Taxonomia e potencial de preservação de ostracodes (Crustacea, Ostracoda) da Cadeia Vitória-Trindade, Brasil

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"A beleza da natureza está nos
detalhes; a mensagem, nas generalidades."

Stephen J. Gould

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Resumo

As ilhas oceânicas são áreas de grande importância ecológica, podendo servir de laboratório natural para diversas áreas do conhecimento, incluindo biogeografia, conservação, taxas de dispersão, entre outros estudos, bem como testar várias hipóteses científicas. Pesquisas sobre a ostracofauna de ilhas oceânicas brasileiras são bem recentes, tendo aumentado consideravelmente na última década, fornecendo importantes aspectos sobre a zoogeografia destas faunas. Este grupo de microcrustáceos tem grande relevância para a Paleontologia, sendo amplamente utilizados em estudos de reconstrução paleoambiental, paleoclimática e paleoceanográfica. Apesar disso, até onde sabemos, não existem estudos abordando a relação ‘vivo-morto’ considerando os ostracodes marinhos. Um importante meio para medir a qualidade do registro fóssil é avaliar a fidelidade na qual uma associação morta preserva a composição e a estrutura da comunidade. Neste sentido, os ostracodes podem se tornar uma excelente fonte informação em pesquisas sobre a qualidade do registro fóssil, através do estudo do seu potencial de preservação, inclusive em ambientes insulares. Esta tese tem por objetivo o estudo taxonômico detalhado da fauna de ostracodes da Cadeia Vitória-Trindade, uma sequência linear composta por montes submarinos e o arquipélago de Trindade e Martin Vaz, bem como avaliar a fidelidade das associações viva e morta destes organismos em uma ampla escala espacial. A ostracofauna observada na cadeia mostrou-se bastante diversificada, apresentando 54 espécies, e similar às faunas reportadas para a plataforma continental brasileira e ambientes marinhos marginais. Dez espécies novas foram registradas e são descritas em dois artigos oriundos desta pesquisa. As comparações entre vivos e mortos da ilha da Trindade mostraram que a associação morta representa com fidelidade a associação viva, podendo capturar mudanças de longo prazo na comunidade viva local. Já nos montes submarinos, concordância entre associação viva e morta, em geral, foi bem menor quando comparada a ilha. A fauna viva dos montes é composta principalmente por indivíduos juvenis, enquanto a fauna morta é, em sua maioria, formada por adultos. Essa diferença, que influencia nos valores de fidelidade, está possivelmente relacionada a uma rápida perda das carapaças após a morte dos indivíduos.

Palvaras-chave: Ilha da Trindade, Montes Submarinos, Ostracoda, Fidelidade Quantitativa.

Abstract

Oceanic islands are areas of great ecological importance and can serve as a natural laboratory for numerous fields of science, including biogeography, conservation, dispersion rates, among other studies, as well as testing various scientific hypotheses. Research on the ostracofauna of Brazilian oceanic islands is quite recent, increasing considerably in the last decade, and has provided important aspects on the zoogeography of these faunas. This group of microcrustaceans has several applications for paleontology, being widely used in paleoenvironmental, paleoclimate and paleoceanographic reconstruction studies. Nevertheless, as far as we know, there are no studies developing approaches to 'live-dead' studies considering marine ostracodes. An important means of measuring the quality of the fossil record is to assess the fidelity in which a dead association preserves the composition and structure of the community. In this context, ostracodes can become an excellent source of information in research on the quality of the fossil record by studying their preservation potential, including island environments. The current work aims to the detailed taxonomic study of the ostracode fauna of the Vitória-Trindade Chain, a linear sequence composed by seamounts and the Trindade and Martin Vaz archipelago, as well as to evaluate the fidelity of the living and dead associations of these organisms in a wide spatial scale. The ostracofauna observed in the chain was quite diverse, with 54 species, and similar to the faunas reported for the Brazilian continental shelf and marginal marine environments. Ten new species were recorded and are described in two articles from this research. Comparisons between the living and the dead ostracodes on Trindade Island showed that the dead association faithfully represents the living association and can capture long-term changes in the local living community. Already in the seamounts, the agreement between living and dead association, in general, was much lower when compared to the island. The live fauna of the seamounts is mainly composed of juvenile individuals, while the dead fauna is mostly made up of adults. This difference, which influences fidelity values, is possibly related to a rapid loss of carapaces after the death of individuals.

Keywords: Trindade, Seamounts, Ostracoda, Quantitative Fidelity.

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INTRODUÇÃO

Características Gerais dos Ostracodes

Os ostracodes são pequenos crustáceos constituídos por uma carapaça bivalve quitino-calcítica articulada ao longo da margem dorsal pela charneira e secretada a partir do carbonato retirado da água. O grupo possui um rico registro fossilífero, que data desde o Eopaleozoico, sendo amplamente utilizado como *proxie* para reconstruções de ambientes e climas do passado (Bergue 2006; Rodriguez-Lazaro & Ruiz-Muñoz 2012; Smith & Palmer 2012). A maioria das espécies é bentônica e tem tamanho microscópico, medindo entre 0,4 e 1 mm, mas algumas podem atingir mais de 2 mm no estágio adulto (Horne *et al.* 2002; Coimbra & Bergue 2011).

O crescimento se dá através de ecdises ou mudas, apresentando cerca de oito estágios ontogenéticos, onde o adulto é chamado de "A" e a forma mais juvenil denominada de A-8 (Figura 1). Para cada estágio de crescimento uma nova carapaça é secretada, aumentando progressivamente de tamanho e tornando-se mais calcificada. Estas mudanças podem ser acompanhadas por modificações na forma e na ornamentação, e, em alguns podocopídeos, pelo aumento da complexidade da charneira, lamela interna e porocanais (Armstrong & Brasier 2005; Coimbra & Bergue 2011; Rodriguez-Lazaro & Ruiz-Muñoz 2012).

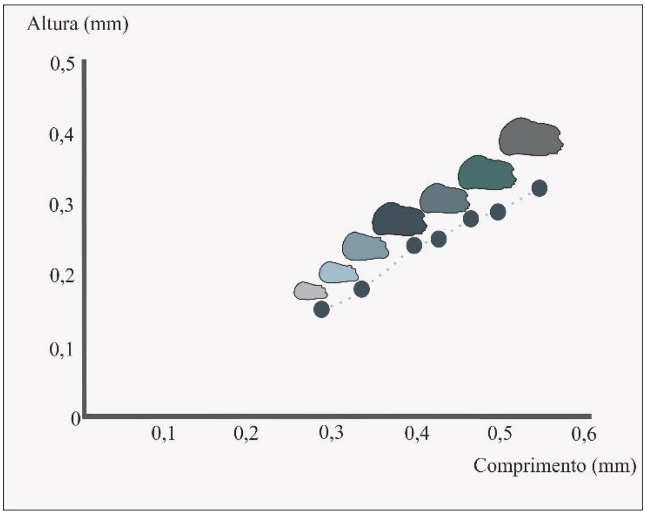

Figura 1. Esquema ilustrando a relação altura vs. comprimento das carapaças ao longo dos estágios ontogenéticos de *Neohornibrookella trindadensis*.

Os ostracodes tiveram uma rápida irradiação e são encontrados nos mais variados ambientes aquáticos, vivendo em água doce, salobra, marinha e hipersalina, e em ambientes semiaquáticos (*e.g.* reserva de água dos tanques das bromélias). Nos mares habitam desde a linha de costa até profundidades abissais (Figura 2). A presença do grupo em diferentes nichos ocorre devido a sua plasticidade ecológica baseada na tolerância às limitações do ambiente e na adaptação a fontes alimentares (Boomer 2002; Rodriguez-Lazaro & Ruiz-Muñoz 2012).

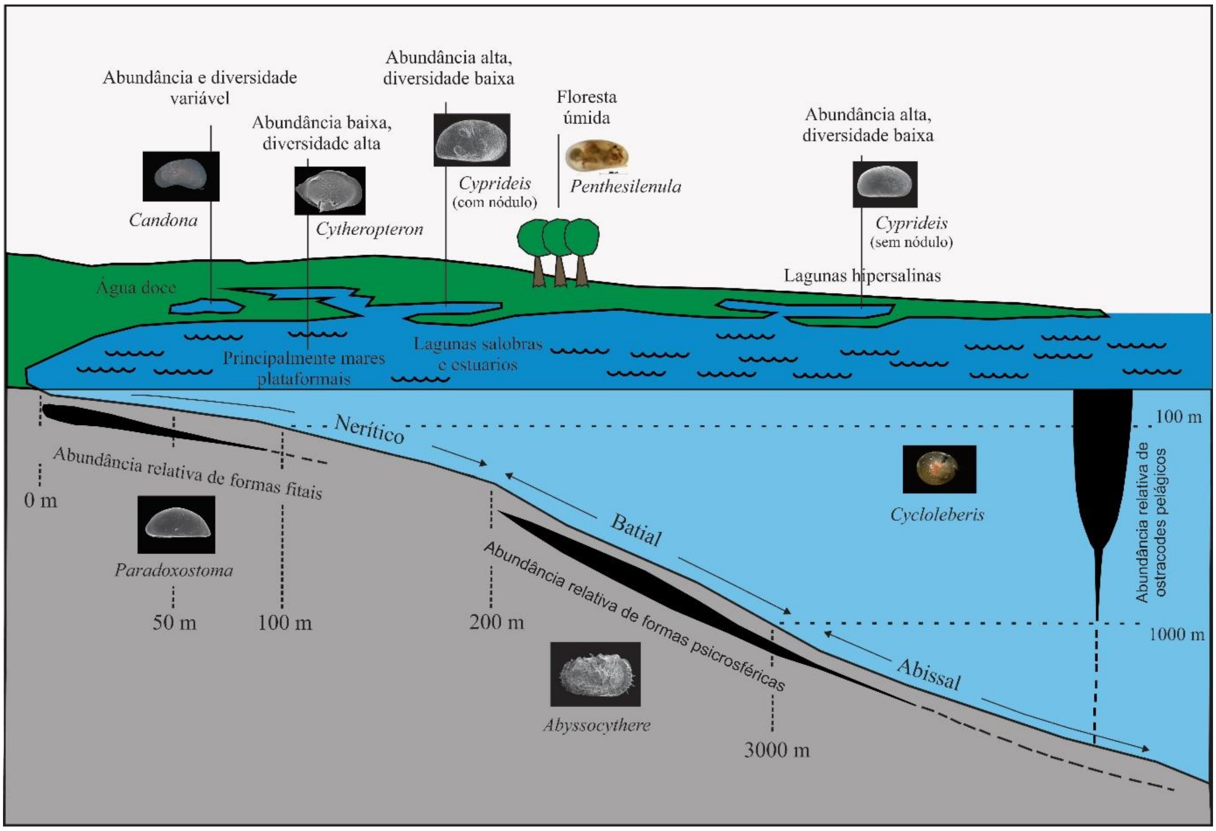

Figura 2. Distribuição dos ostracodes nos ambientes aquáticos e no húmus de florestas tropicais (modificado de Armstrong & Brasier 2005).

Ilhas Oceânicas e Montes Submarinos

As ilhas oceânicas elevam-se do fundo oceânico devido a atividades vulcânicas e/ou tectônicas e sua formação se dá distante de áreas continentais. Após o processo de erosão, surge uma plataforma insular, podendo estabelecer uma diversidade de ambientes. Podem ser encontradas sozinhas ou em grupos de ilhas (arquipélagos), sempre cercadas por águas profundas. Estas áreas isoladas são uma oportunidade de estudar padrões de distribuição e diversidade das espécies, tendo servido de modelo para as teorias evolutivas de Darwin (Kueffer & Fernández-Palacios 2010; Rominger *et al.* 2016). Um dos estudo pioneiros sobre ilhas oceânicas foi realizado por Wallace (1887), o qual trata de características físicas e biológicas, além das primeiras abordagens biogeográficas.

Os montes submarinos são componentes importantes de muitas ilhas oceânicas tropicais e subtropicais, em geral de origem vulcânica. Contudo, devido aos biomas que se desenvolvem nestas estruturas, muitos autores os consideram como caso particulares dentro do ecossistema marinho (McClain 2007; Etnoyer *et al.* 2010; Fernández-Palacios *et al.* 2014). Estes ambientes fragmentados consistem em vulcões submersos (ativos ou inativos), com alturas superiores a 100 m. Estima-se que existam até 200.000 montes submarinos, dependendo da definição adotada (Wessel 2001; Hillier & Watts 2007; Kitchinman *et al.* 2007). Juntos, estes edifícios vulcânicos ocupam uma extensa área geográfica (aproximadamente o tamanho da Europa), e apresentam fatores físicos similares entre si, além de uma biota muito particular. Mas, nem todos os montes são iguais, diferindo significativamente na forma, tamanho, profundidade e localização, que influenciarão na composição faunística e florística (Wessel 2001; Rowden *et al.* 2005; Clark *et al.* 2010; Etnoyer *et al.* 2010).

Sedimentos finos dominam grande parte do topo dos montes, principalmente os bancos e *guyots* de topos aplainados, e respondem a muitos gradientes oceanográficos de larga escala e anomalias, com correntes oceânicas atuando significativamente no aumento da conectividade entre as áreas mais próximas, comumente apresentando uma fauna similar àquelas encontradas em plataformas e ilhas adjacentes (Wilson & Kaufmann 1987). Apesar das barreiras potenciais existentes entre os montes submarinos, e das limitações de dispersão de cada espécie, há poucas evidências conclusivas que o isolamento leve à dissimilaridade genética entre as populações destes montes. Muitos casos de endemicidade em ilhas oceânicas podem estar relacionados à falta de caracterização da biota regional, já que vários estudos revelam semelhança entre as comunidades de montes e ilhas mais próximas (Larwood & Whatley 1993; McClain 2007).

O conhecimento a respeito da biologia de montes submarinos, ilhas e atóis ainda é bastante incompleto, embora a quantidade de pesquisas descrevendo comunidades biológicas e avaliando os padrões de diversidade bentônica nestes ambientes venha crescendo nos últimos anos (Wilson & Kaufmann 1987; Boehlert & Genin 2013). De modo geral, estes estudos enfocam a mega e mesofauna bentônica, além de organismos planctônicos e peixes (Clark *et al.* 2010; George 2013). Em escala macroecológica, a fauna bentônica reflete o conjunto de espécies encontrado nos montes submarinos próximos e na plataforma continental adjacente (Samadi *et al.* 2006; McClain *et al.* 2009). Invertebrados bentônicos com estágio larval livre-natante normalmente estão representados por comunidades mais ou menos similares em todos os montes submarinos localizados em uma área relativamente ampla de um mesmo oceano (Wilson & Kaufmann 1987), confirmando a expectativa inicial de que muitas espécies sejam amplamente distribuídas.

As ilhas oceânicas despertam grande interesse científico, principalmente no que diz respeito a sua gênese e ao desenvolvimento de ecossistemas únicos. Os ambientes insulares vêm sendo usados como modelo para várias linhas de pesquisa, como biogeografia, ecologia, evolução e biologia da conservação. À medida que as pesquisas se expandem em novas direções, as ilhas continuam a oferecer oportunidades para o desenvolvimento de novos trabalhos por serem laboratórios naturais (muitas vezes sem atividade antrópica), além de apresentarem exceções às "regras" usuais da ecologia (Smith 2011). Por serem ainda pouco estudadas, novas iniciativas de coleta de dados em ilhas são necessárias em todo os oceanos, e devem ser direcionadas inicialmente para preencher as imensas lacunas no conhecimento detalhado das biotas insulares aquáticas e terrestres. Somente assim será possível avançar da biodiversidade para o entendimento das relações ecológicas e dos padrões distribuição das espécies no espaço e no tempo geológico.

Potencial de Preservação de Invertebrados

A documentação de características tafonômicas tanto no registro fóssil quanto no recente está construindo uma base de dados essencial para a compreensão do potencial de fossilização dos diferentes organismos. Existe uma gama de possibilidades para comparações de fenômenos tafonômicos similares que operam de forma diferente nos diversos grupos taxonômicos superiores dentro de uma mesma associação e em diferentes configurações ambientais (Behrensmeyer & Kidwell 1985). Apesar da problemática na comparação dos resultados atualísticos com biotas mais antigas (*e.g.*, Mesozoico, Paleozoico), os sistemas recentes constituem-se em guia para a determinação de princípios e tipos de percursos que formam a base dos processos e padrões tafonômicos (Kidwell & Bosence 1991).

Está cada vez mais evidente a necessidade de entender como esses processos ocorrem em variados tipos de ambientes e em grupos taxonômicos distintos. A constituição do corpo dos diferentes organismos, isto é, se apresenta exoesqueleto biomineralizado ou se é formado exclusivamente por tecidos moles, pode influenciar na qualidade e na completude do seu registro fóssil. Quanto maior a robustez do esqueleto, maior a completude do organismo no registro fossilífero, porém menor será sua resolução tanto espacial quanto temporal (Figura 3). Assim, os organismos que apresentam partes biomineralizadas são os comumente encontrados no registro fóssil, mas a qualidade da informação biológica e ecológica fornecidas por estes remanescentes biológicos costuma ser desigual e incompleta. Mesmo entre táxons com esqueletos resistentes pode haver diferenças na susceptibilidade à destruição pós-morte (Kidwell & Bosence 1991; Behrensmeyer *et al.* 2000; Kowalewski 2007).

A maior parte do progresso na tafonomia de invertebrados aquáticos tem ocorrido através de pesquisas em ambientes marinhos carbonáticos e, mais raramente, em plataformas terrígenas. Apesar de ainda não terem sido explorados completamente, está claro que o contexto deposicional é extremamente importante para o controle da qualidade e da natureza da preservação dos fósseis. Em decorrência do crescente interesse sobre este assunto, as transformações tafonômicas são agora sustentadas por um conhecimento mais completo e quantitativo do percurso dos organismos desde a morte até a fossilização. Quanto maior o tempo de acumulação, maior a probabilidade de que a composição taxonômica e a estrutura etária da associação sejam alteradas pela preservação diferencial, ou seja, conchas de sucessivas gerações serão misturadas (*time-averaging*), podendo modificar o ambiente deposicional (Kidwell & Flessa 1995, 1996; Behrensmeyer *et al.* 2000).

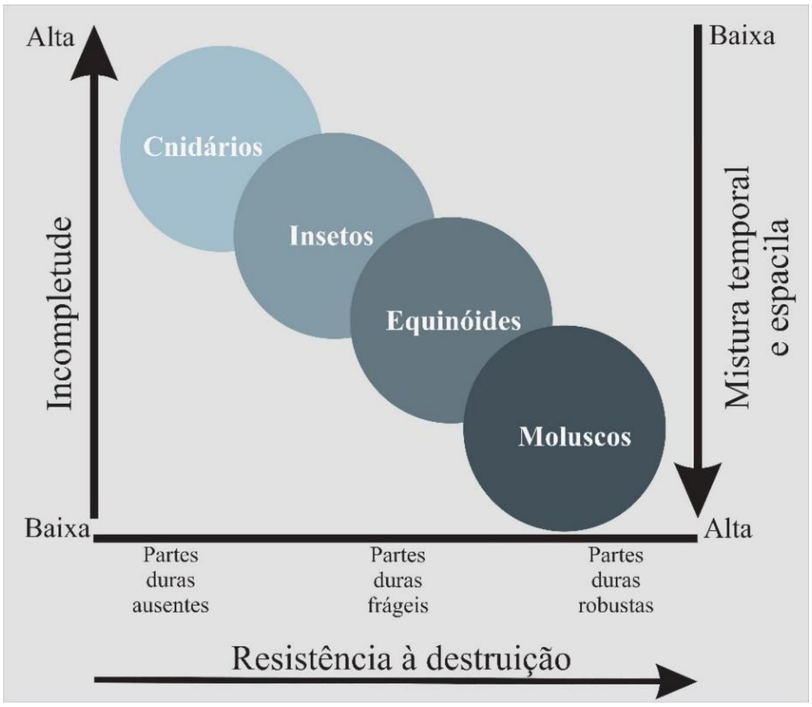

Figura 3. Modelo tafonômico recíproco (modificado de Kowalewski 2007).

Fidelidade de associações modernas

Atualmente, uma das principais abordagens da tafonomia é a quantificação do sinal biológico preservado nos acúmulos conchíferos após a influência de fatores bióticos, físicos e do *time-averaging*, além da variação da capacidade de preservação no espaço e no tempo. Esta avaliação do grau de fidelidade entre a comunidade viva e as associações mortas e fósseis correspondentes (quando possível), permite o reconhecimento das limitações em relação ao uso das associações preservadas na interpretação de ecossistemas antigos (Fürsich 1978; Kidwell & Flessa 1995, 1996; Jablonski 1999; Archuby *et al.* 2015).

As associações mortas (*death assemblages*, DAs) são a evidência da existência de populações de gerações passadas de espécies viventes (ou recentemente extintas) em uma localidade, como conchas ou outros tipos de esqueletos resistentes (Kidwell & Tomasovych 2013). Elas são capazes de fornecer um quadro mais completo das comunidades e do tipo de hábitat do que um único censo da associação viva (*living assemblage*, LA). Apesar das alterações *post-mortem* sofridas por essas associações, sua avaliação é fundamental para determinar a fidelidade do registro fóssil como arquivo da informação biológica (Kidwell & Bosence 1991; Kidwell 2007, 2013).

Os estudos de fidelidade composicional têm contado com vários tipos de comparação entre associações vivas e mortas, principalmente em moluscos marinhos. Na década de 1990, os trabalhos de fidelidade em moluscos cresceram de tal forma, que foi possível estabelecer uma síntese de métodos estatísticos para comparações entre as associações. Estas análises fornecem dados consideráveis sobre os processos iniciais da formação das associações fósseis. Apesar da concentração destes estudos em moluscos, outros grupos marinhos e continentais vêm sendo analisados mais recentemente (Kidwell 2013; Kidwell & Tomasovych 2013).

As amostras “paleoecológicas”, que representam uma média na composição da comunidade, podem ser uma ferramenta de alta resolução na avaliação da dinâmica da comunidade bentônica ao longo do tempo. Entretanto, é necessário maior entendimento das especificidades de cada grupo e seu comportamento nos diferentes tipos de ambientes (Kidwell & Tomasovych 2013). No caso dos ostracodes, vários efeitos podem influenciar na composição final da fauna, os quais muitas vezes são negligenciados nas reconstruções paleoecológicas. A variação no ciclo de vida, taxa de mortalidade, dissolução dos estágios ontogenéticos iniciais (pouco calcificados) e acumulação aleatória de conchas de diferentes idades (*time-averaging*), fazem com que uma associação morta, mesmo coletada em uma cultura, não reflita completamente a população original (Kontrovitz 1966; Kilenyi 1971; Oertli 1975; Kontrovitz *et al.* 1998). Assim, quantificar os vieses preservacionais que atuaram em uma comunidade permite uma interpretação mais precisa do registro fóssil, uma vez que é possível diferenciar alterações na informação biológica oriundas do processo tafonômico e da variação ecológica.

O emprego dos ostracodes em estudos de fidelidade é recente, embora o conhecimento da ecologia das associações vivas seja utilizado como base para a reconstrução de ambientes antigos. A tafonomia das conchas de ostracodes é assunto de interesse entre os paleomicrontólogos (*e.g.* Kilenyi 1971; Danielopol *et al.* 1986; Swanson 1996; Meireles *et al.* 2014b), e alguns trabalhos, inclusive, avaliam os efeitos de determinados fatores abióticos na preservação delas. Para ostracodes marinhos, Oertli (1971, 1975) propôs um modelo preliminar para o estado de preservação da carapaça ser usado em interpretações paleoecológicas. Kontrovitz (1966), Kaesler *et al.* 1993, Kontrovitz *et al.* 1998, e Whatley *et al.* (1982) mostraram experimentalmente como se dá a fragmentação das conchas de ostracodes devido a agentes físicos. Dados valiosos sobre a destruição seletiva de conchas de ostracodes do Holoceno por agentes biológicos e químicos também são relatados por Frydl (1982). Mais recentemente, Zhai *et al.* (2015) investigaram a preservação diferencial de diferentes instares em lagos do Norte da China. Os resultados obtidos nestes trabalhos são valiosos para o entendimento de determinados processos tafonômicos, mas ainda estão longe de fornecer uma compreensão mais abrangente a respeito da preservação diferencial destes organismos.

O primeiro trabalho abordando comparações entre associações vivas, mortas e fósseis de ostracodes foi realizado por Alin & Cohen (2004), com amostras do Lago Tanganica, examinando a variabilidade da fauna em diferentes escalas temporais e espaciais. Os autores observaram que as associações morta e fóssil conservaram os atributos da comunidade viva. Essa característica observada nas associações de ostracodes do Tanganica evidencia que as amostras fósseis podem ser utilizadas em estudos de biologia da conservação, já que tendem a representar a variação da fauna ao longo de décadas. O potencial da utilização de comparações entre as associações viva e morta de ostracodes, como meio de avaliar possíveis perturbações de origem antrópica, foi também abordado nos trabalhos de Michelson & Park (2013) e Michelson *et al.* (2018) em lagos (salobros a hipersalinos) da ilha San Salvador (Bahamas). O trabalho mais recente, Michelson *et al.* (2018), investigou a relação entre a discordância vivo-morto e o estresse de origem antrópica. Os autores concluíram que lagos ambientalmente impactados apresentam menor concordância entre a comunidade morta e a viva, enquanto em lagos pristinos a fidelidade entre as duas comunidades é mais elevada.

Área de Estudo

A Cadeia Vitória-Trindade (CVT) é uma sequência linear composta por montes submarinos e o arquipélago de Trindade e Martin Vaz, representando a porção emersa da cadeia. Está localizada no paralelo de Vitória (Espírito Santo) e disposta em direção geral leste-oeste, ao longo da latitude 20°30’S, estendendo-se por cerca de 1000 km (Figura 4). A origem desta cadeia está relacionada à passagem da placa sul-americana sobre a pluma de Trindade, ou de Martin Vaz, como citado em algumas literaturas (Herz 1977; Motoki *et al.* 2012). De acordo com esta teoria, a placa sul-americana ao separar-se da placa Africana, moveu-se sobre o *hotspot* de Trindade (que fica sob a ilha), reativando assim a Zona de Fratura Vitória-Trindade (ZFVT; Thomaz Filho & Rodrigues 1999; Almeida 2006; Skolotnev *et al.* 2010, 2011; Oliveira 2013).

