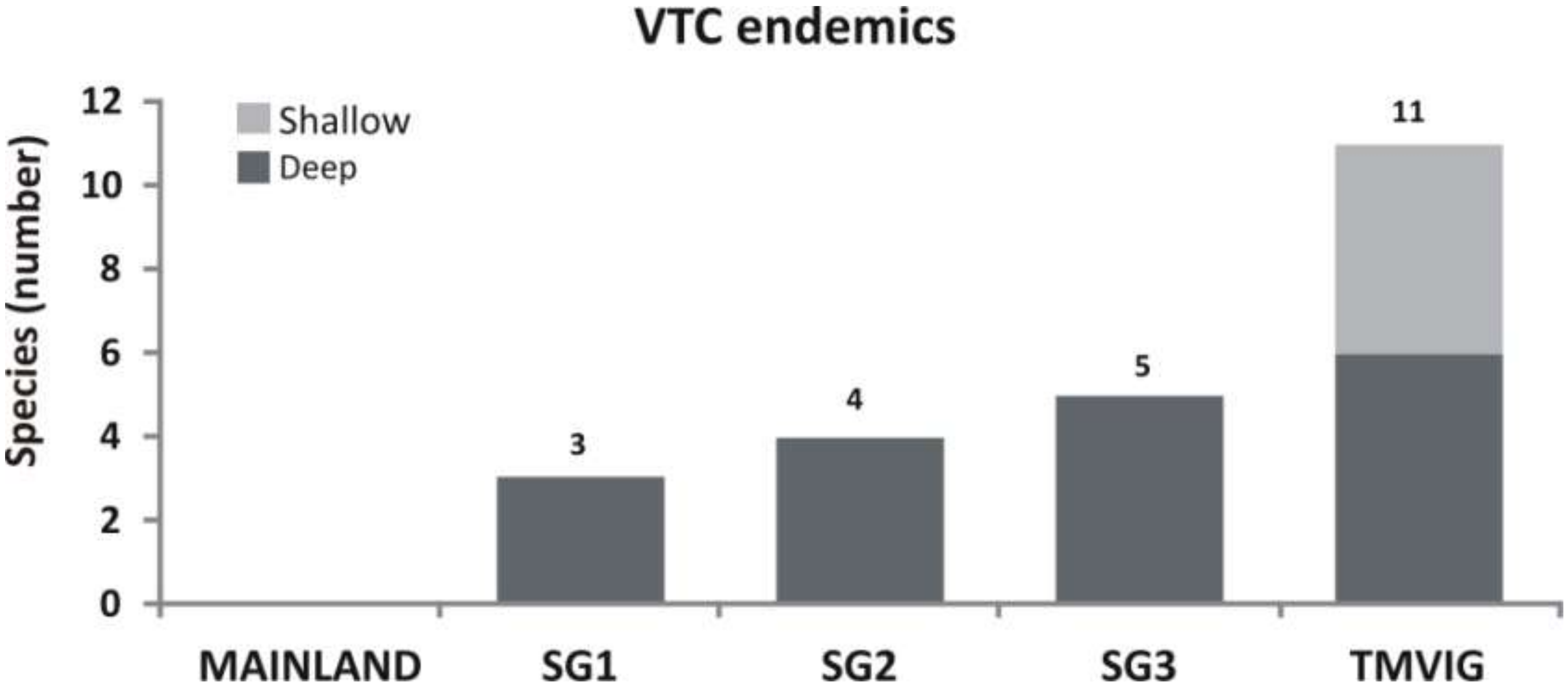

Figure 6: Variation of the number of endemic species along the VTC. Species were segregated by habitat depth with the light-gray representing species restricted to very shallow waters (< 10m).

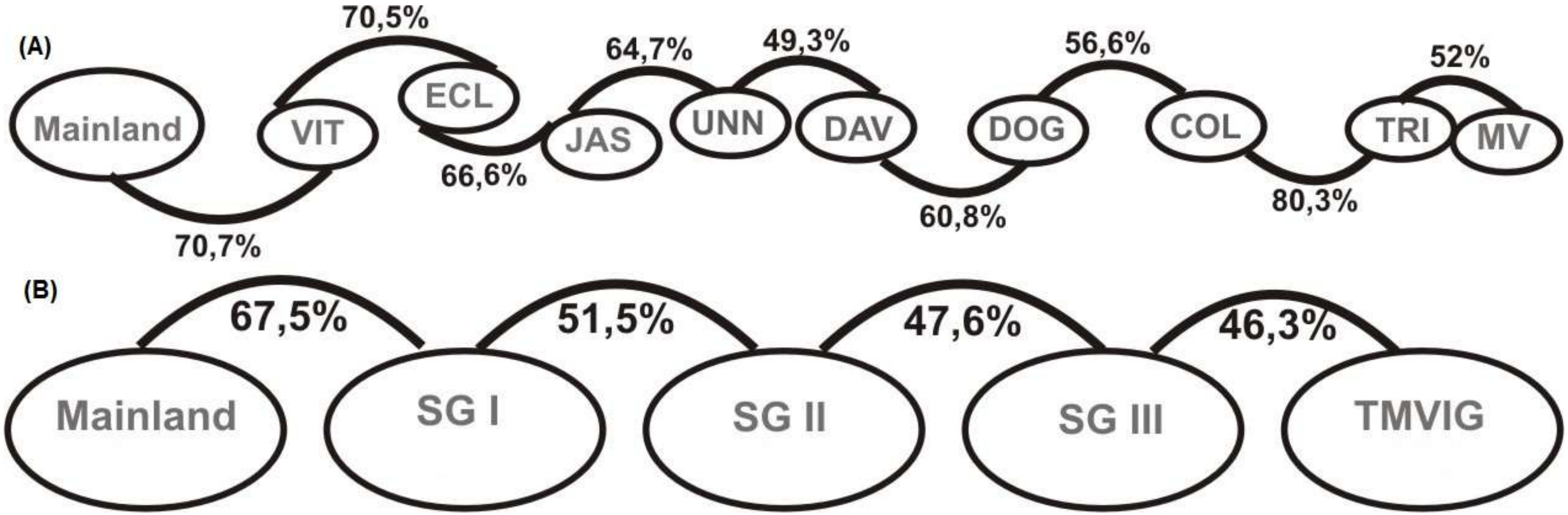

Figure 7: Turnover (beta diversity) between adjacent reef fish assemblages along the VTC for each location (A) and site groups (B) (Jaccard coefficient). The proportion refers to species dissimilarity between each area.

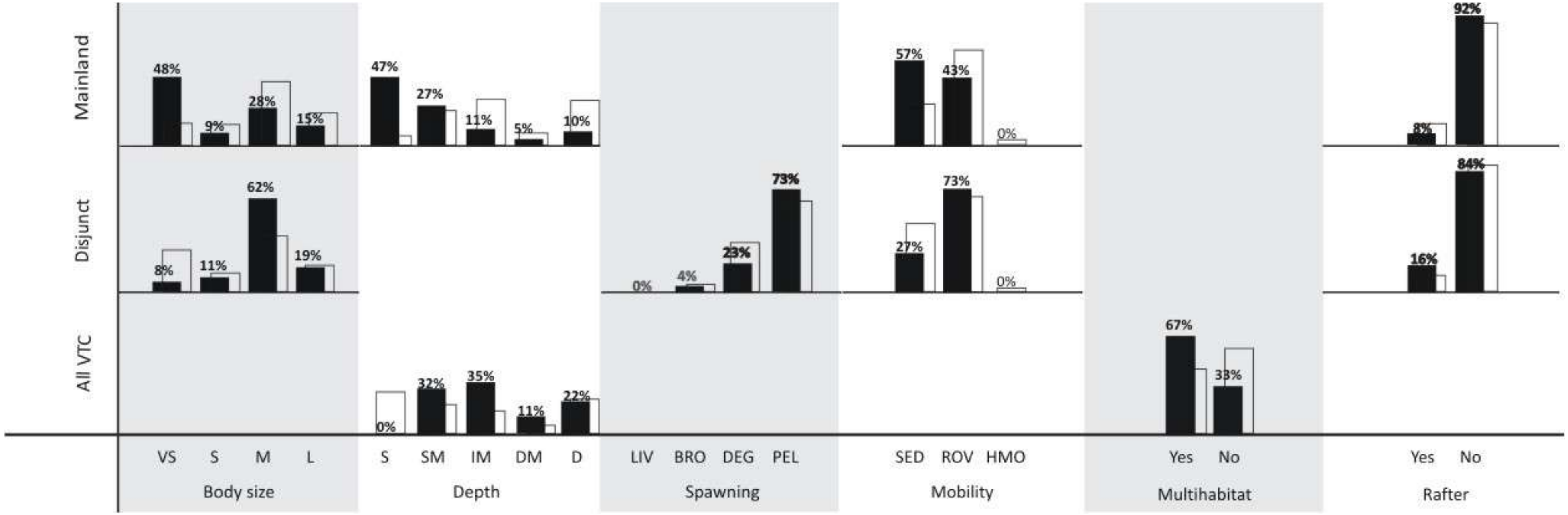

Figure 8: Species traits contribution in predicting significant regional patterns of distribution (black bars) silhouetted against the traits of species following other distribution patterns (open bars). Body size: **VS** - Very small, **S** - Small, **M** - Medium, **L** - large; Depth: **S** - Shallow, **SM** - Shallow mesophotic, **IM** – Intermadiate mesophotic, **DM** - Deep mesophotic, **D** – Deep; Spawning: **LIV** - Live bearer, **BRO** – Brooder. **DEG** - Demersal eggs, **PEL** - Pelagic eggs; Mobility: **SED** - Sedentary/territorial, **ROV** – Roving, **HMO**- Highly mobile/migratory; Multihabitat: **Yes** _ generalists, **No** _specialists; Rafter: **Yes**, **No**.

14. TABLES

Table 1: Summary of sampling effort, data sources and sampling site's characteristics.

Site	***Depth range(m)***	**Summit areas(km²)**	***Substrate type***	***Sampling Techniques***	***Immersions***	***Primary data type***	***References***
Vitoria Seamount	50-120	1184	RH/*RH/RS/ PR/SD	DIV/ROV/ ZEE/CF	38	VO/PHO/VID/VIS/ OB/ZEE	Primary data
Almirante Saldanha Seamount	66	37	RH/*RH/SD	DIV	3	PHO/VID/VIS/	Primary data
Bernard Seamount****	N.A*	1978	Unknow	ZEE	-	ZEE	Primary data
Montague Seamount	N.A*	124	Unknow	ZEE/CF	-	ZEE/OB	Primary data; Andreata & Seret, 1995
Jaseur Seamount	62	89	*RH/RS/SD	DIV/ROV/ZEE	5	PHO/VID/VIS/ ZEE/OB	Primary data
"Unnamed" Seamount	62	99	*RH/RH/RS/SD	DIV	20	VO/PHO/VID/VIS/	Primary data
Eclaireur Seamount	71	6,4	*RH/SD	DIV/ROV	6	PHO/VID/VIR	Primary data
Davis Seamount	17-57	1002	*RH/RH/RS/SD	DIV/ROV/ZEE	46	VO/PHO/VID/VIR/ UVC/ZEE	Primary data

Dogaressa Seamount	65	80,5	*RH/RH/SD	DIV/ZEE	14	VO/PHO/VID/VIR / ZEE	Primary data; Andreata & Seret, 1995
Columbia Seamount	84	36,5	*RH/RH/ PR/SD	DIV/ZEE	3	PHO/VID/VIR/ZEE	Primary data; Andreata & Seret, 1995
Islands							
Trindade Island	0-85	85	*RH/RH/RR /PR/SD	DIV/ROV/ZEE	200	VO/PHO/VID/VIR / UVC/ZEE	Primary data; Nichols & Murphy 1914; Miranda & Ribeiro 1919; Carvalho 1950; Gasparini & Floeter 2001; Pinheiro et al.2009; Pereira-Filho et. al. 2011b; Pinheiro et.al.2010; Simon et al., 2013
Martin Vaz Arquipelago	0-30	24	RR/SD	DIV/ROV	20	VO/PHO/VID/VIR / UVC	Primary data; Pereira-Filho et. al. 2011b; Pinheiro et.al.2010; Simon et al., 2013;
Mainland							
Abrolhos Bank	0-90	52747	RS/*RH/RH / PR/SD	DIV/ROV	-	VO/PHO/VID/VIR /UVC	Primary data; Floeter et al., 2001; Moura & Francini-Filho, 2005; Moura et al., 2005
Espírito Santo	0-70	33091	RR/PR/RH/ SD	DIV	-	VO/PHO/VIR/UVC	Floeter et al., 2001 and 2007; Simon et al. 2011; Macieira & Joyeux, 2011; Pinheiro et al., 2013; Gasparini et al., in prep.;

* refers to the no precise definition of depth REVIZEE survey; ** also known as Parnamirim Bank (local name)

Type of substrate: RS– Reef structure (carbonatic); RR- Rocky reef; PR- patch reef; RH- Rhodolith bed; *RH- Rhodolith bed with sparse structures; SD- Sand and unconsolidated substrate. **Sampling techniques**: DIV– Diving; ROV; CF-commercial fishing; number of **Immersions** per divers. **Primary data type**: VO- Voucher specimen; PHO- photo record; VID-video record; VIS - *in situ* visual record; UVC - underwater visual census; ZEE- REVIZEE project record; OB - onboard observer record during commercial fishing.

Table 2: Results of Mantel tests relating assemblage structure between beta diversity matrices vs FIs characteristics (inter-FI geographic distance, FI areas and mainland distance, and Age) to selected characteristics of the funcional islands. Ability to capture propagules is a function of area and distance from coast. Test result values (R) and associated probabilities (p) are give. Significant ($p < 0.05$) results are in bold.

Coefficient	Island's ability to capture propagules		Inter-island distances		Island age	
	R	p	R	p	R	
Jaccard	- 0.188	0.806	0.319	**0.047**	0.326	0.559
Kulczynski	- 0.151	0.719	0.2641	0.0941	0.285	0.065

15. SUPPORTING INFORMATION

Table S1: Record types and species traits.

Type of record	
Voucher	Specimens deposited at the Ichthyology Collection of the Universidade Federal do Espírito Santo, CIUFES
Literature record	1- Nichols & Murphy (1914); 2- Miranda-Ribeiro (1919); 3 - Carvalho (1950); 4 - Andreata & Seret (1995); 5- Gasparini & Floeter (2001); 6 - Moura et al. (2006); 7 - Pinheiro el al. (2009); 8 - Pereira-Filho et. al. (2011b); 9- Macieira & Joyeux (2011); 10 - Simon et al., 2013
Other records	ZEE - Data from REVIZEE; FIS - Data from commercial fisheries; PHO - Photographic record from diving survey; VID - Underwater video record (includes ROV footage); VIR - Visual record during dive surveys.
Type of habitat	**RS** - reef, **RH** – rhodolith bed, **RH*** - rhodolith bed with sparse reef structures - **SD** – sand bottom; **WC** - water column
Multihabitat use	Yes (**Y**): “generalists” found at more than one habitat. No (**N**): “specialists” recorded in a specific habitat type
Brackish water use	Species that require coastal/estuarine habitats to complete their life cycle: Yes (**Y**) or No (**N**)
Rafter ability	Use of floating objects: Yes (**Y**) or No (**N**)
Spawning Type	**BAL** - Balistid-type; **DEG** - Demersal eggs, short pelagic phase; **DNP** - Demersal eggs with no pelagic phase; **LIV** - Live bearer; **BRO** - Brooder; **PEL** - Pelagic eggs; **NA** – no available data.
Body size	**Large** (adult > 60cm); **Medium** (20-60cm); **Small** (10-20cm); **Very small** (<10cm)

Mobility	**SED** - Sedentary/territorial: adults live in restricted areas (scale of dozens of m^2); **ROV** – Roving: adults can make small scale movements between adjacent reefs over sand and rhodolith beds, but not over greater extensions of deep water; **HMO**- Highly mobile/migratory: adults migrate at larger scales and are able to cross greater extensions of deep water using the water column
Geographical Distribution	**Br**: Brazilian Province endemic; **CA**: Distributed along the Central Atlantic islands and VTC; **CT**: Circumtropical; **CG**: Global distribution on tropical and temperate waters; **TA**: Trans-Atlantic, (i.e. distributed on both sides of Atlantic); **WA**: restricted to the Western Atlantic; **EA**: Eastern Atlantic and VTC **TE**: Trindade Island endemic; **AE**: Abrolhos Bank shelf endemic; **VTC**: Restricted to the seamounts and TMVIG;
Maximum depth	**Shallow**: 0-30m; **Shallow Mesophotic**: 30-70m; **Intermediate Mesophotic**: 70-110m; **Deep Mesophotic**: 110-150m; **Deep**: >150m

Table S2: Species traits according to distribution patterns of fishes along VTC region. NA:no data available. Abbreviations: see Table S1.

Regional distribution	**Total nº species**	**Global geographic distribution**						**Mobility**			**Rafting use**			**Size**				**Spawn type**					**Brackish use**	
		Worldly	Brazilian endemic	VTC endemic	Western Atlantic	Trans-Atlantic	OTH	Hmo	Rov	Sed	No Rafter	Rafter	NA	Large	Medium	Small	Very small	LIV	BRO	*DEG	PEL	NA	YES	NO
Mainland	88	5	16	-	59	8	-	-	38	50	73	6	9	13	25	8	42	-	7	39	42	-	23	65
Islands	7	-	-	5	1	1	-	-	1	6	7	-	-	1	-	1	5	-	-	5	2	-	-	7
Mainland + Seamounts + islands	69	5	12	-	33	19	-	2	47	20	59	9	1	14	29	15	11	-	3	21	45	-	8	61
Seamounts + islands	13	2	1	5	2	3	-	2	5	6	11	2	-	2	6	-	5	-	1	5	7	-	-	13
Disjunct (Mainland + Islands)	26	3	2	-	12	9	-	-	19	7	21	4	1	5	16	3	2	-	1	6	19	-	3	23
Mainland + Seamounts	37	3	5	-	23	6	-	2	29	6	27	6	1	14	17	4	2	-	2	5	30	-	6	31
Seamounts	7	1	-	0	3	1	1	-	6	1	5	1	1	2	4	1	-	-	-	1	6	-	-	7
Volcanic edifices (all species less those restricted to mainland)	159	14	20	11	74	39	-	6	107	46	133	22	4	38	72	24	25	-	7	43	109	-	17	142
All species	247	19	36	11	133	47	1	6	145	96	206	28	13	51	97	32	67	-	14	82	151	-	40	207

Table S3: Species traits according to distribution patterns of fishes along VTC region, continuation. Abbreviations: see Table S1

Regional distribution	Total n° species	Depth					Habitat utilization				Exclusive habitat use				Habitat use	
		S	SM	IM	DM	D	RH	RS	WC	SD	RH	RS	WC	SD	Generalist	Specialist
Mainland	88	41	24	10	4	9	33	74	5	26	4	44	-	3	37	52
Islands	7	7	-	-	-	-	-	7	-	-	-	7	-	-	-	7
Mainland + Seamounts + Islands	69	-	22	24	8	15	47	61	6	4	4	20	-	-	46	23
Seamounts + Islands	13	-	4	6	-	3	10	10	2	1	3	2	-	-	7	6
Disjunct (Mainland + islands)	26	5	8	5	3	5	10	20	-	1	-	16	-	1	9	17
Mainland + Seamounts	37	-	6	8	2	21	28	28	4	3	7	7	-	-	23	14
Seamounts	7	-	-	4	1	2	5	3	1	-	3	1	1	-	2	5
Volcanic edifices (all species less those restricted to mainland)	159	12	40	47	14	46	100	129	13	8	17	53	1	1	86	73
All species	247	53	64	57	18	55	133	201	18	33	21	97	1	4	121	126

Table S4: Summary of generalized linear models for the effects of bioecological traits on the distribution patterns of the reef fish fauna of the study region. Significant (P < 0.05) relationships are in bold. NA =- not evaluated due to numerical limitations.