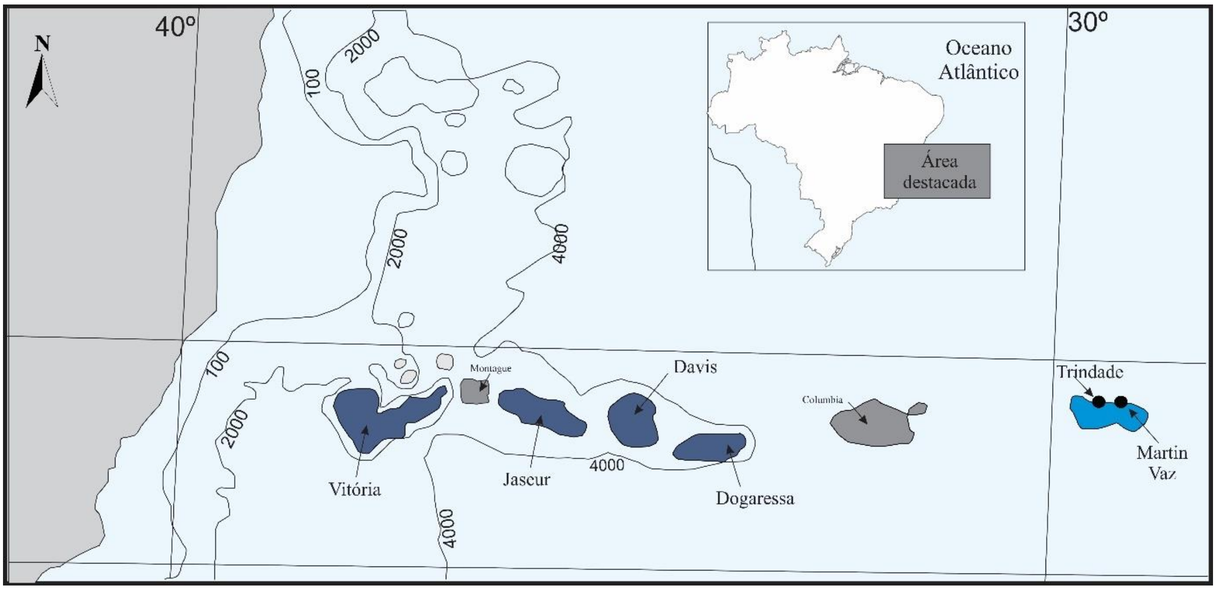

Figura 4. Localização da Cadeia Vitória-Trindade (modificado de Almeida 2006).

A maioria dos montes submarinos da CVT apresenta forma cônica, morfologicamente denominada de edifícios vulcânicos. As ilhas da Trindade e Martin Vaz, os montes submarinos Columbia e Jaseur, e os bancos Davis e Dogaressa foram confirmados como vulcões (Fodor & Hanan 2000; Skolotnev *et al.* 2010; Motoki *et al.* 2012). O monte Vitória e outros bancos localizados nas proximidades da plataforma, apresentam diferenças morfológicas significativas em relação aos demais montes da cadeia, sugerindo que estes possam ser fragmentos da plataforma continental (Motoki *et al.* 2012). Alguns dos edifícios vulcânicos da CVT possuem datações, mostrando o aumento gradativo da idade em direção a oeste (Cordani 1970; Ferrari & Riccomini 1999; Thomaz Filho & Rodrigues 1999; Fodor & Hanan 2000; Skolotnev *et al.* 2011).

A extensão da plataforma continental adjacente à cadeia é bastante variável. Próximo à cidade de Vitória, apresenta cerca de 40 km, enquanto nas cercanias de São Mateus, cidade ao norte de Vitória, a plataforma atinge aproximadamente 200 km. O talude e a elevação continental ao norte e ao sul da CVT mostram nítido contraste. Ao norte da cadeia, as características observadas indicam uma transição continente-oceano (COT, *Continent Ocean Transition*) simples, não apresentando afinamento crustal, e a morfologia submarina mostrando contato brusco entre a crosta continental e a oceânica (Gladczenko *et al.* 1997; Gomes *et al.* 2000; Zalán *et al.* 2011; Motoki *et al.* 2012). Já ao sul, observa-se um talude com altura e declividade menores, ou seja, com uma suave elevação continental. A morfologia submarina desta região aponta para uma COT mais complexa, decorrente do afinamento da crosta continental através de falhas escalonares (Gomes *et al.* 2000; Motoki *et al.* 2012).

A circulação oceânica na região é composta pela Corrente do Brasil (CB), em níveis superiores, e pela Corrente de Contorno Intermediária (CCI), em níveis intermediários, que atingem a porção da cadeia mais próxima à plataforma (Figura 5). Como os montes submarinos chegam bem próximos à superfície, o escoamento das massas d'água, tanto superficial quanto profunda, é afetado significativamente, ocasionando um desvio de fluxo nesta região, que se reorganiza bem mais ao sul da CVT (23°S). Não há evidência de correntes superficiais bem definidas nos montes mais afastados da plataforma e na própria Ilha da Trindade, sendo estes influenciados por correntes ocasionais, que podem ser oriundas de ventos, ondas internas e correntes de maré residuais (Fu 1981; Evans & Signorini 1985; Peterson & Stramma 1991; Stramma & England 1999).

Ainda que a CB atinja apenas a região mais costeira da cadeia, a interação com a topografia da cordilheira torna a circulação bastante complexa na região. Meandros ciclônicos e anticiclônicos podem ser formados, dando origem ao Vórtice de Vitória, responsável por bombear águas ricas em nutrientes para a plataforma continental (Gaeta *et al.* 1999; Schmid *et al.* 2003). Pimentel (2012) descreveu diferentes padrões de circulação da Corrente do Brasil através da CVT, demonstrando grande variabilidade na circulação superficial nesta região e a possibilidade de deslocamento dos organismos entre os montes. No entanto, para os montes submarinos mais afastados da plataforma e a Ilha de Trindade, não há evidências claras da atuação de correntes superficiais, como já discutido no parágrafo anterior.

A profundidade dos topos dos montes submarinos é variável e grande parte deles está coberta por bancos de rodolitos, bastante comuns na plataforma de Trindade e Martin Vaz e na região costeira adjacente (Pereira-Filho *et al.* 2011, 2012; Amado-Filho *et al.* 2012; Dias & Villaça 2012). Pinheiro *et al.* (2014) descobriram uma estrutura complexa nos topos dos montes, formada por algas calcárias incrustantes, corais escleractíneos e hidrocorais. Estas estruturas atingem 35 e 17 m da superfície no Monte Vitória e no Banco Davis, e 62 e 84 m nos montes Jaseur e Columbia, respectivamente. A plataforma carbonática abaixo dos rodolitos e das estruturas recifais pode chegar a 300 m de espessura (Skolotnev *et al.* 2010).

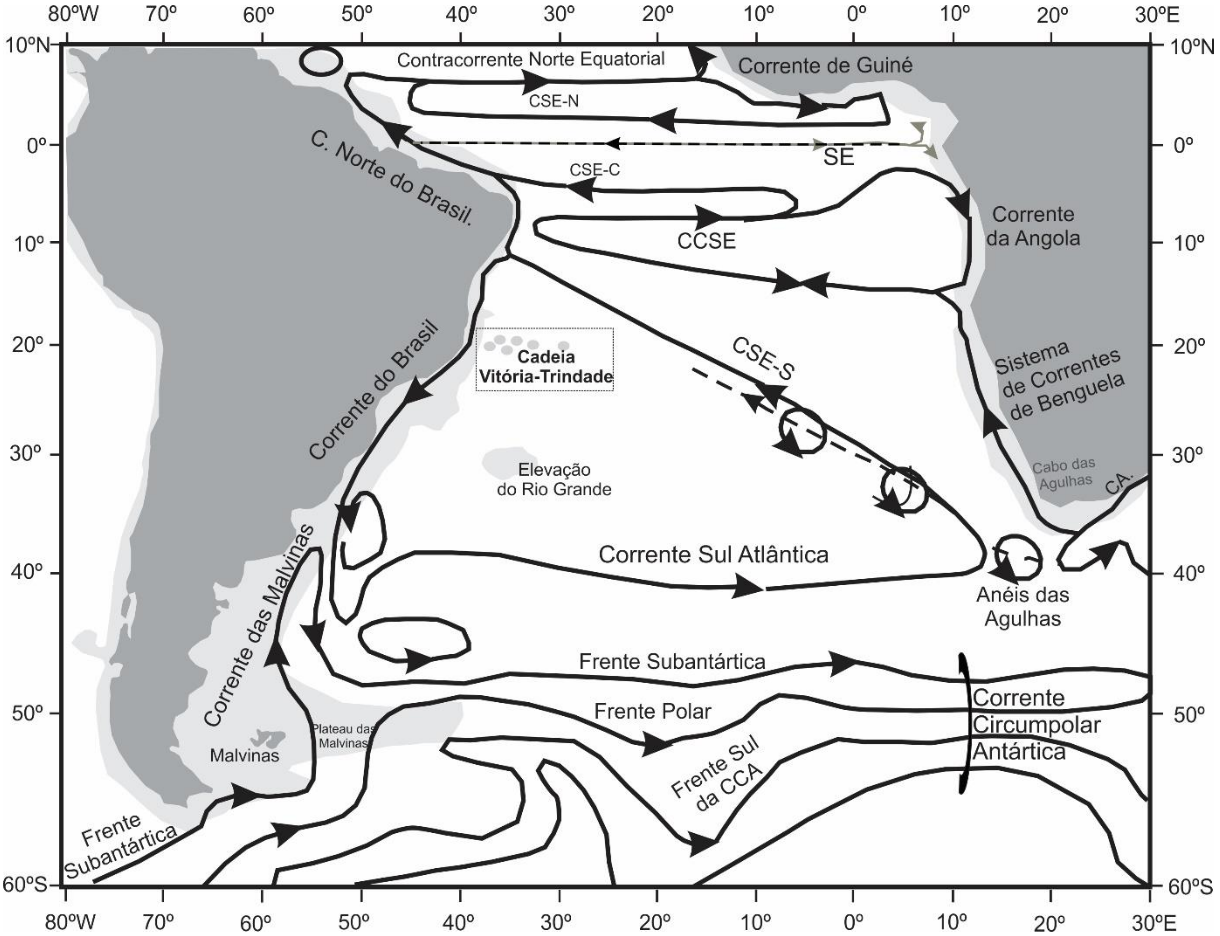

Figura 5. Circulação superficial no Atlântico Sul. CSE-N = Corrente Sul Equatorial Ramo Norte; CSE-C = Corrente Sul Equatorial Ramo Central; CSE-S = Corrente Sul Equatorial Ramo Sul; CCSE = Contracorrente Sul Equatorial; SE = Subcorrente Equatorial; CA = Corrente das Agulhas; CCA = Corrente Circumpolar Antártica (modificado de Talley *et al.* 2011).

O Arquipélago de Trindade e Martin Vaz são os edifícios vulcânicos mais a leste da CVT. A Ilha da Trindade apresenta cerca de 13 km^2 de área, com um relevo extremamente acidentado, resultado dos processos de intemperismo em um maciço rochoso altamente heterogêneo. A ilha está a cerca de 5500 m do assoalho oceânico e seus dois pontos mais altos atingem 550 e 600 m acima do nível do mar. A área costeira de Trindade é composta por recifes algálicos, praias estreitas, dunas localizadas e depósitos fluviais limitados à linha de costa, em rochas predominantemente vulcânicas. É o único local no território brasileiro onde se encontra preservada parte da estrutura de um cone vulcânico (Almeida 2006).

A linha de costa da Ilha da Trindade é formada por vários embaiamentos, sendo que as porções nortes, noroeste, sudeste e oeste apresentam promontórios alongados, compostos por corpos fonolíticos e diques. O contexto geológico resultou em uma diferenciação entre os lados leste e oeste da ilha, sendo o primeiro mais plano com praias mais desenvolvidas. As seis praias com maior volume de sedimento, de nordeste a sudoeste, são: Cabritos, Calheta, Andradas, Tartarugas, Vermelha (ou Túnel) e Príncipe. Estas praias arenosas são compostas por areia média a grossa, bem selecionada, com fragmentos de algas calcárias dos recifes que compõem de 19 a 66% do sedimento. Como padrão geral, o conteúdo de carbonato aumenta em direção a face de praia (*foreshore*). A praia com menor conteúdo carbonático é a praia Vermelha, em que sedimentos de rochas vulcânicas alcalinas de coloração avermelhada são predominantes. Altas concentrações de metais pesados são observadas principalmente na face de praia, com as praias das Tartarugas e Príncipe apresentando as maiores concentrações (90% e 66%, respectivamente). A circulação na zona de surfe da maioria das praias é celular, podendo ser observada, principalmente, nas praias Vermelha e Príncipe, onde os recifes de algas coralinas estão ausentes. Nas praias das Tartarugas e dos Cabritos a planície recifal é contínua, enquanto na Calheta e Andradas é descontínua (Almeida 2002; Calliari *et al.* 2016).

Material e Métodos

O material estudado neste trabalho é proveniente de quatro montes submarinos da Cadeia Vitória-Trindade (Vitória, Jaseur, Davis e Dogaressa) e da Ilha da Trindade (Anexo 1).

AMOSTRAGEM

Ilha da Trindade

As amostras da Ilha da Trindade foram adquiridas ao longo de quatro campanhas de coletas, realizadas em fevereiro/2002, abril-junho/2014, agosto-outubro/2016 e dezembro/2017-fevereiro/2018, totalizando 60 amostras, sendo as três últimas realizadas pela autora. As coletas abrangeram a diversidade de ambientes ~~e~~ encontrados na região costeira da ilha, como piscinas naturais, praias, costões rochosos, enseadas e ilhotas, com profundidades variando de 0 a 25 m (Figura 6).

A metodologia de coleta variou de acordo com o tipo de ambiente amostrado. Em zonas de intermaré, as coletas foram realizadas de forma manual durante o período de maré baixa. Em piscinas naturais a amostragem também foi feita manualmente, utilizando-se mergulho livre para obter as amostras de fundo. As zonas de inframaré foram amostradas principalmente com auxílio de uma draga (tipo Van Veen), mas em alguns casos foi necessário realizar as coletas com equipamento de mergulho autônomo.

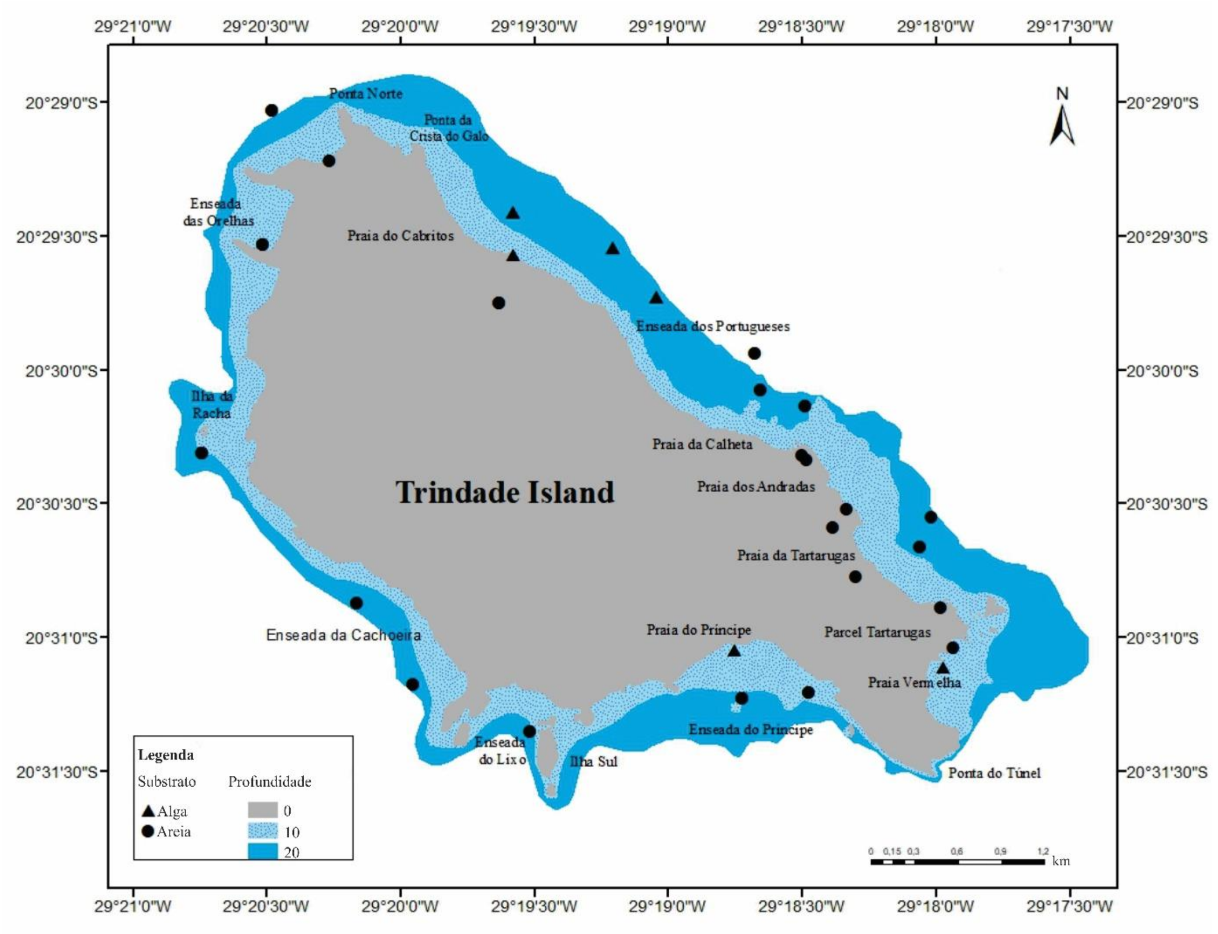

Figura 6. Mapa da Ilha da Trindade indicando as localidades amostradas. Batimetria baseada na carta náutica disponibilizada pela Diretoria de Hidrografia e Navegação.

Coleta das amostras

A Ilha da Trindade comporta uma diversidade de ambientes emersos e submersos, como dunas, praias, e costões, que estão sujeitos a processos similares aqueles observados em regiões marinho marginais. As amostras coletadas na ilha compreendem o mesolitoral (sujeito as flutuações da maré) e o infralitoral (para regiões permanentemente submersas). As amostras dos montes submarinos, que são encontrados em ambiente marinho profundo, foram classificadas como oceânicas.

As expedições realizadas para a Ilha da Trindade ocorreram em diferentes épocas do ano, em condições climáticas variadas, refletindo também na amostragem e na ostracofauna recuperada nas amostras. A expedição de 2014, que ocorreu no período do outono do hemisfério do sul, foi realizada em condições de mar estável, podendo, desta maneira, abranger o máximo de pontos de amostragem ao redor da ilha. A expedição de 2016, que ocorreu entre o inverno e primavera do hemisfério sul, foi marcada pela chega de frentes frias, causando ressacas e ondas altas. Essas condições impossibilitaram o acesso a alguns locais para realização de amostragens, como por exemplo a Enseada do Lixo. A última expedição foi realizada nos meses de dezembro/2017 a fevereiro/2018 (verão do hemisfério sul). As localidades foram amostradas em condições de mar estável, em grande parte do tempo, permitindo obter amostras de um grande número de localidades, incluindo piscinas de maré e zonas de intermaré das praias.

Montes Submarinos

O material dos topos montes submarinos foi doado pelo professor Jean-Christophe Joyeux, da Universidade Federal do Espírito Santo (UFES), para o Laboratório de Microfósseis Calcários da UFRGS. As coletas foram realizadas utilizando técnicas de mergulho profundo em profundidades que variaram de 18 a 65 m.

PREPARAÇÃO E TRIAGEM

A preparação e a triagem do material foram realizadas no Laboratório de Microfósseis Calcários (LMC) da Universidade Federal do Rio Grande do Sul (UFRGS). As amostras foram lavadas em água corrente e peneiradas em malhas de 0,84 mm e 0,104 mm, e novamente fixadas em álcool 70%. A malha utilizada para recuperar os ostracodes foi a de 0,104 mm, malhas menores se mostraram estéreis. Para a triagem foi padronizado um volume de 60 ml de sedimento, sendo os espécimes recuperados de cada amostra armazenados em lâminas de células múltiplas tipo “Flank”. Durante o processo de triagem os espécimes foram separados entre “associação viva”, ou seja, aqueles organismos com a carapaça completa e que continham apêndices preservados, ou parte deles, e “associação morta”, que consistia em carapaças vazias e valvas isoladas.

ANÁLISE DOS DADOS

Foram analisadas 60 amostras da Cadeia Vitória-Trindade, sendo oito dos montes submarinos e o restante da Ilha da Trindade. A primeira etapa da análise de dados consistiu no estudo da composição taxonômica dos ostracodes da Ilha da Trindade e dos topos dos montes submarinos, incluindo a descrição de novos táxons. Para auxiliar na identificação e ilustração das espécies foram obtidas imagens através de Microscópio Óptico (MO) do LMC e Microscópio Eletrônico de Varredura (MEV) do Centro de Microscopia e Microanálise (CMM) da UFRGS.

A partir do conjunto de dados da fauna de ostracodes foram realizadas comparações entre a associação viva (LA) e a associação morta (DA). Foi avaliada a transferência de parâmetros como composição taxonômica, riqueza, diversidade e abundância da LA para a

DA. As análises para a quantificação do grau de correspondência entre a fauna viva e morta de ostracodes foram realizadas a partir de métodos estatísticos multivariados disponíveis na literatura (Kidwell 2007, 2013; Olszewski & Kidwell 2007). O detalhamento tanto do material quanto dos métodos encontra-se nos três artigos que compõem o núcleo duro da tese (veja Resultados).

Resultados

Os resultados desta tese estão divididos em três capítulos:

- Capítulo I: Taxonomia dos Ostracodes da Cadeia Vitória-Trindade
- Capítulo II: Potencial de Preservação dos Ostracodes da Cadeia Vitória-Trindade
- Capítulo III: Aspectos Zoo- e Paleozoográficos da Fauna da Cadeia Vitória Trindade

Cada capítulo é apresentado como um artigo e, portanto, está formatado segundo as normas da revista para a qual foi submetido.

CAPÍTULO I

Taxonomia dos ostracodes da Cadeia Vitória-Trindade

Artigo 1: Ostracods (Crustacea: Ostracoda) of the Vitória-Trindade Chain, Southwestern Atlantic

Submetido ao Anais da Academia Brasileira de Ciências

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Ostracods (Crustacea: Ostracoda) of the Vitória-Trindade Chain, Southwestern Atlantic

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Abstract

The current work is part of a taxonomic study on ostracods from the Trindade Island and four seamounts (Vitória, Jaseur, Davis, and Dogaressa) summits of the Vitória-Trindade Chain. Twenty-five species belonging to nine families and 17 genera were identified, being five species of Cytheruridae and Loxoconchidae new, as follows: *Hemicytherura trindadensis* sp. nov., *Loxocorniculum micropapillosum* sp. nov., *Phlyctocythere christophei* sp. nov., *Phlyctocythere apua* sp. nov., and *Semicytherura parva* sp. nov. The remaining taxa are under study in ongoing research.

Introduction

This paper is part of a taxonomic study on ostracods from the Trindade Island and four seamounts summits along the Vitória-Trindade Chain (VTC). The Trindade and Martin Vaz Archipelago is linked to the shelf through a linear sequence of volcanic seamounts. Together with other oceanic islands, this insular area has strategic importance for the expansion of the Brazilian maritime territory. Moreover, it holds a vast variety of species of several groups (Almeida 2006; Viana *et al.* 2009; Pereira-Filho *et al.* 2011; Amado-Filho *et al.* 2012; Motoki *et al.* 2012; Pinheiro *et al.* 2014, 2015; Santos & Venekey 2017).

Faunas of oceanic islands and seamounts have been focused by several studies. Notwithstanding, few of them have dealt with ostracods, and most of these ostracod studies are concentrated in the Pacific Ocean (Holden 1967; Hartmann 1988; Larwood & Whatley 1993). Species-level identification of ostracods in Brazilian oceanic islands, is pivotal for understanding their distribution pattern in the South Atlantic. Therefore, such studies increased conspicuously during the last decade. The researches carried out in the São Pedro and São Paulo Archipelago (Antonietto *et al.* 2012; Coimbra *et al.* 2013; Luz & Coimbra 2014; Coimbra *et al.* 2018), Rocas Atoll and Trindade Island (Coimbra *et al.* 2009; Coimbra & Carreño 2012) are examples of contributions that provided important zoogeographic insights (Coimbra *et al.* 2009; Antonietto *et al.* 2012; Coimbra & Carreño 2012; Coimbra *et al.* 2013; Luz & Coimbra 2014; Coimbra *et al.* 2018). It is noteworthy that Coimbra *et al*. (2013) pointed out some misidentifications of Antonietto *et al*. (2012).

This paper is the first part of a taxonomic study of Vitória-Trindade Chain ostracods, which records 25 species and 17 genera of cytherurids, hemicytherids, leptocytherids, loxoconchids, paracytherideids, pectocytherids, polycopids, thaerocytherids and trachyleberidids. Five species are described as new. Besides the new contribution to the biodiversity knowledge of the Trindade Island, this study represents the first taxonomic survey on ostracods from the Vitória, Jaseur, Davis and Dogaressa seamounts.

Material and Methods

The study samples herein analyzed come from four seamounts summits of the Vitoria-Trindade Chain (Vitoria, Jaseur, Davis, and Dogaressa) and the Trindade Island (Fig. 1). The VTC is arranged in an east-west direction along the latitude 20°30'S, off Vitória (Espírito Santo State), extending about 1000 km, being the Trindade and Martin Vaz Archipelago the easternmost portion of the chain (Almeida 2002, 2006; Motoki *et al.* 2012).

The seamount samples were kindly given by Professor Jean Christophe Joyeux (Department of Oceanography, UFES) to the ‘Laboratório de Microfósseis Calcários’ of the ‘Universidade Federal do Rio Grande do Sul’. The sampling was carried out in April 2011 with advanced techniques of deep dive, at depths varying from 18 to 65 m. These sites are fragmented habitats separated by depths ranging between 2000 and 5000 m. The summits of most seamounts are covered by a complex structure formed by encrusting calcareous algae, scleractinian corals, and hydrocoral (Dias & Villaça 2012; Pereira-Filho *et al.* 2012; Pinheiro *et al.* 2014).