	Regional distribution pattern/number of species	MAINLAND  88	MAINLAND – SEAMOUNTS  37	DISJUNCT  27	All VTC  69	SEAMOUNTS-ISLANDS  13
Full model Omnibus test	Likelihood ratio Chi-Square	154,921	76,669	81,146	114,611	57,969
	DF	55	55	55	55	55
	Sig	**<0,001**	0,28	**0,012**	**< 0,001**	0,366
Intercept	Wald Chi-Square	1,904	-	NA	NA	-
	DF	1				
	Sig	0,168				
Body size	Wald Chi-Square	11,935	-	7,269	7,670	-
	DF	3		2	3	
	Sig	**0,008**		**0,026**	0,053	
Maximum depth	Wald Chi-Square	17,251	-	7,409	49,559	-
	DF	4		4	4	
	Sig	**0,002**		0,116	**< 0,001**	
Multiple habitat use	Wald Chi-Square	0,016	-	1,676	5,552	-
	DF	1		1	1	
	Sig	0,899		0,195	**0,018**	
Mobility	Wald Chi-Square	70,646	-	31,654	1,073	-
	DF	2		2	2	
	Sig	**< 0,001**		**< 0,001**	0,585	

Brackish water use	Wald Chi-Square	1,273	-	1,168	0,080	-
	DF	1		1	1	
	Sig	0,259		0,280	0,777	
Spawning strategy	Wald Chi-Square	6,943	-	58,405	4,230	-
	DF	3		3	3	
	Sig	0,074		**< 0,001**	0,238	
Rafting ability	Wald Chi-Square	8,557	-	440,223	0,769	-
	DF	2		2	2	
	Sig	**0,014**		**< 0,001**	0,681	
Family	Wald Chi-Square	186,503	-	NA	NA	-
	DF	5				
	Sig	**< 0,001**				

16. S1 CHECKLIST

An checklist of the fish species of VTC is provided below. Family was ordered following Nelson (2006). Informations about species are arranged in the following order: **habitat type** in which the species has been recorded (RS - recifal structure, RH - rhodolith, SD - sand/mud or WC - water column); **global distribution** (Br - Brazilian province; CA - Central Atlantic; CT - Circumtropical; EA - Eastern Atlantic; SCa - Southern Caribbean; TA - Trans-Atlantic; WA - Western Atlantic; CG - Circumglobal; M - Mediterranean; TE - Trindade endemic; SW - Southwestern Atlantic; EP - Eastern Pacific; WC - Western Central Atlantic; IP - Indo-Pacific; AE - Abrolhos endemic; VTC - Vitória - Trindade Chain endemic); **conservation status** according to IUCN Red List (LC - Least concern; NA - Not appraised; NT - Near threatened; DD - Data deficient; CR - Critically endangered; ED - Endangered; VU - Vulnerable) and/or Brazilian Red List (ET – Threatened of Extinction; OT - Over explotation; CT - Comercial target); **depth range**, from information available in the litterature (L), occasionaly extended based on our records (O); **regional distribution** (Islands; Coast; Seamounts; Coast-Seamount; Islands-Seamounts; Disjunct; Coast-Seamounts-Islands); **location record** (Abrolhos bank - ABRO; Espírito Santo south continental shelf - ES; Almirante Saldanha seamount - ALSAL; Columbia seamount - COL; Eclaireur seamount - ECL; Montague seamount - MON; Davis seamount - DAV; Dogaressa seamount - DOG; Jaseur seamount- JAS; Unnamed seamount- UNN; Parnamirim seamount - PARN; Vitoria Seamount - VIT; Trindade island - TRI; Martin Vaz island - MAR); **Type of record**: CIUFES - Ichthyological Collection of the Universidade Federal do Espírito Santo; LIT - Literature record (Miranda-Ribeiro, 1919; Carvalho, 1950; Andreata & Seret, 1995; Gasparini & Floeter, 2001; Moura et al, 2006; Pinheiro el al, 2009; Pereira-Filho et. al, 2010; Macieira & Joyeux, 2011; Simon et al., 2013 ; 1 to 9, respectively); FIS - caught by fisherman and/or record by author´s personal observation; ZEE - REVIZEE unpublished record; PHO - Photo record; VID - Video record; VIS - visual sighting. Photographs showing *in situ* or freshly-collected specimens illustrating sexual and developmental (juvenile to adult) variability in color pattern in the study area were included.

ORECTOLOBIFORMES

GINGLYMOSTOMATIDAE

Ginglymostoma cirratum (Bonnaterre, 1788)

RS; CG; DD/ET; **-** ; Coast-Seamounts-Islands: ABRO (LIT 7, FIS, ZEE), ES (FIS), VIT (VIS, VID), UNN (VIS, PHO, VID), DAV (VIS, PHO, VID), DOG (ZEE), TRI (LIT 1, LIT 2), MAR (PHO). *Ginglymostoma cirratum* was the only shark sighted during dive surveys on VTC.

Figure 1: *Ginglymostoma cirratum,* photo by R. L. Moura at Davis seamount.

RHINCODONTIDAE

Rhincodon typus (Smith, 1828)

WC; CG; VU/ET; **-** ; Disjunct: ABRO (FIS), ES (FIS), TRI (LIT 4).

LAMNIFORMES

ALOPIIDAE

Alopias superciliosus Lowe, 1841

WC; CT; VU; **-** ; Seamounts: PARN (ZEE).

LAMNIDAE

Carcharodon carcharias (Linnaeus, 1758)

RS/RH/WC; CG; VU; **-** ; Islands: TRI (LIT 9).

Isurus oxyrinchus (Rafinesque, 1810)

WC; CG; VU; **-** ; Seamounts: VIT (ZEE), PARN (ZEE).

Isurus paucus Guitart, 1966

WC; CG; VU; L (200 m), O (41-66 m); Seamounts: PARN (ZEE).

CARCHARHINIFORMES

TRIAKIDAE

Mustelus canis (Mitchill, 1815)

RS/RH; WA; NT; **-** ; Seamounts: PARN (ZEE), ECL (ZEE), JAS (ZEE), MONT (ZEE).

CARCHARHINIDAE

Carcharhinus falciformis (Müller & Henle, 1839)

WC; CG; NT; **-** ; Coast-Seamounts-Islands: ES (FIS), VIT (FIS), PARN (ZEE), MONT (FIS), TRI (FIS).

Figure 2: *Carcharhinus falciformes* shortly after death, photo by E. Mazzei at Montague seamount.

Carcharhinus galapagensis (Snodgrass & Heller, 1905)

WC; CT; NT; **-** ; Islands: TRI (FIS).

Carcharhinus leucas (Muller & Henle, 1839)

WC; CG; NT; **-** ; Coast-Seamounts-Islands: ABRO (FIS), ES (FIS), MONT (FIS), TRI (FIS).

Carcharhinus limbatus (Müller & Henle, 1839)

RS/RH/WC; CG; NT; **-** ; Islands: TRI (LIT 8).

Carcharhinus longimanus (Poey, 1861)

WC; CG; VU/ET; **-** ; Coast-Seamounts-Islands: ES (FIS), VIT (FIS), TRI (FIS).

Figure 3: *Carcharhinus longimanus* shortly after death, photo by E. Mazzei at Vitoria seamount.

Carcharhinus obscurus (Lesueur, 1818)

RS/RH/WC; CG; VU; **-** ; Islands: TRI (LIT 8).

Carcharhinus perezii (Poey, 1876)

RS/RH/WC; WA; NT; **-** ; Disjunct: ABRO (LIT 7), ES (FIS), TRI (LIT 2), MAR (LIT 1, VIS, PHO).

Figure 4: *Carcharhinus perezii* shortly after death, photo by H. T. Pinheiro at Trindade.

Carcharhinus plumbeus (Nardo, 1827)

WC; CG; VU; **-** ; Coast-Seamounts-Islands: ES (FIS), PARN (ZEE), TRI (FIS).

Carcharhinus signatus (Poey, 1868)

WC; TA; VU/ET; **-** ; Seamounts: PARN (ZEE).

Figure 5: *Carcharhinus signatus,* photo by P. Costa.

Galeocerdo cuvier (Perón & LeSueur, 1822)

RS/RH/WC; CG; NT; **-** ; Coast-Seamounts-Islands: ABRO (LIT 7), ES (FIS), VIT (FIS, PHO), PARN (ZEE), ECL (ZEE), DOG (CI UFES, VID, PHO), TRI (LIT 4), MAR (FIS).

Figure 6: *Galeocerdo cuvier* shortly after death, photo by E. Mazzei at Vitoria seamount.

Prionace glauca (Linnaeus, 1758)

WC; CG; NT/ET; **-** ; Seamounts-Islands: VIT (FIS, ZEE), PARN (ZEE), MONT (FIS), TRI (FIS). Clarke and collaborators (2006) determined that the commercial exploration of blue shark stocks is close to exceeding the maximum sustainable yield levels. Blue shark is the main target of the commercial fisheries operations that utilize longline on VTC region (unpublished data).

SPHYRNIDAE

Sphyrna lewini (Griffith & Smith, 1834)

RS/WC; CG; ED/OT; **-** ; Coast-Seamounts-Islands: ABRO (FIS), ES (FIS), PARN (ZEE), TRI (FIS), MAR (PHO).

Figure 7: *Sphyrna lewini* shortly after death, photo by E. Mazzei adjacent to the Vitoria seamount.

Sphyrna zygaena (Linnaeus, 1758)

WC; CG; VU; **-** ; Seamounts: PARN (ZEE).

SQUALIFORMES

SQUALIDAE

Squalus mitsukurii Jordan & Snyder, 1903

RS; CG; DD; **-** ; Seamounts: PARN (ZEE).

ZEIFORMES

ZENIONIDAE

Zenion hololepis (Goode & Bean, 1896)

SD; CG; NA; L (180-650 m), O (52 m); Coast-Seamounts: ES (ZEE), VIT (LIT 5).

Figure 8: *Zenion hololepis*, photo by P.Costa.

MYLIOBATIFORMES

DASYATIDAE

Dasyatis centroura (Mitchil, 1815)

RS/RH; TA/M; LC; **-** ; Coast-Seamounts: ABRO (LIT 7), ES (FIS), VIT (VID).

Dasyatis guttata (Bloch & Schneider, 1801)

RS/RH; TA/M; LC; **-** ; Coast-Seamounts: ABRO (LIT 7), ES (FIS), UNN (VIS).

Dasyatis sp.

Seamounts: DAV (PHO, VIS, ZEE)

Figure 9: *Dasyatis sp.*, photo by R.L.Moura at Davis seamount.

Pteroplatytrygon violacea (Bonaparte, 1832)

WC; CG; LC; **-** ; Seamounts: VIT (ZEE).

MYLIOBATIDAE

Aetobatus narinari (Euphrasen, 1790)

WC; CT; NT; **-** ; Coast-Seamounts-Islands: ABRO (LIT 7), ES (FIS), UNN (VIS, VID, PHO), TRI (LIT 4).

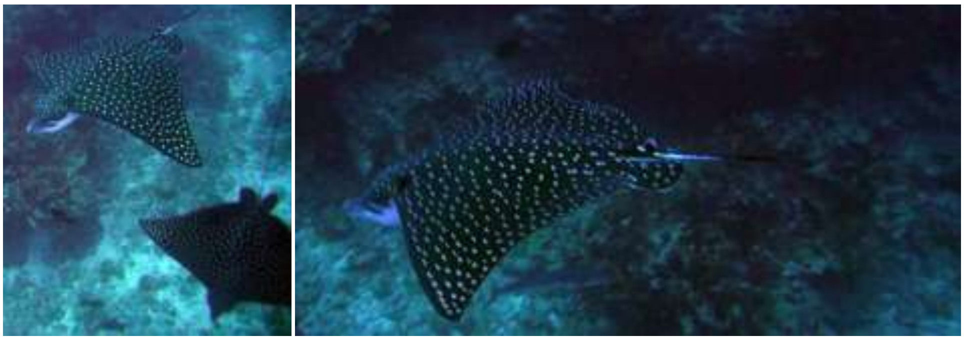

Figure 10: *Aetobatus narinari*, photos by H-T Pinheiro at Trindade.

Mobula sp.

WC; **-** ; Coast-Seamounts: ABRO (FIS), MONT (FIS).

Figure 11: *Mobula* sp. shortly after death, photo by E. Mazzei at Montague seamount.

ANGUILLIFORMES

MORINGUIDAE

Moringua edwardsi (Jordan & Bollman, 1889)

RS; WA; LC; **-** ; Disjunct: ABRO (FIS), TRI (LIT 2).

CHLOPSIDAE

Chlopsis bicolor Rafinesque, 1810

RH; TA/M; L (80-365 m), O (60 m); NA; Islands: TRI (LIT 5).

Kaupichthys hyoproides (Strömman, 1896)

RH; CT; NA; **-** ; Islands: TRI (CIUFES#2205).

Figure 12: *Kaupichthys hyoproides* shortly after death, photo by T. Simon at Trindade.

MURAENIDAE

Channomuraena vittata (Richardson, 1844)

RH; CT; NA; **-** ; Seamounts-Islands: DOG (LIT 5), TRI (PHO, VIS).

Figure 13: *Channomuraena vittata, p*hoto by J. B. Mendonça Junior at Trindade.

Echidna catenata (Bloch, 1795)

RS; TA; NA; **-** ; Islands: TRI (LIT 2, CIUFES#1256).

Enchelycore carychroa Böhlke & Böhlke, 1976

RS; TA; NA; L (1-54 m), O (65 m); Seamounts-Islands: DOG (CIUFES#2051), TRI (LIT 4, CIUFES#2241).

Enchelycore nigricans (Bonaterre, 1788)

RS; TA; NA; **-** ; Disjunct: ES (FIS), TRI (LIT 2).

Figure 14: *Enchelycore nigricans* shortly after death, photo by H. T. Pinheiro at Trindade.

Gymnothorax funebris Ranzani, 1840

RS/RH; CT; NA; **-** ; Coast-Seamounts: ABRO (LIT 7), ES (FIS), VIT (VIS, VID), JAS (LIT 5), MONT (LIT 5), UNN (VIS, VID), DAV (PHO, VID, LIT 5), DOG (LIT 5).

Figure 15: *Gymnothorax funebris*, photo by J-C Joyeux at Guarapari islands (ES).

Gymnothorax maderensis (Johnson, 1862)

RS/RH; TA; NA; **-** ; Seamounts: PARN (ZEE), DOG (ZEE), COL (ZEE).

Gymnothorax miliaris (Kaup, 1856)

RS/RH; TA; NA; L (0-60 m), O (0-71 m); Coast-Seamounts-Islands: ES (FIS), ECL (VIS, PHO), DOG (CIUFES#2052), TRI (LIT 1, LIT 2).

Figure 16: *Gymnothorax miliaris*; Photo by T. Simon at Trindade.

Gymnothorax moringa (Cuvier,1829)

RS/RH; TA; NA; **-** ; Coast-Seamounts-Islands: ABRO (LIT 7, VIS), ES (FIS), VIT (VIS, ZEE), PARN (ZEE), ECL (ZEE), JAS (VIS, PHO, VID); MONT (ZEE), DAV (ZEE, VIS), DOG (VIS, ZEE), COL (LIT 5, ZEE), TRI (FIS, ZEE, LIT 1, LIT 2, CIUFES#2242), MAR (LIT 1, VIS, PHO,VID).

Figure 17: *Gymnothorax moringa,* photo by R. Macieira at Trindade.

Gymnothorax ocellatus Agassiz, 1831

RS/RH; WA; NA; **-** ; Coast-Seamounts: ABRO (LIT 7), ES (FIS), VIT (LIT 5), PARN (ZEE), DOG (LIT 5), COL (LIT 5).

Gymnothorax polygonius Poey 1876

RS/RH; TA; NA; L (10-256 m), O (50-354 m); Seamounts-Islands: PARN (ZEE), ECL (ZEE), DAV (ZEE), DOG (ZEE), COL (ZEE), TRI (ZEE, LIT 2).

Gymnothorax vicinus (Castelnau, 1855)

RS/RH; TA; NA; L (0-145 m), O (97-186 m); Coast-Seamounts: ABRO (LIT 7), ES (FIS), PARN (ZEE), JAS (ZEE), MONT (ZEE).

Figure 18: *Gymnothorax vicinus*, photo by J-C Joyeux at Guarapari islands (ES).

Monopenchelys acuta (Parr, 1930)

RH; CT; LC; L (13-45 m), O (30-81 m); Seamounts-Islands: MONT (LIT 5), TRI (CIUFES#2204).

OPHICHTHIDAE

Myrichthys breviceps (Richardson, 1848)

RS/RH/SD; WA; NA; **-** ; Disjunct: ABRO (LIT 7), ES (FIS), TRI (LIT 1, LIT 2), MAR (LIT 1, LIT 2).

Figure 19: *Myrichthys breviceps*, photo by H. T. Pinheiro at Trindade.

Myrophis sp.

SD; WA; Islands: TRI (LIT 2).

Ophichthus gomesi (Castelnau, 1855)

RH/SD; WA; NA; **-** ; Coast-Seamounts: ES (FIS), UNN (LIT 5), COL (LIT 5).

Ophichthus ophis (Linnaeus, 1758)

RH/SD; TA; NA; L (21-50 m), O (5-66 m); Disjunct: ABRO (LIT 7), ES (FIS), ALSAL (PHO), TRI (LIT 2).

Figure 20: *Ophichthus ophis,* photo by T. Simon at Trindade.

Pseudomyrophis frio (Jordan & Davis, 1891)

SD; WA; NA; **-** ; Seamounts: COL (LIT 5).

MURAENESOCIDAE

Cynoponticus savanna (Bancroft, 1831)

RH/SD; WA; NA; **-** ; Coast-Seamounts: ABRO (LIT 7), DOG (LIT 5).

CONGRIDAE

Ariosoma opisthophthalmum (Ranzani, 1838)

RH/SD; Br; L (110-600 m), O (50 m); NA; Coast-Seamounts; ES (CIUFES#130629); MONT (LIT 5).

Heteroconger sp.

SD; TA; NA; L (10-60 m), O (84 m); Islands: TRI (VIS, PHO).

CLUPEIFORMES

CLUPEIDAE

Harengula jaguana Poey, 1865

WC; WA; NA; **-** ; Disjunct: ABRO (LIT 7), TRI (LIT 2; CIUFES#2658).

Figure 21: *Harengula jaguana*, photo by H. T. Pinheiro at Trindade.

STOMIIFORMES

GONOSTOMATIDAE

Diplophos taenia Günter, 1873

WC; CT; NA; **-** ; Seamounts: MONT (ZEE), DAV (ZEE).

Manducus maderensis (Johnson, 1890)

WC; TA; NA; **-** ; Seamounts: DAV (ZEE).

STERNOPTYCHIDAE

Maurolicus stehmanni Parin & Kobyliansky, 1993

WC; SW; NA; **-** ; Seamounts: VIT (ZEE).

Figure 22: *Maurolicus stehmanni,* photo by P. Costa.

PHOSICHTHYIDAE

Pollichthys mauli (Poll, 1953)

WC; CG; NA; L (100-600 m), O (49-68 m); Seamounts: MONT (ZEE), DAV (ZEE).

Vinciguerria nimbaria (Jordan & Williams, 1895)

WC; CG; NA; **-** ; Seamounts: MONT (ZEE).

STOMIIDAE

Astronesthes similus Parr, 1927

WC; NA; **-** ; Seamounts: DAV (ZEE).

AULOPIFORMES

SYNODONTIDAE

Saurida sp.

WC; **-** ; Seamounts: VIT (ZEE), DAV (ZEE).

Synodus foetens (Linnaeus, 1766)

RS; WA; NA; **-** ; Coast-Seamounts: ABRO (LIT 7) ES (FIS); VIT (LIT 5).

Figure 23: *Synodus foetens*, photo by J-C Joyeux at Guarapari islands (ES).

Synodus intermedius (Spix & Agassiz, 1829)

RS/RH; WA; NA; **-** ; Coast-Seamounts: ABRO (LIT 7), ES (FIS), VIT (LIT 5), DOG (VIS), COL (LIT 5).

Figure 24: *Synodus intermedius*, photo by J-C Joyeux at Guarapari islands (ES).

Synodus synodus (Linnaeus, 1758)

RS/RH; TA; NA; **-** ; Coast-Seamounts-Islands: ABRO (FIS), ES (FIS), DAV (VIS, PHO), TRI (LIT 1, LIT 2).

Figure 25: *Synodus synodus*, photo by J-C Joyeux at Guarapari islands (ES).

Trachinocephalus myops (Forster, 1801):

RH/SD; CG; NA; - ; Disjunct: ABRO (LIT 7), ES (FIS), TRI (LIT 2).

MYCTOPHIFORMES

MYCTOPHIDAE

Ceratoscopelus warmingii (Lütken, 1892)

WC; CG; NA; - ; Seamounts: MONT (ZEE).

Diaphus brachycephalus Taning, 1928

WC; CG; NA; L (200-600 m), O (68 m); Seamounts: MONT (ZEE).

Diaphus dumerilii (Bleeker, 1856)

WC; TA; NA; - ; Seamounts: MONT (ZEE), DAV (ZEE).

Diaphus fragilis Taning, 1928

WC; CT; NA; - ; Seamounts: MONT (ZEE).

Diaphus garmani Gilbert, 1906

WC; CT; NA; - ; Seamounts: DAV (ZEE).

Diaphus lucidus (Goode & Bean, 1896)

WC; CT; NA; - ; Seamounts: MONT (ZEE).

Diaphus perspicillatus (Ogilby, 1898)

WC; CT; NA; - ; Seamounts: MONT (ZEE), DAV (ZEE).

Diaphus problematicus Parr, 1928

WC; CT; NA; - ; Seamounts: MONT (ZEE).

Diaphus splendidus (Brauer, 1904)

WC; CT; NA; - ; Seamounts: MONT (ZEE).

Hygophum reinhardtii (Lütken, 1892)

WC; CG; NA; - ; Seamounts: MONT (ZEE).

Lepidophanes guentheri (Goode & Bean, 1896)

WC; TA; NA; - ; Seamounts: MONT (ZEE), DAV (ZEE).

Myctophum affine (Lütken, 1892)

WC; TA; NA; - ; Seamounts: MONT (ZEE).

Myctophum obtusirostre Taning, 1928

WC; CT; NA; - ; Seamounts: MONT (ZEE), DAV (ZEE).

Notoscopelus caudispinosus (Johnson, 1863)

WC; CG; NA; L (175-1000 m), O (68 m); Seamounts: MONT (ZEE).

POLYMIXIIFORMES

POLYMIXIIDAE

Polymixia lowei Günther, 1859

RH/SD; WA; NA; - ; Coast-Seamounts: ABRO (FIS), VIT (ZEE), DAV (ZEE), DOG (ZEE).

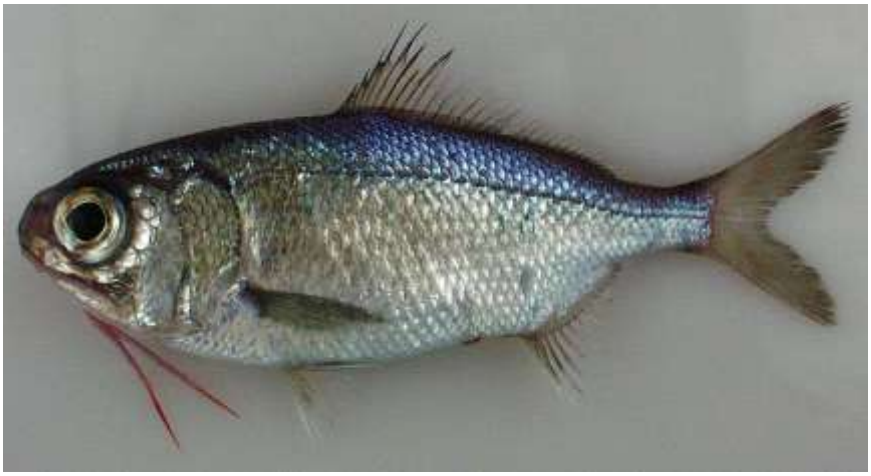

Figure 26: *Polymixia lowei*, photo by P. Costa.

OPHIDIIFORMES

CARAPIDAE

Carapus bermudensis (Jones, 1874)

RS/RH; WA; NA; - ; Disjunct: ABRO (FIS), ES (CIUFES#1373), TRI (CIUFES#2107).

Figure 27: *Carapus bermudensis* shortly after death, photo by T. Simon at Trindade.

BATRACOIDIFORMES

BATRACHOIDIDAE

Porichthys porosissimus (Cuvier, 1829)

SD; SW; NA; L (30-200 m), O (34-217 m); Coast-Seamounts: ES (FIS), VIT (LIT 5).

MUGILIFORMES

MUGILIDAE

Mugil curvidens (Valenciennes, 1836)

RS/WC; WA; NA; - ; Islands: TRI (LIT 2, CIUFES#1559).

BELONIFORMES

EXOCOETIDAE

Cheilopogon cyanopterus (Valenciennes, 1847)

WC; CG; NA; - ; Seamounts: UNN (PHO, CIUFES 2132).

Cheilopogon furcatus (Mitchill, 1815)

WC; CT; NA; - ; Islands: TRI (LIT 8).

Cheilopogon heterurus (Rafinesque, 1810)

WC; CG; NA; - ; Islands: TRI (LIT 9).

Exocoetus volitans Linnaeus, 1758

WC; CG; NA; - ; Coast-Seamounts-Islands: ES (FIS), UNN (CIUFES 2131), TRI (FIS, LIT 9).

Hirundichthys affinis (Günther, 1866)

WC; TA/IP; NA; - ; Islands: TRI (LIT 8).

Parexocoetus hillianus (Gosse, 1851)

WC; WA; NA; - ; Seamounts: UNN (CIUFES#2130).

HEMIRAMPHIDAE

Hemiramphus brasiliensis (Linnaeus, 1758)

WC; TA; NA; - ; Disjunct: ABRO (LIT 7), ES (FIS), TRI (LIT 2), MAR (VIS).

BELONIDAE

Platybelone argalus (Lesueur, 1821)

WC; WA; NA; - ; Coast-Seamounts-Islands: ES (FIS); UNN (CIUFES 2133), TRI (LIT 2).

Figure 28: *Platybelone argalus,* photo by H. T. Pinheiro at Trindade.

BERYCIFORMES

HOLOCENTRIDAE

Holocentrus adscensionis (Osbeck, 1771)

RS/RH; TA; NA; - ; Coast-Seamounts-Islands: ABRO (LIT 7, VID), ES (FIS), VIT (VID, CIUFES#2035, VIS, PHO, ZEE), ALSAL (VIS, PHO, VID), PARN (ZEE), ECL (VIS, PHO,

ZEE), JAS (VID), MONT (ZEE), UNN (VIS, PHO, VID), DAV (VIS, PHO, VID, ZEE), DOG (VIS, VID, ZEE), COL (VIS, ZEE), TRI (VIS, PHO, VID, FIS, LIT 1, LIT 2,CIUFES#2640), MAR (LIT 1, VIS).

Figure 29: *Holocentrus adscensionis*, photo by J-C Joyeux at Guarapari Islands (ES).

Myripristis jacobus Cuvier, 1829

RS/RH; TA; NA; - ; Coast-Seamounts-Islands: ABRO (LIT 7, VIS), ES (FIS), VIT (VID, VIS, PHO), ECL (VIS), UNN (VIS, VID, PHO), DAV (VIS, UVC, PHO), TRI (FIS, LIT 2), MAR (VIS, VID).

Figure 30: *Myripristis jacobus*, photo by H. T. Pinheiro at Trindade.

Plectrypops retrospinis (Guichenot, 1853)

RS; WA; NA; - ; Coast-Seamounts-Islands: ES (FIS), DAV (VIS), TRI (LIT 4, CIUFES#2380).

Figure 31: *Plectrypops retrospinis,* photo by T. Simon at Trindade.

Sargocentron bullisi (Woods, 1955)

RS; WA; NA; - ; Coast-Seamounts-Islands: ABRO (FIS), ES (FIS), VIT (VIS), DAV (VIS), TRI (LIT 1, FIS, LIT 4,CIUFES#2381), MAR (VIS).

Figure 32: *Sargocentron bullisi,* photo by T. Simon at Trindade.

GASTEROSTEIFORMES

SYNGNATHIDAE

Hippocampus reidi Ginsburg, 1933

RS/RH; WA; L (0-55 m), O (65 m); DD/OT; Coast-Seamounts: ABRO (LIT 7), ES (FIS, CIUFES#1483), VIT (LIT 5).

Figure 33: *Hippocampus reidi,* photo by J-C Joyeux (Guarapari Islands, ES) and R.M. Macieira (Santa Cruz sandy beaches, ES).

AULOSTOMIDAE

Aulostomus strigosus Wheeler, 1955

RS; TA; NA; L (5-25 m), O (10-45 m); Coast-Seamounts-Islands: ABRO (FIS), ES (FIS), VIT (VIS, PHO), TRI (CIUFES#2339, VIS, PHO), MAR (LIT 4, COL).

Figure 34: *Aulostomus strigosus*, photo by J-C Joyeux at Guarapari islands (ES).

FISTULARIIDAE

Fistularia petimba. Lacepède, 1803

RS, CT, NA; - ; Coast-Island: ES (FIS), TRI (VIS, PHO).

SCORPAENIFORMES

DACTYLOPTERIDAE

Dactylopterus volitans (Linnaeus, 1758)

RH/SD; TA/M; NA; - ; Coast-Seamounts-Islands: ABRO (LIT 7, VID), ES (FIS), PARN (ZEE), DOG (VIS), TRI (VID, LIT 4).

Figure 35: *Dactylopterus volitans*, photo by H. T. Pinheiro at Trindade.

SCORPAENIDAE

Pontinus longispinis Goode & Bean, 1896

RS/RH; WA; NA; - ; Seamounts-Islands: COL (ZEE), TRI (ZEE).

Figure 36: *Pontinus longispinis*, shortly after death photo by P.Costa.

Pontinus rathbuni Goode & Bean, 1896

RS/RH; WA; NA; Seamounts: VIT (LIT 5), DOG (ZEE).

Figure 37: *Pontinus rathbuni*, shortly after death photo by P.Costa.

Scorpaena albifimbria Everman & Marsh, 1900

RH; WA; NA; - ; Seamounts-Islands: VIT (CIUFES#2185), TRI (CIUFES#2197). New record from Brazilinian province.

Figure 38: *Scorpaena albifimbria*, photo by R. M. Macieira at Vitoria Seamount.

Scorpaena brasiliensis Cuvier, 1829

RS/RH; WA; NA; - ; Coast-Seamounts: ABRO (LIT 7), ES (FIS), UNN (LIT 5).

Scorpaena dispar Longley & Hildebrand, 1940

RS/RH; WA; NA; - ; Coast-Seamounts: ABRO (LIT 7), MONT (LIT 5), UNN (LIT 5), DOG (LIT 5), COL (LIT 5).

Scorpaena isthmensis Meek & Hildebrand, 1928

RS/RH; WA; NA; - ; Disjunct: ABRO (LIT 7), ES (FIS), TRI (CIUFES#2342).

Figure 39: *Scorpaena isthmensis*, photo by T. Simon at Trindade.

Scorpaena plumieri Bloch, 1789

RS/RH; WA/CA; NA; - ; Disjunct: ABRO (LIT 7) ES (FIS), TRI (LIT 1, LIT 2).

Scorpaenodes caribbaeus Meek & Hildebrand, 1928

RS; WA; NA; - ; Disjunct: ES (FIS), TRI (LIT 4, CIUFES#2200).

Figure 40: *Scorpaenodes caribbaeus*, photo by T. Simon at Trindade.

Scorpaenodes tredecimspinosus (Metzelaar, 1919)

RS; WA; NA; - ; Seamounts: DOG (CIUFES#2202).

Figure 41: *Scorpaenodes tredecimspinosus*, photo by R. M. Macieira at Dogaressa seamount.

PERCIFORMES

ACROPOMATIDAE

Synagrops sp.

WC; - ; Seamounts: DAV (ZEE).

SERRANIDAE

Anthias menezesi Anderson & Heemstra, 1980

RH; Br; L (160-260 m), O (120 m); NA; Coast-Seamounts: ABRO (FIS), ES (FIS), VIT (VID). The Anthias genus was also reported to inhabit seamounts from northeast Atlantic at mesophotic depths (160 -180m) (Anthias anthias em Christiansen et al., 2009) and this could be a common seamounts specie.

Figure 42: *Anthias menezesi* shortly after death, photo by A. Nunes at Abrolhos Bank (ABRO).

Pronotogrammus martinicensis (Guichenot, 1868)

RS/RH/WC; WA; NA; - ; Coast-Seamounts: ES (FIS, FIS), VIT (VID).

Figure 43: *Pronotogrammus martinicensis* photo by A. Carvalho-Filho at Arraial do Cabo.

Serranus annularis (Günther, 1880)

RH; WA; NA; - ; Coast-Seamounts-Islands: ABRO (FIS), ES (FIS), ECL (VIS), JAS (VIS, PHO, VID), DOG (VID), UNN (CIUFES 2135), TRI (VIS).

Figure 44: *Serranus annularis* shortly after death, photo by R. Macieira at Dogaressa seamount.

Serranus baldwini (Evermann & Marsch, 1900)

RS/RH; WA; NA; - ; Coast-Seamounts: ABRO (LIT 7, FIS), ES (FIS), VIT (CIUFES#2148), JAS (VIS, VID), DOG (VIS).

Figure 45: *Serranus baldwini* photo by J-C Joyeux at Guarapari islands (ES).

Serranus phoebe Poey, 1851

RH; WA; NA; - ; Coast-Seamounts-Islands: ABRO (VID), ES (FIS), VIT (VID), JAS (LIT 5, FIS, PHO), DAV (PHO), TRI (LIT 2), MAR (LIT 5).

EPINEPHELIDAE

Cephalopholis fulva (Linnaeus, 1758)

RS/RH; WA; LC; L (2-160 m), O (2-218 m); Coast-Seamounts-Islands: ABRO (LIT 7, VID), ES (FIS), VIT (VID, VIS, PHO, CIUFES#2125, ZEE), ALSAL (VIS, PHO, VID), PARN (ZEE), ECL (VIS, PHO, VID, ZEE), JAS (VIS, PHO, VID, FIS), MONT (ZEE), UNN (VIS, PHO, VID), DAV (VIS, UVC, PHO, VID, ZEE, CIUFES#2062); DOG (FIS, VIS, VID, ZEE,), COL (VIS, ZEE, FIS), TRI (VIS, PHO, VID, LIT 1, LIT 2, ZEE), MAR (VID, LIT 1, PHO, VIS). This species occurs in all locales surveyed, being common and exceptionally abundant on TMVIG (Pinheiro et al., 2011; Pereira-Filho et al., 2011, Coelho *et al.,* 2012). However, is rarely found on the shallow waters of adjacent shallow continental shelf at the Abrolhos Bank (ABRO). A yellow color morph of this species was found along all VTC, as well as a case of hybridization with *Cephalopholis furcifer* (describe as *Menephorus dubius* by Poey, 1860) (photo 43) present in another Brazilian oceanic islands (i.e. San petro e São Paulo rocks, Noronha and Rocas atol).

Figure 46: *Cephalopholis fulva* with both coloration morphs, photos from top clockwise by R. Moura (Vitoria seamount), R.M.Macieira (Trindade) and J-C. Joyeux (Guarapari Islands- ES).

Cephalopholis furcifer (Valenciennes, 1828)

RS/RH/WC; TA; LC; - ; Coast-Seamounts-Islands: ABRO (FIS), ES (FIS), VIT (VID, VIS, PHO), ALSAL (VIS, PHO, VID), ECL (VIS, PHO), JAS (VIS, PHO), UNN (VIS, VID, CIUFES#1886, PHO), DAV (VIS, UVC, PHO, VID), DOG (VIS, VID), TRI (VIS, PHO, VID, LIT 1, FIS, LIT 4,CIUFES#2379), MAR (PHO). Rare in the shallow waters of Abrolhos archipelago; surprizingly unrecord in the shallow waters of Trindade Island by Floeter & Gasparini (2001).

Figure 47: *Cephalopholis furcifer* (top) and hybrid with *C. fulva* (*Menephorus*; down) shortly after death, photos by J-C Joyeux (Guarapari Island-ES) and L.Rabelo (Trindade) respectively.

Dermatolepis inermis (Valenciennes, 1833)

RS/RH;WA; NT; L (3-213 m), O (3-315 m); Coast-Seamounts-Islands: ABRO (LIT 7, FIS), ES (FIS), VIT (VIS, ZEE), PARN (ZEE), ECL (VIS, ZEE), JAS (ZEE), UNN (VIS, VID), DAV (VIS, UVC, VID, PHO, ZEE), DOG (FIS, ZEE), COL (VIS, VID, ZEE),TRI (LIT 2, ZEE), MAR (VIS). *Dermatolepis inermis* was the largest and most abundant Epinephelidae found during dive surveys on seamounts; the species is uncommon on the Abrolhos bank.

Figure 48: *Dermatolepis inermis*, photo by T. Simon at Trindade.

Epinephelus adscensionis (Osbeck, 1765)

RS; TA; LC; L (1-120 m), O (0-189 m); Disjunct: ABRO (FIS), ES (FIS), TRI (VID, FIS, LIT 1, LIT 2, ZEE, CIUFES#2639), MAR (VIS, PHO, LIT 1). This species is interestingly found in disjunctive distribution, present on continental shelf and at TMVIG where it is abundant (Pinheiro *et al*., 2011) and where it reaches the largest known sizes of the southwestern Atlantic (65cm maximum record, B. Padovani unpublished data). In contrast, it is rare on the continental margin of VTC region.

Figure 49: *Epinephelus adscensionis*, photo by H.T. Pinheiro at Trindade.

Epinephelus itajara (Lichtenstein, 1822)

RS; CG; CR/ET; - ; Coast-Seamounts: ABRO (LIT 7), ES (FIS), UNN (VIS, PHO, VID).