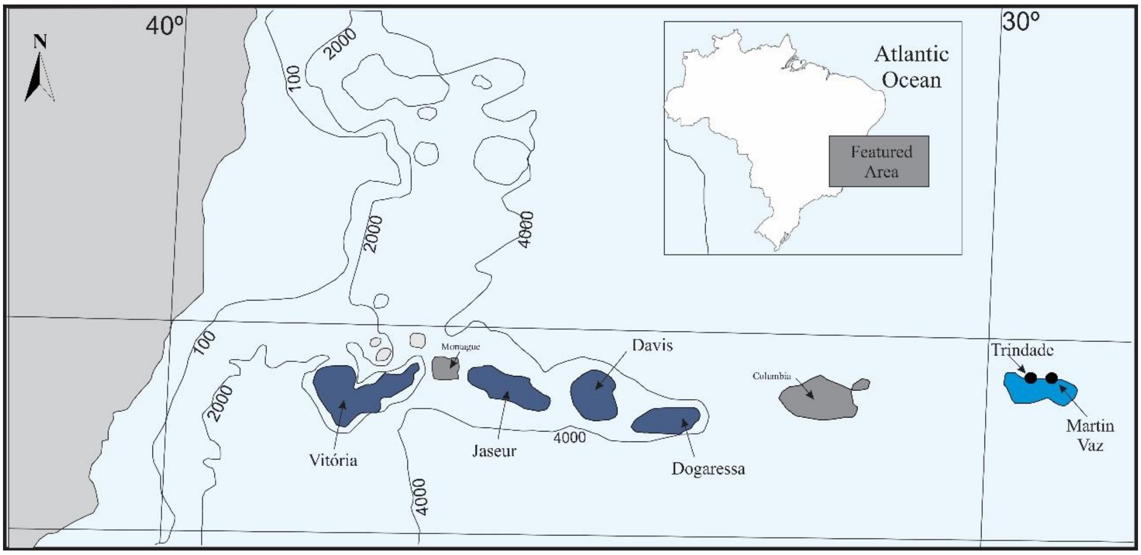

Figure 1. Location map of Vitória-Trindade Chain (modified from Almeida 2006).

The Trindade Island samples (Fig. 2) were obtained in four sampling campaigns occurred in February 2002, April to May 2014, August to September 2016 and December 2017 to February 2018. Since the creation of oceanic island scientific programs by CNPq (Brazilian National Council for Scientific and Technological Development) together with the Brazilian Navy, such as PROTRINDADE, there is a scientific station in the Trindade Island that has infrastructure for different sampling strategies. Beach samples were hand-collected up to 1 m of water depth, while for deeper material either a Van Veen dredge or free diving manual collection of algae were adopted.

Liebau (2005) was followed for the higher taxa classification. The material is housed in the collections of the ‘Museu de Paleontologia Professor Irajá Damiani Pinto’, Section of Ostracoda, at Universidade Federal do Rio Grande do Sul - UFRGS, under the prefix MP-O. All the Scanning Electronic Microscopy (= SEM) images were taken at the ‘Centro de Microscopia e Microanálises’ at UFRGS.

Abbreviations: C= carapace, RV= right valve, LV= left valve, H= height, L= length, W= width.

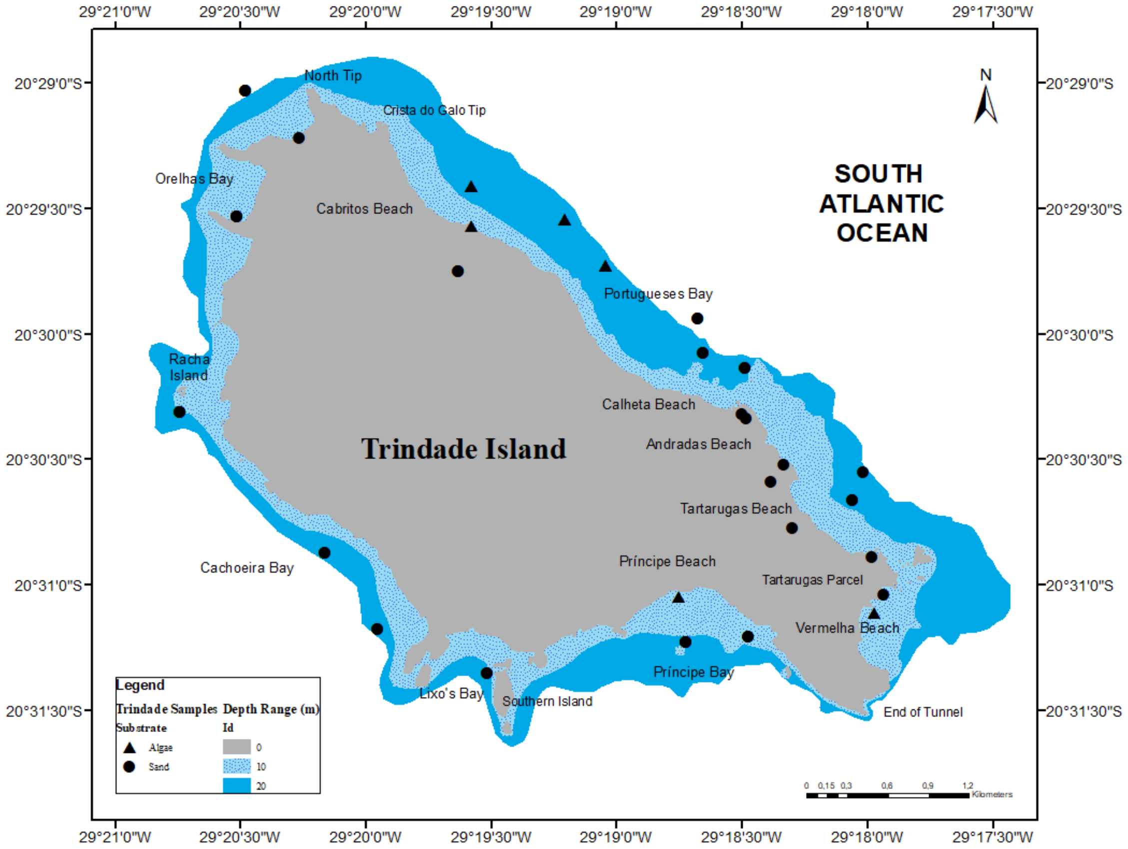

Figure 2. Map of Trindade Island indicating the sampling sites. Bathymetry based on the nautical chart provided by the 'Diretoria de Hidrografia e Navegação' (DHN) of the Brazilian Navy.

Results

Systematic

Subclass OSTRACODA Latreille, 1802

Order PODOCOPIDA Sars, 1866

Superfamily CYTHEROIDEA Baird, 1850

Family CYTHERURIDAE Müller, 1894

Genus *Hemicytherura* Elofson, 1941

Hemicytherura bradyi (Puri, 1960)

Figs. 3:1-2

1960 *Kangarina bradyi* Puri, p. 115, pl. 4, figs. 6-7.

1999a *Hemicytherura bradyi* (Puri). Coimbra *et al.*, p. 125-126, figs. 10-11 (see this paper for a more complete synonymy).
1999b *Hemicytherura bradyi* (Puri). Coimbra *et al.*, p. 370, pl. 2, fig. 7; p. 372, tab. 1.
2000 *Hemicytherura bradyi* (Puri). Keyser & Schöning, p. 570, tab. 1; p. 589, figs. 93-94.
2008 *Hemicytherura bradyi* (Puri). Machado, p. 152-153; p. 224, tab. 6; p. 230, tab. 8; pl. 7, fig. 9; appx. 2.
2009 *Hemicytherura bradyi* (Puri). Coimbra *et al.*, p. 123, tab. 5.3; p. 126, tab. 5.4; p. 127, tab. 5.5; p. 128, fig. 5.10.
2012 *Hemicytherura bradyi* (Puri). Coimbra & Carreño, p. 194, tab. 2; p. 195, tab. 3, p. 202, appx. 1.

Figured specimens. MP-O-2820, RV; MP-O-2821, LV.

Dimensions. See Table 1.

TABLE 1. Dimensions of *Hemicytherura bradyi* (Puri, 1960).

Material	Length (mm)	Height (mm)
MP-O-2820 (RV)	0.323	0.194
MP-O-2821 (LV)	0.324	0.187

Material. Dead assemblage: 32 adults and 6 juveniles. Living assemblage: 2 adults and 2 juveniles.

Stratigraphic range. Late Miocene to Recent.

Occurrence and Distribution. In this paper: Davis seamount and Trindade Island. It also occurs in other Brazilian territorial waters (Northern and Eastern shelves and Rocas Atoll). Late Miocene to Recent: Gulf of Mexico, Florida, and Caribbean.

***Hemicytherura trindadensis* sp. nov.**

Figs. 3:3-9

Type series. Holotypes: MPO-2822, open carapace. Paratypes: MP-O-2823, open carapace; MP-O-2824, C.

Type locality. Trindade Island.

Etymology. With reference to the type locality, Trindade Island.

Dimensions. See Table 2.

TABLE 2. Dimensions of *Hemicytherura trindadensis* sp. nov.

Material	Length (mm)	Height (mm)	Width (mm)
MP-O-2822 (RV)	0.317	0.179	-

MP-O-2822 (LV)	0.321	0.177	-
MP-O-2823 (RV)	0.299	0.177	-
MP-O-2823 (LV)	0.304	0.169	-
MP-O-2824 (C)	0.323	-	0.183

Material. Dead assemblage: 20 adults and 3 juveniles. Living assemblage: 42 adults and 1 juvenile.

Diagnosis. A small subrectangular to subtriangular species of *Hemicytherura* with greatest height in the middle. Caudal process well-developed, more acute and adorned in RV. Surface ornamented mainly by six large fossae, each one with secondary reticulation and riblets. The subquadrate dorsal median the largest, containing a prominent curved central riblet from which appear smaller delicate riblets. Below the horizontal median ridge, two irregularly delimited fossae, the upper smaller and rounder, the lower larger and elongate.

Description. Carapace small and thick-shelled, subrectangular to subtriangular in lateral view. Valves unequal, RV higher and overlapping LV dorsally, LV overhangs RV in the caudal process and ventrally. Greatest height in the middle. Dorsal margin more evenly convex in RV. Ventral margin with conspicuous oral indentation, obscured by the ornamentation. Anterior margin obliquely rounded, slightly convex anterodorsally in RV, anteroventrally more protruded and ornamented by five small fossae. Posterior margin with an almost median caudal process, more acute and ornate in RV. In dorsal view sagittiform, widest medianly. Surface ornamented by fossae delimited by thick ridges; each fossa with delicate but conspicuous secondary reticulation and riblets. Six large fossae adorn the lateral surface, the subquadrate dorsal median the largest, containing a prominent curved central riblet of which appear smaller delicate riblets. Below the horizontal median ridge, two irregularly delimited fossae, the upper smaller and rounder, the lower larger and elongate. A vertical fossa ornaments the posterior region. Anteriorly, the median ridge separates two broad, elongate fossae; in some specimens, the lower one meets the elongate ventrocentral fossae by a small interruption in the murus. Four more discrete fossae are visible laterally, two smaller, posteroventrally, two larger and elongate, anteroventrally. Between the dorsal ridge and the corresponding margin, arise five or six fossae, most elongate. Inner lamella well-developed, much wider anteriorly. Line of concrescence separated from the inner margin anteriorly and posteroventrally; posterior vestibule smaller. Hinge merodont, RV with smooth elongate terminal teeth and a median smooth groove with thickened and crenulate ends. Sexual dimorphism not observed.

Remarks. *Hemicytherura trindadensis* sp. nov. is a small cytherurid so far restricted to Trindade Island, occurring mainly associated with algae, both live and dead specimens. This species resembles *H. bradyi* (Puri, 1960), but can be distinguished chiefly by the dorsal outline, which is more arched in *H. trindadensis* sp. nov., and the number and shape of the larger fossae.

Stratigraphic range. Recent.

Occurrence and distribution. Trindade Island.

Genus *Semicytherura* Wagner, 1957

Semicytherura parva sp. nov.

Fig. 3: 10 and Figs. 4:1-6

Type series. Holotype: MP-O-2825, female, RV. Paratypes: MP-O-2826, female, LV; MP-O-2827, male, RV; MP-O-2828, male, LV.

Type locality. Davis seamount.

Etymology. Latin origin, *parvus*= small, with reference to the small size of the species.

Dimensions. See Table 3.

TABLE 3. Dimensions of *Semicytherura parva* sp. nov.

Material	Length (mm)	Height (mm)	Width (mm)
MP-O-2825 (Female, RV)	0.372	0.209	-
MP-O-2826 (Female, LV)	0.370	0.203	-
MP-O-2827 (Male, RV)	0.385	0.192	-
MP-O-2828 (Male, LV)	0.382	0.187	-

Material. Dead assemblage: 21 adults and 1 juvenile. Living assemblage: 2 adults.

Diagnosis. Carapace very small; dorsal margin evenly convex in RV, almost straight in LV. Caudal process mid-dorsal, more acute in RV. Eye tubercle weak. Surface strongly reticulate, with well-marked longitudinal ridges, one of which surrounds the ventrolateral alar process, terminating thicker and more sinuous in RV. Reticules ornate by numerous small punctae.

Description. Carapace very small, thick-shelled, subrectangular to subovate in lateral view, flattened ventrally. In dorsal view, subovate with greater width in the ventrolateral alar processes. Valves unequal, RV overlapping LV mainly dorsally. RV greatest height medianly, LV greatest height just behind mid-length. Dorsal margin evenly convex in RV, subrectilinear in LV. Ventral margin with a gentle oral concavity, partially obscured by a ventrolateral alar process. Anterior margin more rounded in the upper half, in RV; less protruded in LV. A very delicate concavity marks the meeting between the anterior and posterior margins, in RV. Posterior margin with a well-developed mid-dorsal caudal process, more acute in RV. Ornament strongly reticulate in the entire surface, with well-marked longitudinal ridges, one of which surrounds the ventrolateral alar process, terminating thicker and more sinuous in RV. Reticules ornate by numerous small punctae. Eye tubercle weak. Hinge as for genus, RV with bilobate anterior tooth, smooth median groove, and a small rounded posterior tooth connected to an elongate bar. Inner lamella quite wide anteriorly and posteriorly. Sexual dimorphism typical for the genus.

Remarks. *Semicytherura parva* sp. nov. resembles *Semicytherura bertelsae* Coimbra, Carreño & Michelli, 1999, but differs by the smaller size, RV convex dorsal margin, and caudal process more dorsally positioned. The number and the distribution pattern of reticules and longitudinal ridges are distinct in each species.

Stratigraphic range. Recent.

Occurrence and distribution. Davis seamount.

Semicytherura sp.

Figs. 4:7-8

Figured specimen. MP-O-2830, open carapace.

Dimensions. See Table 4.

TABLE 4. Dimensions of *Semicytherura* sp.

Material	Length (mm)	Height (mm)
MP-O-2830 (RV)	0.364	0.189
MP-O-2830 (LV)	0.359	0.186

Material. Dead assemblage: 1 adult.

Occurrence. Trindade Island.

Family LEPTOCYTHERIDAE Hanai, 1957

Genus *Callistocythere* Ruggieri, 1953

Callistocythere cranekeyensis (Puri, 1960)

Figs. 4:9-10

1960 *Leptocythere cranekeyensis* Puri, p. 114, figs. 12-13.
1995 *Callistocythere cranekeyensis* (Puri). Coimbra *et al*., p. 120, pl. 1, figs. 9-11 (see this paper for a more complete synonymy).
1999b *Callistocythere cranekeyensis* (Puri). Coimbra *et al*., p. 370, pl. 2, fig. 13; p. 372, tab. 1
2008 *Callistocythere cranekeyensis* (Puri). Machado, p. 173-174; p. 224, tab. 6; pl. 8, fig. 5; appxs.1-2.

Figured specimens. MP-O-2818, C; MP-O-2819, C.

Dimensions. See Tables 5.

TABLE 5. Dimensions of *Callistocythere cranekeyensis* (Puri, 1960).

Material	Length (mm)	Height (mm)
MP-O-2818 (C, RV)	0.367	0.212
MP-O-2819 (C, LV)	0.354	0.206

Material. 8 adults (dead assemblage).

Remarks. *Callistocythere cranekeyensis* is a rare species, occurring in small number in two samples of Trindade Island, with no specimens recorded in the live assemblages. The same can be observed on the Brazilian shelf, in which it is restricted to a small portion of the Northern and Northeastern regions, in a depth range of 10 to 40 m (Coimbra *et al.* 1995)

Stratigraphic range. Recent.

Occurrence and distribution. In this paper: Trindade Island. It also occurs in other Brazilian territorial waters (Northern and Northeastern shelves). Florida Bay, Puerto Rico, Belize, and Vera-Cruz-Anton Lizardo reefs (Gulf of Mexico).

Family LOXOCONCHIDAE Sars, 1925

Genus *Loxoconcha* Sars, 1866

Loxoconcha forda Bold, 1968

Figs. 5:1-2

1968 *Loxoconcha forda* Bold, p. 70-71, pl. 3, figs. 3a-e.
1988a *Loxoconcha forda* Bold. Bold, p. 47, pl. 7, figs. 1-2.
2008 *Loxoconcha (Loxoconcha) forda* Bold. Machado, p. 67-69; p. 224, tab. 6; p. 230, tab. 8; pl. 3, fig. 5; appxs.1-2.

Figured specimens. MP-O-2831, RV; MP-O-2832, LV.

Dimensions. See Table 6.

TABLE 6. Dimensions of *Loxoconcha forda* Bold, 1968.

Material	Length (mm)	Height (mm)
MP-O-2831 (RV)	0.588	0.404
MP-O-2832 (LV)	0.586	0.392

Material. 12 adults and 21 juveniles (dead assemblage).

Stratigraphic range. Miocene to Recent.

Occurrence and distribution. In this paper: Vitória and Dogaressa seamounts. It also occurs in other Brazilian territorial waters (Northeastern and Eastern shelves). Fossil: Dominican Republic (Miocene, Caribbean).

Loxoconcha foveata Hartmann, 1956

Figs. 5:3-4

1956 *Loxoconcha foveata* Hartmann, p. 46, figs. 72-78.
2009 *Loxoconcha foveata* Hartmann. Coimbra *et al.*, p. 131, tab. 5.3; p. 135, tab. 5.5 (non) 1956 *Loxoconcha foveata* Hartmann, p. 49, figs. 79-87.
2011 *Loxoconcha foveata* Hartmann. Coimbra & Bergue, figs. 3.17e-g (non) 1956 *Loxoconcha foveata* Hartmann, p. 49, figs. 79-87.
2012 *Loxoconcha foveata* Hartmann. Coimbra & Carreño, p. 194, tab. 2 (non) 1956 *Loxoconcha foveata* Hartmann, p. 49, figs. 79-87.

Figured specimens.MP-O-2833 (3), female, RV; MP-O-2834 (4), female, LV.

Dimensions. See Table 7.

TABLE 7. Dimensions of *Loxoconcha foveata* Hartmann, 1956.

Material	Length (mm)	Height (mm)
MP-O-2833 (Female, RV)	0.541	0.348
MP-O-2834 (Female, LV)	0.569	0.380

Material. Dead assemblage: 584 adults and 112 juveniles. Living assemblage: 7 adults.

Remarks. *Loxoconcha foveata* is quite similar to *L. bullata* but differ in the ornament characters, more developed in the first.

Stratigraphic range. Recent.

Occurrence and distribution. In this paper: Trindade Island. Also occurs in the littoral of Santos and Porto Novo (São Paulo State), southeastern Brazil.

Genus *Loxocorniculum* Benson & Coleman, 1963

Loxocorniculum micropapillosum sp. nov.

Figs. 5:5-10 and Figs.6:1-4

2008 *Loxoconcha* (*Loxocorniculum*) sp. Machado, p. 65; p. 221, tab. IV; p. 241, tab. IX; pl. 3, fig. 3; appx. 1.

Type series. Holotype: MP-O-2835, female, RV. Paratypes: MP-O-2836, female, LV; MP-O-2837, male, RV; MP-O-2838, juvenile, RV.

Type locality. Vitória seamount.

Etymology. With reference to the small papillae that ornament both muri and the peripheral zone adjacent to the free margin.

Dimensions. See Table 8.

TABLE 8. Dimensions of *Loxocorniculum micropapillosum* sp. nov.

Material	Length (mm)	Height (mm)
MP-O-2836 (Female, RV)	0.536	0.311
MP-O-2835 (Female, LV)	0.506	0.290
MP-O-2837 (Male, RV)	0.517	0.273
MP-O-2838 (Juvenile, RV)	0.428	0.241

Material. 5 adults and 1 juvenile (dead assemblage).

Diagnosis. A medium, thick-shelled and strongly ornamented species of *Loxocorniculum*. Eye tubercle large and rounded. Ornament of coarse reticulae with fossae varying in shape and size, and predominantly longitudinal ridges. Small papillae cover most muri and the compressed peripheral zone.

Description. Medium-sized carapace, heavily calcified, subrectangular to subquadrate, peripherally compressed in lateral view. Greatest height and greatest wide posteriorly. Dorsal margin straight but appearing somewhat sinuous due to the over-reach of the dorsal ornaments; posteriorly hidden by a horn-like tubercle. Ventral margin with a gentle oral concavity, obscured by the submarginal ornamentation; an ornate flange protrudes in the posterior half. Anterior margin slightly concave in upper 1/3, rounded in lower 2/3; three narrow elongated fossae adorn the anteromedian margin. Posterior margin with a small, blunt dorsal caudal process. Eye-tubercle rounded and prominent. Surface ornamented by coarse reticulae with fossae varying in shape and size, and predominantly longitudinal ridges. Delicate and numerous papillae cover most muri and the compressed peripheral zone. Two well-developed horizontal anteromedian ridges, typical for the genus, delimit three papillate huge submarginal fossae. The upper anteromedian ridge runs to the center, turns up and subdivides into two branches, one reaching the ocular tubercle and another followingbackward by a short distance and then upwards reaching the horn-like tubercle. The lower anteromedian ridge runs backwards to the posterior ventrolateral tubercle, turns up raising a very short vertical ridge that subdivides into two branches, the most robust follows to the center, the most delicate follows obliquely backwards and upwards and splits becoming similar to a trunk of sling. Three subparallel horizontal ridges run in the anterior ventrolateral half. The uppermost reaches the posteroventral alar tubercle, folds obliquely up and backward and follows very sinuously to the posterodorsal horn-like tubercle. RV with two small projections behind the posteroventral alar tubercle but only one in LV. A sinuous dorsal ridge begins in the eye tubercle and runs backwards reaching the posterodorsal horn-like tubercle. Normal porecanals not numerous, sieve-type. Hinge gongylodont with somewhat atypical anterior and anteromedian elements. Anterior and posterior inner lamella moderately wide. Central muscle scars four adductors in a subvertical row, a C-shaped anteriorly opened frontal scar and two mandibular scars. Sexual dimorphism distinct: males more elongate, with inconspicuous lateral tubercles, and a longer and narrower posteroventral flange.

Remarks. *Loxocorniculum micropapillosum* sp. nov. is easily distinguished from other species of *Loxocorniculum* mainly by strong reticulae with fossae varying in shape and size and the muri covered by small papillae that also adorn the wide compressed peripheral zone.

Stratigraphic range. Recent.

Occurrence and distribution. In this paper: Vitória and Davis seamounts. Also occurs in the Brazilian Northeastern shelf (Lat. 07°45’-08°03.5’S/Long. 34°31-34°36’W).

Genus *Phlyctocythere* Keij, 1958

Remarks. Schornikov (2011) discussed the problematic taxonomy of the family Loxoconchidae Sars, 1926, and its three subfamilies: Loxoconchinae Sars, 1926, Cytheromorphinae Mandelstam, 1960, and Nigeroloxoconchinae Reyment, 1963. However, most authors recognize only the first subfamily, as also assigned by Schornikov (2011). In his study, the author also creates the subfamily Loxocaudine, a special category to group together "the genus *Loxocauda* and the four closest genera", as follows: *Loxocauda* Schornikov, 1969, *Glacioloxoconcha* Hartmann, 1990, *Phlyctocythere* Keij, 1958, *Pseudoloxoconcha* Müller, 1894 and *Sarmatina* Stancheva, 1984.

With regarding the genus *Phlyctocythere*, Schornikov (2011) considers that only the Paleogene nominal species with two subspecies should be attributed to that genus: *P. eocaenica eocaenica* Keij, 1958 and *P. eocaenica oriunda* Moos, 1973. According to him, five *Phlyctocythere* species studied by Bold (1988) from the Neogene of Dominican Republic constitute a closely related group due to the "identical costulae in the posteroventral region of the valves". Nevertheless, based on the presence of "prominent small eye tubercles", and "one species [*P. curva*] with incisions on the hinge bar and on the terminal teeth of the valve", Schornikov (2011) does not include the five Bold's species in his new subfamily Loxocaudinae.

The two new species of *Phlyctocythere* described below belong to the Miocene/Pliocene morphological group of five species studied by Bold (1988) in the Dominican Republic, Caribbean. Therefore, if we follow Schornikov (2011) the Bold's species and those studied here should be grouped in a new genus. The present authors prefer to maintain these two Brazilian species in the genus *Phlyctocythere*, especially due to the precarious knowledge of this genus, which needs a thorough revision.

Phlyctocythere christophei sp. nov.

Figs. 6:5-9

1999b *Phlyctocythere* sp. 1 Coimbra *et al*., p. 368, pl. 1, fig. 9, tab. 1.

Type series. Holotype: MP-O-2839, RV. Paratype: MP-O-2840, LV.

Type locality. Vitória seamount.

Etymology. In honor to Jean-Christophe Joyeux who kindly provided the samples of the seamounts.

Dimensions. See Table 9.

TABLE 9. Dimensions of *Phlyctocythere christophei* sp. nov.

Material	Length (mm)	Height (mm)
MP-O-2839 (RV)	0.460	0.297
MP-O-2840 (LV)	0.425	0.280

Material. 5 adults and 2 juveniles (dead assemblage).

Diagnosis. A small, clearly inequivalve and irregularly ovate species of *Phlyctocythere*. RV dorsal margin anteriorly convex and somewhat concave posteriorly; in LV less arched, slightly sinuous posteriorly. Two (RV) or three (LV) concentric wrinkles runs subparallel to the ventro-posterior and posterior margins, finishing before reaching the caudal process. Eye tubercle rather faint, anterodorsally.

Description. Carapace small, clearly inequivalve, thin-shelled, fragile and irregularly ovate in lateral view. Maximum height just in front of the middle; maximum length subdorsal; maximum width near the middle. Valves strongly inflated, with a compressed peripheral zone similar to a very delicate flange anteriorly, large and similar to a sharp keel ventro-posteriorly and posteriorly. Eye tubercle rather faint, anterodorsally. Anterior margin almost evenly rounded. Posterior end rather blunt, with an obtuse subdorsal caudal process. Ventral margin sinuous. Dorsal margin anteriorly convex and somewhat concave posteriorly, in RV; almost straight but slightly sinuous posteriorly, in LV. Surface smooth, except by a few wrinkles. Two (RV) or three (LV) concentric wrinkles runs subparallel to the ventro-posterior and posterior margins, finishing before reaching the caudal process. Inner lamella broad, except in the oral region. Anterior vestibule wide; posterior vestibule narrow. Hinge consisting of a fine and smooth bar in RV and a corresponding groove in LV. Adductor muscle scars aligned in a slightly curved row of four compact scars; frontal scar poorly visible, somewhat U-shaped.