Figure 50: *Epinephelus itajara*, photo by Mike Netto (movie frame) at Unnamed seamount.

Epinephelus morio (Valenciennes, 1828)

RS/RH; WA; NT/OT; - ; Coast-Seamounts: ABRO (LIT 7, VID, ZEE), ES (FIS), ECL (ZEE).

Figure 51: *Epinephelus morio*, photo by J-C Joyeux at Guarapari islands (ES).

Gonioplectrus hispanus (Cuvier, 1828)

RS; WA; LC; - ; Coast-Seamounts-Islands: ES (FIS, CIUFES#577), COL (ZEE), TRI (LIT 2).

Hyporthodus mystacinus (Poey, 1852)

RS/RH; CG; LC; - ; Coast-Seamounts-Islands: ABRO (ZEE), ES (ZEE), DOG (ZEE), COL (ZEE), TRI (FIS, ZEE).

Figure 52: *Hyporthodus mystacinus*, photo by P. Costa.

Hyporthodus nigritus (Holbrook, 1855)

RH; WA; CR; - ; Coast-Seamounts: ABRO (ZEE), ES (ZEE), JAS (ZEE).

Hyporthodus niveatus (Valenciennes, 1828)

RS; WA; VU/OT; - ; Coast-Seamounts: ABRO (LIT 7), ES (FIS), PARN (ZEE), ECL (ZEE).

Liopropoma carmabi (Randall, 1963)

RS/RH; WA; NA; - ; Coast-Seamounts: ES (FIS), JAS (PHO, VID). *Liopropoma carmabi* is considerate a rare species at southwestern Atlantic (difficult to see), recorded just on rhodolith habitats of seamounts.

Figure 53: *Liopropoma carmabi*, photo by R.M Macieira at Guarapari islands (ES).

Mycteroperca bonaci (Poey, 1861)

RS; WA; NT/OT; - ; Coast-Seamounts-Islands: ABRO (LIT 7, VID), ES (FIS), VIT (VID), DAV (VIS, UVC), TRI (LIT 1, LIT 2).

Mycteroperca interstitialis (Poey, 1861)

RS; WA; VU; - ; Coast-Seamounts-Islands: ABRO (LIT 7, ZEE), ES (FIS), VIT (VID, PHO), JAS (FIS), DAV (VIS, PHO, ZEE), DOG (ZEE), COL (ZEE), TRI (VID, FIS, ZEE, LIT 2).

Figure 54: *Mycteroperca interstitialis*, photo by P. Costa.

Mycteroperca tigris (Valenciennes, 1833)

RS; WA; LC/ET; - ; Coast-Seamounts: ES (FIS), PARN (ZEE).

Mycteroperca venenosa (Linnaeus, 1758)

RS/RH; WA; NT; L (2-137 m), O (5-262 m); Coast-Seamounts-Islands: ABRO (FISC, ZEE), ES (FIS), VIT (VID, ZEE), JAS (ZEE), UNN (VIS,VID), DAV (UVC, PHO, VID, VIS), DOG (FIS), COL (ZEE), TRI (FIS, LIT 1, LIT 2), MAR (PHO).

Figure 55: *Mycteroperca venenosa*, photo by Maik-Netto (movie-frame).

Pseudogramma gregoryi (Breder, 1927)

RS/RH; WA; NA; L (1-61 m), O (45-85 m); Coast-Seamounts-Islands: ES (CIUFES#2372), VIT (CIUFES#2151), UNN (CIUFES#2155), DOG (CIUFES#2154), COL (CIUFES#2152), TRI (CIUFES#2203).

Figure 56: *Pseudogramma gregoryi*, photo by R.M Macieira at Unnamed seamount.

Rypticus saponaceus (Schneider 1801)

RS/RH; TA; NA; - ; Coast-Seamounts-Islands: ABRO (LIT 7, VID), ES (FIS), UNN (VID), DAV (PHO), TRI (FIS, LIT 1, LIT 2), MAR (PHO, VIS).

Figure 57: *Rypticus saponaceus* photo by R.M Macieira at Trindade.

OPISTOGNATHIDAE

Opistognathus aff. *aurifrons* (Jordan & Thompson, 1905)

RH; Br; NA; L (59 m), O (15-65 m); Coast-Seamounts-Islands: ABRO (LIT 7), ES (FIS), UNN (CIUFES #2158, VIS), DAV (UVC), DOG (VIS, VID), COL (VIS), TRI (LIT 2, CIUFES#1548).

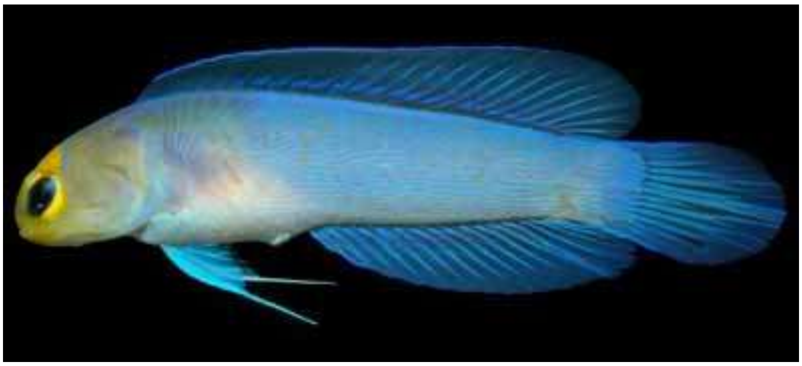

Figure 58*: Opistognathus aff. aurifrons*, photo by R.M. Macieira at Unnamed seamount.

Opistognathus sp.

RH; VTC; NA; L (60 m), O (65 m); Coast-Seamounts-Islands: ES (FIS), DOG (CIUFES#2054), TRI (CIUFES#2345). *Opistognathus* sp. it is new specie under description found at VTC and at Fernando de Noronha.

Figure 59: *Opistognathus sp.,* photo by R.M. Macieira at Dogaressa seamount.

PRIACANTHIDAE

Heteropriacanthus cruentatus (Lacépède, 1801)

RS; CG; NA; **-** ; Coast-Seamounts-Islands: ABRO (FIS), ES (FIS), MONT (ZEE), UNN (VID, VIS), DAV (VIS),TRI (FIS, LIT 2), MAR (VIS).

Figure 60: *Heteropriacanthus cruentatus*, photo by H.T. Pinheiro at Trindade.

Priacanthus arenatus Cuvier, 1829

RS; TA/M; NA; - ; Disjunct: ABRO (LIT 7, ZEE), ES (FIS), MAR (VIS).

APOGONIDAE

Apogon americanus Castelnau, 1855

RS; WA; NA; L (0-50 m), O (0-63 m); Coast-Seamounts-Islands: ABRO (LIT 7), ES (FIS), VIT (VIS), UNN (CIUFES#2053), DAV (CI-UFES#2034), TRI (LIT 2, LIT 1,CIUFES#2321).

Figure 61: *Apogon americanus,* photo by J-C Joyeux at Guarapari islands (ES).

Apogon pseudomaculatus Longley, 1932

RS; WA; NA; - ; Coast-Seamounts: ES (FIS), VIT (LIT 5), DAV (CIUFES#2044).

Astrapogon puncticulatus (Poey, 1867)

RS/RH; WA; NA; - ; Disjunct: ABRO (LIT 7) ES (FIS), TRI (CIUFES#1551, LIT 1, LIT 4).

Figure 62: *Astrapogon puncticulatus*, photo by R.Macieira at Trindade.

Phaeoptyx pigmentaria (Poey, 1860)

RS; TA; NA; L (13-50 m), O (2-55 m); Coast-Seamounts-Islands: ABRO (LIT 7), ES (FIS), VIT (CIUFES#2160, VIS), UNN (CIUFES#2047), DAV (CIUFES#3979), TRI (COL 2, LIT 1, LIT 4,CIUFES#2418).

Figure 63: *Phaeoptyx pigmentaria*, photo by R.Macieira at Trindade.

MALACANTHIDAE

Lopholatilus villarii Miranda Ribeiro, 1915

RH; SW; NA; L (142 m), O (100-500 m); Coast-Seamounts: ABRO (LIT 7, UD1), ES (ZEE), VIT (ZEE), PARN (ZEE), ECL (ZEE).

Figure 64: *Lopholatilus villarii,* photo by R.Zanchetta at Espirito Santo shelf.

Malacanthus plumieri (Bloch, 1786)

RH; WA; NA; - ; Coast-Seamounts-Islands: ABRO (FIS, VID), ES (FIS), VIT (VID, VIS, ZEE), ALSAL (VIS, PHO), ECL (VIS, PHO, ZEE), JAS (VIS, FIS), MONT (ZEE), UNN (VIS, PHO, CIUFES#1888), DAV (VIS, UVC, VID, ZEE), DOG (FIS, VIS, ZEE), COL (VIS, VID, ZEE), TRI (VIS, VID, LIT 1, FIS, LIT 2), MAR (VIS). The sand tilefish was abundant present along all VTC rhodolit beds, biulding nests composed of piles of rhodoliths.

Figure 65: *Malacanthus plumieri*, photo by R.Macieira at Trindade.

CORYPHAENIDAE

Coryphaena hippurus Linnaeus, 1758

WC; CT; LC; L (5-85 m), O (5-91 m); Coast-Seamounts-Islands: ABRO (LIT 7, ZEE), ES (FIS), VIT (ZEE), ALSAL (ZEE), PARN (ZEE), MONT (FIS), TRI (LIT 2). The dolphinfish is an important commercial target in VTC region. It is mainly abundant during the spring between September November).

Figure 66: *Coryphaena hippurus*, photo by P. Costa.

ECHENEIDAE

Echeneis naucrates Linnaeus, 1758

WC; CT; NA; - ; Disjunct: ABRO (LIT 7), ES (FIS), TRI (LIT 2).

Remora remora (Linnaeus, 1758)

WC; CG; NA; - ; Disjunct: ES (FIS), TRI (LIT 4).

Figure 67: *Remora remora*, photo by E.Mazzei (adjacent to the Vitoria seamount).

CARANGIDAE

Alectis ciliaris (Bloch, 1787)

WC; CT; LC; - ; Coast-Seamounts: ABRO (ZEE), ES (FIS), VIT (ZEE), COL (ZEE), TRI (LIT 4).

Figure 68: *Alectis ciliaris*, photo by P. Costa.

Carangoides bartholomaei (Cuvier, 1833)

RS/RH/WC; TA; NA; - ; Coast-Seamounts-Islands: ABRO (LIT 7), ES (FIS), UNN (VID), TRI (LIT 2).

Caranx crysos (Mitchill, 1815)

RS/RH/WC; TA; LC; - ; Coast-Seamounts-Islands: ABRO (LIT 7,VID), ES (FIS), VIT (VIS, VID, PHO, ZEE, FIS), PARN (ZEE), ECL (VIS, PHO, ZEE), JAS (VIS, VID, ZEE), MONT (ZEE), UNN (VIS), DAV (VIS, VID, ZEE), DOG (FIS), COL (ZEE),TRI (LIT 4, ZEE, LIT 1), MAR (LIT 4, VIS, PHO).

Figure 69: *Caranx crysos*, photo by H.T.Pinheiro at Trindade.

Caranx latus Agassiz, 1831

RS/RH/WC; TA; NA; - ; Coast-Seamounts-Islands: ABRO (LIT 7, VIS), ES (FIS), VIT (VID, VIS, PHO), JAS (ZEE), UNN (VIS, VID, PHO), DAV (VIS, UVC, PHO, VID), DOG (FIS, PHO, ZEE), COL (ZEE), TRI (FIS, LIT 2).

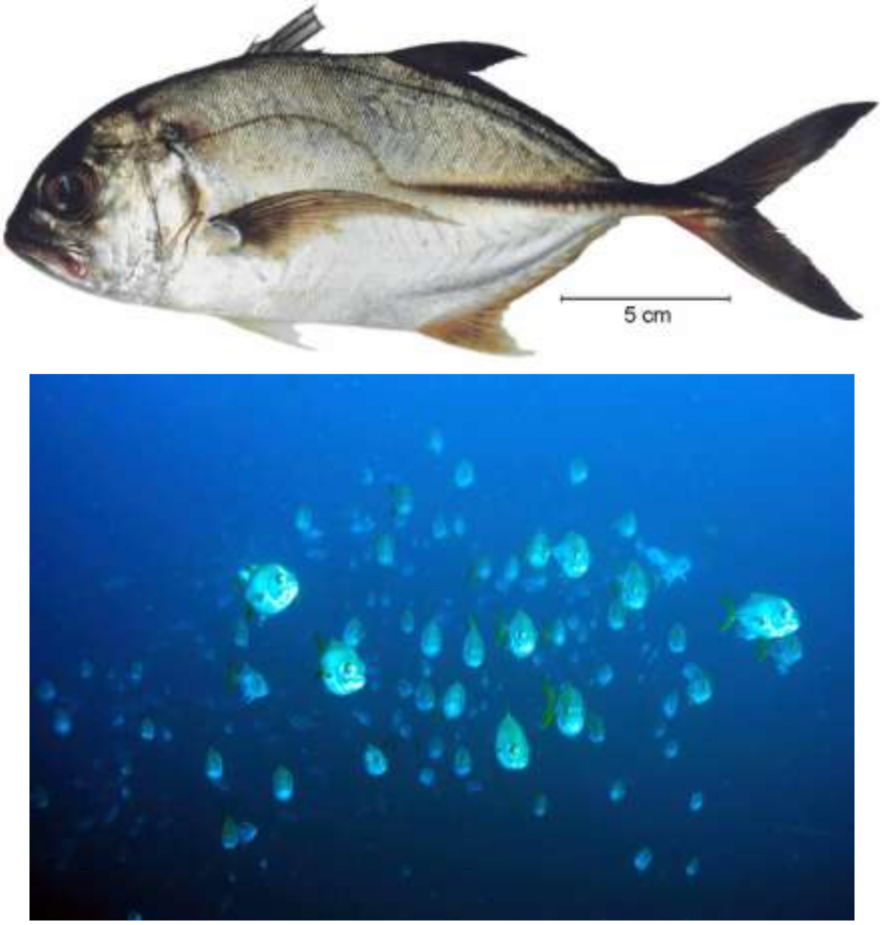

Figure 70: *Caranx latus*, photos from top to bottom by P.Costa and R.Francini-Filho (Davis seamount).

Caranx lugubris Poey, 1860

RS/RH/WC; CT; NA; - ; Coast-Seamounts-Islands: ABRO (VID), ES (FIS), VIT (VID, FIS), JAS (FIS), DAV (VIS, UVC, PHO, VID, ZEE), DOG (FIS, PHO, ZEE), COL (VID, VIS, ZEE), TRI (VID, LIT 1, FIS), TRI (LIT 2, ZEE), MAR (VID, PHO, VIS, LIT 1).

Figure 71: *Caranx lugubris*, photo by H.T.Pinheiro at Trindade.

Caranx ruber (Bloch, 1793)

RS/RH/WC; CT; NA; L (1-70 m), O (3-106 m); Coast-Seamounts-Islands: ABRO (LIT 7, FIS, ZEE), ES (FIS), VIT (VIS, VID, PHO, UD1), JAS (ZEE), MONT (ZEE), UNN (VIS, VID, PHO), DAV (VIS, UVC, PHO, VID), DOG (ZEE), COL (ZEE), TRI (VID, FIS, LIT 1, LIT 2), MAR (PHO).

Figure 72: *Caranx ruber*, photo by H.T.Pinheiro at Davis seamount.

Decapterus macarellus (Cuvier, 1833)

WC; CG; NA; - ; Coast-Seamounts-Islands: ES (FIS), VIT (VIS), DAV (VIS), DOG (VIS), TRI (LIT 2).

Figure 73: *Decapterus macarellus*, photo by H.T.Pinheiro at Trindade.

Decapterus tabl Berry, 1968

WC; CG; NA; - ; Coast-Seamounts: ABRO (FIS), ES (FIS), PARN (ZEE), JAS (ZEE), MONT (ZEE), DAV (ZEE).

Elagatis bipinnulata (Quoy & Gaimard, 1825)

WC; CG; NA; - ; Coast-Seamounts-Islands: ABRO (FIS), ES (FIS), VIT (VIS, PHO), UNN (VIS, VID), DAV (VID, VIS), DOG (VIS), TRI (LIT 2, ZEE).

Selar crumenophthalmus (Bloch, 1793)

WC; CT; NA; - ; Disjunct: ABRO (LIT 7), ES (FIS), TRI (LIT 2, CIUFES#1486), MAR (PHO).

Seriola dumerili (Risso, 1810)

RS/RH/WC; CG; NA; - ; Coast-Seamounts-Islands: ABRO (ZEE), ES (FIS), VIT (VIS, PHO, VID), ECL (ZEE), JAS (ZEE), DAV (ZEE), DOG (ZEE), COL (ZEE), TRI (ZEE).

Figure 74: *Seriola dumerli*, photos by H.T.Pinheiro (Trindade) and E.F.Mazzei (adjacent to the Vitoria seamount).

Seriola fasciata (Bloch, 1793)

RS/RH/WC; WA; NA; L (55-150 m), O (49-94 m); Seamounts: ECL (ZEE), DAV (ZEE).

Seriola lalandi (Valenciennes, 1833)

RS/RH/WC; CG; NA; - ; Coast-Seamounts: ABRO (LIT 7), ES (FIS), VIT (ZEE), COL (ZEE).

Seriola rivoliana (Valenciennes, 1833)

RS/RH/WC; CG; NA; - ; Coast-Seamounts-Islands: ABRO (VID, ZEE), ES (FIS), VIT (VID, VIS, ZEE), ALSAL (VIS, PHO, VID), JAS (PHO, FIS), MONT (FIS), DAV (VID), DOG (VIS), COL (ZEE), TRI (VID, FIS, ZEE, LIT 2), MAR (VIS, PHO).

Figure 75: *Seriola rivoliana*, photo by P.Costa.

Seriola zonata (Mitchill, 1815)

WC; WA; NA; - ; Seamounts: PARN (ZEE).

Uraspis secunda (Poey, 1860)

RS/WC; CG; NA; - ; Disjunct: ABRO (ZEE), ES (FIS), TRI (LIT 2).

EMMELICHTHYIDAE

Erythrocles monodi Poll & Cadenat, 1954

WC; TA; NA; L (90-300 m), O (45 m); Seamounts: DAV (ZEE).

LUTJANIDAE

Etelis ocullatus (Valenciennes, 1828)

RS/RH/WC; WA; NA; - ; Coast-Seamounts-Islands: ABRO (ZEE), ES (FIS), PARN (ZEE), DAV (ZEE), COL (ZEE), TRI (ZEE).

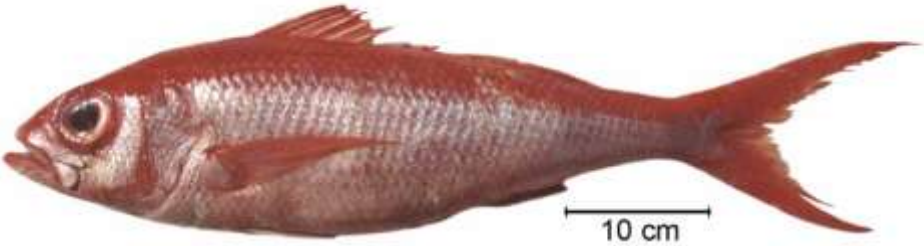

Figure 76: *Etelis ocullatus*, photo by P.Costa.

Lutjanus analis (Cuvier, 1828)

RS/RH/SD; WA; VU/OT; - ; Coast-Seamounts: ABRO (FIS, ZEE), ES (FIS), JAS (ZEE), DAV (ZEE).

Figure 77: *Lutjanus analis*, photo by P.Costa.

Lutjanus chrysurus (Bloch, 1791)

RS/WC; WA; OT; - ; Coast-Seamounts: ABRO (LIT 7, VID), ES (FIS), VIT (ZEE), DAV (VID), COL (ZEE).

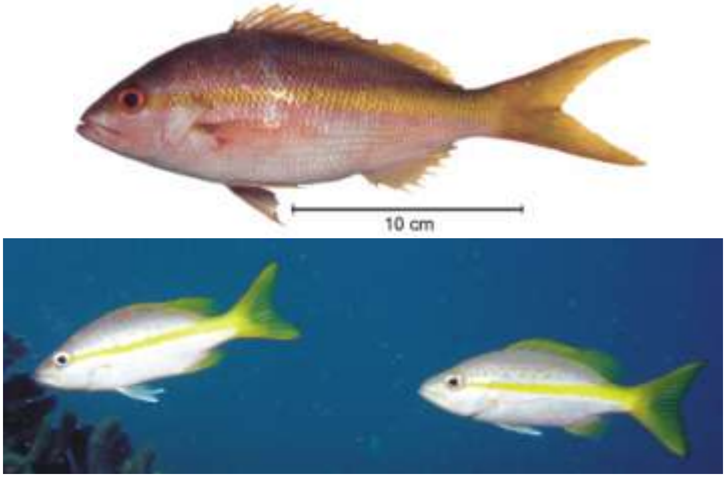

Figure 78: *Lutjanus chrysurus*, photos by P.Costa e J-C Joyeux (Guarapari islands-ES)

Lutjanus jocu (Bloch & Schneider, 1801)

RS; TA; NA; - ; Coast-Seamounts-Islands: ABRO (LIT 7, VID), ES (FIS), UNN (VIS, VID), TRI (PHO, VIS). *Lutjanus jocu* was recently sighted for the first time at Trindade island (record by R. Araújo on 2012 July), being considerate as uncommon vagant.

Figure 79: *Lutjanus jocu*, photo by J-C Joyeux at Guaraari islands (ES).

Lutjanus vivanus (Cuvier, 1828)

RS/RH; WA; NA; - ; Coast-Seamounts-Islands: ABRO (ZEE), ES (FIS), VIT (ZEE), PARN (ZEE), ECL (ZEE), JAS (ZEE, FIS), DAV (ZEE, PHO), DOG (ZEE), TRI (LIT 2).

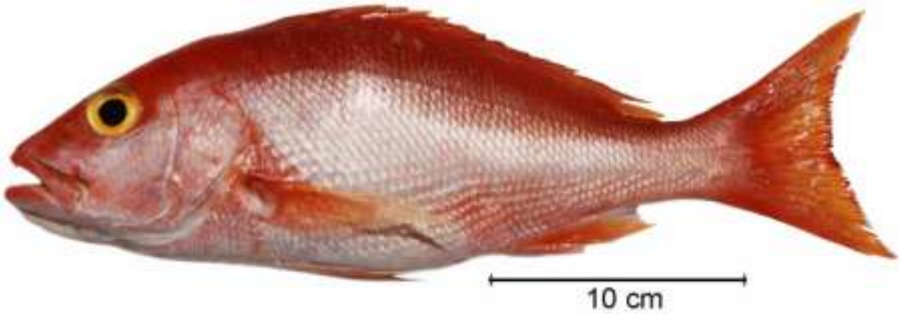

Figure 80: *Lutjanus vivanus*, photo by P.Costa.

Rhomboplites aurorubens (Cuvier, 1829)

RS/RH/WC; WA; OT; L (40-300 m), O (20-112 m); Coast-Seamounts: ABRO (LIT 7, VID), ES (FIS), PARN (ZEE), ECL (ZEE), JAS (FIS, UD1).

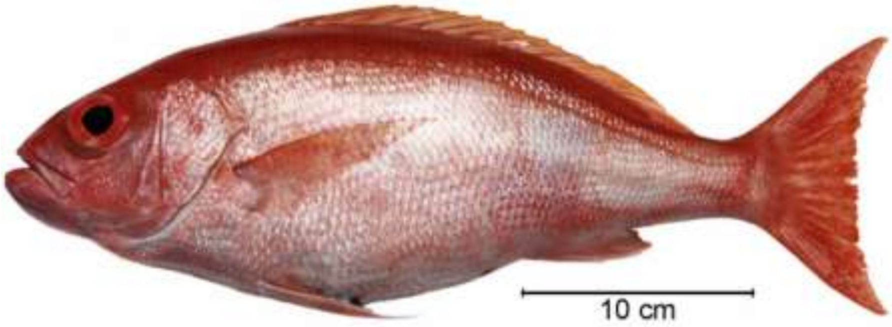

Figure 81: *Rhomboplites aurorubens*, photo by P.Costa.

GERREIDAE

Eucinostomus argenteus Baird & Girard, 1855

SD; WA/EP; NA; - ; Disjunct: ES (FIS), TRI (LIT 8).

HAEMULIDAE

Despite dominating the reef environment on the continental shelf, only one Haemulidae (with disjunct distribution) is found on the VTC volcanic edifices. In addition, no Haemulidae larvae was found on previously surveys at VTC and Abrolhos bank shelf break (Nonaka et al., 2000). This puts on evidence that an ecological mechanism of species exclusion may exist that would limit two distinct domains, coastal and oceanic. A large number of species are restricted to the continental shelf and absent from all seamounts and islands of the VTC: *Anisotremus moricandi, Anisotremus virginicus, Haemulon aurolineatum, H. parra, H. plumieri, H. squamipinna* and *H. steindachneri*.

Anisotremus surinamensis (Bloch, 1791)

RS; WA; NA; - ; Disjunct: ABRO (LIT 7), ES (FIS), TRI (FIS, LIT 1, LIT 2).

Figure 82: *Anisotremus surinamensis*, photo by H.T. Pinheiro at Trindade.

SPARIDAE

Diplodus argenteus (Valenciennes, 1830)

RS; WA; NA; - ; Disjunct: ABRO (LIT 7), ES (FIS), TRI (LIT 1, LIT 2), MAR (LIT 1).

Figure 83: *Diplodus argenteus*, photo by J-C Joyeux at Guarapari islands (ES).

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Pagrus pagrus (Linnaeus, 1758)

RH; TA/M; - ; ED/OT; Coast-Seamounts: ABRO (VID), ES (FIS, ZEE), VIT (ZEE), COL (ZEE).

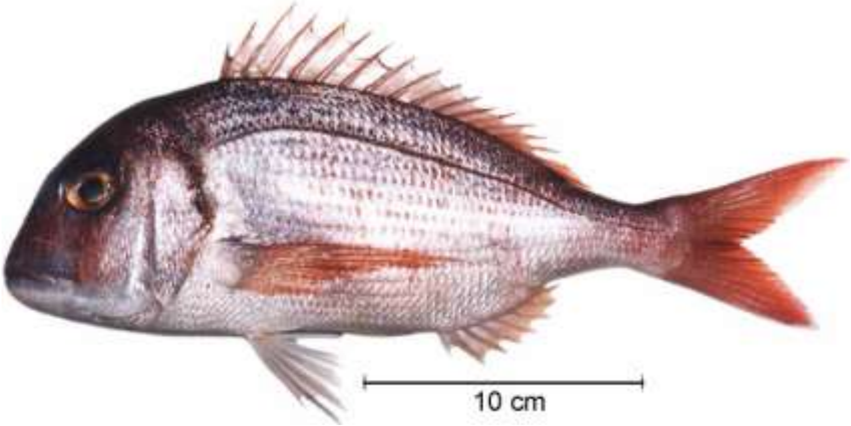

Figure 84: *Pagrus pagrus*, photo by P.Costa.

SCIAENIDAE

Equetus lanceolatus (Linnaeus, 1758)

RS; WA; NA; - ; Coast-Seamounts: ES (FIS), VIT (VIS, PHO, LIT 5), UNN (VIS, PHO, CIUFES#2060, VID), DAV (VID).

Pareques acuminatus (Bloch & Schneider, 1801)

RS; WA; NA; - ; Coast-Seamounts: ABRO (LIT 7), ES (FIS), VIT (VIS, PHO), S\N (VID).

Figure 85: *Pareques acuminatus*, photo by J-C Joyeux at Guarapari islands (ES).

MULLIDAE

Mulloidichthys martinicus (Cuvier, 1829)

RS/RH/SD; TA; NA; - ; Coast-Seamounts-Islands: ABRO (VIS), ES (FIS), VIT (VIS, PHO, VID), UNN (VID, VIS), DAV (VIS, UVC, PHO), TRI (VIS, PHO, VID, LIT 1, FIS), TRI (LIT 2), MAR (VIS).

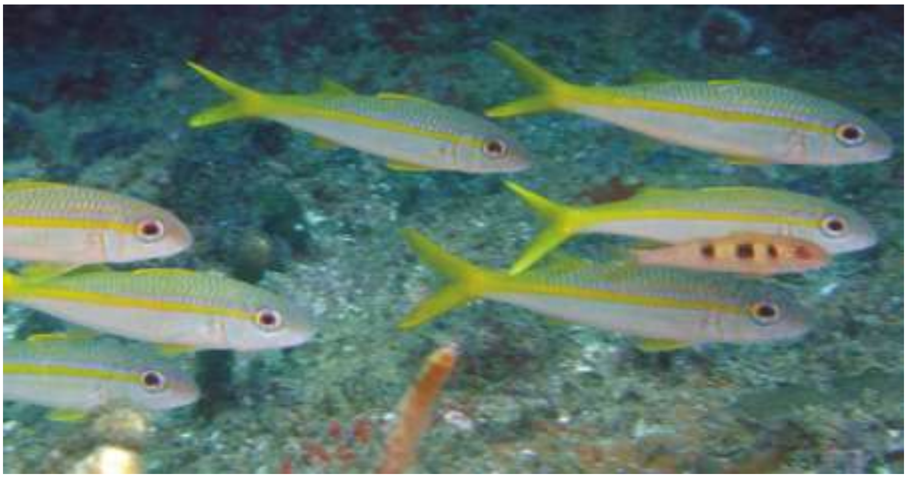

Figure 86: *Mulloidichthys martinicus*, photo by J-C Joyeux at Guarapari islands (ES).

*Pseudupeneus maculatus (*Bloch, 1793)

RS/RH; WA; NA; - ; Coast-Seamounts-Islands: ABRO (LIT 7, VID), ES (FIS), VIT (LIT 5), UNN (VID), DAV (VIS, PHO, VID), TRI (VIS, PHO, VID, UD4, LIT 1, LIT 2), MAR (VIS, VID).

Figure 87: *Pseudopeneus maculatus*, photo by J-C Joyeux at Guarapari islands (ES).

PEMPHERIDAE

Pempheris poeyi Bean, 1885

RS; WC; NA; - ; Islands: TRI (LIT 4,CIUFES#2423). First record of Brazilian province, this was a case of greate disjunct distribution between Brazil and Caribbean Sea.

Pempheris schomburgki Müller & Troschel, 1848

RS; WA; NA; - ; Disjunct: ABRO (LIT 7), ES (FIS), TRI (LIT 4).

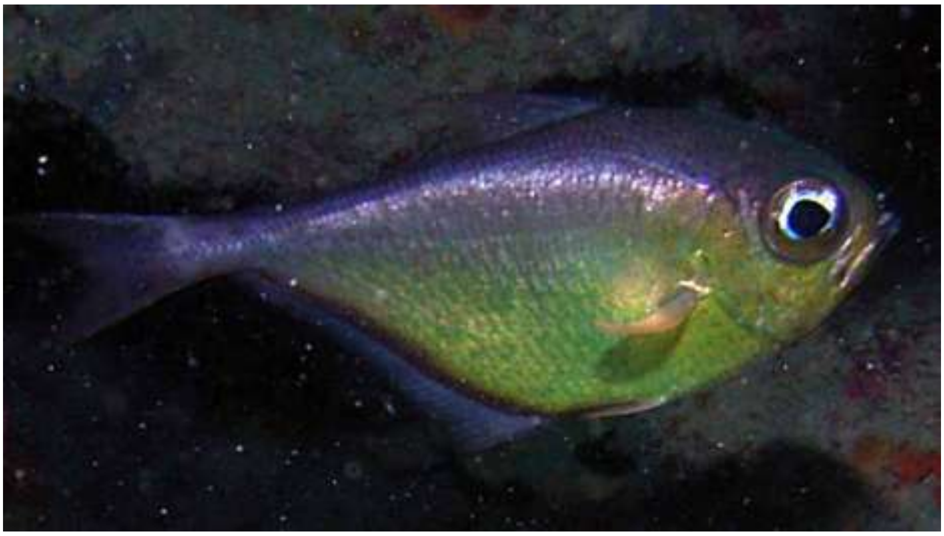

Figure 88: *Pempheris schomburgki*, photo by T.Simon at Trindade.

KYPHOSIDAE

Kyphosus spp.

RS; TA; NA; L (1-40 m), O (1-55 m); Coast-Seamounts-Islands: ABRO (LIT 7, VID), ES (FIS), VIT (VIS, VID), UNN (VIS, VID, PHO), DAV (PHO, VID, VIS), TRI (LIT 1, UD 4, LIT 2, LIT 9, CIUFES#1620), MAR (LIT 1, VID, VIS, PHO).

Figure 89: *Kyphosus sp.,* photo by T.Simon at Trindade.

CHAETODONTIDAE

Chaetodon sedentarius Poey, 1860

RS/RH; WA; LC; - ; Coast-Seamounts-Islands: ABRO (LIT 7, VID), ES (FIS), VIT (VIS, PHO, VID), DAV (VIS, PHO), DOG (VID), TRI (VID).

Figure 90: *Chaetodon sedentarius*, photo by R.M.Moura (Davis seamount) and J-C Joyeux (Guarapari islands –ES).

Chaetodon striatus Linnaeus, 1758

RS/RH; WA/CA; LC; L (2-60 m), O (2-65 m); Coast-Seamounts-Islands: ABRO (LIT 7, VID), ES (FIS), VIT (VIS, VID), UNN (VID), DAV (VIS, UVC, PHO, VID, CIUFES#2127), DOG (VIS, VID), TRI (VID, FIS, LIT 1, LIT 2), MAR (VIS, VID). Chaetodontidae sisters *C. sedentarius* and *C. striatus* co-occur along all VTC region. However, *C. striatus* is it apparently more abundant than *C. sedentarius* that inhabit deepest sites. Therefore, a hypothesis of a niche partition relationship through differential resource use cannot be dropped (Duffy, 1996; Orr & Smith 1998).

Figure 91: *Chaetodon striatus*, photo by R.Francini-Filho (Davis seamount) e J-C Joyeux (Guarapari Islands, ES).

Prognathodes brasiliensis (Burgess, 2001)

RS; Br; LC; L (50 m), O (5-65 m); Coast-Seamounts-Islands: ABRO (VID), ES (FIS), VIT (VID, VIS, PHO, LIT 5), ALSAL (VIS, VID), JAS (PHO, VID), UNN (VIS, VID, PHO,

CIUFES#2031), DAV (VIS, UVC, PHO, VID, CIUFES#2032, COL 2), DOG (CIUFES#2056, FIS, VIS, VID), TRI (VIS, LIT 1, FIS, LIT 2), MAR (VID, LIT 1).

Figure 92: *Prognathodes brasiliensis* shortly after death, photo by R.M.Macieira at Trindade.

Prognathodes guyannensis (Durand, 1860)

RS/RH; WA; LC; - ; Coast-Seamounts: ES (FIS), VIT (LIT 5).

POMACANTHIDAE

The gray angelfish *Pomacanthus arcuatus* (Linnaeus, 1758) and the french angelfish *Pomacanthus paru* (Bloch, 1787) are absent from the VTC volcanic edifices. However, this species are commonly found along the Brazilian continental shelf and oceanic islands (with P. *paru* registered at Noronha, Atol da Rocas and St. Paul´s Rocks and P. *arcuatus* only at Noronha).

Centropyge aurantonotus Burgess, 1974

RS/RH; WA; LC; - ; Coast-Seamounts-Islands: ES (FIS), VIT (VID, VIS, PHO), ECL (VIS, PHO), JAS (VIS, PHO, VID), MONT (LIT 5), UNN (VIS), DAV (VIS, UVC, PHO, VID, CIUFES#2041), DOG (VIS, VID, CIUFES#2037, LIT 5), COL (CIUFES#2036, VID), TRI (VIS, VID, LIT 1, LIT 2), MAR (VIS). *C. aurantonotus* was present along all VTC. This species came to the Atlantic in recent invasion from Indo Pacific (Bowen et al., 2005) and despite found along the whole Brazilian province it is restricted to the southern tip of the Caribbean (Joyeux et al., 2001).

Figure 93: *Centropyge aurantonotus* shortly after death, photo by R.Macieira at Dogaressa seamount.

Holacanthus ciliaris (Linnaeus, 1758)

RS/RH; WA/CA; LC; L (1-70 m), O (45-120 m); Coast-Seamounts: ABRO (LIT 7), ES (FIS), VIT (VID, VIS, PHO), ECL (VIS), UNN (VID, VIS), DAV (VID). The queen angelfish was for first time found at mesophotic reefs (120 m) exceeding his knowing range depth (at Vitória seamount). This species is found along Brazilian continental shelf and oceanic islands (at Noronha, Atol da Rocas and St. Paul´s Rocks), but is surprising present only middle of the chain and absent from TMVIG.

Figure 94: *Holachantus ciliaris* photo by J-C Joyeux at Guarapari islands (ES).

Holacanthus tricolor (Bloch, 1795)

RS/RH; WA; LC; - ; Coast-Seamounts-Islands: ABRO (LIT 7, VID), ES (FIS), VIT (VID, VIS, PHO, CIUFES 2128), ALSAL (VIS, PHO), ECL (VIS), JAS (VIS, PHO, VID), UNN (VIS, PHO, VID), DAV (VIS, UVC, PHO, VID), DOG (CIUFES#2046, VIS, VID), TRI (VIS, PHO, VID, LIT 1, FIS, LIT 2,CIUFES#2307), MAR (VIS, PHO, VID). This species is rare in the shallow waters of Abrolhos archipelago and is absent from all Brazilian oceanic islands but islands (and seamounts) of the CVT. Joyeux and collaborators (2001) suggested that this is a case inter-specific exclusion with *Pomacanthus paru*, which is found at other oceanic islands but absent on VTC.

Figure 95: *Holachantus tricolor*, photo by H.T.Pinheiro (top left, Davis seamount) R.M.Macieira (Trindade) and J-C Joyeux (down, Guarapari islands-ES)

CIRRHITIDAE

Amblycirrhitus pinos (Mowbray, 1927)

RS/RH; WA; NA; L (2-46 m), O (12-66 m); Coast-Seamounts-Islands: ABRO (LIT 7), ES (FIS), VIT (VIS, PHO), ALSAL (VIS,VID), UNN (VIS), DAV (VIS, UVC, PHO, VID), DOG (VIS, VID, CIUFES#2049), TRI (VID, CIUFES#2210), TRI (LIT 1, LIT 4).