Remarks. *Phlyctocythere christophei* sp. nov. is a very rare species, previously recorded in open nomenclature on the Brazilian equatorial shelf by Coimbra *et al.* (1999b), resembles the Caribbean Miocene species *Phlyctocythere curva* Bold 1988a, differing mainly by the more elongate outline, less arched dorsal margin, absence of anterior faint reticulae and RV with only two ventro-posterior and posterior concentric wrinkles. *P. christophei*sp. nov. is very similar to *P. apua*sp. nov., diverging in the less spherical outline in lateral view, number and distribution of wrinkles, and a hinge lacking traces of terminal elements. Similar to other species attributed to the genus, all specimens of *P. christophei* sp. nov. have the posterior margin and the caudal process somewhat damaged.

Stratigraphic range. Recent.

Occurrence and distribution. In this paper: Vitória and Davis seamounts. Also occurs in the Brazilian Northern shelf (from Orange Cape to mouth of Pará River).

***Phlyctocythere apua* sp. nov.**

Figs. 6: 10-11 and Figs. 7:1-3

Type series. Holotype: MP-O-2841, RV. Paratype: MP-O-2842, LV.

Type locality. Vitória seamount.

Etymology. Tupi-Guarani origin, *apu'a*= spherical, due to the subspherical shape of the carapace in lateral view.

Dimensions. See Table 10.

TABLE 10. Dimensions of *Phlyctocythere apua* sp. nov.

Material	Length (mm)	Height (mm)
MP-O-2841 (RV)	0.437	0.291
MP-O-2852 (LV)	0.443	0.288

Material. 11 adults and 5 juveniles (dead assemblage).

Diagnosis. A small and ovate species of *Phlyctocythere*, apparently equivalve except by the subdorsal caudal process slightly upturned only in RV. Surface with three delicate but distinct concentric wrinkles subparallel to the ventro-posterior and posterior margins; the innermost nearly meets the dorsal margin, while the other two finish before reaching the caudal process. Hinge with traces of terminal elongate elements, more visible in LV. Eye tubercle few conspicuous, anterodorsally.

Description. Carapace small, thin-shelled, fragile and ovate in lateral view. Valves apparently equivalve except by the subdorsal caudal process somewhat upturned only in RV. Maximum height in the middle; maximum length subdorsal; maximum width near the middle. Valves heavily inflated, with a compressed peripheral zone similar a very delicate flange anteriorly, large and similar to a sharp keel ventro-posteriorly and posteriorly. Eye tubercle few conspicuous, anterodorsally. Anterior margin almost evenly rounded. Posterior end with a subdorsal caudal process, slightly upturned in RV. Ventral margin sinuous. Dorsal margin strongly arched, mainly anteriorly. Surface smooth, except by a few wrinkles. Three delicate but distinct concentric wrinkles run subparallel to the ventro-posterior and posterior margins; the innermost nearly meets the dorsal margin, while the other two stop before reaching the caudal process. Inner lamella broad, except in the oral incurvature. Anterior vestibule wide; posterior vestibule narrow. Hinge consisting of a fine and smooth bar in RV and a corresponding groove in LV; traces of terminal elongate sockets in LV, correspondent RV terminal elements inconspicuous. Adductor muscle scars aligned in a slightly curved row of four compact small scars; frontal scar somewhat U-shaped. Sexual dimorphism not observed.

Remarks. See remarks of *P. christophei* sp. nov. As in many species of this genus, all specimens of *P. apua* sp. nov. show the posterior margin and the caudal process somewhat damaged.

Stratigraphic range. Recent.

Occurrence and distribution. Vitória, Davis and Dogaressa seamounts.

Family PECTOCYTHERIDAE Hanai, 1957

Genus *Kotoracythere* Ishizaki, 1966

Kotoracythere inconspicua (Brady, 1880)

Figs. 7:4-5

1880 *Cythere inconspicua* Brady, p. 70, pl. 13, figs. 1a-d.
1993 *Kotoracythere inconspicua* (Brady). Witte, p. 25-26, pl. 3, figs. 19-22 (see this paper for a more complete synonymy).
?1995 *Kotoracythere inconspicua* (Brady). Babinot & Kouyoumontzakis, p. 28; p. 33, tab. 2
1995 *Kotoracythere inconspicua* (Brady). Whatley & Roberts, p. 362, fig. 1.26.
1995 *Kotoracythere inconspicua* (Brady). Yassini & Jones, p. 338; p. 419, figs. 287-288.
1995 *Morkhovenia inconspicua* (Brady). Zhou,p. 71-72; pl. 3, figs. 2a-b.
1999b *Kotoracythere inconspicua* (Brady). Coimbra *et al*., p. 370, pl. 2, fig. 11; p. 372, tab. 1; p. 377, tab. 6.
2001 *Kotoracythere inconspicua* (Brady). Titterton *et al*., p. 36, pl. 2, figs. 11-12; p. 39.
2002 *Kotoracythere inconspicua* (Brady). Coimbra & Fauth, p. 572-573, fig. 3.10.
2002 *Kotoracythere inconspicua* (Brady). Sridhar *et al*., p. 22-23, pl. 1, figs. 17-20.
2003 *Kotoracythere inconspicua* (Brady). Wouters, p. 144, pl. 6, figs. 1-7; pl. 12, figs. 5a-b.

2005 *Kotoracythere inconspicua* (Brady). Mostafawi *et al.*,p. 124, tab. 1; p. 126, pl. 1, figs. 10-12; p. 130.
2006 *Leptocythere pulchra* (Zhao & Whatley). Hussain *et al.*, p. 1666, fig. 7.5 (non) 1989 *Leptocythere pulchra* Zhao & Whatley, p. 173; p. 175, pl. 1, figs. 5-9.
2006 *Kotoracythere inconspicua* (Brady). Warne *et al.*, p. 138-139, pl. 6, fig. 6.
2007 *Kotoracythere inconspicua* (Brady). Sridhar *et al.*,p. 982-984; pl. 1, figs. a-d.
2008 *Kotoracythere inconspicua* (Brady). Machado, p. 76-77; p. 224, tab. 6; p. 230, tab. 8; pl. 3, fig. 12; appx 1-2.
2009 *Kotoracythere inconspicua* (Brady). Coimbra *et al.*,p. 131, tab. 5.3; p. 134-135, tabs. 5.4-5.5; p. 136, fig. 5.1k.
?2009 *Kotoracythere inconspicua* (Brady). Maddocks *et al.*, p. 288.
?2011 *Kotoracythere inconspicua* (Brady). Chaitanya *et al.*, appx 4.
2012 *Kotoracythere inconspícua* (Brady). Coimbra & Carreño, p. 194-195, tabs. 2-3;
?2013 *Kotoracythere inconspicua* (Brady). Baskar *et al.*,p. 1051-1056, tabs. 1-4.

Figured specimens. MP-O-2843, RV; MP-O-2844, LV.

Dimensions. See Table 11.

TABLE 11. Dimensions of *Kotoracythere inconspicua* (Brady, 1880).

Material	Length (mm)	Height (mm)
MP-O-2843 (RV)	0.385	0.214
MP-O-2844 (LV)	0.342	0.191

Material. Dead assemblage: 58 adults and 9 juveniles. Living assemblage: 1 juvenile.

Stratigraphic range. Early Miocene to Recent.

Occurrence and distribution. In this paper: Trindade Island. In the Recent, it occurs also in other Brazilian territorial waters (Northern, Northeastern and Eastern shelves, Sepetiba Bay and Rocas Atoll), Gulf of Mexico (Yucatan, Veracruz Reef), Caribbean (Bahamas, Jamaica, Trinidad, Venezuela, Guadelope, St. Eustatius, Barbados, Belize), Eastern North America, Australia (Northern, Northwestern, Southeastern and Southern), Great Barrier Reef (Lizard Island, Heron Island,), Torres Strait, Solomon Archipelago, New Caledonia islands, New Hebrides, Micronesia, Fiji, Japan, Hawaiian islands, Polynesia (Pitcairn Island), French Polynesia (Huahine), Southeast India, Cape Verde islands, Senegal, Gambia, Gulf of Aqaba, Saudi Arabia, Ethiopia, Quatar, Kenya, Comores Archipelago, and Reunion island. Fossil: Midway Island (Early Miocene-Pleistocene), Andaman Islands (Middle-Late Miocene), Marshall Islands (Late Miocene), Japan (Pleistocene and Recent).

Superfamily CYTHERIDEIOIDEA Sars, 1925

Family PARACYTHERIDEIDAE Puri, 1957

Genus *Paracytheridea* Müller, 1894

Paracytheridea inflata Purper & Ornellas, 1987
Fig. 7:6

1987 *Paracytheridea inflata* Purper & Ornellas, p. 106-108; p. 120, pl. 1, figs. 1-12.
1999a *Paracytheridea inflata* Purper & Ornellas. Coimbra *et al*., p. 38, fig. 41.
2008 *Paracytheridea inflata* Purper & Ornellas. Machado, p.158-160; p. 224, tab. 6; p. 230, tab. 8; p. 241, tab. 9; pl. 7, fig. 13; appx 1.

Figured specimens. MP-O-2845, male, RV.

Dimensions. See Table 12.

TABLE 12. Dimensions of *Paracytheridea inflata* Purper & Ornellas, 1987.

Material	Length (mm)	Height (mm)
MP-O-2845 (Male, RV)	0.524	0.253

Material. 21 adults and 6 juveniles (dead assemblage).

Stratigraphic range. Recent.

Occurrence and distribution. In this paper: Vitória, Davis and Dogaressa seamounts. Also occurs in others Brazilian territorial waters (Northern, Northeastern and Eastern shelves).

Paracytheridea tschoppi Bold, 1946
Figs. 7:10-11

1946 *Paracytheridea tschoppi* Bold, p. 85, pl. 16, figs. 6-7.
1999a *Paracytheridea tschoppi* Bold. Coimbra *et al*., p. 137, fig. 39 (see this paper for a more complete synonymy).
1999b *Paracytheridea tschoppi* Bold. Coimbra *et al*., p. 372, tab. 1; p. 377, tab. 2.
2000 *Paracytheridea tschoppi* Bold. Keyser & Schöning, p. 571, tab. 1; p. 573; p. 590, pl. 6, figs. 105-107.
2008 *Paracytheridea tschoppi* Bold. Machado, p. 161-163; p. 224, tab. 6; p. 230, tab. 8; pl. 7, fig. 15; appx 1.
?2008 *Paracytheridea tschoppi* Bold. Perez-Gelabert, p. 25.
2009 *Paracytheridea tschoppi* Bold. Coimbra *et al*., p. 131, tab. 5.3; p. 135, tab. 5.5.
2012 *Paracytheridea tschoppi* Bold. Munef *et al*., p. 153, tab. 2; p. 156, pl. 2, figs. 28-29; p. 157.
2012 *Paracytheridea tschoppi* Bold. Coimbra & Carreño, p. 194, tab. 2; p. 202, appx 1.

Figured specimens. MP-O-2847, RV; MP-O-2848, LV.

Dimensions. See Table 13.

TABLE 13. Dimensions of *Paracytheridea tschoppi* Bold, 1946.

Material	Length (mm)	Height (mm)
MP-O-2847 (RV)	0.562	0.245
MP-O-2848 (LV)	0.554	0.273

Material. Dead assemblage: 624 adults and 49 juveniles. Living assemblage: 1 juvenile.

Stratigraphic range. Miocene to Recent.

Occurrence and distribution. In this paper: Vitória and Jaseur seamounts and Trindade Island. In the Recent, it occurs also in other Brazilian territorial waters (Northern, Northeastern and Eastern shelves, and Sepetiba Bay), Gulf of Mexico, Caribbean, West African Coast, Reunion Island, Red Sea, Indo-Pacific, Socotra Island, Solomon Islands, and Clipperton Islands. Fossil: Caribbean (Early Miocene-Pleistocene), Fiji (Late Miocene), Okinawa (Pliocene), and Java Sea (Plio-Pleistocene).

Superfamily TRACHYLEBERIDOIDEA Liebau 2005

Family HEMICYTHERIDAE Puri, 1953

Genus *Auradilus* Jellinek, 1995

Auradilus convolutus (Brady, 1868)

Figs. 8:1-2

1868 *Cythere convoluta* Brady, p. 182, pl. 12, figs. 3-4.
1979 *Radimella costata* Hu, p. 61, pl. 1, figs. 23-29, text-figs. 2a-d.
1981 *Radimella* sp. indet. Jain, p. 114, pl. 3, fig. 1.
1981 *Mutilus* sp. Hartmann, p. 110, pl. 6, fig. 11.
?1982 *Radimella costata* Hu. Hu, p.189 (pars), pl. 4, figs. 22-24, text-figs. 10a, c. (non figs. 14-15, text-Fig. 10b, d).
1986 *Radimella wantlandi* (Teeter). Cabioch *et al.*, p. 27, pl. 9, figs. 5-6 (mislabeled as *Morkhovenia inconspicua*). (non) 1975 *Aurila wantlandi* Teeter, p. 440, figs 8i, 9a-c.
1988 *Mutilus* sp. 2 Dias-Brito *et al.*, p. 480, pl. 2, fig. 46 (it is a somewhat distorted image, which changed the length/height ratio).
1989 *Mutilus splendideornatus* Hartmann. Whatley & Keeler, p. 71, pl. 3, figs. 1-3 (non) 1974 *Mutilus splendideornatus* Hartmann, p. 281, pl. 49, figs. 375-381; pl. 50, figs. 382-384; pl. 150, fig. 9.
1992 *Mutilus splendideornatus* Hartmann. Coimbra *et al.*, p. 96, pl. 1, fig. 7, tabs. 1-4.
1995 *Auradilus costatus* (Hu). Jellinek, p. 168, pl. 2, figs. 12-16.
1998 *Auradilus costatus* (Hu). Fauth & Coimbra, p. 466-468, figs. 2.1-2.4.

1999b *Auradilus* sp. Coimbra *et al.*, p. 370, pl. 2, fig. 15; p. 372, tab. 1.
2005 *Auradilus convolutus* (Brady). Mostafawi *et al.*, p. 124, tab. 1; p. 128, pl. 2, fig. 6-7; p. 132.
2008 *Auradilus costatus* (Hu). Machado, 186; p. 224, tab. 6; p. 230, tab. 8; pl. 8, fig. 15; appx 1.
2011 *Auradilus costatus* (Hu). Coimbra & Bergue, p. 203, fig. 3.17a.
2012 *Auradilus costatus* (Hu). Coimbra & Carreño, p. 194, tab. 2; p. 202, appx. 1.
2019 *Auradilus costatus* (Hu). Morais & Coimbra 2019, p. 76, fig. 5J-K, tab. 1.

Figured specimens. MP-O-2849, RV; MP-O-2950, LV.

Dimensions. See Table 14.

TABLE 14. Dimensions of *Auradilus convolutus* (Brady, 1868).

Material	Length (mm)	Height (mm)
MP-O-2849 (RV)	0.583	0.377
MP-O-2850 (LV)	0.596	0.385

Material. 9 adults (dead assemblage).

Stratigraphic range. Pleistocene to Recent.

Remarks. This species, described from Mauritius Island by Brady (1868), was unknown for a long time. Although the author drew only a LV in lateral view, he showed enough details so that, along with the description, it can be identify with relative facility (Mostafawi *et al.*, 2005). It was only with the work of Hu (1979) that it reappears in the scientific literature but receiving different names ever since. Therefore, we presented a new and more complete synonymy list, which also has some differences with that of Mostafawi *et al.* (2005, p. 132). Finally, it is noteworthy that *Radimella minor* described by Hu (1979, p.1, fig. 10) does not seem to be conspecific with *Auradilus convolutus*, as proposed by those authors. It is smaller than *A. convolutus* and differs in ornamentation in adults and juveniles.

Occurrence and distribution. In this paper: Trindade Island. In the Recent, it occurs also in other Brazilian territorial waters (Northern, Northeastern and Eastern shelves, Sepetiba Bay, and littoral of Santa Catarina State), Indian Ocean and Western Pacific. Fossil: Taiwan (Pleistocene).

Genus *Caudites* Coryell & Fields, 1937

Caudites exmouthensis Hartmann, 1978

Figs. 8:3-4

1978 *Caudites exmouthensis* Hartmann, p. 102, figs. 10-11.
1988 *Caudites exmouthensis* Hartmann. Whatley & Zhao, p. 7, pl. 6, figs. 8-9.
1989 *Caudites exmouthensis* Hartmann. Whatley & Keeler, p. 69, pl. 2, figs. 6-7.
1992 *Caudites exmouthensis* Hartmann. Coimbra *et al*., p. 96, pl. 1, fig. 9, tabs. 1-4.
2006 *Caudites exmouthensis* Hartmann. Warne *et al.*, p. 117, pl. 3, figs. 25-27.
2012 *Caudites exmouthensis* Hartmann. Coimbra & Carreño, p. 194, tab. 2; p. 202, appx. 1.

Figured specimen. MP-O-2851, C.

Dimensions. See Table 15.

TABLE 15. Dimensions of *Caudites exmouthensis* Hartmann, 1978.

Material	Length (mm)	Height (mm)
MP-O-2851 (RV)	0.516	0.275
MP-O-2851 (LV)	0.516	0.273

Material. 6 adults and 1 juvenile (dead assemblage).

Stratigraphic range. Recent.

Occurrence and distribution. In this paper: Trindade Island. It also occurs in the Tamandaré Bay (Brazil), Reunion Island, Malaysia (Malacca Strait) and Northern Australia.

Caudites obliquecostatus Bold, 1963

Figs. 8:5-6

1963 *Caudites obliquecostatus* Bold, p. 387, pl. 6, figs. 1a-b, pl. 12, fig. 4.
?1966 *Caudites obliquecostatus* Bold. Bold, p. 55, tab. 1.
1992 *Caudites obliquecostatus* Bold. Coimbra *et al*., p. 96, pl. 1, fig. 8, tabs. 1-4.
2009 *Caudites obliquecostatus* Bold. Coimbra *et al*., p. 131, tab. 5.3; p. 133, tab. 5.4; p. 135, tab. 5.5; p. 137, fig. 5.2d.
2011 *Caudites obliquecostatus* Bold. Coimbra & Bergue, p. 203, fig. 3.17C.
2012 *Caudites obliquecostatus* Bold. Coimbra & Carreño, p. 194, tab. 2; p. 202, appx. 1.
2017 *Caudites obliquecostatus* Bold. Morais & Coimbra, p. 71, tab. 1; p. 77 fig. 6A; appx.

Figured specimens. MP-O-2852, RV; MP-O-2853, LV.

Dimensions. See Table 16.

TABLE 16. Dimensions of *Caudites obliquecostatus* Bold, 1963.

Material	Length (mm)	Height (mm)
MP-O-2852 (RV)	0.543	0.282

MP-O-2853 (LV)	0.564	0.282

Material. Dead assemblage: 25 adult and 1 juvenile. Living assemblage: 3 adults.

Stratigraphic range. Pleistocene to Recent.

Occurrence and distribution. In this paper: Trindade Island. In the Recent, occurs also in other Brazilian territorial waters (Northern shelf to the northern part of the Southern shelf, Tamandaré Bay, littoral of the States of São Paulo and Santa Catarina) and the Caribbean. Fossil: Trinidad (Pleistocene).

Caudites seminudus Whatley & Keeler 1989

Figs.8:7-8

1989 *Caudites seminudus* Whatley & Keeler, p.68-69, pl. 1, figs. 2-5.
1992 *Caudites seminudus* Whatley & Keeler. Coimbra *et al*., p. 96, pl. 1, fig. 11, tabs. 1-4.
2005 *Caudites seminudus* Whatley & Keeler. Machado *et al*., p. 243, pl. 3, fig. 2, tab. 1.
2011 *Caudites seminudus* Whatley & Keeler. Coimbra & Bergue, p. 203, fig. 3.17B.
2012 *Caudites seminudus* Whatley & Keeler. Coimbra & Carreño, p. 194, tab. 2; p. 195, tab. 3; p. 202, appx. 1.
2019 *Caudites seminudus* Whatley & Keeler. Morais & Coimbra, p. 77, figs. 6C-D, tabs. 1-2.

Figured specimens. MP-O-2854, RV; MP-O-2855, LV.

Dimensions. See Table 17.

TABLE 17. Dimensions of *Caudites seminudus* Whatley & Keeler, 1989.

Material	Length (mm)	Height (mm)
MP-O-2854 (RV)	0.479	0.261
MP-O-2855 (LV)	0.495	0.267

Material. Dead assemblage: 119 adults and 28 juveniles. Living assemblage: 49 adults.

Stratigraphic range. Recent.

Occurrence and distribution. In this paper: Trindade Island. It also occurs in other Brazilian territorial waters (Northeastern shelf to the northern part of the Southern shelf, Rocas Atoll, Tamandaré Bay, littoral of the States of São Paulo and Santa Catarina) and Reunion Island.

Genus *Coquimba* Ohmert, 1968

***Coquimba* cf. *C. punctata* Ramos, 1994**
Fig. 8:9

Figured specimen. MP-O-2858, RV.

Dimensions. See Table 18.

TABLE 18. Dimensions of *Coquimba* cf. *C. punctata* Ramos, 1994.

Material	**Length (mm)**	**Height (mm)**
MP-O-2858 (RV)	0.633	0.335

Material. 1 valve.

Occurrence. Vitória seamount.

Remarks. This species is very similar to *Coquimba punctata* Ramos, 1994, but the unique valve recorded in the analyzed material is outworn, masking some diagnostic characters of the species.

Genus *Cornucoquimba* Ohmert, 1968

***Cornucoquimba decorata* Ramos, 1996**
Figs. 9:1-2

1992 *Cornucoquimba* sp. Coimbra *et al*., p. 96, pl. 1, fig. 15, tabs. 1-4.
1996 *Cornucoquimba decorata* Ramos, p. 108, pl. 3, figs. 1-19.
2012 *Nanocoquimba labyrinthica* Ramos. Coimbra & Carreño, p. 194, tab. 2. (non) 1996 *Nanocoquimba labyrinthica* Ramos, p. 108, pl. 2, figs. 1-19.

Figured specimen. MP-O-2856, open carapace.

Dimensions. See Table 19.

TABLE 19. Dimensions of *Cornucoquimba decorata* Ramos, 1996.

Material	**Length (mm)**	**Height (mm)**
MP-O-2856 (RV)	0.448	0.262
MP-O-2856 (LV)	0.454	0.271

Material. 37 adult and 2 juveniles (dead assemblage).

Stratigraphic range. Recent.

Occurrence and distribution. In this paper: Vitória and Dogaressa seamounts and Trindade Island. It also occurs in other Brazilian territorial waters (Northern shelf to the northernmost part of the Southern shelf, and Tamandaré Bay).

Cornucoquimba nana Ramos, 1996

Figs. 9:3-4

1996 *Cornucoquimba nana* Ramos, p.110, pl. 5, figs. 1-18.
1999b *Cornucoquimba nana* Ramos. Coimbra *et al.*, p. 370, pl. 1, fig. 9; p. 372, tab. 1.

Figured specimens. MP-O-2857, open carapace.

Dimensions. See Table 20.

TABLE 20. Dimensions of *Cornucoquimba nana* Ramos, 1996.

Material	Length (mm)	Height (mm)
MP-O-2857 (RV)	0.417	0.235
MP-O-2857 (LV)	0.411	0.242

Material. Dead assemblage: 5 adults. Living assemblage: 1 adult.

Stratigraphic range. Recent.

Occurrence and distribution. In this paper: Dogaressa seamount. It also occurs in other Brazilian territorial waters (Northern, Northeastern and Eastern shelves).

Genus *Neocaudites* Puri, 1960

Neocaudites subimpressus (Edwards, 1944)

Figs. 9:5-6

1944 *Cythereis subimpressus* Edwards, p. 523, pl. 87, figs. 29-30.
2004 *Neocaudites subimpressus* (Edwards). Coimbra *et al.*, p. 108, figs. 1-2; p. 114, pl. 2, figs. 5-6 (see this paper for a more complete synonymy).
2008 *Neocaudites subimpressus* (Edwards). Machado, p. 111; p. 224, tab. VI; p. 230, tab. VIII; pl. 5, fig. 10; appx. 1-2.
2009 *Neocaudites subimpressus* (Edwards). Coimbra *et al.*, p. 134-135, tabs. 5.4-5.5; p. 137, fig. 5.2f.
2012 *Neocaudites subimpressus* (Edwards). Coimbra *et al.*, p. 195, tab. 3.

Figured specimen.MP-O-2859, open carapace.

Dimensions. See Table 21.

TABLE 21. Dimensions of *Neocaudites subimpressus* (Edwards, 1944).

Material	Length (mm)	Height (mm)
MP-O-2859 (RV, juvenile)	0.474	0.237
MP-O-2859 (LV, juvenile)	0.475	0.267

Material. Dead assemblage: 10 adults and 3 juveniles. Living assemblage: 3 adults.

Stratigraphic range. Pliocene to Recent.

Occurrence and distribution. In this paper: Vitória, Jaseur, Davis and Dogaressa seamounts, and Trindade Island. It also occurs in other Brazilian territorial waters (Northern, Northeastern and Eastern shelves, and Rocas Atoll), Cuba, Dominican Republic, Costa Rica, Belize and Clipperton Island (the last one in theeastern Pacific Ocean). Fossil: North Carolina (Upper Miocene and Pliocene) and Cuba (Pliocene).

Family THAEROCYTHERIDAE Hazel, 1967

Genus *Neohornibrookella* Jellinek, 1993

Neohornibrookella trindadensis(Coimbra & Carreño, 2012)

Fig. 9:7-8

1988 *Quadracythere producta* (Brady). Bold, p. 36, pl. 3, fig. 12 (non)1866 *Cythere producta* Brady, p. 378, pl. 59, figs. 7a-c.

2012 *Tenedocythere trindadensis* Coimbra & Carreño, p. 196, figs. 5A-L, tab. 4(see this paper for a more complete synonymy).

Figured specimens. MP-O-2860, RV; MP-O-2861, LV.

Dimensions. See Table 22.

TABLE 22. Dimensions of *Neohornibrookella trindadensis* (Coimbra & Carreño, 2012).

Material	Length (mm)	Height (mm)
MP-O-2860 (RV)	0.495	0.300
MP-O-2861 (LV)	0.533	0.324

Material. Dead assemblage: 337 adults and 69 juveniles. Living assemblage: 1 adult and 4 juveniles.

Remarks. This species, described by Coimbra & Carreño (2012) for Trindade Island, was firstly allocated within the genus *Tenedocythere*. However, Warne & Whatley (2016) analyzing a range species of this genus, found that *Tenedocythere* occurs exclusively in the Mediterranean region, fossil and recent, placing all species outside this region in the genus *Neohornibrookella* Jellinek, 1993. Those authors proposed a new subfamily of shallow marine ostracodes, Tenedocytherinae, which includes the phylogenetically related genera *Tenedocythere*, *Neohornibrookella*, and

Bosasella. *Neohornibrookella trindadensis*was also recorded for the Caribbean region, erroneously identified by Bold (1988) in Late Miocene-Pliocene sediments of the Dominican Republic as *Quadracythere producta* (Brady, 1866).

Stratigraphic range. Late Miocene-Pliocene to Recent.

Occurrence and distribution. In this paper: Davis and Dogaressa seamounts and Trindade Island. In the Recent, it also occurs in other Brazilian territorial waters (Northern shelf and Rocas Atoll). Fossil: Dominican Republic (Caribbean).

Family TRACHYLEBERIDIDAE Sylvester-Bradley, 1948

Genus *Australimoosella* Hartmann, 1978

Australimoosella polypleuron Coimbra, Ramos, Whatley & Bergue, 2004

Figs. 10:1-2

1999b Gen. et sp. indet. 1 Coimbra *et al*., p. 370, pl. 2, fig. 2, tab. 1.
2004 *Australimoosella polypleuron* Coimbra *et al*., p. 115, pl. 2, figs. 13-17 (non) *Australimoosella polypleuron* Titterton & Whatley, 2009 p. 67, fig. 5:23, pl. 5, figs. 27, 28, 31, 35.
2008 *Australimoosella polypleuron* Coimbra *et al*. Machado, p. 122-123; p. 224, tab. VI; p. 230, tab. VIII; p. 241, tab. IX; pl. 5, figs. 12-13.
2009 *Australimoosella* sp. Coimbra *et al.*, p. 123, tabs. 5.3, 5.5, appx. 5.1
2012 *Australimoosella polypleuron* Coimbra *et al*. Coimbra & Carreño, p. 194, tab. 2.

Figured specimens. MP-O-2862, RV; MP-O-2863, LV.

Dimensions. See Table 23.

TABLE 23. Dimensions of *Australimoosella polypleuron* Coimbra, Ramos, Whatley & Bergue, 2004.

Material	Length (mm)	Height (mm)
MP-O-2862 (RV, juvenile, A-1)	0.621	0.313
MP-O-2863 (LV, juvenile, A-1)	0.624	0.318

Material. 10 juveniles (dead assemblage).

Stratigraphic range. Recent.

Occurrence and distribution. In this paper: Trindade Island. It also occurs in other Brazilian territorial waters (Northern, Northeastern and Eastern shelves).

Genus *Puriana* Coryell & Fields

***Puriana variabilis* Chukewiski & Purper, 1985**
Figs. 10:3-4

1985 *Puriana variabilis* Chukewiski & Purper, p. 314, pl. 2-6.
1992 *Puriana variabilis* Chukewiski & Purper. Coimbra *et al*., pl. 2, fig. 10, tabs. 1-4.
1999b *Puriana variabilis* Chukewiski &Purper. Coimbra *et al*., p. 374, pl. 3, fig. 8; p. 372, tab. 1.
2004 *Puriana variabilis* Chukewiski & Purper. Coimbra *et al*., p. 115, pl. 2, figs. 9-10.
2008 *Puriana variabilis* Chukewiski & Purper. Machado, p. 99-100; p. 224, tab. VI; p. 230, tab. VIII; p. 241, tab. IX; pl. 4, fig. 13; appx. 1.

Figured specimens. MP-O-2864, RV; MP-O-2865, LV.

Dimensions. See Table 24.

TABLE 24. Dimensions of *Puriana variabilis* Chukewski & Purper, 1985.

Material	Length (mm)	Height (mm)
MP-O-2864 (RV)	0.521	0.276
MP-O-2865 (LV)	0.529	0.280

Material. Dead assemblage: 60 adult and 2 juveniles. Living assemblage: 4 adults.

Stratigraphic range. Recent

Occurrence and distribution. In this paper: Trindade Island. It also occurs in other Brazilian territorial waters (Northern, Northeastern and Eastern shelves, and Tamandaré Bay).

Superorder MYODOCOPOMORPHA Kozur, 1972

Order HALOCYPRIDIDA Skogsberg, 1920

Suborder CLADOCOPINA Sars, 1866

Family POLYCOPIDAE Sars, 1865

Genus *Polycope* Sars, 1866

***Polycope* sp. 1**
Fig. 10:5

Figured specimens. MP-O-2866, RV.

Dimensions. See Table 25.

TABLE 25. Dimensions of *Polycope* sp. 1.

Material	Length (mm)	Height (mm)
MP-O-2866 (RV)	0.335	0.278

Material. 13 specimens.

Occurrence. Vitória and Dogaressa seamounts.

Remarks. *Polycope,* the most diversified genus of the family Polycopidae, has been poorly studied in South America, including the Brazilian territorial waters. When recorded, the species are in open nomenclature (e.g. Drozinski *et al.*, 2003; Bergue & Coimbra, 2008). Some zoologists, such as Karanovic & Brandão (2016), claim that the carapace morphology of the polycopids would not be enough to distinguish the species. Although such a conclusion seems hasty, we prefer to keep the two species of *Polycope* in open nomenclature due to the current state of knowledge of this group.

Polycope sp. 2
Fig. 10:6

Figured specimens.MP-O-2867, LV.

Dimensions. See Table 26.

TABLE 26. Dimensions of *Polycope* sp.

Material	Length (mm)	Height (mm)
MP-O-2867 (LV)	0.373	0.309

Material. 7 specimens.

Occurrence. Vitória and Dogaressa seamounts.

Remarks. See the discussion in *Polycope* sp. 1.

Acknowledgement

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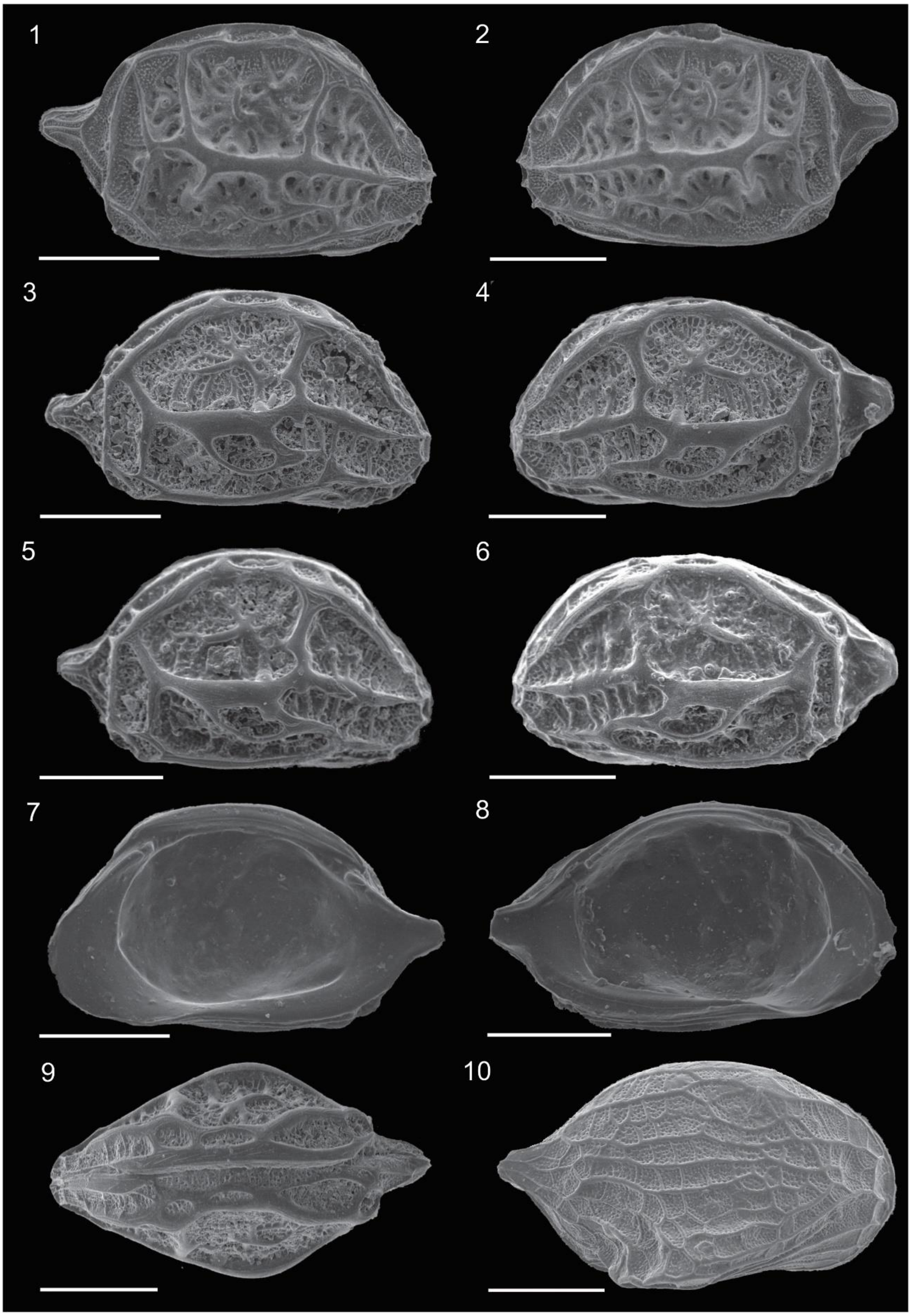

Figure 3. 1-2: *Hemicytherura bradyi*. 1) MP-O-2820, RV; 2) MP-O-2821, LV. **3-9: *Hemicytherura trindadensis* sp. nov.** 3) MP-O-2822, RV; 4) MP-O-2822, LV; 5) MP-O-2823, RV; 6) MP-O-2823, LV; 7) MP-O-2823, RV, internal view; 8) MP-O-2823, LV, internal view; 9) MP-O-2824, dorsal view. **10) *Semicytherura parva* sp. nov.**, MP-O-2825, female, RV. Scale bar = 100µm.

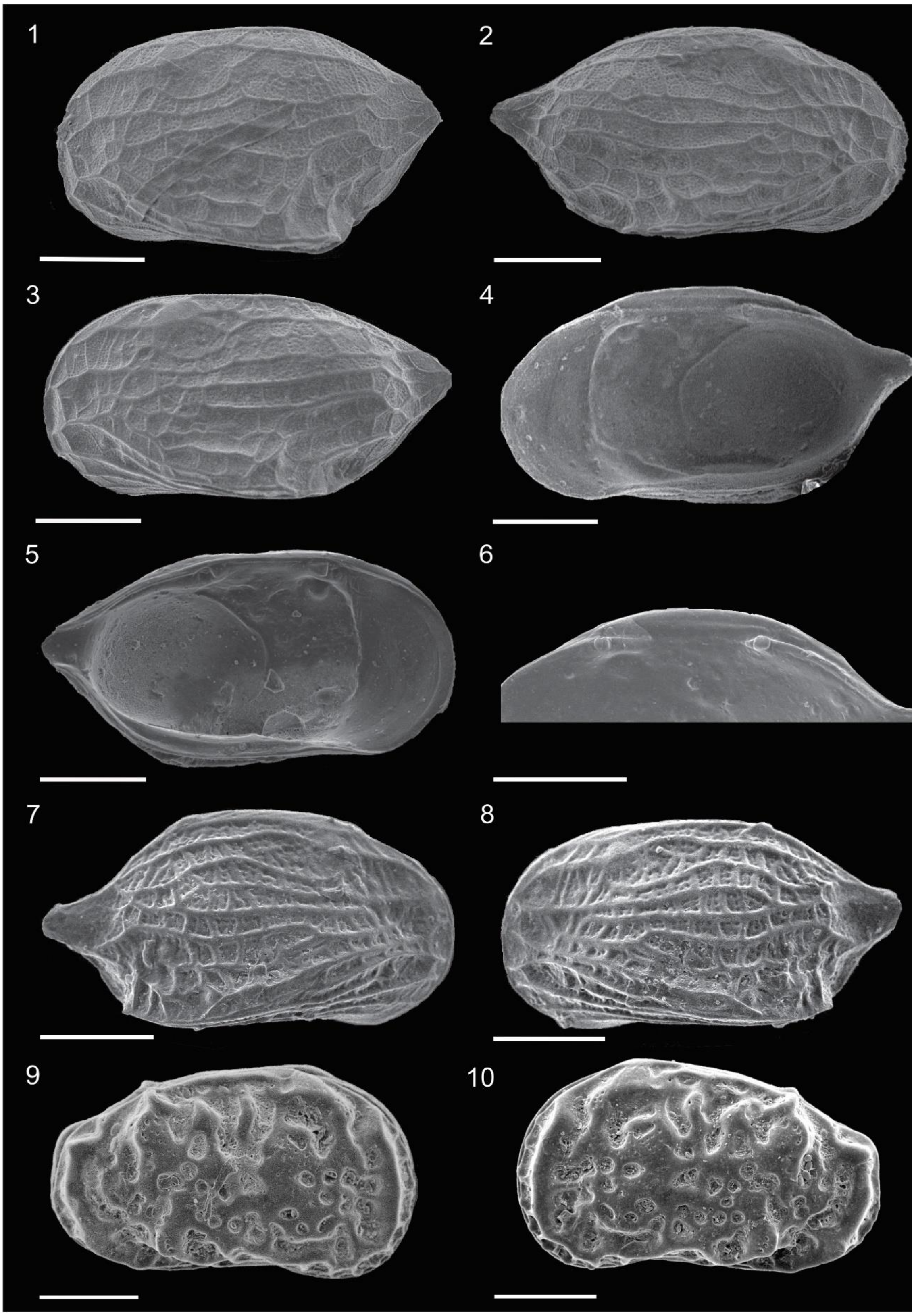

Figure 4. 1-6: ***Semicytherura parva*** **sp. nov.** 1) MP-O-2826, female, LV; 2) MP-O-2827, male, RV; 3) MP-O-2828, male, LV; 4) MP-O-2827, male, RV, internal view; 5) MP-O-2828, male, LV, internal view; 6) MP-O-2825,female, RV, hinge**. 7-8:** ***Semicytherura*** **sp.** 7) MP-O-2830, RV; 8) MP-O-2830, LV. **9-10:** ***Callistocythere craneckeyensis*.** 9) MP-O-2818, carapace, RV; 10) MP-O-2819, carapace, LV. Scale bar = 100µm.

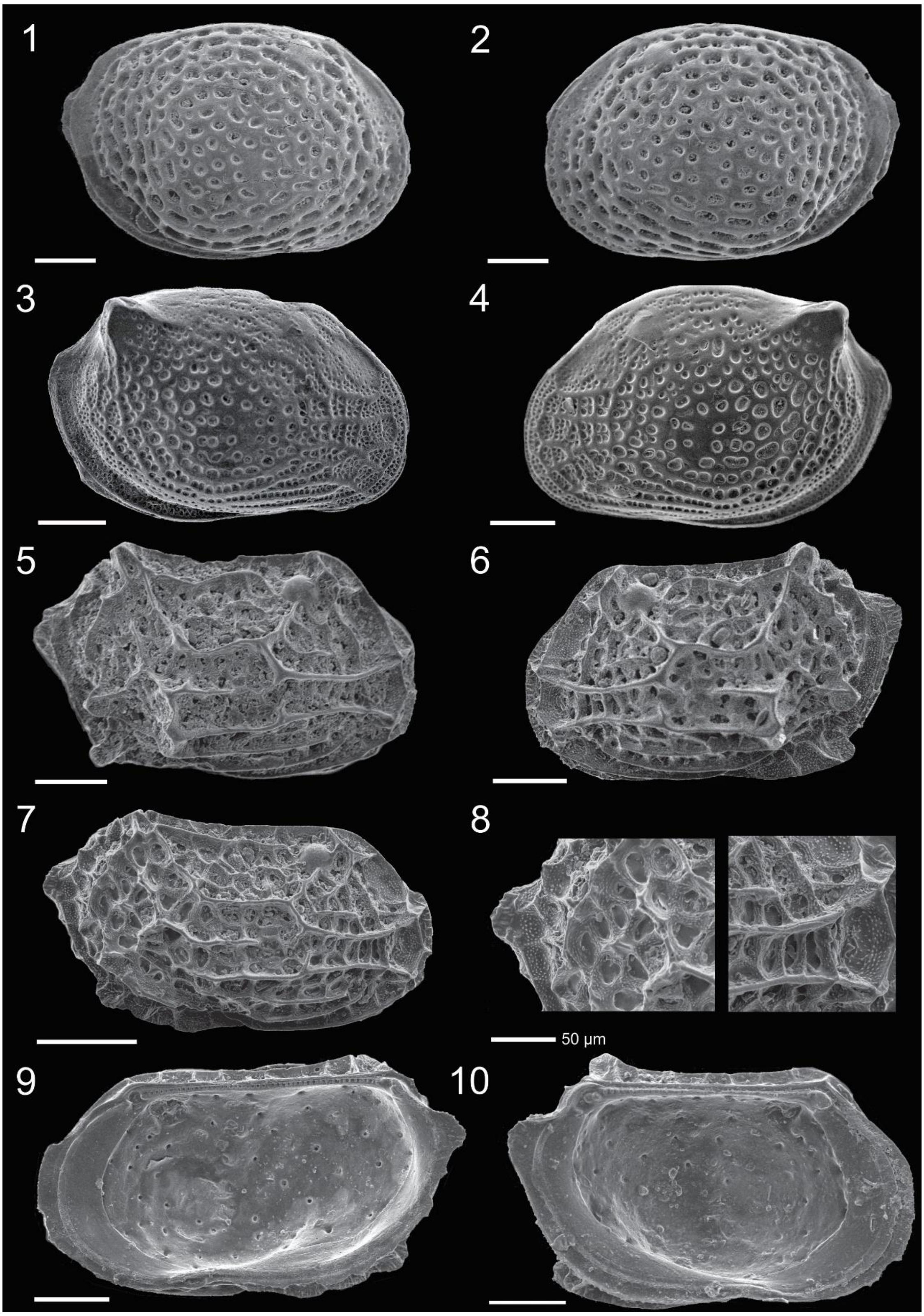

Figure 5. 1-2: ***Loxoconcha forda*****.**1) MP-O-2831, RV; 2) MP-O-2832, LV. **3-4:** ***Loxoconcha foveata*****.**3) MP-O-2833, female, RV; 4) MP-O-2834, female, LV. **5-10:** ***Loxocorniculum micropapillosum*** **sp. nov.** 5) MP-O-2836, female, RV; 6) MP-O-2835, female, LV; 7) MP-O-2837, male, RV; 8) MP-O-2837, papillae detail. 9) MP-O-2837, male, RV, internal view; 10) MP-O-2835, female, LV, internal view. Scale bar = 100µm.

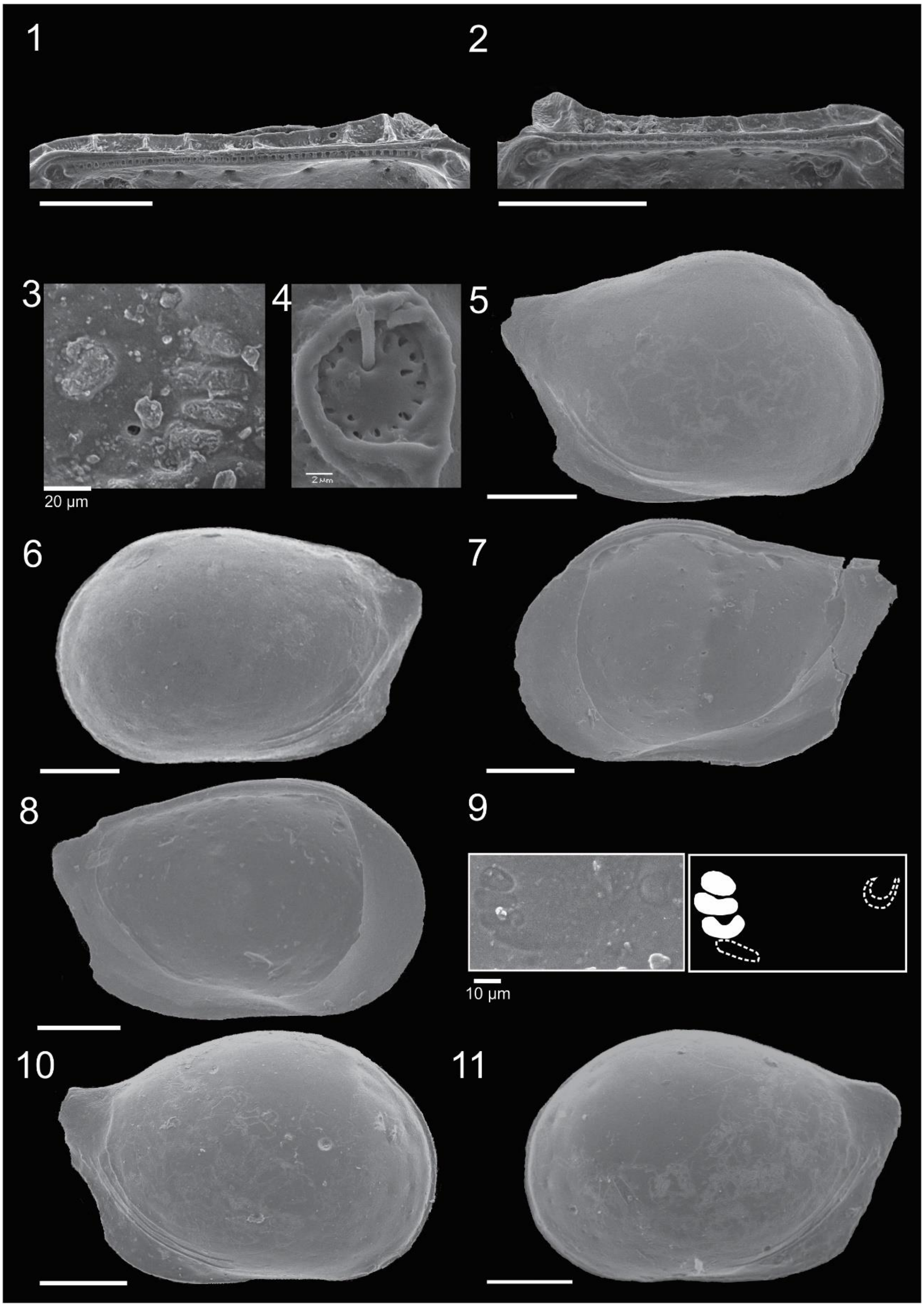

Figure 6. 1-4: ***Loxocorniculum micropapillosum*** **sp. nov.** 1) MP-O-2837, male, RV, hinge; 2) MP-O-2835, female, LV, hinge; 3) MP-O-2837, male, RV, central muscle scars; 4) MP-O-2838, juvenile, RV, sieve-type normal pore canal. **5-9:** ***Phlyctocythere christophei*** **sp. nov.** 5) MP-O-2839, RV; 6) MP-O-2840, LV; 7 MP-O-2839, RV, internal view; 8) MP-O-2840, LV, internal view; 9) MP-O-2840, LV, central muscle scars. **10-11:** ***Phlyctocythere apua*** **sp. nov.** 10) MP-O-2841, RV; 11) MP-O-2842, LV. Scale bar = 100µm.

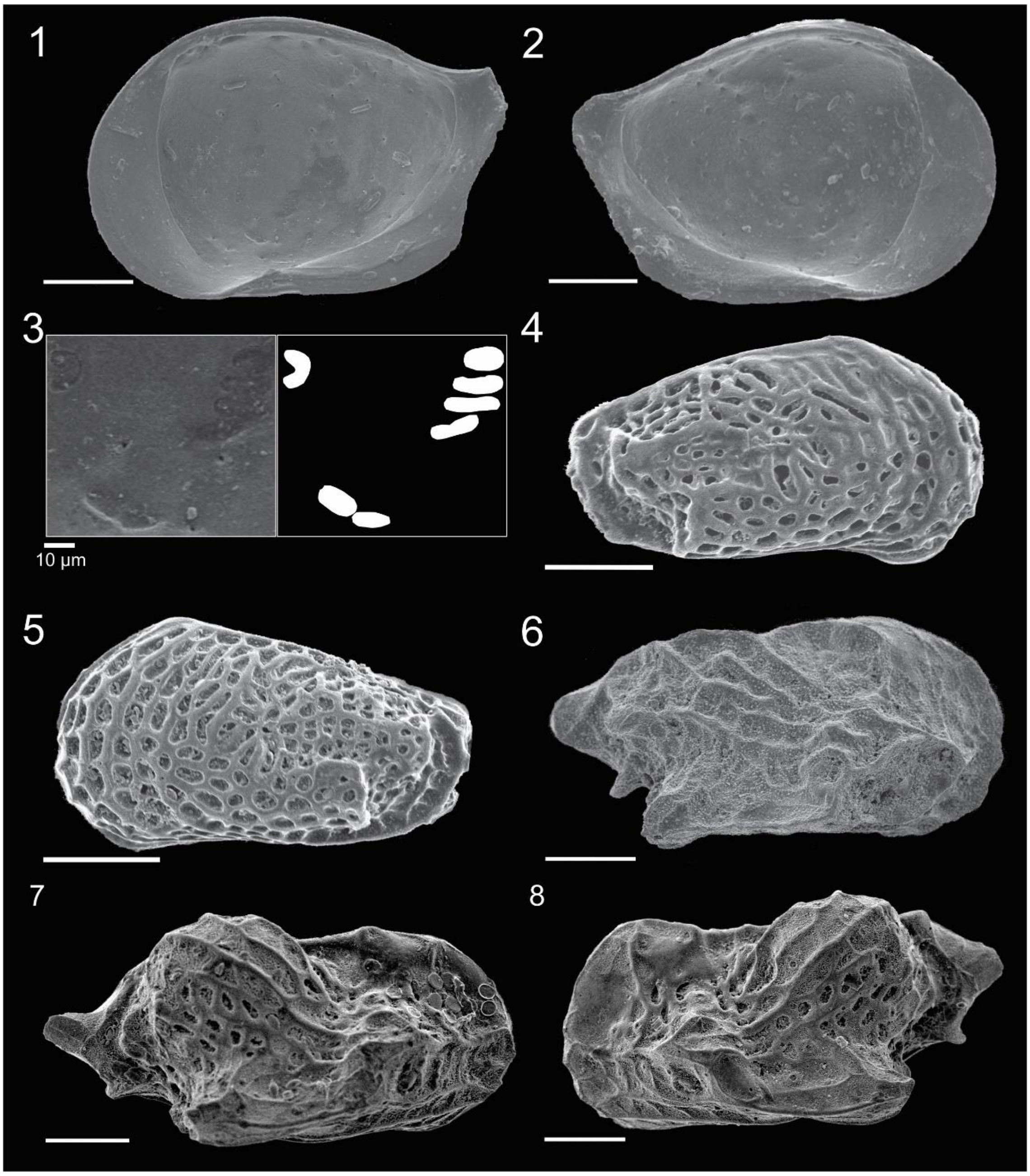

Figure 7. 1-3: ***Phlyctocythere apua*** **sp. nov.**1) MP-O-2841, RV, internal view; 2) MP-O-2842, LV, internal view; 3) MP-O-2842, LV, central muscle scars. **4-5:** ***Kotoracythere inconspicua*****.** 4) MP-O-2843, RV; 5) MP-O-2844, LV. **6)** ***Paracytheridea inflata***, MP-O-2845, male, RV. **10-11:** ***Paracytheridea tschoppi*****.** 10) MP-O-2847, RV; 11) MP-O-2848, LV. Scale bar = 100µm.