Figure 96: *Amblycirrhitus pinos*, photo by J-C Joyeux at Guarapari islands (ES).

POMACENTRIDAE

*Abudefduf saxatilis (*Linnaeus, 1758)

RS; TA; NA; - ; Disjunct: ABRO (LIT 7), ES (FIS), TRI (FIS, LIT 2, LIT 1, CIUFES#1254), MAR (VIS, PHO, LIT 1). This is characteristically a shallow water species that holds a disjunct pattern of distributionon the CVT.

Figure 97: *Abudefduf saxatilis*, photo by J-C Joyeux at Trindade.

The *Chromis* species *C. flavicauda, C. jubauna* and *C. multilineata* coexist on seamounts of the VTC.

Chromis aff.*enchrysura* Jordan & Gilbert, 1882

RS/RH; TA; NA; - ; Coast-Seamounts: ABRO (FIS, VID), ES (CIUFES#2374), VIT (VID, VIS, PHO), ECL (VIS).

Figure 98: *Chromis aff.enchrysura* shortly after death, photo by H.T.Pinheiro at Abrolhos bank (ES).

Chromis flavicauda (Günther, 1880)

RS/RH; WA; DD; L (50-60 m), O (50-120 m); Coast-Seamounts-Islands: ABRO (FIS), ES (FIS), VIT (VID, VIS, PHO), JAS (VID), UNN (VID, VIS), DAV (VIS, VID), DOG (VIS, VID, CIUFES #2045), COL (CIUFES#2043, VID), TRI (VID, LIT 1, LIT 2, CIUFES#2207), MAR (LIT 5).

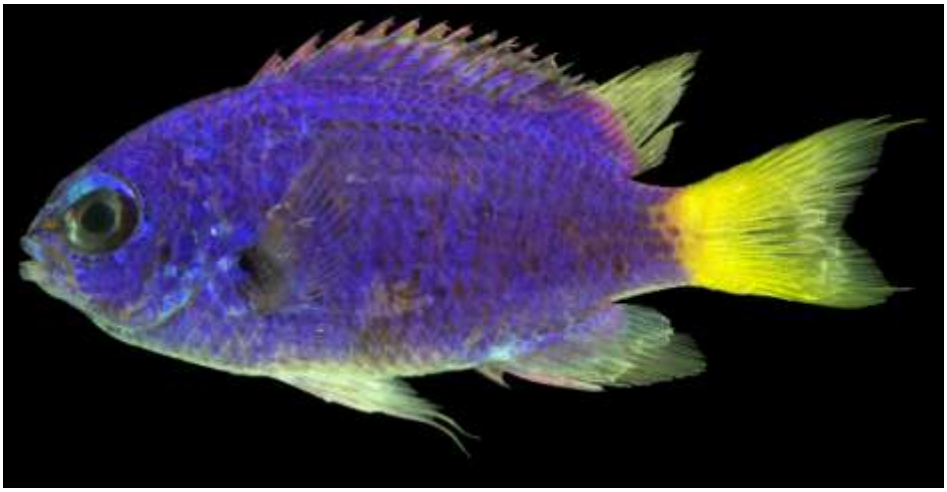

Foto 99: Chromis flavicauda shortly after death, photo by R.M. Macieira at Dogaressa seamount.

Chromis jubauna Moura, 1995

RS/RH; Br; NA; L (10-54 m), O (40-71 m); Coast-Seamounts-Islands: ABRO (FIS, VID), ES (FIS), VIT (VID, PHO, CIUFES 2126, VIS), ECL (VIS), UNN (CIUFES#2038, VIS), DAV (VID),TRI (PHO, VIS, VID, LIT 1).

Foto 100: *Chromis jubauna*, photo by J-C Joyeux at Guarapari islands (ES)

Chromis multilineata (Guichenot, 1853)

RS/WC; TA; NA; L (0-60 m), O (3-84 m); Coast-Seamounts-Islands: ABRO (LIT 7, VID), ES (FIS), VIT (VID, VIS, PHO), UNN (VID), DAV (VIS), TRI (VIS, PHO, FIS, LIT 1, LIT 2), MAR (VID, VIS, LIT 1).

Figure 101: *Chromis multilineata*, photo by J-C Joyeux at Guarapari islands (ES).

Microspathodon chrysurus (Cuvier, 1830)

RS/RH; WA; NA; - ; Coast-Seamounts-Islands: ABRO (LIT 7), ES (FIS), UNN (VIS), DAV (VIS, PHO, CIUFES#2124, VID), TRI (FIS, LIT 1, LIT 2), MAR (VIS, PHO, LIT 1, VID). *Microspathodon chrysurus* is found on Espírito Santo continental margin, where it is rare, and Abrolhos, where is is abundant.

Figure 102: *Microspathodon chrysurus*, photo by H.T.Pinheiro at Trindade.

Stegastes fuscus (Cuvier, 1830)

RS; Br; LC; L (1-12 m), O (0-55 m); Coast-Seamounts-Islands: ABRO (LIT 7), ES (FIS), UNN (CIUFES 2124, VIS), DAV (VIS, UVC, PHO, VID, CIUFES#2033, COL 2), TRI (FIS, LIT 1, LIT 2, COL 2, CIUFES#2211), MAR (VIS, PHO, LIT 1, COL 2). The morph found at Trindade (and Martin Vaz and a few localized sites on the NE shores of continental Brazil) has been described as Stegastes trindadensis (Gasparini, Moura e Sazima, 1999).

Figure 103: *Stegastes fuscus*, photo by R.M. Macieira at Trindade.

Stegastes pictus (Castelnau, 1855)

RS/RH; WA; NA; L (6-70 m), O (5-85 m); Coast-Seamounts-Islands: ABRO (LIT 7, VID), ES (FIS, CIUFES#2409), VIT (VID, VIS, CIUFES#2040), ALSAL (VIS, PHO, VID), ECL (VIS, PHO), JAS (VIS, PHO, VID), UNN (VIS, PHO, VID, CIUFES#2048), DAV (VIS, UVC, PHO,

VID, CIUFES#2146), DOG (VIS, VID), COL (CIUFES#2042), TRI (VIS, VID, LIT 1, FIS, LIT 4), MAR (LIT 1).

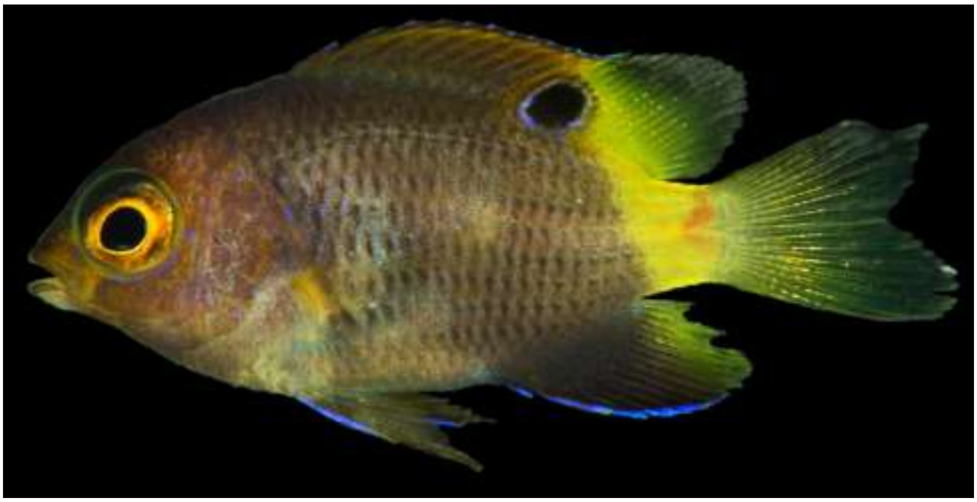

Figure 104: Stegastes pictus shortly after death, photo by T.Simon at Trindade.

LABRIDAE

Thirteen Labridae species were found on CVT below published depth ranges, i.e., almost all species of the *Halichoeres* and *Sparisoma* genera (*S. frondosum* and *S. radians*, were recorded at their published depth limits) found along the VTC.

Bodianus pulchellus (Poey, 1860)

RS/RH; TA; LC; - ; Coast-Seamounts-Islands: ABRO (LIT 7, VID), ES (FIS), VIT (VID, VIS, PHO), UNN (VIS, VID, PHO), DAV (VIS, UVC, VID, PHO), TRI (VIS, PHO, VID, LIT 1, FIS, LIT 2), MAR (PHO, VID).

Bodianus rufus (Linnaeus, 1758)

RS; WA; LC; - ; Coast-Seamounts-Islands: ABRO (LIT 7, VID), ES (FIS), VIT (VIS), DAV (VIS), TRI (FIS, LIT 2, LIT 1), MAR (PHO, VIS, VID).

Sister wrasses *Bodianus pulchellus* and *Bodianus rufus* co-occur along the VTC region. The relationship may be conducted with niche partition, that was found also for another wrasses (Rocha et al., 2005), with more generalist *B. pulchellus* (found in both sides of Atlantic) exploring niches present on more cold and deepest sites where their sister *B. rufus* (present only on west site of Atlantic) is not present. This relationship is found at TMVIG (Pereira-Filho et al., 2011) and on the continental margin (personal observation on mesophotic sites of Espírito Santo). Previously similar relationship between this sisters species was reported from São Tomé oceanic archipelago, where *B. pulchellus* is present but *B. rufus* is absent (Joyeux et al., 2001).

Figure 105: *Bodianus pulchellus*, photo by J-C Joyeux at Guarapari island (ES).

Figure 106: *Bodianus rufus*, photo by J-C Joyeux at Guarapari island (ES).

Clepticus brasiliensis (Heiser, Moura & Robertson, 2001)

RS/WC; Br; LC; L (5-54 m), O (6-62 m); Coast-Seamounts-Islands: ABRO (LIT 7, VID), ES (FIS), VIT (VIS, VID, PHO), JAS (VIS), DAV (VIS, UVC, VID, PHO), TRI (LIT 1, LIT 4).

Figure 107: Clepticus brasiliensis, photos clockwise from top left by HT. Pinheiro (tTrindade), J-C Joyeux (tGuarapari-ES) and R.L.Moura (Davis seamount).

Cryptotomus roseus Cope, 1871

RS/RH; WA; LC; L (0-60 m), O (12-66 m); Coast-Seamounts-Islands: ABRO (LIT 7), ES (FIS), VIT (PHO), ALSAL (VID), DAV (VID), TRI (LIT 4, CIUFES#1494).

Figure 108: Cryptotomus roseus shortly after death, photo by H.T.Pinheiro at Trindade.

Decodon puellaris (Poey, 1860)

RS; WA; DD; - ; Coast-Seamounts: ES (FIS), DAV (PHO).

Doratonotus megalepis Günther, 1862

RS/RH; TA; LC; - ; Disjunct: ABRO (LIT 7), ES (FIS, CIUFES#1398), TRI (LIT 3, CIUFES#1541).

Halichoeres brasiliensis (Bloch, 1791)

RS, Br, DD, L (0-35 m), O (0-44 m); Disjunct: ABRO (LIT 7), ES (FIS), TRI (FIS, LIT 1, LIT 2, CIUFES#1569), MAR (VIS, PHO, LIT 1).

Figure 109: *Halichoeres brasiliensis*, adult (top) and juvenile (down)photos by J-C Joyeux at Guarapari islands (ES).

Halichoeres dimidiatus (Agassiz, 1831)

RS/RH; Br; LC; - ; Coast-Seamounts: ABRO (LIT 7, VID), ES (FIS), VIT (VIS, VID, PHO), ALSAL (VIS), ECL (VIS, PHO), JAS (VIS), UNN (VIS, VID), DAV (VIS, UVC, PHO, VID), DOG (CIUFES#2189, VIS).

Figure 110: *Halichoeres dimidiatus*, photo by J-C Joyeux at Guarapari island (ES).

Halichoeres penrosei (Starks, 1913)

RS/RH; Br; LC; L (0-40 m), O (0-66 m); Coast-Seamounts-Islands: ABRO (LIT 7), ES (FIS), ALSAL (VIS), DAV (VIS), DOG (VID), TRI (FIS, LIT 2, CIUFES#1543), MAR (VIS, PHO, VID).

Figure 111: *Halichoeres penrosei*, photos by H.T. Pinheiro at Trindade.

Halichoeres poeyi (Steindachner, 1867)

RS/RH; WA; LC; L (1-54 m), O (0-71 m); Coast-Seamounts-Islands: ABRO (LIT 7, VID), ES (FIS), ECL (VIS), UNN (VIS, VID), TRI (LIT 1, LIT 2, CIUFES#1261), MAR (VIS, LIT 1).

Figure 112: *Halichoeres poey*, photo by H.T. Pinheiro at Trindade.

Halichoeres rubrovirens (Rocha, Pinheiro & Gasparini, 2010)

RS/RH; VTC; NA; L (25 m), O (5-84 m); Seamounts-Islands: VIT (VID, CIUFES #2137, VIS), ALSAL (VID), JAS (VID), UNN (VIS, PHO, VID), DAV (VIS, UVC, PHO, VID), DOG (CIUFES#2153, VID), TRI (VIS, PHO, FIS, LIT 1, LIT 4, CIUFES#2284), MAR (LIT 4, VIS, PHO, LIT 1, VID).

Figure 113: Halichoeres rubrovirens photos from top to bottom by R.M. Macieira (shortly after death, Vitória seamount), H.T. Pinheiro (Trindade) and T. Simon (Trindade)

The genus *Halichoeres* shows an interesting pattern of distribution probably due to complex interespecific ecological relationships. For instance, the Brazilian endemic *Halichoeres brasiliensis* together with *H. poeyi* are the most abundant and common *Halichoeres* found on adjacent continental shelf, but they maintain a disjunct pattern of distribution in the VTC region. *Halichoeres. dimidiatus*, despite being found on seven seamounts of the VTC is absent from TMVIG. *Halichoeres rubrovirens,* previously belived to be endemic of TMVIG (Rocha et al., 2010), actually is endemic to all volcanic edifices of VTC, including the southern-most and isolated Almirante Saldanha. Its closest relative to H. rubrovirens is from Eastern Pacific and it may be that this relict species specializes in seamounts oceanic habitats. Body coloration varies widely in this species (Figure 107).

Scarus zelindae Moura, Figueiredo & Sazima, 2001

RS/RH; Br; DD; - ; Coast-Seamounts: ABRO (LIT 7, VID), ES (FIS), DAV (VIS, UVC, PHO, VID).

Figure 114: Scarus zelindae photo by R.L.Moura at Davis seamount.

Scarus zelindae is highly dependent from coral reef habitats (Choat and Randall, 1986; Bellwood and Choat, 1989), and this is the first record in oceanic waters (Moura et al., 2001). This specie is found at VTC region on Abrolhos bank (like all parrotfish) and on Davis seamount. It is absent from TMVIG and scarce on adjacent Espírito Santo continental shelf (possibly due to fishing pressure). Thus, Davis´s population may be isolated from mainland. Together with *Sparisoma amplum*, it is the most abundant herbivorous scraper and a major determinant (Lewis & Wainwright, 1985) of the benthic community structure of coral reefs and a dominant agent of reef bioerosion (Bellwood & Choat, 1990; Bellwood, 1995).

Sparisoma amplum (Ranzani, 1842)

RS/RH; Br; LC; L (1-54 m), O (3-57 m); Coast-Seamounts-Islands: ABRO (LIT 7, VID), ES (FIS), VIT (VIS, VID, PHO), DAV (VIS, UVC, PHO, VID), TRI (VID, FIS, LIT 1, LIT 2), MAR (VIS, PHO, VID).

Figure 115: *Sparisoma amplum*, photos by H.T. Pinheiro at Trindade.

Sparisoma axillare (Steindachner, 1878)

RS; Br; DD; L (1-35 m), O (2-45 m); Disjunct: ABRO (LIT 7), ES (FIS), TRI (FIS, LIT 1, LIT 2, CIUFES#2425), MAR (VIS, PHO).

Figure 116: *Sparisoma axillare*, photo by J-C Joyeux at Guarapari islands (ES).

Sparisoma frondosum (Agassiz, 1831)

RS; Br; DD; - ; Coast-Seamounts: ABRO (LIT 7, VID), ES (FIS), VIT (VIS), DAV (VIS).

Figure 117: *Sparisoma frondosum*, photos by J-C Joyeux at Guarapari islands (ES)

Sparisoma radians (Valenciennes, 1839)

RS/RH; WA; LC; - ; Coast-Seamounts: ABRO (LIT 7), ES (FIS), VIT (VID, VIS), ECL (VIS).

Sparisoma rocha (Pinheiro, Gasparini & Sazima, 2010)

RS/RH; VTC; NA; L (10-25 m), O (5-85 m); Seamounts-Islands: DAV (UVC, VID, PHO), DOG (VIS), COL (CIUFES#2142), TRI (VIS, FIS, LIT 2, LIT 4).

Figure 118: *Sparisoma rocha*, photos by H.T. Pinheiro at Trindade.

Sparisoma tuiupiranga Gasparini, Joyeux & Floeter, 2003

RS/RH; Br; LC; L (5-20 m), O (45-71 m); Coast-Seamounts: ABRO (LIT 7), ES (FIS), VIT (VID, VIS), ALSAL (VIS, VID), ECL (VIS), JAS (PHO), DAV (VIS, PHO, VID), DOG (VID, CIUFES#2059, VIS).

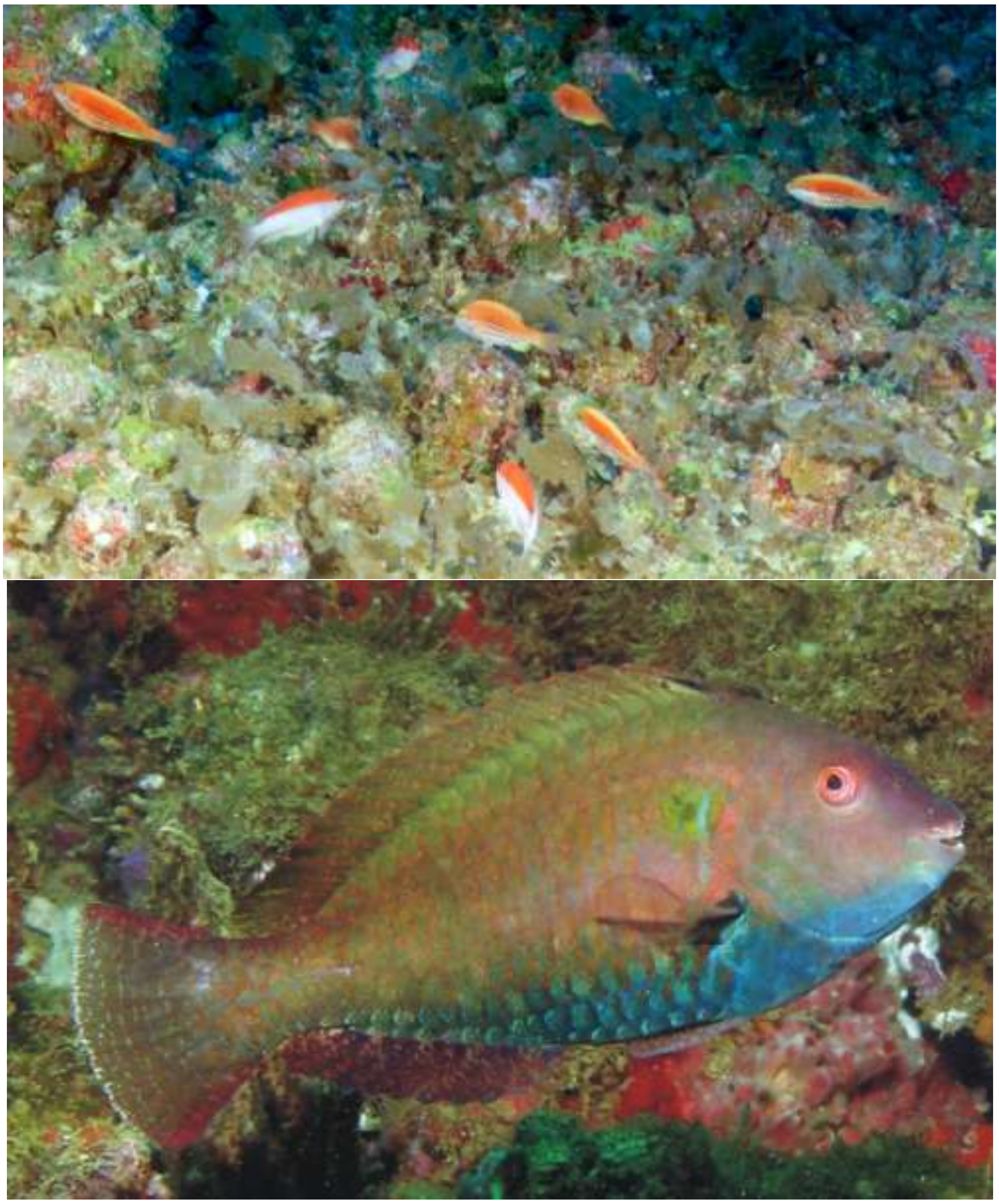

Figure 119: *Sparisoma tuiupiranga*, photos from the top down by R.L. Moura (Davis seamount) and J-C Joyeux (Guarapari islands-ES).