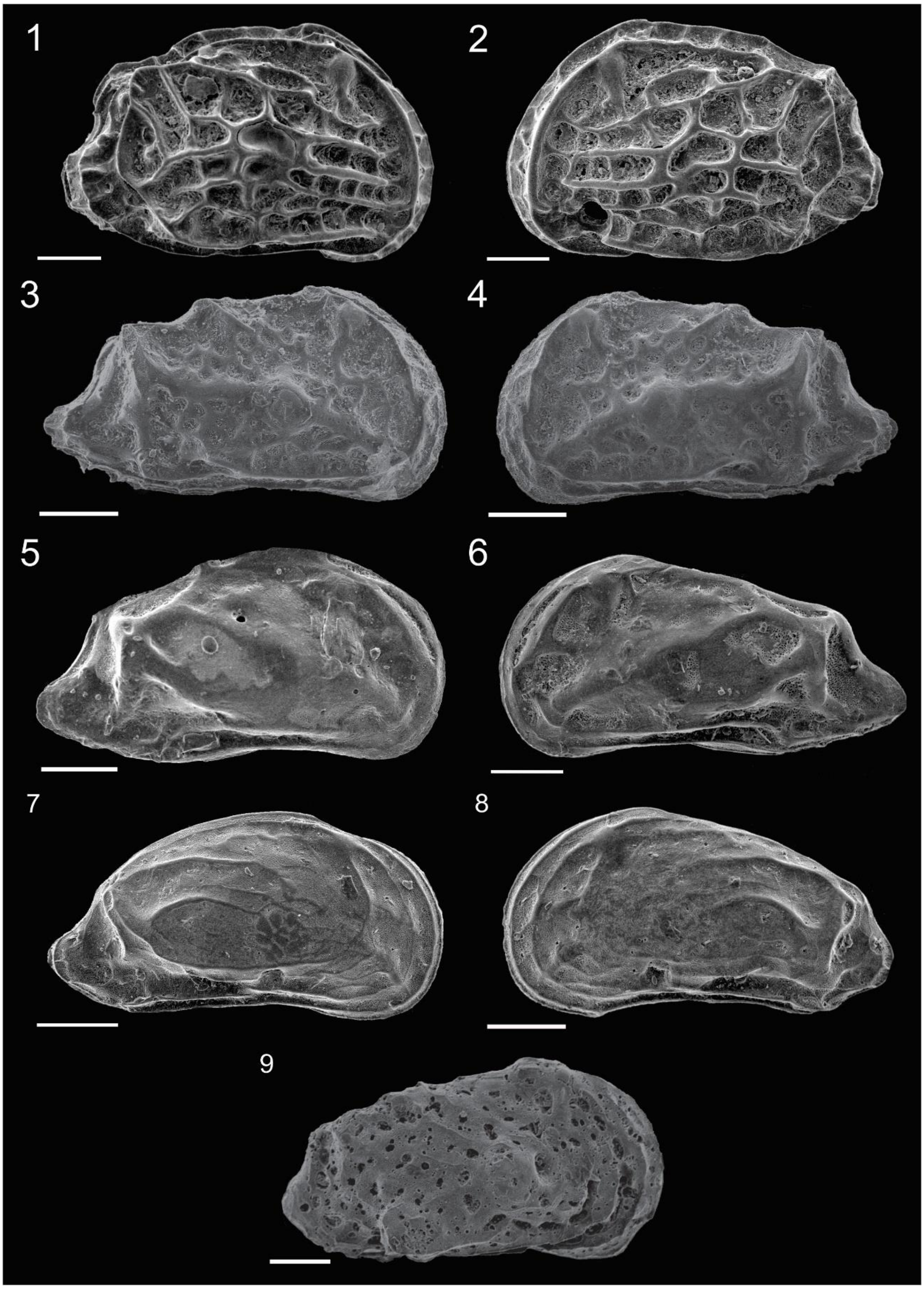

Figure 8. 1-2: ***Auradilus convolutus.*** 1) MP-O-2849, RV; 2) MP-O-2850, LV. **3-4:** ***Caudites exmouthensis*****.** 3) MP-O-2851, RV; 4) MP-O-2851, LV. **5-6:** ***Caudites obliquecostatus*****.** 5) MP-O-2852, RV; 6) MP-O-2853, LV. **7-8:** ***Caudites seminudus*****.** 7) MP-O-2854, RV; 8) MP-O-2855, LV. **9)** ***Coquimba*** **cf.** ***C. punctata***, MP-O-2858, RV. Scale bar = 100µm.

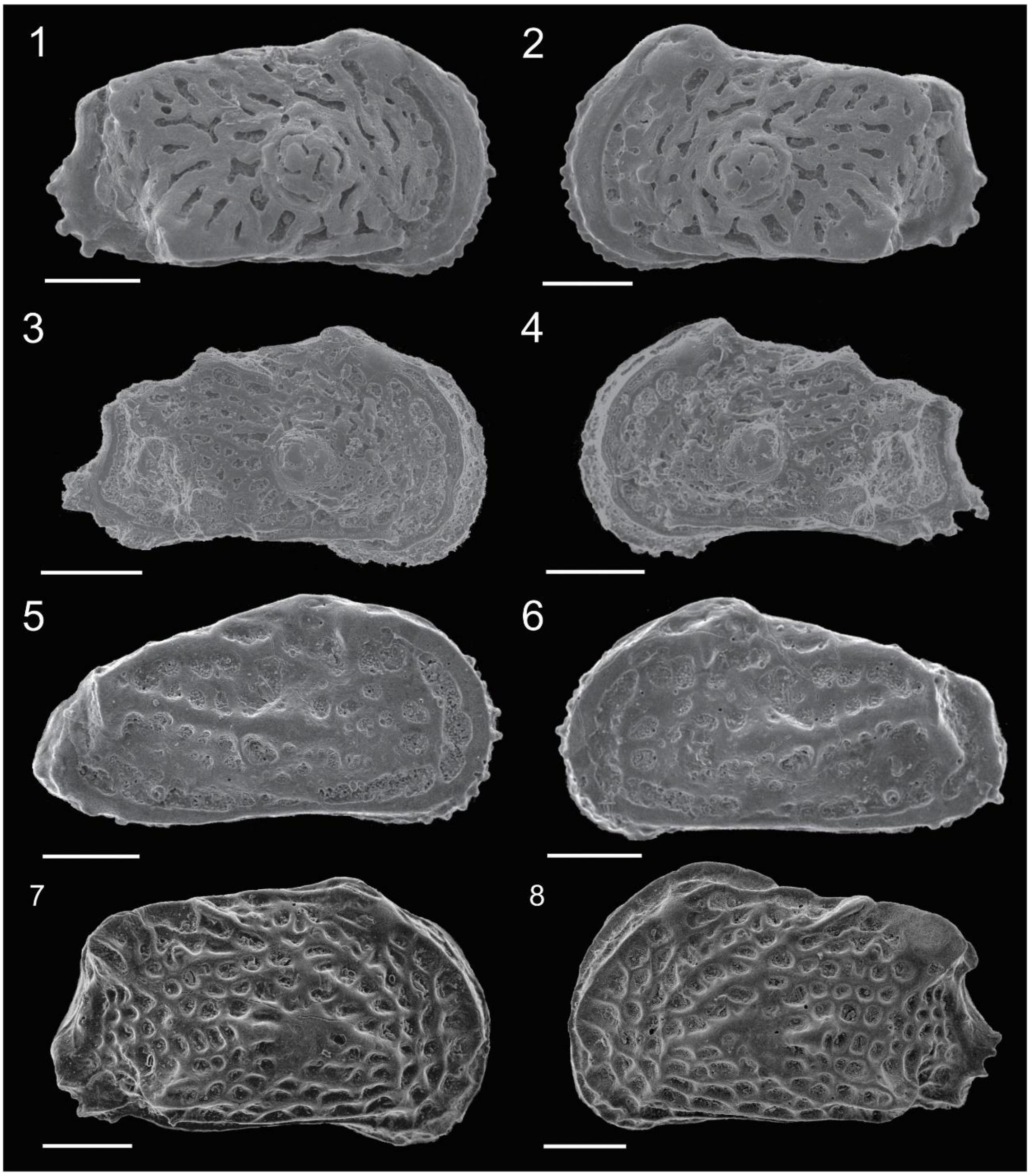

Figure 9. 1-2: ***Cornucoquimba decorata*****.** 1) MP-O-2856, RV; 2) MP-O-2856, LV. **3-4:** ***Cornucoquimba nana*****.** 3) MP-O-2857, RV; 4) MP-O-2857, LV. **5-6:** ***Neocaudites subimpressus*****.** 5) MP-O-2859, carapace, RV; 6) MP-O-2859, carapace, LV. **7-8:** ***Neohornibrookella trindadensis*****.** 7) MP-O-2860, RV; 8) MP-O-2861, LV. Scale bar = 100µm.

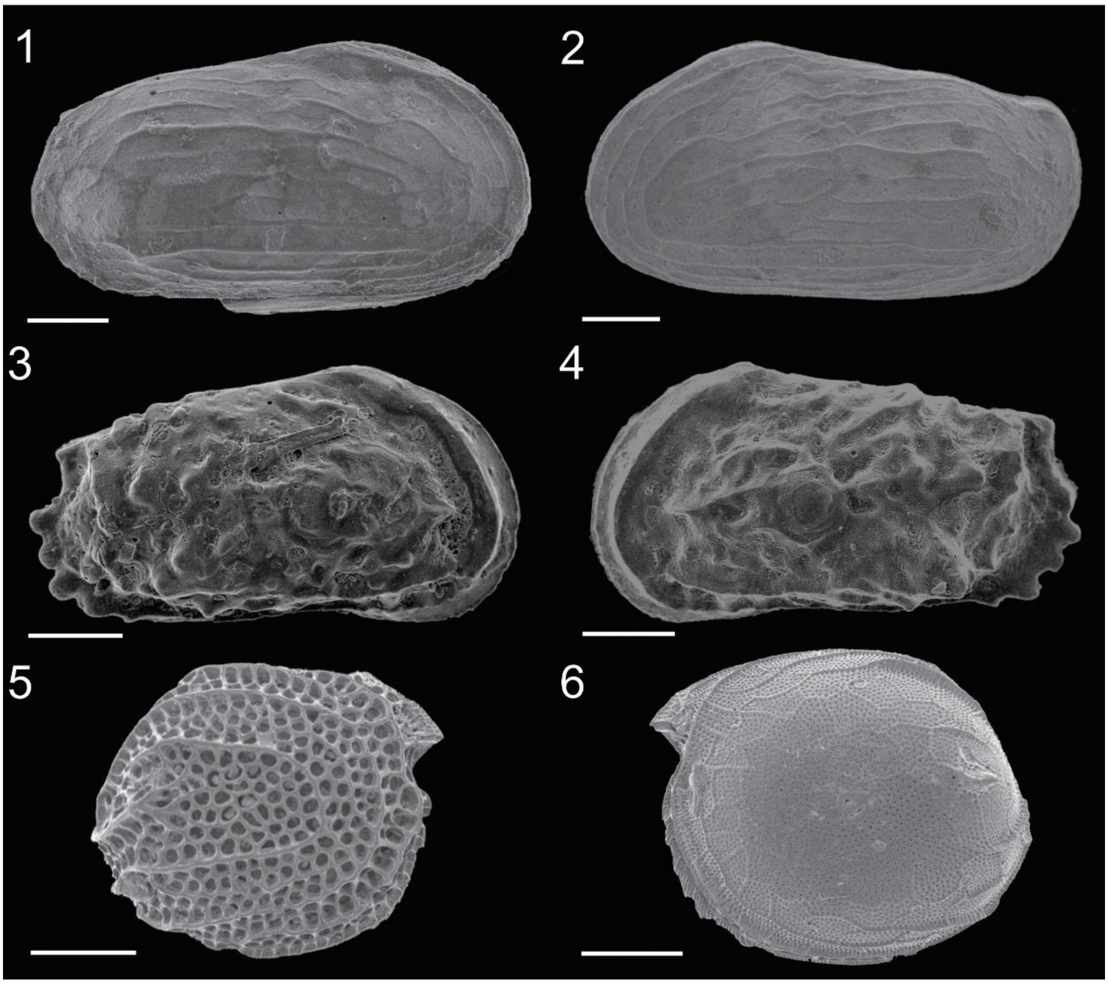

Figure 10. 1-2: *Australimoosella polypleuron*. 1) MP-O-2862, carapace, RV; 2) MP-O-2863, LV. **3-4: *Puriana variabilis.***3) MP-O-2864, RV; 4) MP-O-2865, LV. **5) *Polycope* sp. 1**, MP-O-2866, RV. **6) *Polycope* sp. 2**, MP-O-2867, LV. Scale bar = 100µm.

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Artigo 2: Benthic ostracods (Crustacea) from the Vitória-Trindade Chain, South Atlantic Ocean, with description of five new species

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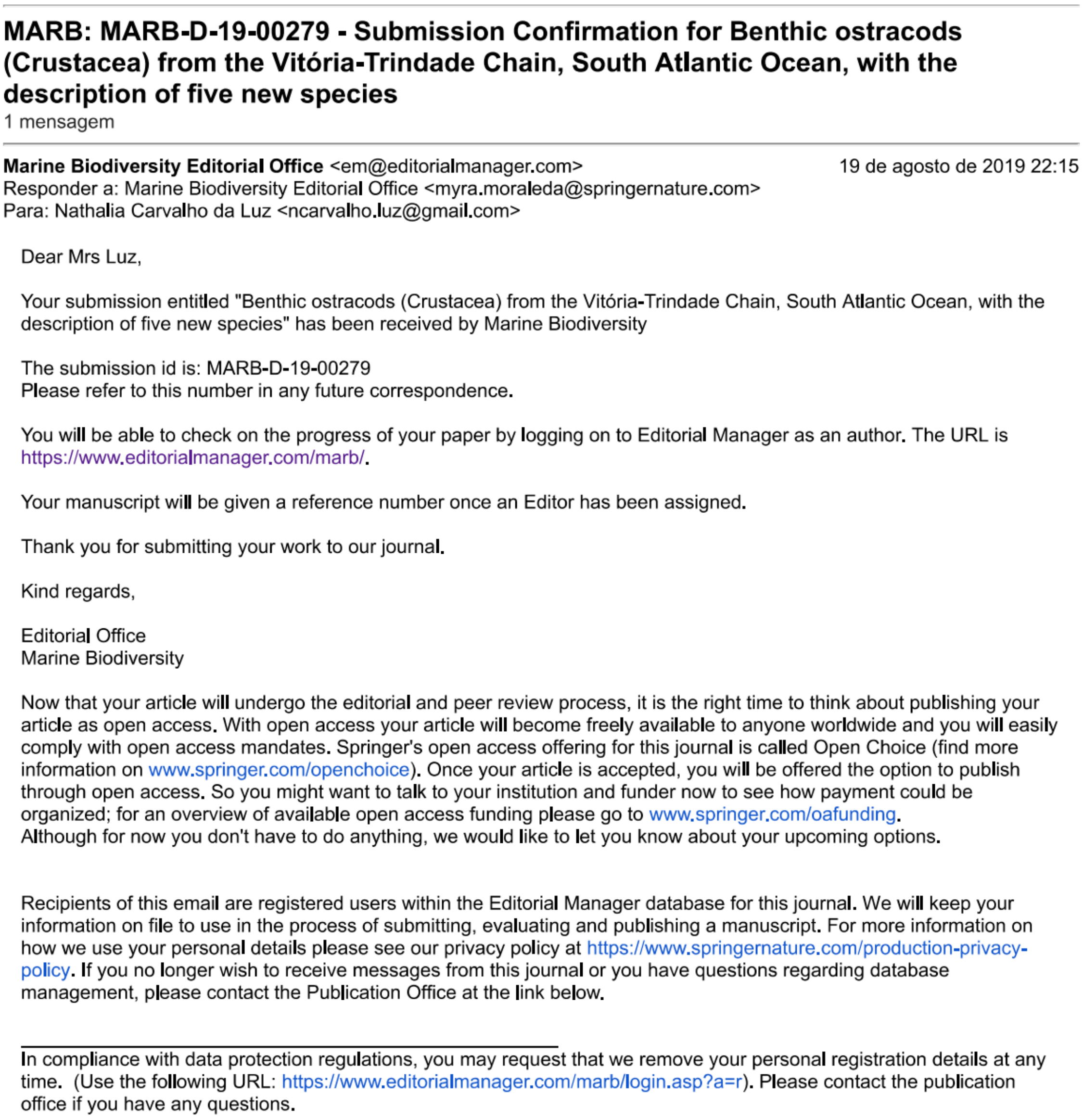

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Abstract:	The analysis of ostracods from Vitória-Trindade Chain – consisting of four seamounts and the Trindade Island – resulted in the register of 28 species belonging to 14 genera and eight families. Five new species of Cytherellidae, Bairdiidae, Bythocytheridae, and Xestoleberididae are described in this work: Keijcyoidea oceanica sp. nov., Bairdoppilata vitoriensis sp. nov., Vandenboldina kryia sp. nov., Xestoleberis acuminata sp. nov., and Xestoleberis caperata sp. nov.
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Benthic ostracods (Crustacea) from the Vitória-Trindade Chain, South Atlantic Ocean, with the description of five new species

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Abstract. The analysis of ostracods from Vitória-Trindade Chain – consisting of four seamounts and the Trindade Island – resulted in the register of 28 species belonging to 14 genera and eight families. Five new species of Cytherellidae, Bairdiidae, Bythocytheridae, and Xestoleberididae are described in this work: *Keijcyoidea oceanica* sp. nov., *Bairdoppilata vitoriensis* sp. nov., *Vandenboldina kyryia* sp. nov., *Xestoleberis acuminata* sp. nov., and *Xestoleberis caperata* sp. nov.

Keywords: Ostracoda; Taxonomy; Oceanic Islands; Seamounts.

INTRODUCTION

The present work is part of a larger study on Holocene ostracods of the Vitória-Trindade Chain (VTC), a linear sequence of volcanic elements composed of seamounts and the Trindade and Martin Vaz Archipelago, which represent the emergent portion of the chain. This archipelago is one of the most isolated areas in the Brazilian territory, but due to its location is of great importance for the expansion of the Brazilian territory into the sea. In conjunction with the continental shelf and other oceanic islands, such as the São Pedro and São Paulo Archipelago (SPSPA), Fernando de Noronha and Rocas Atoll, constitute a large territory known as ‘Amazônia Azul’ (Blue Amazon) (Almeida 2006; Viana et al. 2009; Motoki et al. 2012).

Island environments have been used as a model for several lines of research, such as biogeography, ecology, evolution and conservation biology. Seamounts are important components of many tropical and subtropical volcanic islands, although many authors consider them a distinct biome in the oceanic domain (McClain 2007; Etnoyer et al. 2010; Fernández-Palacios et al. 2014). These environments harbor endemic or rare species, the latter having a (or not) spatial relationship with other islands, seamounts top or continental shelves.

Researches carried out in the Brazilian oceanic islands during the last decade improved significantly the taxonomic knowledge on podocopid ostracods providing, moreover, zoo- and paleozoogeographic insights (Coimbra et al. 2009, 2013, 2018; Antonietto et al. 2012; Coimbra and Carreño 2012; Luz and Coimbra 2014). The Trindade Island ostracods were initially studied by Coimbra et al. (2009), who recorded 21 species, being seven in open nomenclature plus a group of indeterminate Bairdiidae. Afterwards, Coimbra and Carreño (2012) described *Tenedocythere trindadensis* (= *Neohornibrookella trindadensis*) and identified the occurrence of *Australimoosella polypleuron* Coimbra et al. 2014, until then known only for the equatorial Brazilian shelf. The genus *Australimoosella* is more common and speciose in the Australian region, being *A. polypleuron* the unique species recorded outside that region.

In this paper, we present a taxonomic study of the families Cytherellidae, Bairdiidae, Macrocyprididae, Pontocyprididae, Candonidae, Paradoxostomatidae, Bythocytheridae and Xestoleberididae based on the study of samples recovered from the top of four VTC seamounts and the shallow sea around Trindade Island. Twenty-eight species distributed in 14 genera are herein recorded, five of which are new.

MATERIAL AND METHODS

The Vitória-Trindade Chain is arranged in an east-west direction along the latitude 20°30'S, off Vitória (Espírito Santo State), extending about 1000 km. This seamount chain results from the passage of the South American plate over the Trindade plume, or Martin Vaz plume as cited by some authors. According to this model, the South American plate, when separating from the African plate, moved over the hot spot of Trindade (which lies under the island), thus activating the Vitória-Trindade Fraction Zone (Herz 1977; Thomaz-Filho et al. 2005; Almeida 2006; Motoki et al. 2012; Oliveira 2013). Most of the seamounts from VTC (Trindade and Martin Vaz islands and the seamounts Columbia, Jaseur, Davis, and Dogaressa) are cone-shaped volcanic buildings. On the other hand, Vitória, Besnard, and Congress, which lie closer to the continental shelf, are morphologically different, suggesting that they could be shelf fragments (Fodor and Hanan 2000; Skolotnev et al. 2010; Motoki et al. 2012).

The study material comes from four seamounts summits of the Vitoria-Trindade Chain (Vitoria, Jaseur, Davis, and Dogaressa) and Trindade Island (Fig. 1). The samples were donated to the Calcareous Microfossils Laboratory (UFRGS) by Professor Jean Christophe Joyeux (UFES). The sampling was carried out with advanced techniques of deep-dive, at depths varying from 18 to 65 m. The shelves of these four seamounts are covered by encrusting calcareous algae, scleractinian corals and hydrocorals. The carbonate shelf below the rhodoliths beds and reef structures presents about 300 m of thickness.

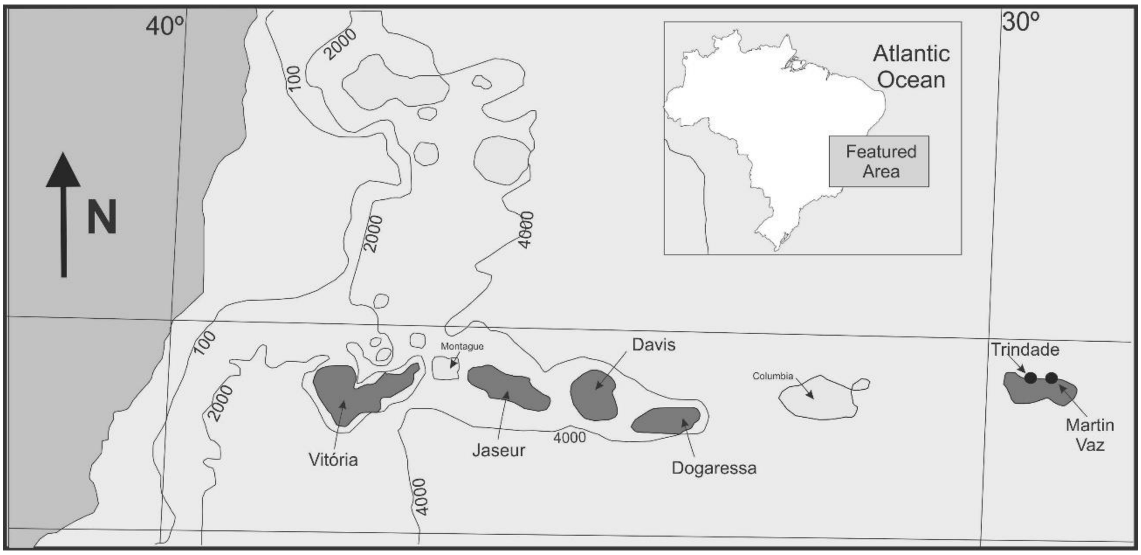

Figure 7. Location map of Vitória-Trindade Chain (Modified from Almeida 2006).

The Trindade Island samples were obtained by the first author by manual collection (for beach samples, less than 1 m water depth), and Van Veen dredge and free diving for deeper sites (Fig. 2), during four sampling campaigns. Due to the institution of scientific programs devoted exclusively to oceanic islands by the Brazilian Navy in partnership with CNPq (a Brazilian science development agency) (e.g. PROTRINDADE), the access to these remote areas became relatively easier enabling continuous acquisition of samples in a larger area of the Trindade Island.

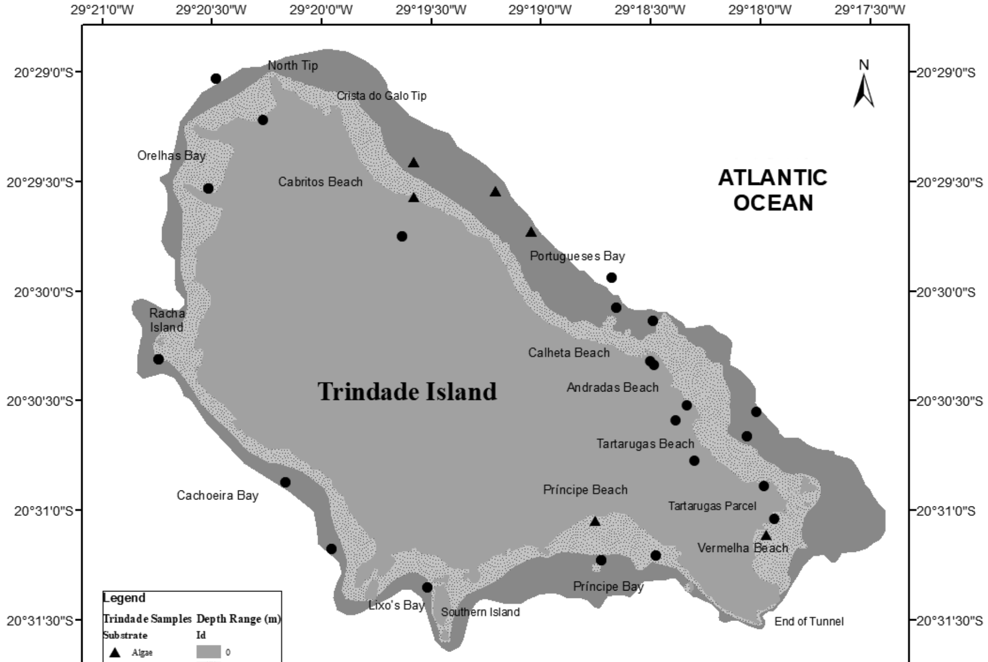

Figure 8. Trindade Island map indicating the sampling sites. Bathymetry based on the nautical chart provided by the 'Diretoria de Hidrografia e Navegação' (DHN) of the Brazilian Navy.

The suprageneric taxonomy follows Liebau (2005). The material herein analyzed is hold in the collections of the 'Museu de Paleontologia Irajá Damiani Pinto', Section of Ostracoda, of the 'Universidade Federal do Rio Grande do Sul' (UFRGS), identified by the prefix MP-O. All SEM (Scanning Electronic Microscopy) images were obtained at the 'Centro de Microscopia e Microanálises' at UFRGS.