Three species of Sparisoma S. *frondosum*, S. *tuiupiranga* and S. *radians* were found on seamounts but are absent at TMVIG. *Sparisoma tuiupiranga* and *S. radians* were found only on rhodolith beds, while *S. amplum* and *S. frondosum* where only founds on recifal habitats. This relationship may configure a strategy of niche partition.

Thalassoma noronhanum (Boulenger, 1890)

RS/RH; Br; LC; L (0-70 m), O (0-85 m); Coast-Seamounts-Islands: ABRO (LIT 7, VID), ES (FIS), VIT (VIS, VID, PHO), ALSAL (VID), JAS (ZEE), UNN (VIS, VID, PHO), DAV (VIS,

UVC, VID, PHO, CIUFES#2055, COL 2), DOG (VIS, VID), COL (VID, ZEE), TRI (VIS, PHO, LIT 1, FIS, LIT 2,CIUFES#2659), MAR (VIS, PHO, LIT 1).

Figure 120: *Thalassoma noronhanum*, photos by H.T. Pinheiro at Davis (top) and Trindade (bottom).

Thalassoma genus is very diverse in the Atlantic (six species), with a clear division between west (*T. bifasciatum* and *T. noronhanum*) and east lineages (*T. pavo*, *T. newtoni*, *T. ascensionis* and *T. sanctaehelenae*) (Bernardi *et al.*, 2004), with two species restricted to oceanic island of the mid-Atlantic ridge (*T. ascensionis* and *T. sanctaehelenae*). *Thalassoma noronhanum* is found along all Brazilian province (since continental shelf until oceanic islands), but rarely found on the shallow waters of Abrolhos bank.

Xyrichthys splendens (Castelnau, 1855)

RH/SD; WA; LC; - ; Disjunct: ES (FIS), TRI (LIT 4).

Xyrichtys novacula (Linnaeus, 1758)

RH/SD; TA/M; LC; - ; Disjunct: ABRO (LIT 7), ES (FIS), JAS (LIT 8), TRI (VID, LIT 2), MAR (LIT 5).

Figure 121: *Xyrichthys splendens* shortly after death, photos by H.T. Pinheiro.

Xyrichtys sp.

RH; NA; - ; Seamounts: DOG (VID), COL (CIUFES#2186).

TRIPTERYGIIDAE

Enneanectes altivelis Rosenblatt, 1960

RS; WA; NA; L (3-25 m), O (3-45 m); Coast-Seamounts-Islands: ABRO (LIT 7), ES (FIS), DAV (CIUFES#2141, VID), TRI (LIT 1, LIT 2, CIUFES#1561).

BLENNIIDAE

Entomacrodus sp.n

RS; TE; NA; - ; Islands: TRI (LIT 1, LIT 2, CIUFES#2427), MAR (VIS).

Hypleurochilus sp.n

RS; VTC; NA; O (4-45 m); Seamounts-Islands: DAV (CIUFES#2136), TRI (LIT 1, LIT 2, LIT 4, CIUFES#2215), MAR (LIT 1, VIS).

Figure 121: *Hypleurochilus* sp.n shortly after death, photo by R.M. Macieira at Davis seamount.

Ophioblennius trinitatis Miranda-Ribeiro, 1919

RS; Br; NA; - ; Coast-Seamounts-Islands: ABRO (LIT 7), ES (FIS), DAV (VIS), TRI (LIT 1, LIT 2, CIUFES#2662), MAR (VIS, LIT 1, VID).

Figure 122: *Ophioblennius trinitatis*, photos from the top down by R.M. Macieira (Trindade) and J-C Joyeux (Trindade).

Scartella poiti Rangel, Gasparini & Guimarães, 2004

RS; TE; NA; - ; Islands: TRI (LIT 1, LIT 2, CIUFES#2305), MAR (LIT 1).

LABRISOMIDAE

Labrisomus nuchipinnis (Quoy & Gaimard, 1824)

RS; TA; NA; - ; Disjunct: ABRO (LIT 7), ES (FIS), TRI (LIT 1, LIT 2, CIUFES#2638), MAR (VIS, LIT 1).

Figure 123: *Labrisomus nuchipinnis*, photo by J-C Joyeux at Trindade tide pool.

Malacoctenus brunoi (Guimarães, Nunan & Gasparini, 2010)

RS; TE; NA; L (0-8 m), O (0-10 m); Islands: TRI (LIT 1, LIT 2, FIS, CIUFES#2666); MAR (LIT 1, VID).

Figure 124: *Malacoctenus brunoi*, photo by R.M. Macieira at Trindade.

CHAENOPSIDAE

Emblemariopsis signifer (Ginsburg, 1942)

RS; WA; LC; - ; Coast-Seamounts-Islands: ABRO (LIT 7), ES (FIS), VIT (CIUFES#2188), DAV (CIUFES#2143), TRI (LIT 3, CIUFES#1565).

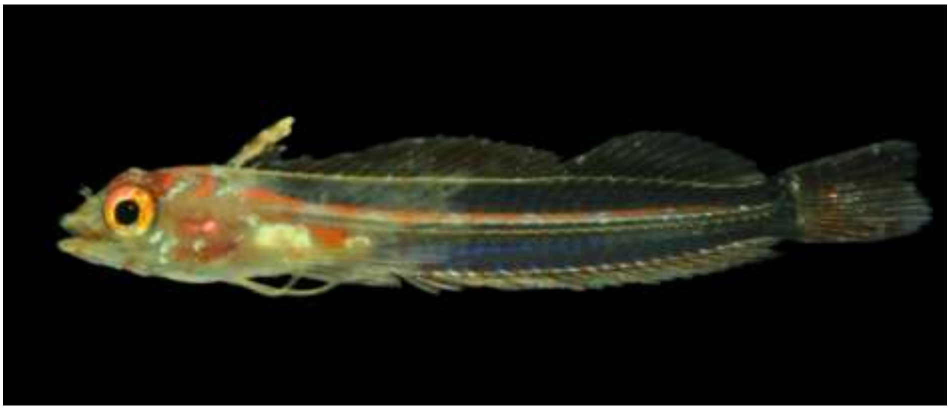

Figure 125: *Emblemariopsis signifer* shortly after death, photo by R.M. Macieira at Davis seamount.

GOBIESOCIDAE

Arcos sp.n

RS; TE; NA; - ; Islands: TRI (LIT 2, LIT 1, CIUFES#2292).

Tomicodon sp.n.1

RS; TE; LC; - ; Islands: TRI (LIT 4, CIUFES#2440).

Figure 126: *Tomicodon sp,* photo by E.F.Mazzei at Trindade.

CALLIONYMIDAE

Callionymus bairdi Jordan, 1887

RH/SD; WA; NA; - ; Disjunct: ES (FIS), TRI (LIT 4, CIUFES#2328).

Figure 127: *Callionymus bairdi,* photo by T.Simon at Trindade.

GOBIIDAE

Coryphopterus thrix (Bohlke & Robins, 1960)

RH/SD; WA; NA; L (10-54 m), O (6-85 m); Coast-Seamounts-Islands: ABRO (LIT 7), ES (FIS), VIT (VIS, CIUFES#2138, LIT 5), ALSAL (VIS), ECL (VIS), JAS (LIT 5), UNN (VIS, CIUFES#2192), DAV (UVC, CIUFES#2139, LIT 5), DOG (VIS, LIT 5), COL (CIUFES#2187), TRI (VIS, LIT 5, FIS, LIT 4), MAR (VIS).

Figure 128: *Coryphopterus thrix*, photo by J-C Joyeux at Trindade.

Elacatinus pridisi (Guimarães, Gasparini & Rocha, 2004)

RS; TE; ET; L (30m), O (84 m); Islands: TRI (VIS, PHO, FIS, LIT 1, LIT 2, CIUFES#2234), MAR (LIT 1).

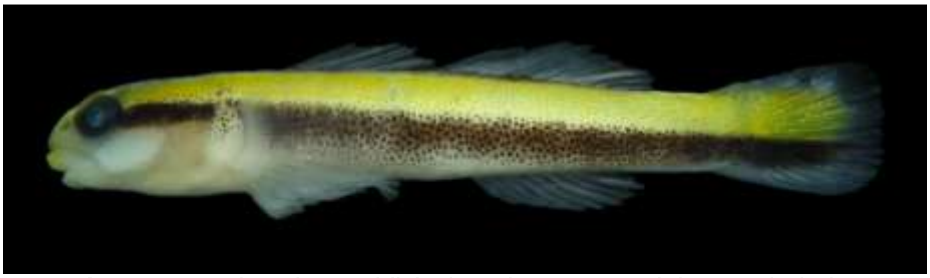

Figure 129: *Elacatinus pridisi*, photo by R.M. Macieira at Trindade.

Elacatinus sp.

RS/RH; Br; ET; - ; Seamounts: VIT (VIS, PHO, CIUFES#2147), ALSAL (VIS, VID), ECL (VIS, VID), UNN (VIS, PHO, VID, CIUFES#2190), DAV (COL 2), DOG (VIS, VID, CIUFES#2144). *Elacatinus Figaro* is the only cleaner goby present along all Brazilian province (except to Fernando de Noronha, where Sazima and collaborators 2008 describe *E. phthirophagus*). Therefore, until present time, both *E.pridisi* and *E. figaro* can co-occur along all VTC and yet remaining the genetic flux between them (Almeida personal communication). For this reason, we consider the *sp.* for all records made along seamounts.

Gnatholepis thompsoni Jordan, 1904

RH/SD; TA; NA; L (0-50 m), O (1-85 m); Coast-Seamounts-Islands: ES (FIS), VIT (VIS), UNN (CIUFES#2150), DOG (VIS, VID), COL (CIUFES#2159, VID), TRI (FIS, LIT 2, CIUFES#2220)

Figure 130: *Gnatholepis thompsoni*, photo by J-C Joyeux at Trindade.

Gobulus myersi (Ginsburg, 1939)

RH/SD; WA; NA; - ; Disjunct: ABRO (FIS, CIUFES#2589), ES (FIS), TRI (LIT 3).

Lythrypnus sp. b

RS/RH; VTC; NA; O (4-65 m); Seamounts-Islands: VIT (CIUFES#2181), UNN (CIUFES#2169), DAV (CIUFES#2166), DOG (CIUFES#2176), TRI (LIT 2, CIUFES#2201).

Figure 131: *Lythrypnus sp.b,.* photo by R.M. Macieira at Davis seamount.

Lythrypnus sp. c

RS/RH; VTC; NA; O (40-65 m); Seamounts-Islands: UNN (CIUFES#2172), DAV (CIUFES#2161), DOG (CIUFES#2178), TRI (CIUFES#2232).

Figure 132: *Lythrypnus sp.c,.* photo by R.M. Macieira at Davis seamount.

Priolepis dawsoni (Greenfield, 1989)

RS/RH; WA; NA; - ; Coast-Seamounts-Islands: ABRO (LIT 7), ES (FIS), UNN (CIUFES#2183), DOG (CIUFES#2175), TRI (LIT 2).

Figure 133: *Priolepis dawsoni*, photo by R.M. Macieira at Trindade.

Risor ruber (Rosén, 1911)

RH; WA; NA; - ; Coast-Seamounts: ABRO (LIT 7), DOG (CIUFES 2121).

Figure 134: *Risor ruber*, photo by R.M. Macieira at Dogaressa seamount.

ACANTHURIDAE

Three Acanthuridae are found along the VTC (i.e. *Acanthurus bahianus, A. chirurgus* and *A. coeruleus*). Despite a presence from continental shelf to middle of the chain (Vitória, Unnamed e Davis) *A. chirurgus* is absent at TMVIG. This specie is present on both sides of Atlantic and along all Brazilian province. According to Rocha and collaborators (2002), there is no populational separation between northern and southern populations of the west Atlantic. This seems to exclude the hypothesis of difficulty of dispersal and thus indicates another possiblility of strong interspecific relationship of competition for resource use.

Acanthurus bahianus Castelnau, 1855

RS/RH; WA; NA; L (2-40 m), O (0-71 m); Coast-Seamounts-Islands: ABRO (LIT 7, VID), ES (FIS), VIT (VIS, VID, PHO), ECL (VIS), JAS (VIS), UNN (VIS, PHO, VID), DAV (VIS, UVC, PHO, VID), TRI (VID, FIS, LIT 1, LIT 2), MAR (VIS, PHO, LIT 1).

Figure 135: *Acanthurus bahianus*, photos from the top down by H.T. Pinheiro (Trindade) and J-C Joyeux (Guarapari islands-ES).

Acanthurus chirurgus (Bloch, 1787)

RS/RH; TA; NA; - ; Coast-Seamounts: ABRO (LIT 7, VID), ES (FIS), VIT (VIS, PHO), JAS (VIS), UNN (VIS, VID), DAV (UVC, VIS, VID), TRI (LIT 8, LIT 9).

Figure 136: *Acanthurus chirurgus*, photo by J-C Joyeux at Guarapari islands (ES).

Acanthurus coeruleus (Bloch & Schneider, 1801)

RS/RH; WA/CA; NA; - ; Coast-Seamounts-Islands: ABRO (LIT 7, VID), ES (FIS), VIT (VID, VIS), ECL (VIS), JAS (VIS), UNN (VIS, VID), DAV (VIS, UVC, PHO, VID), DOG (VIS), TRI (FIS), TRI (LIT 1, LIT 2), MAR (VIS, PHO, LIT 1).

Figure 137: *Acanthurus coeruleus*, photos from the left to right by H.T.Pinheiro (Trindade) and J-C Joyeux (juvenile, Guarapari islands-ES).

SPHYRAENIDAE

Sphyraena barracuda (Walbaum, 1792)

RS/RH/WC; CG; NA; - ; Coast-Seamounts-Islands: ABRO (LIT 7, FIS, ZEE), ES (FIS), VIT (VIS, PHO, VID), PARN (ZEE), UNN (VIS, VID), DAV (VIS, UVC, PHO, VID), DOG (VIS), COL (VIS), TRI (LIT 2, CIUFES#1491), MAR (VID, PHO, VIS, LIT 1).

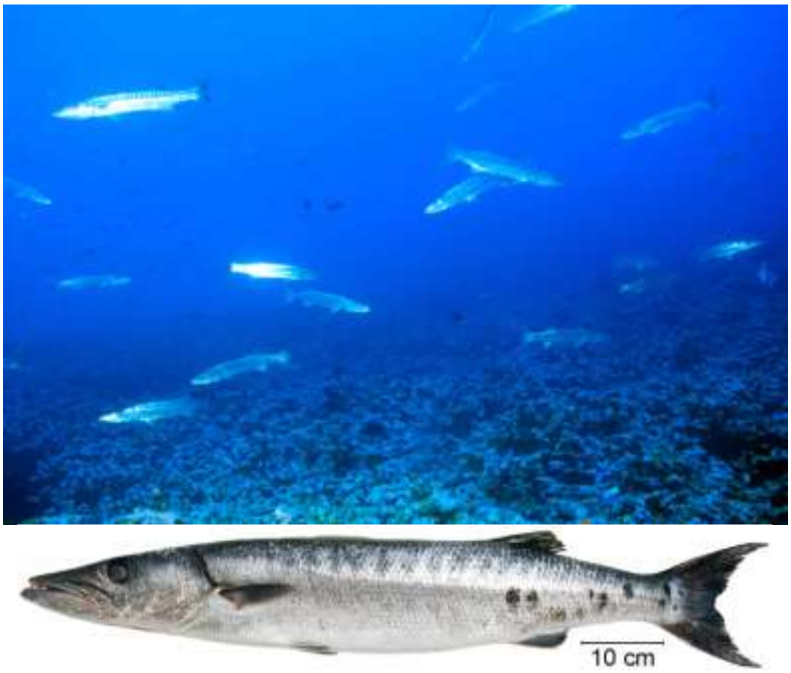

Figure 138: *Sphyraena barracuda*, photos from the top to down by R.L.Moura (Davis seamount) and P.Costa.

GEMPYLIDAE

Gempylus serpens

Cuvier 1829; WC; CG; NA; - ; Seamounts: PARN (ZEE).

Figure 139: *Gempylus serpens*, photos from the top down by E.F.Mazzei (adjacent to Vitoria seamount) and P.Costa.

Lepidocybium flavobrunneum (Smith, 1843)

WC; CG; NA; L (200-1100 m), O (45-94 m); Seamounts: VIT (ZEE), ALSAL (ZEE), PARN (ZEE), MONT (FIS).

Figure 140: *Lepidocybium flavobrunneum*, photo by E.F.Mazzei at Montague seamount.

SCOMBRIDAE

Acanthocybium solandri (Cuvier, 1832)

WC; CG; NA; L (0-12 m), O (1-52 m); Coast-Seamounts-Islands: ABRO (ZEE), ES (FIS), VIT (VIS), ALSAL (VIS), PARN (ZEE), ECL (VIS), MONT (FIS), UNN (VIS), DAV (VIS), TRI (VIS).

Figure 142: *Acanthocybium solandri*, photo by P. Costa.

Katsuwonus pelamis (Linnaeus, 1758)

WC; CT; NA; - ; Islands: MAR (PHO).

Scomberomorus cavalla (Cuvier, 1829)

WC; WA/CA; NA; - ; Islands: TRI (LIT 2).

Thunnus alalunga (Bonnaterre, 1788)

WC; CG; DD/CT; - ; Seamounts-Islands: ALSAL (ZEE), TRI (LIT 8).

Thunnus albacares (Bonnaterre, 1788)

WC; CG; LC; - ; Coast-Seamounts: ABRO (ZEE), ES (ZEE), VIT (FIS), ALSAL (ZEE).