Abbreviations: v= valve, C= carapace, RV= right valve, LV= left valve, H= height, L= length, W= width.

RESULTS

Systematic

Subclass Ostracoda Latreille, 1802
Order Platycopida Sars, 1866
Superfamily Cytherelloidea Sars, 1866
Family Cytherellidae Sars, 1866
Genus *Keijcyoidea* Malz, 1981
***Keijcyoidea oceanica* sp. nov.**
(Figs. 3a-l)
2009 *Keijcyoidea* sp. Coimbra, Ghilardi, Casetta and Bergue, fig. 5.1A, table 5.3.
2012 *Keijcyoidea* sp. Coimbra and Carreño, p. 194, tab. 2.

Etymology. With reference to its distribution along the Vitória-Trindade Chain.

Type-material. Holotype: MP-O-2770, female, open carapace. Paratypes: MP-O-2771, female, open carapace; MP-O-2772, male, C; MP-O-2773, female, C; MP-O-2774, male, C.

Type-locality. Vitória seamount.

Dimensions:

	L (mm)	H (mm)	W (mm)
MP-O-2770 (female, RV)	0.624	0.358	-
MP-O-2770 (female, LV)	0.618	0.339	-
MP-O-2771 (female, RV)	0.620	0.359	-
MP-O-2771 (female, LV)	0.610	0.341	-
MP-O-2772 (male, LV)	0.521	0.313	-
MP-O-2773 (female, C)	0.592	-	0.251

MP-O-2774 (male, C)	0.527	-	0.191

Material. Dead assemblage: 92 adults and 60 juveniles. Living assemblage: six adults.

Diagnosis. A medium to large sized species of *Keijcyoidea*. Carapace sub-rectangular in lateral view. Surface ornamented with very small and circular punctae, mainly centrally; in the other regions, cribrose and irregular fossae predominate. Longitudinal ribs moderately weak for the genus. Small denticles adorn the anterior margin. Sexual dimorphism pronounced, female much larger and sub-triangular in dorsal view, male sub-elliptical.

Description. Medium to large carapace. Sub-rectangular in lateral view, with slightly sinuous ventral margin. Dorsal margin gently convex in RV, with delicate concavity towards anterior, more conspicuous in LV. Anterior end broadly rounded, more evenly rounded in LV; posterior end obliquely truncated mainly in RV. Slightly inequivalve, with RV overlapping LV in the dorsal margin and somewhat in the posteroventral end. Greatest length dorsally; greatest height just behind the middle; greatest width posteriorly. Surface ornamented with very small and circular punctae, mainly centrally; in the other regions, cribose and irregular fossae predominate. Adductor muscle area smooth, sometimes with conspicuous scars in external view. A delicate sub-marginal ridge begins in the dorsal margin and runs anteriorly to the posteroventral angle, more peripheral ventrally. A well-developed lateral elongate concavity extends dorsally, above the adductor muscle area. Two delicate, sinuous horizontal ridges emerge in the posterior half. The ventral one, larger and more sinuous, runs two-thirds of the length; the dorsal one is much shorter and runs one third or less. In most specimens, these two ridges meet a vertical posterior ridge. Hinge consists of a selvage modified mid-dorsally to form a socket in the LV and a complementary tooth in the RV. Adductor muscle scars typical for the genus, arranged in two vertical and slightly curved rows, convex anteriorly. Sexual dimorphism pronounced, female much larger and sub-triangular in dorsal view, male sub-elliptical. Male RV with a shorter posterior vertical ridge, somewhat nodular dorsally.

Stratigraphic range. Recent.

Occurrence and distribution. Vitória, Davis and Dogaressa seamounts and Trindade Island.

Remarks. *Keijcyoidea oceanica* sp. nov. resembles *Keijcyoidea* sp. Coimbra et al., 2013 of São Pedro and São Paulo Archipelago (SPSPA), but they differ mainly in the contour of the dorsal margin, which is quite sinuous in the latter. Regarding the ornamentation, the species from SPSPA possesses fossae-like ornament bordering the anterior region and different ridge pattern.

Order Podocopida Sars, 1866

Suborder Bairdiocopina Gründel, 1967

Superfamily Bairdioidea Sars, 1865

Family Bairdiidae Sars, 1865

Genus *Bairdoppilata* Coryell, Sample and Jennings, 1935

***Bairdoppilata vitoriensis* sp. nov.**

(Figs. 4a-f)

Etymology. With reference to the type-locality, Vitória seamount.

Type-material. Holotype: MP-O-2775, RV. Paratypes: MP-O-2776, LV; MP-O-2777, C.

Type-locality. Vitória seamount.

Dimensions.

	L (mm)	H (mm)
MP-O-2775 (RV)	1.083	0.653
MP-O-2776 (LV)	1.031	0.662
MP-O-2777 (C, RV)	1.010	0.602
MP-O-2777 (C, LV)	1.030	0.661

Material. Dead assemblage: 11 adults and 8 juveniles. Living assemblage: 1 adult and 2 juveniles.

Diagnosis. A large and moderately thick-shelled species of *Bairdoppilata*. Dorsal margin strongly dipping towards posterior, mainly in RV. Anteroventral slope bearing a narrow and fragile flange. Surface smooth with sparse normal pore canals.

Description. Carapace smooth, large and bairdoppilate in lateral view, subovate in dorsal view. Moderately thick-shelled. LV greater than RV, overlapping almost all margins except the anteroventral slope; the overlap is very pronounced dorsally and along the posterodorsal and anterodorsal slopes. Maximum length just below the mid-height; maximum height median in LV and at anterior ~1/3 of length in RV; maximum width median. Cardinal angles conspicuous in RV, mainly posteriorly. Anterior margin asymmetrically rounded in LV, more bluntly rounded in RV. Anterodorsal slope almost straight, anteroventral slope larger and convex bearing a narrow and fragile flange, usually partial or totally broken. Posterior margin somewhat truncate, acuminate ventrally, more projected in RV. Posterodorsal slope large, almost straight; posteroventral slope very short and convex. Dorsal margin arched in LV and approximately straight in RV, dipping towards posterior. Ventral margin almost straight in LV, gentle oral concavity in RV. Surface smooth with sparse normal pore canals. Internal features typical for the genus; hinge with well-developed terminal dentition. Sexual dimorphism not observed.

Stratigraphic range. Recent.

Occurrence and distribution. Vitória seamount and Trindade Island.

Remarks. *Bairdoppilata vitoriensis* sp. nov. occurs in sediments of the seamounts chain; one specimen was recorded in the Trindade Island. This species is quite different from any other Brazilian species of this genus, mainly due to its outline and the delicate flange along the anteroventral slope.

Genus *Neonesidea* Maddocks, 1969

Neonesidea longisetosa (Brady, 1902)

(Figs. 4g-h)

1902 *Bairdia longisetosa* Brady, p. 197, pl. 35, figs. 8-9.

1963 *Bairdia gerda* Benson and Coleman, p. 19-20, fig. 8, pl. 1, figs. 14-16.

1969 *Neonesidea gerda* (Benson and Coleman)—Maddocks, p. 24-26, fig. 7.

1994 *Neonesidea longisetosa* (Brady)—Krutak and Gío-Argáez, p. 200, pl. 2, figs. 1-5, tables 2, 4, appendix 1.

2002 *Neonesidea longisetosa* (Brady)—Coimbra and Carreño, p. 193-194, pl. 2, figs. 21-22 (see this paper for a more complete synonymy).

2009 Bairdiidae sp. Indet. 2 Coimbra, Ghilardi, Casetta and Bergue, figs. 5.1E-F.

2014 *Neonesidea longisetosa* (Brady)—Meireles, Keyser, Borges, Silva, Martins and Ávila, pl. 2, fig. 9.

Figured specimen. MP-O-2778, open carapace.

Dimensions.

	L (mm)	H (mm)
MP-O-2778 (RV)	1.033	0.569
MP-O-2778 (LV)	1.032	0.591

Material. 10 adults and 2 juveniles (dead assemblage).

Stratigraphic range. Late Miocene to Recent.

Occurrence and distribution. In this paper: Vitória and Davis seamounts. Occurs also in the Recent of other Brazilian territorial waters (Northern, Northeastern and Eastern shelves), Azores Archipelago (Portugal), Bahamas, Belize, Colón Harbor (Panama), Florida (USA), Gulf of Mexico, Virgin Islands (Caribbean), Yucatán Peninsula (Mexico).

Neonesidea sp. 1

(Fig. 4i)

2009 *Neonesidea* sp. Coimbra, Ghilardi, Casetta and Bergue, fig. 5.1I.

Figured specimen. MP-O-2779, RV.

Dimensions.

	L (mm)	H (mm)
MP-O-2779 (RV)	0.631	0.337

Material. Dead assemblage: 42 juveniles. Living assemblage: 9 juveniles.

Stratigraphic range. Recent.

Occurrence. Vitória and Dogaressa seamounts and Trindade Island.

***Neonesidea* sp. 2**

(Fig. 4j)

Figured specimens. MP-O-2780, RV.

Dimensions.

	L (mm)	H (mm)
MP-O-2780 (RV)	0.618	0.312

Material. 2 juveniles (Dead assemblage).

Stratigraphic range. Recent.

Occurrence. Vitória seamount and Trindade Island.

Genus *Paranesidea* Maddocks, 1969

***Paranesidea* cf. *P. conulifera* (Bonaduce, Masoli and Pugliese, 1976)**

(Figs. 5a-c)

2009 *Paranesidea parabipustulosa* Coimbra and Carreño—Coimbra, Ghilardi, Casetta and Bergue, p. 131, table 5.3 (non) 2002 *Paranesidea parabipustulosa* Coimbra and Carreño, p. 190, pl. 1, figs. 3-9.

2012 *Paranesidea parabipustulosa* Coimbra and Carreño—Coimbra and Carreño, table 2 (non) 2002 *Paranesidea parabipustulosa* Coimbra and Carreño, p. 190, pl. 1, figs. 3-9.

Figured specimens. MP-O-2781, RV; MP-O-2782, RV; MP-O-2783, LV.

Dimensions.

	L (mm)	H (mm)
MP-O-2781 (RV)	0.925	0.507
MP-O-2782 (RV)	1.041	0.568
MP-O-2783 (LV)	1.161	0.758

Material. Dead assemblage: 18 adults and 28 juveniles. Living assemblage: 1 adult.

Stratigraphic range. Recent.

Occurrence. Vitória seamount and Trindade Island.

Remarks. Maddocks (1995) reallocated *Neonesidea conulifera* Bonaduce, Masoli and Pugliese, 1978 in the genus *Paranesidea*. According to her, the specimens of *P. conulifera* encompass a range of morphotypes, showing variation both in size and degree of development of the ornaments. The author found smaller specimens strongly punctuate and bearing pustules more developed, while the larger specimens were slightly punctuated and less pustular. Thus, Maddocks (1995), pointed the species *P. bipustulosa* Titterton and Whatley 1988a as another morphotype of *P. conulifera*. The pustulous specimens found in the Vitória-Trindade presented similar variation between seamounts and island. The species seems to belong to *P. conulifera* group, including the different morphotypes, but due to slight differences in the marginal fringe and the pattern of punctuation the material herein studied is left in *"conferatur"*.

Genus *Triebelina* Bold, 1946

***Tribelina sertata* Triebel, 1948**

(Figs. 5e-f)

1948 *Triebelina sertata* Triebel, p. 19, figs. 1-2.

1988 *Triebelina sertata* Triebel—Malz and Lord, p. 66-68, pl. 1, figs. 1-7.

1995 *Triebelina sertata* Triebel—Maddocks, p. 214, pl. 7, figs. 1-2, p. 11, figs. 1-4.

2004 *Triebelina sertata* Triebel—Whatley, Jones and Roberts, p. 501-502, pl. 2, figs. 9-10 (see this paper for a more complete synonymy).

2009 *Triebelina sertata* Triebel—Coimbra, Ghilardi, Casetta and Bergue, fig. 5.1J, table 5.3.

2012 *Triebelina sertata* Triebel—Coimbra and Carreño, table 2.

2013 *Triebelina sertata* Triebel—Coimbra, Bottezini and Machado, p. 294, figs. 21-24.

Figured specimens. MP-O-2784, RV; MP-O-2785, LV.

Dimensions.

	L (mm)	H (mm)
MP-O-2784 (RV)	0.522	0.265
MP-O-2785 (LV)	0.486	0.248

Material. Dead assemblage: 40 adults and 27 juveniles. Living assemblage: 2 adults and 2 juveniles.

Stratigraphic range. Upper Miocene to Recent.

Occurrence and distribution. In this paper: Trindade Island and Vitória seamount. Occurs also in the Recent of other Brazilian territorial waters (Equatorial shelf, SPSPA and Rocas Atoll) and other seas such as Red Sea, Persian Gulf, Indonesia, Malaysia, Madagascar, Caribbean, and the islands of Clipperton, Solomon, Pitcairn, Henderson, Socotra, and La Reunion. Fossil: Philippines (Late Miocene), Andaman Island and Northern Sumatra (Early Pliocene). For a more detailed discussion of this topic, see Whatley et al. (2004, p. 502).

Remarks. *Triebelina sertata* is part of the small group of shallow water benthonic species with pan-tropical distribution. One of the hypotheses raised is that its occurrence is related to the Tethyan history, and has developed separate populations after the rise of the Mediterranean Sea (Malz and Lord 1988; Titterton and Whatley 1988b). Coimbra et al. (2013), in a study on ostracods from the very isolated Archipelago of São Pedro and São Paulo, also presented a discussion of the zoo- and paleozoogeography of pan-tropical benthonic ostracod species, including *T. sertata*.

***Triebelina* sp.**

(Fig. 5d)

Figured specimen. MP-O-2786, RV.

Dimensions.

	L (mm)	H (mm)
MP-O-2786 (RV)	0.493	0.251

Material. 2 juveniles (Dead assemblage).

Stratigraphic range. Recent.

Occurrence. Davis and Dogaressa seamounts.

Remarks. *Triebelina* sp. resembles the species of *Tribelina* recorded by Machado (2008), also in open nomenclature, on the Brazilian continental shelf. Although both species have similarity in contour and in the punctate ornamentation, the specimens herein studied are smaller, have a less dense punctuation, more sinuous ventral margin and posteroventral fringe, not observed in the Brazilian shelf specimens.

Suborder Cypridocopina Jones, 1901

Superfamily Macrocypridoidea Müller, 1912

Family Macrocyprididae Müller, 1912

Genus *Yemanja* Brandão, 2010

***Yemanja coimbrai* (Brandão 2005)**

(Fig. 5g)

2005 *Macrocyprina coimbrai* Brandão, p. 235-241, figs. 11-14.
2008 *Macrocyprina coimbrai* Brandão—Machado, appendix 1.
2009 *Macrocyprina* sp. Coimbra, Ghilardi, Casetta and Bergue, fig. 5.1B, table 5.4.
2010 *Yemanja coimbrai* (Brandão 2005)—Brandão, p. 586, figs. 5-6.
2012 *Macrocyprina* sp., Coimbra and Carreño, table 2.

Figured specimen. MP-O-2787, RV.

Dimensions.

	L (mm)	H (mm)
MP-O-2787 (RV)	1.531	0.602

Material. 53 adults and 73 juveniles (dead assemblage).

Stratigraphic range. Recent.

Occurrence and distribution. In this paper: Vitória seamount and Trindade Island. In Brazil, occurs also in the Northeastern region: in the Abrolhos Archipelago (South of Bahia State) and Rocas Atoll (Rio Grande do Norte State).

Remarks. *Yemanja coimbrai* was described based on living material recovered around the Abrolhos Archipelago, Bahia state. This species is relatively easily distinguished from the others *Yemanja* registered in the Brazilian shelf by the arrangement of the opaque spots on the carapace surface, the pattern of marginal pore canals and its very large size.

Superfamily Pontocypridoidea Müller, 1894

Family Pontocyprididae Müller, 1894

Genus *Australoecia* McKenzie, 1967

***Australoecia neritica* Sartori and Coimbra 2010**

(Fig. 5h)

2010 *Australoecia neritica* Sartori and Coimbra, p. 118-119, figs. 2A-I (see this for a more complete synonymy).

Figured specimen. MP-O-2788, C.

Dimensions.

	L (mm)	H (mm)
MP-O-2788 (LV)	0.566	0.239
MP-O-2788 (RV)	0.491	0.226

Material. Dead assemblage: 1 adult. Living assemblage: 1 adult.

Stratigraphic range. Recent.

Occurrence and distribution. In this paper: Vitória and Dogaressa seamounts. In Brazil, also occurs in the Eastern and Northeastern shelves.

Remarks. Most species of the genus *Australoecia* are bathyal. However, A. *neritica* fits in the smaller group composed of shallow water elongate species, as discussed since Maddocks (1977).

Genus *Propontocypris* Silvester-Bradley, 1947

Propontocypris sp. 1

(Figs. 5i-j)

Figured specimen. MP-O-2789, C.

Dimensions.

	L (mm)	H (mm)
MP-O-2789 (RV)	0.543	0.266
MP-O-2789 (LV)	0.528	0.256

Material. Dead assemblage: 8 adults, 4 juveniles. Living assemblage: 2 juveniles.

Occurrence. Vitória, Jaseur and Davis seamounts.

Propontocypris sp. 2

(Figs. 6a-b)

Figured specimen. MP-O-2790, RV.

Dimensions.

	L (mm)	H (mm)
MP-O-2790 (RV)	0.532	0.245

Material. 2 adults (dead assemblage).

Occurrence. Dogaressa seamount.

Propontocypris sp. 3

(Figs. 6c-d)

Figured specimen. MP-O-2791, RV.

Dimensions.

	L (mm)	H (mm)
MP-O-2791 (RV)	0.479	0.241

Material. 1 adult (dead assemblage).

Occurrence. Vitória seamount.

Superfamily Cypridoidea Baird, 1845

Family Candonidae Kaufmann, 1900

Genus *Paracypris* Sars, 1866

***Paracypris* sp. 1**

(Fig. 6e)

Figured specimen. MP-O-2792, RV.

Dimensions.

	L (mm)	H (mm)
MP-O-2792 (RV)	0.543	0.278

Material. 9 adults and 4 juveniles (dead assemblage).

Occurrence. Trindade Island.

***Paracypris* sp. 2**

(Fig. 6f)

Figured specimen. MP-O-2793, RV.

Dimensions.

	L (mm)	H (mm)
MP-O-2793 (RV)	0.525	0.242

Material. 1 adult and 1 juvenile (living assemblage).

Occurrence. Vitória seamount.

Suborder Cytherocopina Gründel, 1967

Superfamily Paradoxostomatoidea Brady and Norman, 1889

Family Paradoxostomatidae Brady and Norman, 1889

Genus *Paradoxostoma* Fischer, 1855

***Paradoxostoma* sp. 1**

(Figs. 6g-h)

Figured specimens. MP-O-2794, RV; MP-O-2795, LV.

Dimensions.

	L (mm)	H (mm)
MP-O-2794 (RV)	0.588	0.302
MP-O-2795 (LV)	0.586	0.294

Material. 4 adults and 1 juvenile (dead assemblage).

Occurrence. Vitória seamount.

***Paradoxostoma* sp. 2**

(Fig. 6i)

Figured specimen. MP-O-2796, C.

Dimensions.

	L (mm)	H (mm)
MP-O-2796 (RV)	0.599	0.238
MP-O-2796 (LV)	0.603	0.243

Material. 1 adult and 1 juvenile (living assemblage).

Occurrence. Trindade Island.

***Paradoxostoma*? sp. 3**

(Fig. 6j)

Figured specimen. MP-O-2797, C.

Dimensions.

	L (mm)	H (mm)
MP-O-2797 (RV)	0.418	0.219

Material. 1 adult (dead assemblage).

Occurrence. Trindade Island.

Superfamily Bythocytheroidea Liebau, 2005

Family Bythocytheridae Sars, 1866

Genus *Vandenboldina* Wilson, 2010

Remarks. Bold (1965) described the new genus *Pseudoceratina* (type-species: *Pseudoceratina droogeri*) to the Caribbean region. However, due to homonymy with a sponge genus from Australia (*Pseudoceratina* Carter, 1885), Wilson (2010) proposed a new name for the genus, renaming it *Vandenboldina*, type-species *Vandenboldina droogeri* (Bold, 1965).

Vandenboldina kyryia **sp. nov.**

(Figs. 7a-i)

2008 *Pseudoceratina droogeri* Bold—Machado, p. 74-75, pl. 03, fig. 1.

(non) 1965 *Pseudoceratina droogeri* Bold, p. 161-164, figs. 1-2, pl. 1, figs. 1-4.

Etymology. Tupi-Guarani origin, ‘*kyrÿi’*= rare, with reference its restricted distribution and low abundance.

Type-material. Holotype: MP-O-2798, RV. Paratype: MP-O-2799, LV; MP-O-2800, RV (lost specimen); MP-O-2801, LV (lost specimen).

Type-locality. Dogaressa seamount.

Dimensions.

	L (mm)	H (mm)
MP-O-2798 (RV)	0.481	0.216
MP-O-2799 (LV)	0.477	0.217
MP-O-2800 (RV)	0.489	0.225
MP-O-2801 (LV)	0.508	0.233

Material. 9 adults (dead assemblage).

Diagnosis. A small species of *Vandenboldina*, subrectangular in lateral view. Surface delicately ornamented by predominantly pentagonal reticles. Anterior and posterior margins bordered by a well-defined ponticulate carina, often partially broken. Ventrolateral alae turn into two hollow ornate processes joined at the base by a small arched ridge.

Description. Carapace small, subrectangular elongate in lateral view. Greatest height near the anterior end. Greatest width in the posterior ventrolateral process. Dorsal margin long and straight, somewhat hindered by a sinuous dorsal ridge more robust in the posterior half. Cardinal angles well developed in both ends. Ventral margin slightly concave in the middle, broadly curved upward at the posterior end to the short, compressed and truncated posterodorsal caudal process. Anterior margin bluntly rounded. A well-defined ponticulate carina runs the posterior and anterior margins; unfortunately, this delicate structure is often partially broken. A conspicuous median vertical sulcus extends downwards from the dorsal margin dividing the carapace into two very dissimilar huge lobes, the anterior being the narrowest laterally. Ventrolateral alae turn into two hollow process, each one projected from a lobe, joined at the base by a small arched ridge. Posterior process longer and spiniform, bearing many small spines and some claviform ornaments. Anterior process somewhat rounded and with few ornaments.

Lateral surface with very delicate reticules, mostly pentagonal. Normal pore canals not numerous. Internally, marginal area moderately wide; inner margin and concrescence line separated by a narrow vestibule, anteriorly. Marginal pore canals not numerous, some of them ending into the ponticulate anterior carinae. Hinge pattern common to the genus, a tooth and a socket in both terminal elements and a smooth median element. Central muscle scars arranged in a slightly concave row of five imprints. Sexual dimorphism not observed.

Stratigraphic range. Recent.

Occurrence and distribution. In this paper: Dogaressa seamount. According to Machado (2008), in the Brazilian shelf it occurs only in a sample recovered around 17°59'S/ 38°01'W (49 m water depth).

Remarks. This is the second species described for the genus *Vandenboldina*. In comparison with *Vandenboldina droogeri* (Bold, 1965), this new species has a similar general outline, with anterior end bluntly rounded and a dorsal caudal process, as well the conspicuous median sulcus and the typical double and hollow alar process. Internally, both species have the peculiar hinge that separates them from somewhat externally similar genera, such as *Monoceratina* Roth, 1928 and *Bythoceratina* Hornibrook, 1952. *Vandenboldina kyryia* sp. nov. is more subrectangular and very smaller than *V. droogeri*. Besides, the first species is much more ornate, bearing a reticulate surface and more developed and adorned ventrolateral alae. In relation to the stratigraphic and geographic distributions, Bold's species are known since Late Miocene to Recent (for details see Coimbra and Fauth, 2002).

Genus *Sclerochilus* Sars, 1866

Remarks. Although some authors have placed this genus in the family Paradoxostomatidae Brady & Norman, 1889, we agree with Schornikov (1981) and Athersuch et al. (1989) that it is better placed in Bythocytheridae.

Sclerochilus sp.

(Figs. 7j-k)

2008 *Sclerochilus* sp. Machado, p. 218, pl. 9, fig. 17.

Figured specimen. MP-O-2802, C.

Dimensions.

	L (mm)	H (mm)
MP-O-2802 (RV)	0.392	0.185
MP-O-2802 (LV)	0.388	0.171

Material. Dead assemblage: 1 juvenile. Living assemblage: 2 juveniles.

Occurrence and distribution. In this paper: Trindade Island. On the Brazil shelf, Machado (2008) identified only one valve (22°31'S/40°38'W; 91 m water depth).

Remarks. The three juvenile specimens recorded on Trindade Island exhibit very similar features to that on the shelf.

Superfamily Xestoleberidoidea Sars, 1928

Family Xestoleberididae Sars, 1928

Genus *Semixestoleberis* Hartmann, 1962

Semixestoleberis sp.
(Figs. 8a-b)

Figured specimen. MP-O-2803, C.

Dimensions.

	L (mm)	H (mm)
MP-O-2803 (RV)	0.481	0.238
MP-O-2803 (LV)	0.493	0.240

Material. 3 juveniles (dead assemblages).

Occurrence. Vitória seamount.

Genus *Xestoleberis* Sars, 1866

***Xestoleberis brasilinsularis* Luz and Coimbra, 2014**
(Figs. 8c-d)

2009 *Xestoleberis* sp. 2 Coimbra et al. 2009, p. 137, fig. 5.2L.

2014 *Xestoleberis brasilinsularis* Luz and Coimbra, p. 472-474, figs. 3-13 (see this paper for a more complete synonymy).

Figured specimens. MP-O-2804, RV; MP-O-2805, LV.

Dimensions.

	L (mm)	H (mm)
MP-O-2804 (RV)	0.440	0.228
MP-O-2805 (LV)	0.401	0.203

Material. Dead assemblage: 17 adult and 38 juveniles. Living assemblage: 4 adults and 2 juveniles.

Occurrence and distribution. In this paper: Trindade Island. In Brazil, occurs also in the SPSPA and Rocas Atoll.

Remarks. *Xestoleberis brasilinsularis* was first described to São Pedro and São Paulo Archipelago (SPSPA), an isolated set of very small Brazilian islands (Luz and Coimbra, 2014). Although the authors suggested the possible endemism, this species occurs, both live and dead specimens, in algal matts of Trindade Island.

Xestoleberis inesae Luz and Coimbra, 2015

(Figs. 8e-f)

2015 *Xestoleberis inesae* Luz and Coimbra, p. 185-187, figs. 3, 1-12 (see this paper for a complete synonym).

Figured specimens. MP-O-2806, RV; MP-O-2807, RV.

Dimensions.