Thunnus atlanticus (Lesson, 1831)

WC; WA; LC; - ; Coast-Seamounts: ABRO (ZEE), ES (ZEE), ALSAL (ZEE), PARN (ZEE), COL (PHO).

Figure 143: *Thunnus atlanticus*, photo by P.Costa.

Thunnus obesus (Lowe, 1839)

WC; CG; VU; - ; Islands: TRI (LIT 4).

XIPHIIDAE

Xiphias gladius Linnaeus, 1758

WC; CG; DD/CT; - ; Seamounts-Islands: VIT (FIS, ZEE), PARN (ZEE), MONT (FIS), TRI (FIS).

Figure 144: *Xiphias gladius*, photo by P.Costa.

ISTIOPHORIDAE

Makaira nigricans Lacepède, 1802

WC; TA; VU; - ; Seamounts-Islands: VIT (FIS), PARN (ZEE), TRI (FIS).

ARIOMMATIDAE

Ariomma bondi Fowler, 1930

WC; TA; NA; - ; Seamounts: DAV (ZEE).

Figure 145: *Ariomma bondi*, photo by P. Costa.

BOTHIDAE

Bothus lunatus (Linnaeus, 1758)

RH/SD; TA; L (0-100 m), O (120 m); NA; Disjunct: ABRO (LIT 7), ES (FIS), TRI (LIT 2), MAR (LIT 5).

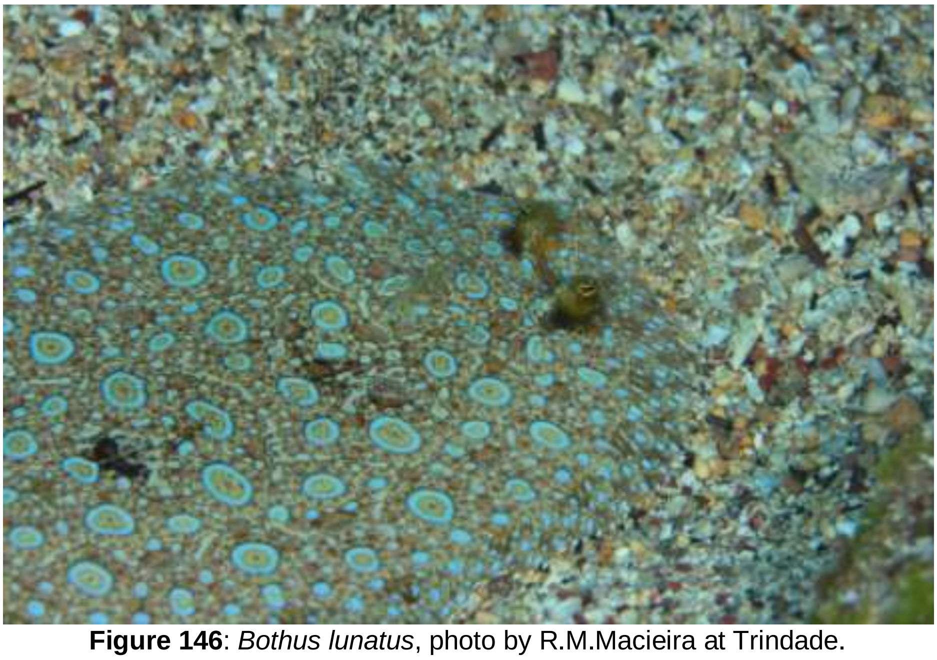

Figure 146: *Bothus lunatus*, photo by R.M.Macieira at Trindade.

Bothus ocellatus (Agassiz, 1831)

RH/SD; WA; L (1-110 m), O (34-120 m); NA; Disjunct: ABRO (LIT 7), ES (FIS), TRI (CIUFES#1488), MAR (LIT 9, LIT 5).

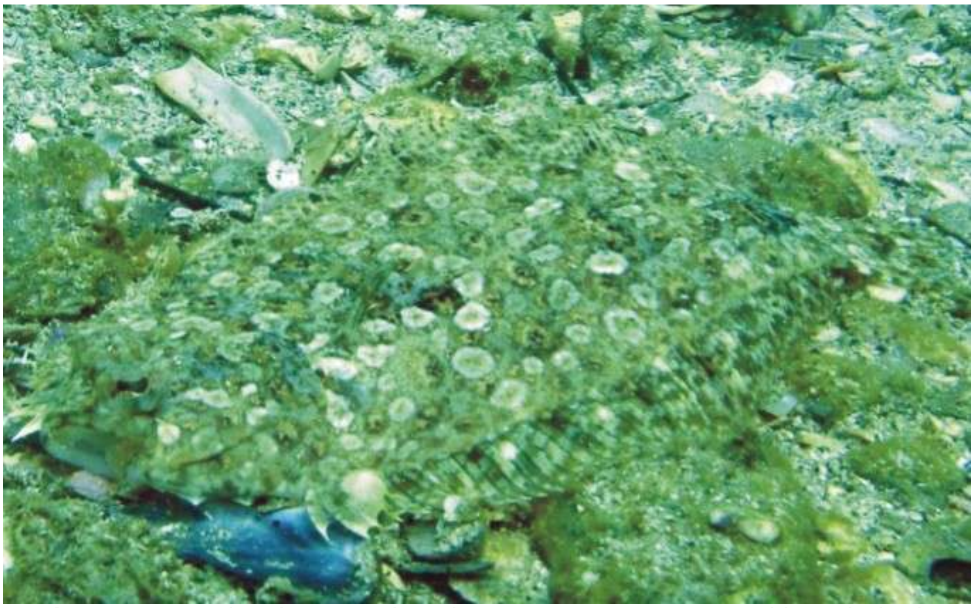

Figure 147: *Bothus lunatus*, photo by J-C Joyeux at Guarapari islands (ES).

CYNOGLOSSIDAE

Symphurus plagusia (Bloch & Schneider, 1801)

SD; WA; NA; - ; Coast-Seamounts: ES (FIS), VIT (LIT 5).

TETRAODONTIFORMES

BALISTIDAE

Balistes capriscus Gmelin, 1788

RH/WC; TA/M; NA; - ; Coast-Seamounts-Islands: ABRO (FIS), ES (FIS), PARN (ZEE), JAS (ZEE), TRI (LIT 2). In the recent past this species figure among the most overexploited by commercial fishing activity in the VTC region.

Figure 148: *Balistes Capriscus*, photo by P. Costa.

Balistes vetula (Linnaeus, 1758)

RS/RH/WC/SD; TA; VU; L (2-60 m), O (3-111 m); Coast-Seamounts-Islands: ABRO (LIT 7; FIS, ZEE), ES (FIS), VIT (VID, VIS, PHO, ZEE), ALSAL (VIS), PARN (ZEE), ECL (VIS, PHO, ZEE), JAS (VIS, PHO, VID, UD1), MONT (ZEE), UNN (VIS), DAV (VIS, UVC, VID, ZEE), DOG (FIS, VIS, VID, ZEE), COL (VIS, ZEE), TRI (VID, FIS), TRI (LIT 1, LIT 2, ZEE), MAR (VID, VIS , PHO, LIT 1). Very commun species distributed along all surveyed places.

Figure 149: *Balistes vetula,* photo by H.T. Pinheiro at Trindade.

Canthidermis sufflamen (Mitchill, 1815)

WC; TA; NA; L (5-75 m), O (5-300 m); Seamounts-Islands: VIT (VIS, VID, PHO), ALSAL (VIS, VID), PARN (ZEE), ECL (VIS), UNN (VIS, VID), DAV (VIS, VID), DOG (FIS, VIS, ZEE), COL (VIS), TRI (LIT 1, FIS), TRI (LIT 2), MAR (VIS, PHO, LIT 1,VID).

Figure 150: *Canthidermis sufflamen,* photo by H.T. Pinheiro at Trindade.

Melichthys niger (Bloch, 1786)

RS/RH/WC/SD; CT; NA; - ; Seamounts-Islands: VIT (VID, VIS), JAS (VIS), UNN (VIS, PHO, VID), DAV (VIS, UVC, PHO, VID), DOG (FIS, VIS, VID), COL (VIS, VID), TRI (VIS, PHO, VID, LIT 1, FIS, ZEE, LIT 2), MAR (VID, VIS, PHO, LIT 1). This species occurs in all volcanic edificies surveyed, being common and exceptionally abundant on TMVIG.

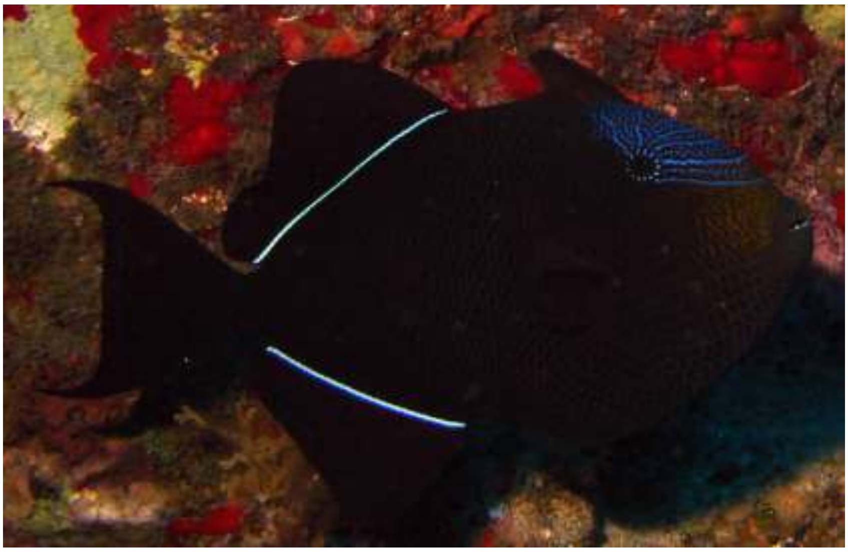

Figure 151: *Melichthys niger,* photo by H.T. Pinheiro at Trindade island.

Xanthichthys ringens (Linnaeus, 1758)

RH; WA; NA; - ; Seamounts: ALSAL (VIS, PHO, VID), JAS (VIS, PHO), DOG (VIS, VID, CIUFES#2122, LIT 5). The Atlantic Triggerfish was found at VTC volcanic edifices and yet unrecorded on continental adjacent shelf. Along Brazilian province was found on northeast (from Tamandaré /PE at shallow waters ~20 m), at Parcel Manuel Luís, at open waters rafting with floating objects and Sargassum turf algae (Carvalho Filho unpublished data) and at the Noronha – Rocas seamounts chain (Francini-Filho and collaborators unpublished data). Along VTC seamounts, individuals was record just on rodolith habitats (Almirante Saldanha, Jaseur and Dogaressa seamounts, about 60 meters depth) and on superficial waters by plankton larvae collected on Martin Vaz Island (Joyeux and collaborators unpublished data).

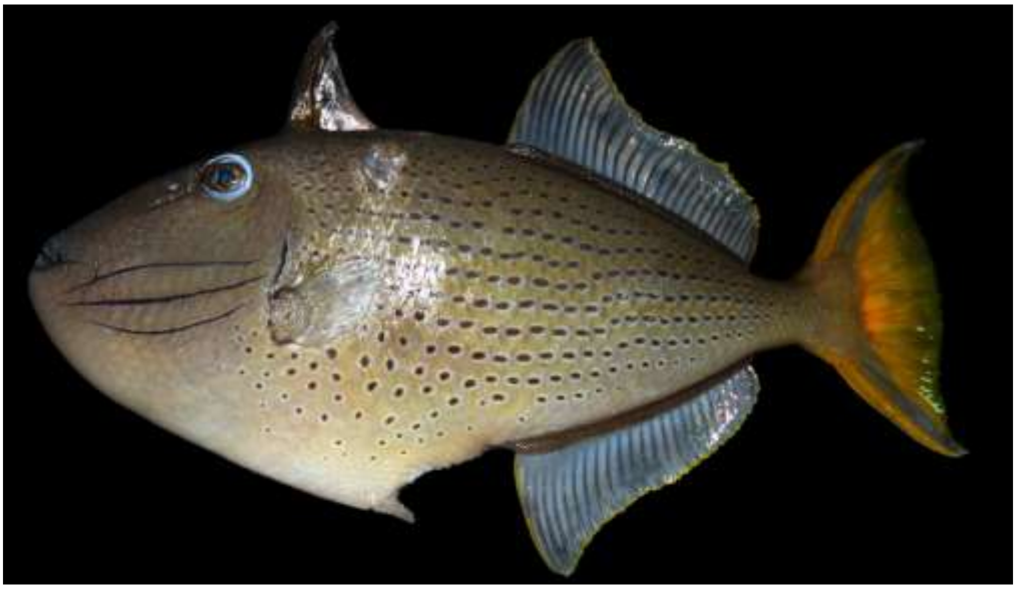

Figure 152: *Xanthichthys ringens* shortly after death, photo by R.M.Macieira at Dogaressa seamount.

MONACANTHIDAE

Aluterus monoceros (Linnaeus, 1758)

WC; CT; NA; L (1-50 m), O (1-72 m); Coast-Seamounts: ABRO (LIT 7), ES (FIS), PARN (ZEE), VIT (ZEE).

Figure 153: *Aluterus monoceros*, photo by P. Costa.

Aluterus schoepfii (Walbaum, 1792)

RH; TA; NA; - ; Coast-Seamounts: ABRO (LIT 7), ES (FIS), ECL (VIS).

Aluterus scriptus (Osbeck, 1765)

RS/RH; CT; NA; - ; Coast-Seamounts-Islands: ABRO (LIT 7), ES (FIS), JAS (VIS), TRI (LIT 2, LIT 1), MAR (PHO, LIT 1).

Figure 154: *Aluterus scriptus*, photo by J-C Joyeux at Guarapari islands (ES).

Cantherhines macrocerus (Hollard, 1854)

RS/RH; TA; NA; L (2-40 m), O (3-65 m); Coast-Seamounts-Islands: ABRO (LIT 7), ES (FIS), VIT (VID, VIS, PHO), JAS (VIS), UNN (VID), DAV (VIS, VID), DOG (VIS), TRI (FIS, LIT 1, LIT 2), MAR (VIS, PHO, LIT 1).

Figure 155: *Cantherhines macrocerus*, photo by J-C Joyeux at Guarapari islands (ES).

Cantherhines pullus (Ranzani, 1842)

RS/RH; TA; NA; L (3-50 m), O (3-57 m); Coast-Seamounts-Islands: ABRO (LIT 7), ES (FIS), VIT (VID, VIS, PHO, LIT 5), DAV (VIS, PHO), TRI (LIT 2, LIT 1), MAR (VIS, LIT 1).

Figure 156: *Cantherhines pullus*, photo by J-C Joyeux at Guarapari islands (ES).

Stephanolepis hispidus (Linnaeus, 1766)

RH; TA; NA; - ; Coast-Seamounts: ABRO (LIT 7), ES (FIS), VIT (VID, VIS, LIT 5).

OSTRACIIDAE

Acanthostracion polygonius Poey,1876

RS; WA; NA; - ; Coast-Seamounts-Islands: ABRO (LIT 7), ES (FIS), VIT (VIS, VID, PHO), UNN (VID), TRI (LIT 1, LIT 3), MAR (VIS).

Figure 157: *Acanthostracion polygonius*, photo by J-C Joyeux at Guarapari islands (ES).

Acanthostracion quadricornis (Linnaeus, 1758)

RS; TA; NA; - ; Disjunct: ABRO (LIT 7), ES (FIS), TRI (LIT 2).

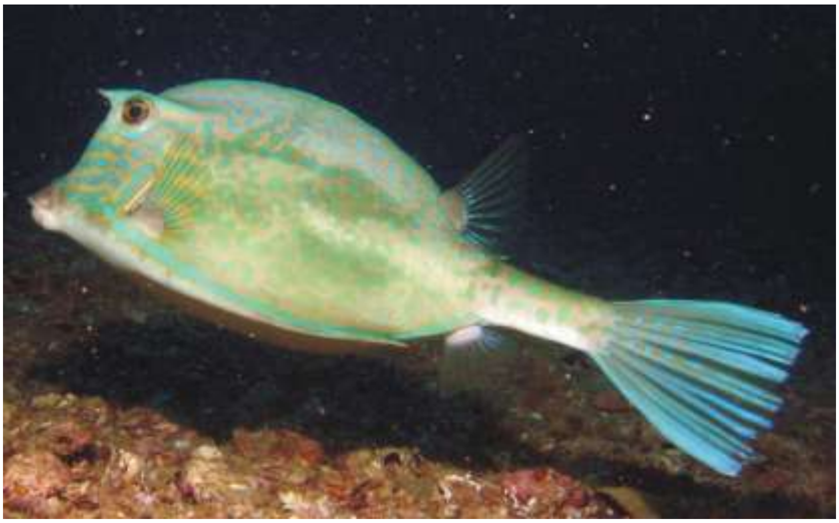

Figure 158: *Acanthostracion quadricornis*, photo by J-C Joyeux at Guarapari islands (ES).

TETRAODONTIDAE

Canthigaster figueiredoi Moura & Castro, 2002

RS/RH; Br; NA; L (1-54 m), O (12 -66m); Coast-Seamounts-Islands; ABRO (LIT 7, VID), ES (FIS), VIT (VIS), ALSAL (VIS), JAS (VIS), UNN (VIS), DAV (VIS), DOG (VIS, VID, CIUFES#2050), TRI (FIS, LIT 1, LIT 4).

Sphoeroides spengleri (Bloch, 1785)

RS; WA; NA; - ; Disjunct: ABRO (LIT 7), ES (FIS), TRI (LIT 1, LIT 4), MAR (LIT 1).

Figure 159: *Sphoeroides spengleri*, photo by H.T. Pinheiro at Trindade.

DIODONTIDAE

Chilomycterus reticulatus (Linnaeus, 1758)

RS; CG; NA; - ; Coast-Seamounts-Islands: ES (FIS), DAV (VIS), TRI (LIT 4).

Figure 160: *Chilomycterus reticulatus*, photo by J-C Joyeux at Guarapari islands (ES).

Chilomycterus spinosus (Linnaeus, 1758)

RS; SW; NA; - ; Disjunct: ABRO (LIT 7), ES (FIS), TRI (LIT 4).

Figure 161: *Chilomycterus spinosus*, photo by H.T. Pinheiro at Trindade.

Diodon holocanthus Linnaeus, 1758

RS; CT; NA; - ; Coast-Seamounts-Islands: ABRO (LIT 7), ES (FIS), VIT (VIS, PHO, LIT 5), PARN (ZEE), VIT (ZEE), TRI (FIS, LIT 1, LIT 2), MAR (PHO).

Figure 162: *Diodon holocanthus*, photo by R.M Macieira at Trindade.

Diodon hystrix Linnaeus, 1758

RS; CT; NA; - ; Disjunct: ABRO (LIT 7, VID), ES (FIS), TRI (LIT 2, LIT 1).

MOLIDAE

Masturus Lanceolatus (Lienard, 1840)

WC; CT; NA; - ; Coast-Seamounts: ABRO (FIS), ES (FIS), MON (FIS).

Figure 163: *Masturus Lanceolatus*, photo by E.F.Mazzei (adjacent to Montague seamount).

Mola mola (Linnaeus, 1758)

WC; CG; NA; - ; Coast-Seamounts: ABRO (FIS), ES (FIS), PARN (ZEE).