	L (mm)	H (mm)
MP-O-2806 (RV)	0.521	0.330
MP-O-2807 (LV)	0.526	0.347

Material. Dead assemblage: 100 adults and 63 juveniles. Living assemblage: 2 adults and 1 juvenile.

Occurrence and distribution. In this paper: Vitória, Jaseur, Davis and Dogaressa seamounts. In Brazil, occurs also in the Northern, Northeastern, and Eastern shelves.

Remarks. *Xestoleberis inesae* is widely distributed in the Brazilian shelf and abundantly found in the sediments along the seamounts chain but absent in the Trindade Island.

Xestoleberis machadoae Luz and Coimbra, 2014

(Fig. 8g)

2014 *Xestoleberis machadoae* Luz and Coimbra, p. 474-476, figs. 14-24 (see this paper for a complete synonym).

Figured specimen. MP-O-2808, RV.

Dimensions.

	L (mm)	H (mm)

MP-O-2808 (RV)	0.320	0.160

Material. Dead assemblage: 3 adults and 4 juveniles. Living assemblage: 4 adults and 7 juveniles.

Occurrence and distribution. In this paper: Trindade Island. In Brazil, also occurs in the SPSPA.

Remarks. *Xestoleberis machadoae* is a small species of Xestoleberididae firstly recorded in the SPSPA. In the Trindade Island, it is found in small populations associated with algal matts, while in SPSPA occurs in higher abundance in the sediments.

***Xestoleberis subtriangularis* Luz and Coimbra, 2015**

(Fig. 8h)

2015 *Xestoleberis subtriangularis* Luz and Coimbra, p. 189-191, figs. 5, 1-11.

Figured specimens. MP-O-2809, juvenile, RV.

Dimensions:

	L (mm)	H (mm)
MP-O-2809 (juvenile, RV)	0.480	0.289

Material. Dead assemblage: 27 adults and 20 juveniles. Living assemblage: 1 adult and 1 juvenile.

Occurrence and distribution. In this paper: Trindade Island. In Brazil, occurs also on the Northeastern and Eastern shelves.

Remarks. *Xestoleberis subtriangularis* is an easily recognized species of *Xestoleberis* by its almost triangular outline. Occurs in a relatively small number on the Brazilian shelf sediments, and in this study, it is found only in the Trindade Island.

***Xestoleberis acuminata* sp. nov.**

(Figs. 9a-g)

2008 *Xestoleberis* sp. 2 Machado, p. 128, pl. 5, figs. 20–21, pl. 6, fig. 1, tab. 6.

2015 *Xestoleberis* sp. Luz and Coimbra, p. 193, pl. 6, fig. 12, tab. 1 (part). [non] pl. 6, figs. 13–14.

Etymology. Latin origin, *acuminatus* = pointed, with reference to the somewhat pointed ends, characteristic of this species.

Type-material. Holotype: MP-O-2810, male, LV. Paratypes: MP-O-2811, male, RV; MP-O-2812, female, LV; MP-O-2813, juvenile, open C; MP-O-1898, female, C.

Type-locality. Dogaressa seamount.

Dimensions.

	L (mm)	H (mm)	W (mm)
MP-O-2810 (male, LV)	0.530	0.220	-
MP-O-2811 (male, RV)	0.502	0.226	-
MP-O-2812 (female, LV)	0.459	0.225	-
MP-O-2813 (juvenile, RV)	0.370	0.162	-
MP-O-2813 (juvenile, LV)	0.412	0.198	-
MP-O-1898 (female, C, RV)	0.461	0.211	0.280
MP-O-1898 (female, C, LV)	0.471	0.241	-

Material. Dead assemblage: 9 adults and 6 juveniles. Living assemblage: 2 adults and 11 juveniles.

Diagnosis. Medium sized species of *Xestoleberis*, elongate in lateral view. Anterior margin obliquely pronounced and narrowly rounded ventrally, somewhat more protrude in LV due to a small anteroventral labium; posterior margin obliquely sloping, somewhat pointed ventrally. Surface typically smooth, with lip- and sieve-type normal pore canals (*sensu* Sato and Kamiya 2007). *Xestoleberis*-spot conspicuous. Males larger, longer and lower than females.

Description. A medium and moderately thick-shelled species of *Xestoleberis*. In lateral view, male subrectangular elongate. In dorsal view, subovate and inflated. Strongly flattened ventrally. LV overlapping RV along dorsal, anterior and posterior margins. Maximum length almost ventrally. Maximum height in the middle. Maximum width in the posterior half. Anterior margin obliquely pronounced and narrowly rounded ventrally, somewhat more protrude in LV due to a small anteroventral labium; posterior margin obliquely sloping, somewhat pointed ventrally. Dorsal margin straight and sloping backward in RV, more arched in LV; ventral margin almost straight, with a gentle oral concavity. Surface typically smooth, with two types of normal pore canals (*sensu* Sato and Kamiya 2007): sieve-type and lip-type. Eye-spot inconspicuous. *Xestoleberis*-spot conspicuous and long. Line of concrescence and inner margin separated by a vestibule more developed anteriorly. Marginal pore canals simple, straight and sparse. Hinge hemimerodont, with long crenulate terminal elements and smooth median element. Adductor muscle scars a row of four sub-elliptical spots. Frontal scar somewhat U-shaped. Sexual dimorphism strong: female shorter and much higher than male in lateral view, posteriorly more inflated in dorsal view.

Stratigraphic range. Recent.

Occurrence and distribution. In this paper: Vitória, Davis and Dogaressa seamounts. In Brazil, also occur few specimens on the Northeastern and Eastern shelves.

Remarks. Due to the scarcity of adult females, the description is based mainly on male adult specimens. *Xestoleberis acuminata* sp. nov. was previously recorded in open nomenclature by Machado (2008) and Luz and Coimbra (2015), which perform a taxonomical study of the family Xestoleberididae from the Brazilian shelf. In a careful study of the material illustrated by Luz and Coimbra (2015, pl. 6, figs. 12–14) we concluded that the specimen MP-O-1968 is only the figure 12. Figures 13 and 14 represent another very rare and undescribed species. Furthermore, figure 12 shows a male adult carapace and not a female as erroneously indicated by the authors.

Xestoleberis caperata sp. nov.

(Figs. 10a-l)

2009 *Xestoleberis* sp. 1 Coimbra et al., p. 137, figs. 5.2j-k.

Etymology. Latin origin, *caperatus* = wrinkled, with reference to the ventrolateral and ventral folds.

Type-material. Holotype: MP-O-2814, female, open carapace. Paratypes: MP-O-2815, male, RV; MP-O-2816, C, juvenile.

Type-locality. Vitória seamount.

Material. Dead assemblage: 7 adults and 3 juveniles. Living assemblage: 1 juvenile.

Dimensions.

	L (mm)	H (mm)	W(mm)
MP-O-2814 (female, RV)	0.525	0.309	-
MP-O-2814 (female, LV)	0.538	0.328	-
MP-O-2815 (male, RV)	0.496	0.298	-
MP-O-2816 (juvenile, C)	0.435	-	0.283

Diagnosis. Medium-sized species of *Xestoleberis*. LV gently overlapping RV. Dorsal margin arched mainly in RV. Surface with longitudinal grooves along the ventrolateral and ventral regions. A flange, more developed in RV, runs along anteroventral end. Hinge antimerodont, with developed crenulated elements.

Description. A medium and thick-shelled species of *Xestoleberis*. Carapace subrectangular to subovate in lateral view, more ovate in dorsal view, very flattened ventrally. LV gently overlapping RV along anterior, dorsal and posterior margins. Maximum length almost ventrally; maximum height in front of the mid-length, maximum width centrally. Anterior margin obliquely rounded, protruding in the ventral half. Posterior margin truncated, in external view hidden posteroventrally by the curvature of the valve, which makes the contour appears somewhat more pronounced. Dorsal margin inclined backward, more evenly convex in LV. Ventral margin with gentle oral region, hidden by the valve inflation in external view. Surface smooth, with longitudinal folds along the ventrolateral and ventral regions. A delicate flange, often partially or totally broken and more developed in RV, runs along the anteroventral end. Normal pore canals spaced, simple and lip-type (*sensu* Sato and Kamiya 2007). Eye-spot inconspicuous. *Xestoleberis*-spot well-marked and large. Hinge antimerodont, with well-developed crenulated elements. Central muscle scars comprise four adductors aligned in a vertical row and a heart-shaped frontal scar. Sexual dimorphism: males smaller and less inflated ventrally than females.

Stratigraphic range. Recent.

Occurrence and distribution. In this paper: Vitória and Davis seamounts. In Brazil, also occurs in the Rocas Atoll.

Remarks. The ventrolateral longitudinal wrinkles of *Xestoleberis caperata* sp. nov. are uncommon in this genus whose species are usually totally smooth. Ornate xestoleberidids has been allocated in the few diversified genus *Ornatoleberis* Keij, 1975. However, *Ornatoleberis* presents more surface ornaments, such as well-developed punctuations, not observed in the species herein described.

***Xestoleberis* sp.**

(Fig. 10m)

Figured specimen. MP-O-2870, RV.

Dimensions.

	L (mm)	H (mm)
MP-O-2870 (RV)	0.544	0.318

Material. 9 adults and 4 juveniles (dead assemblage).

Occurrence. Davis and Dogaressa seamounts.

Remarks. This species, probably new, is in open nomenclature because, unfortunately, most of the material was lost.

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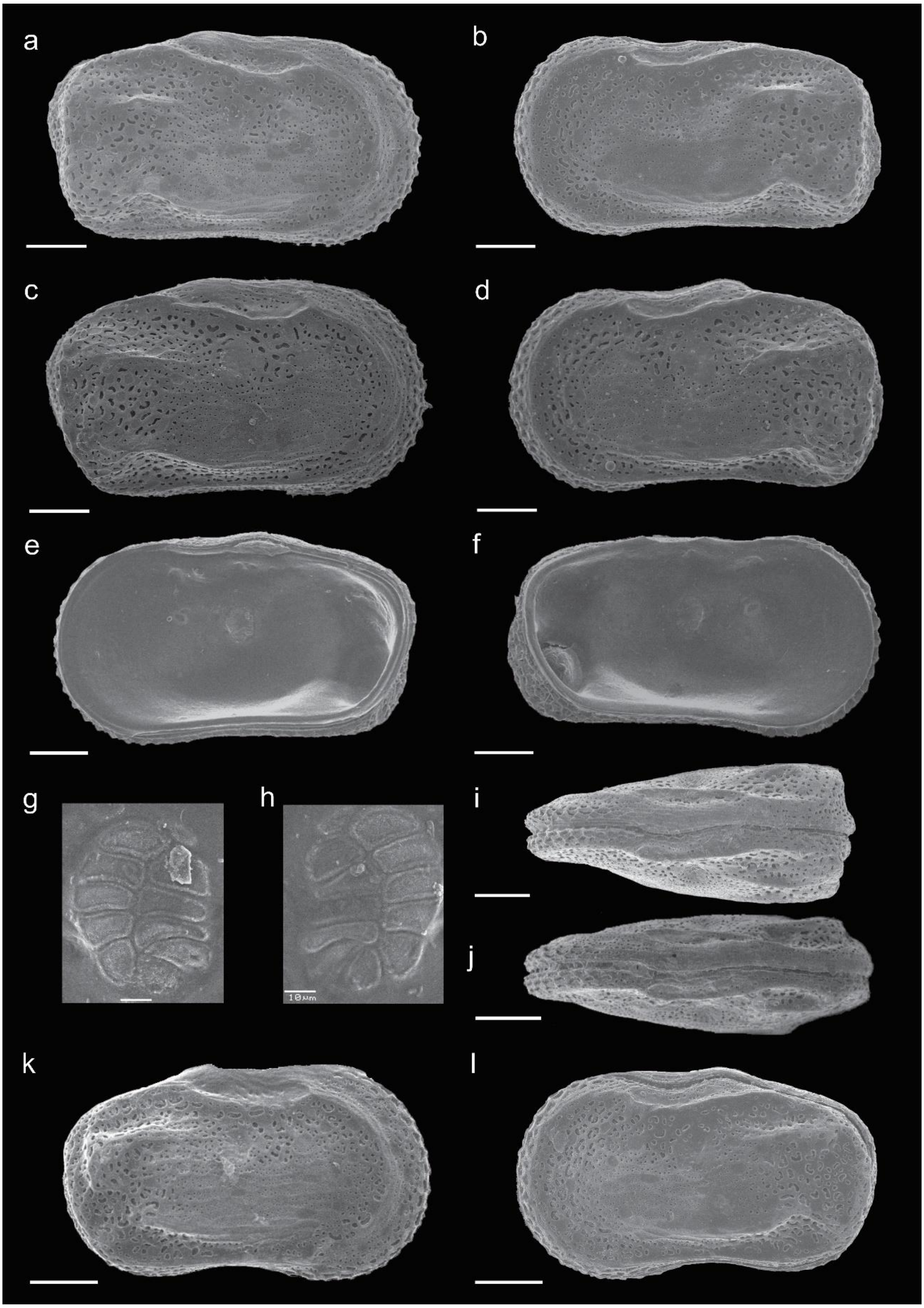

Figure 3. a-l: ***Keijcyoidea oceanica*** **sp. nov.** a) MP-O-2770, female, RV; b) MP-O-2770, female, LV; c) MP-O-2771, female, RV; d) MP-O-2771, female, LV; e) MP-O-2771, female, RV, internal view; f) MP-O-2771, female, LV, internal view; g) MP-O-2771, female, RV, central muscle scars; h) MP-O-2771, female, LV, central muscle scars; i) MP-O-2773, female, dorsal view; j) MP-O-2774, male, dorsal view; k) MP-O-2772, male, RV; l) MP-O-2772, male, LV. Scale bar = 100μm.

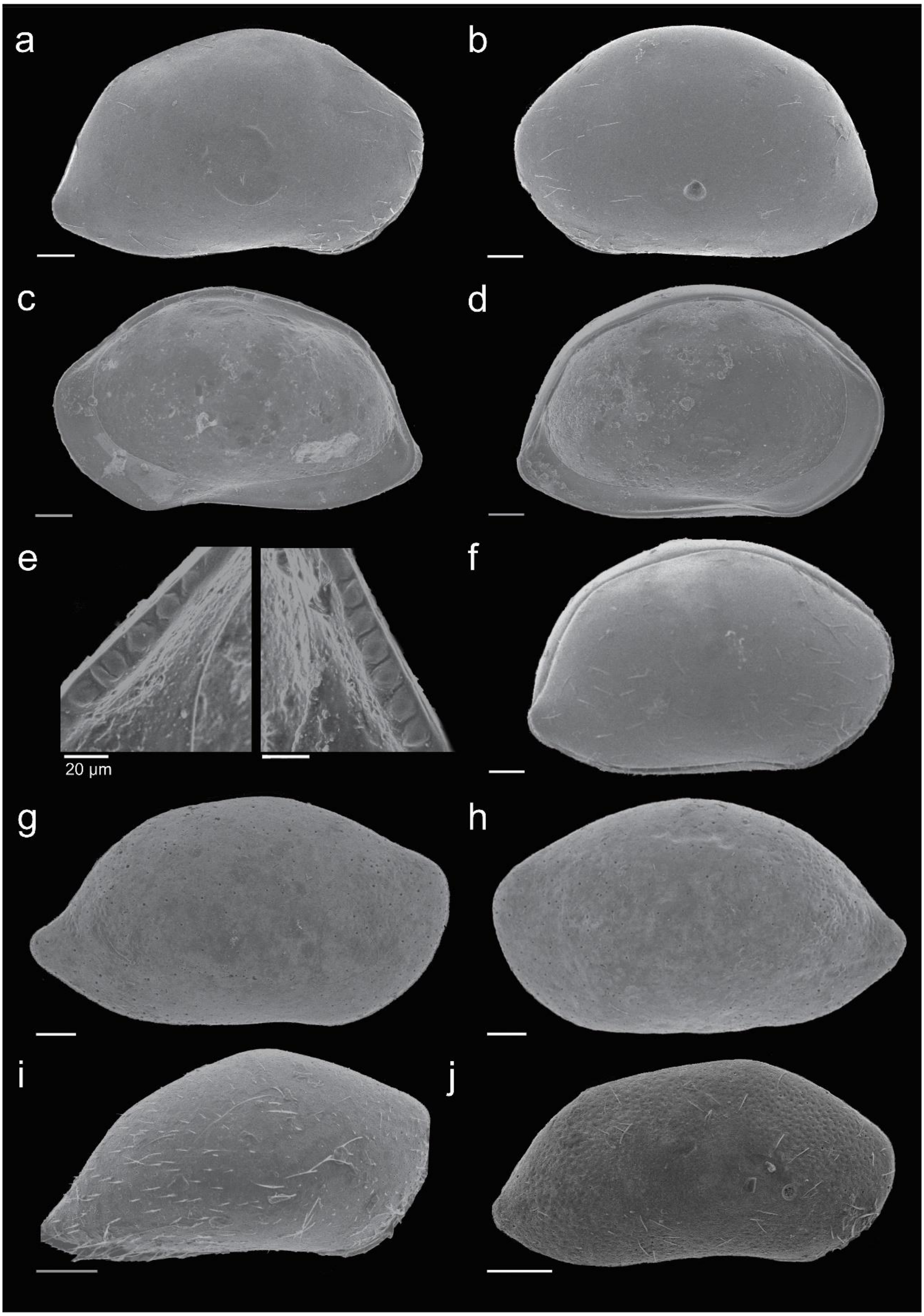

Figure 4. a-f: *Bairdoppilata vitoriensis* sp. nov. a) MP-O-2775, RV; b) MP-O-2776, LV; c) MP-O-2775, RV, internal view; d) MP-O-2776, LV, internal view; e) MP-O-2775, RV, auxiliary denticulation; f) MP-O-2777, carapace, RV. **g-h: *Neonesidea longisetosa*.** g) MP-O-2779, RV; h) MP-O-2779, LV. i**) *Neonesidea* sp. 1**, MP-O-2780, RV. **j) *Neonesidea* sp. 2**, MP-O-2781, RV. Scale bar = 100μm.

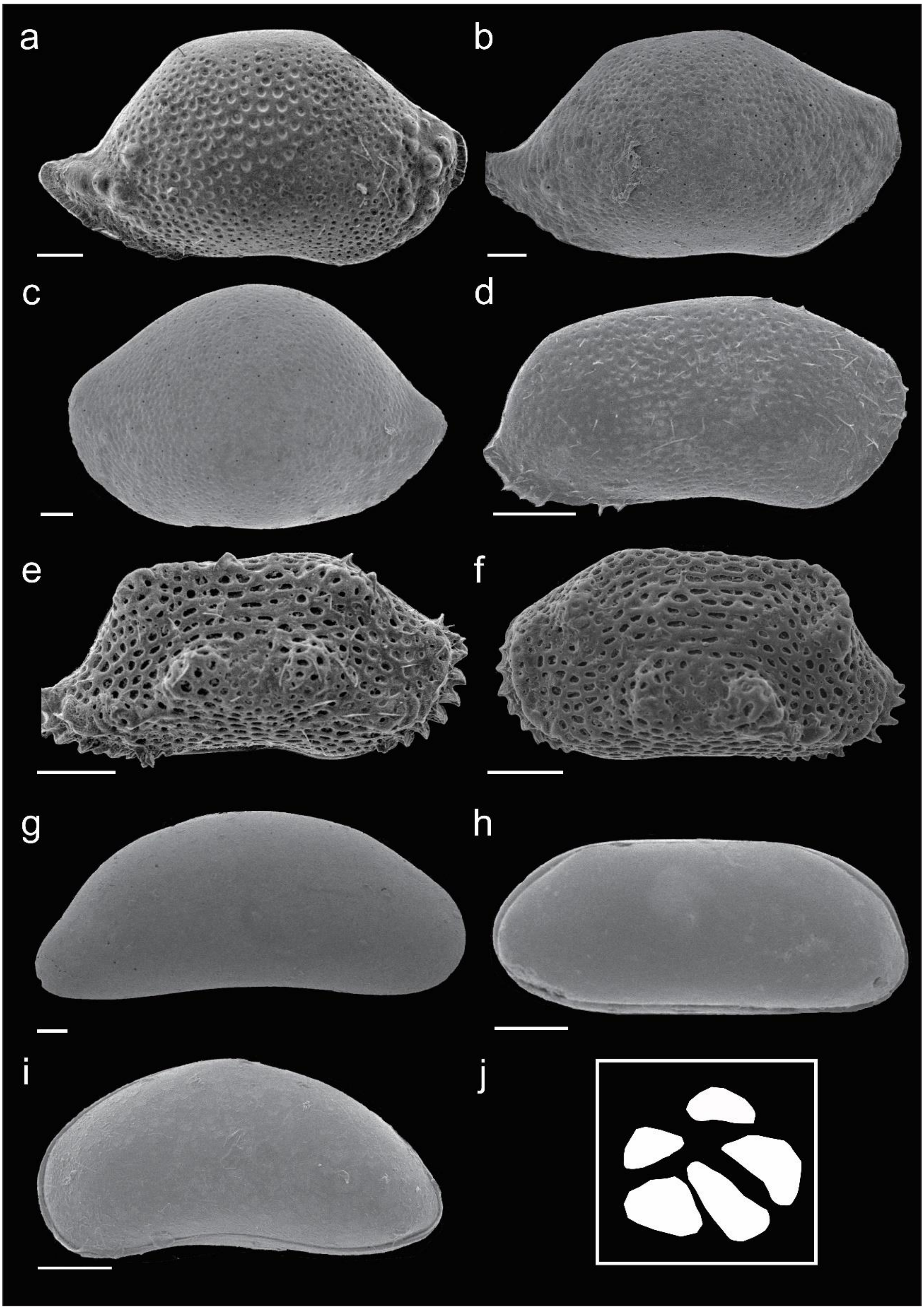

Figure 5. a-c: *Paranesidea* cf. *P. conulifera*. a) MP-O-2781, RV, Trindade Island's morphotype; b) MP-O-2782, RV, seamount's morphotype; c) MP-O-2783, LV, seamount's morphotype. **d) *Triebelina* sp.**, MP-O-2786, RV. **e-f: *Triebelina sertata*.** e) MP-O-2784, RV; f) MP-O-2785, LV. **g) *Yemanja coimbrai***, MP-O-2787, RV. **h) *Australoecia neritica***, MP-O-2788, carapace, RV. **i) *Propontocypris* sp. 1**. i) MP-O-2789, carapace, RV; j) MP-O-2789, central muscle scars. Scale bar = 100µm.

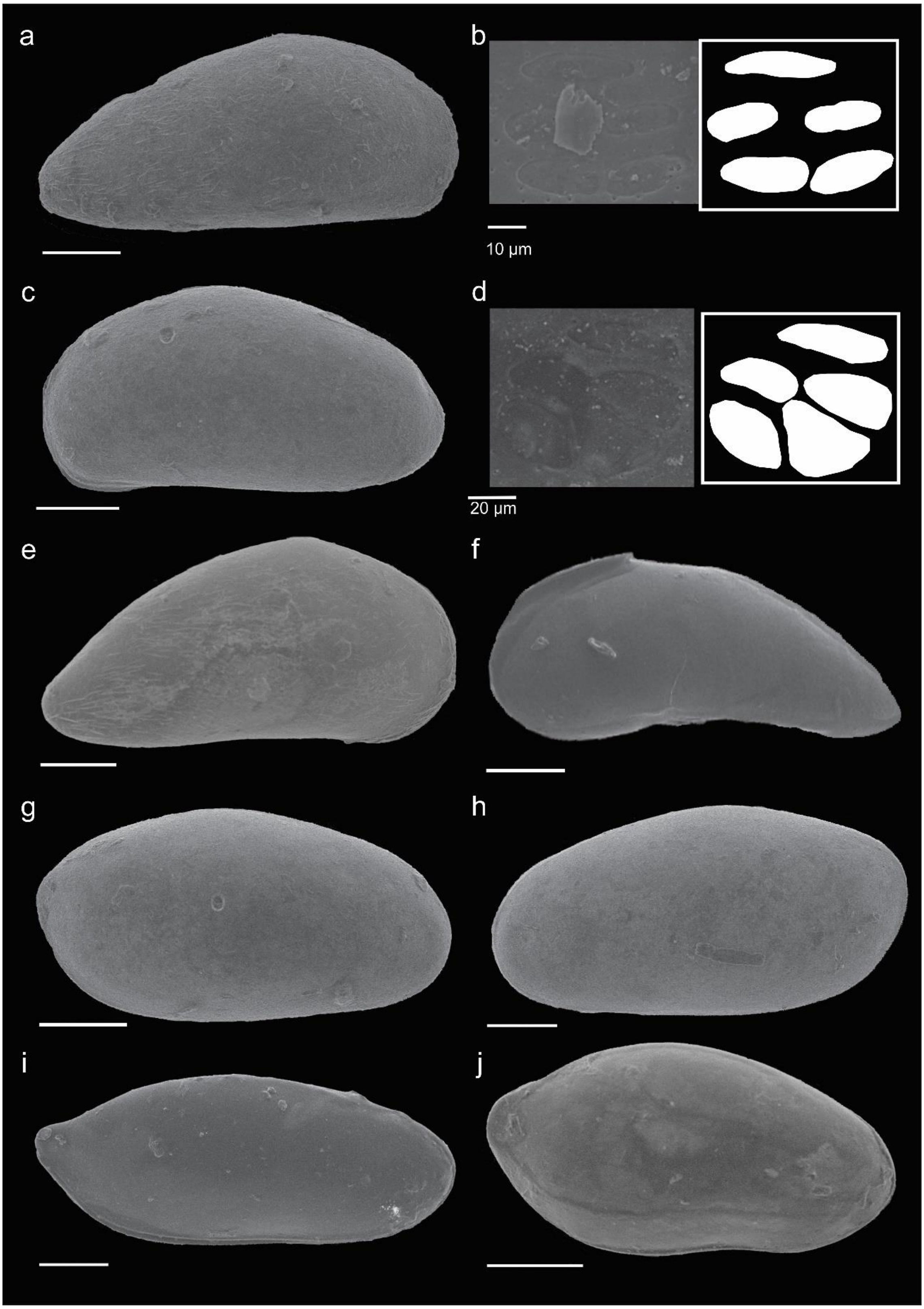

Figure 6. a-b: ***Propontocypris* sp. 2.** a) MP-O-2790, RV; 2) MP-O-2790, central muscle scars. **c-d:** ***Propontocypris* sp. 3.** c) MP-O-2791, LV; d) MP-O-2791, central muscle scars. **e:** ***Paracypris* sp. 1**, MP-O-2792, RV. **f)** ***Paracypris* sp. 2**, MP-O-2793, LV. **g-h:** ***Paradoxostoma* sp. 1.** g) MP-O-2794, RV; h) MP-O-2795, LV. i**)** ***Paradoxostoma* sp. 2**, MP-O-2796, carapace, RV. j**:** ***Paradoxostoma* sp. 3**, MP-O-2797, carapace, RV. Scale bar = 100µm.

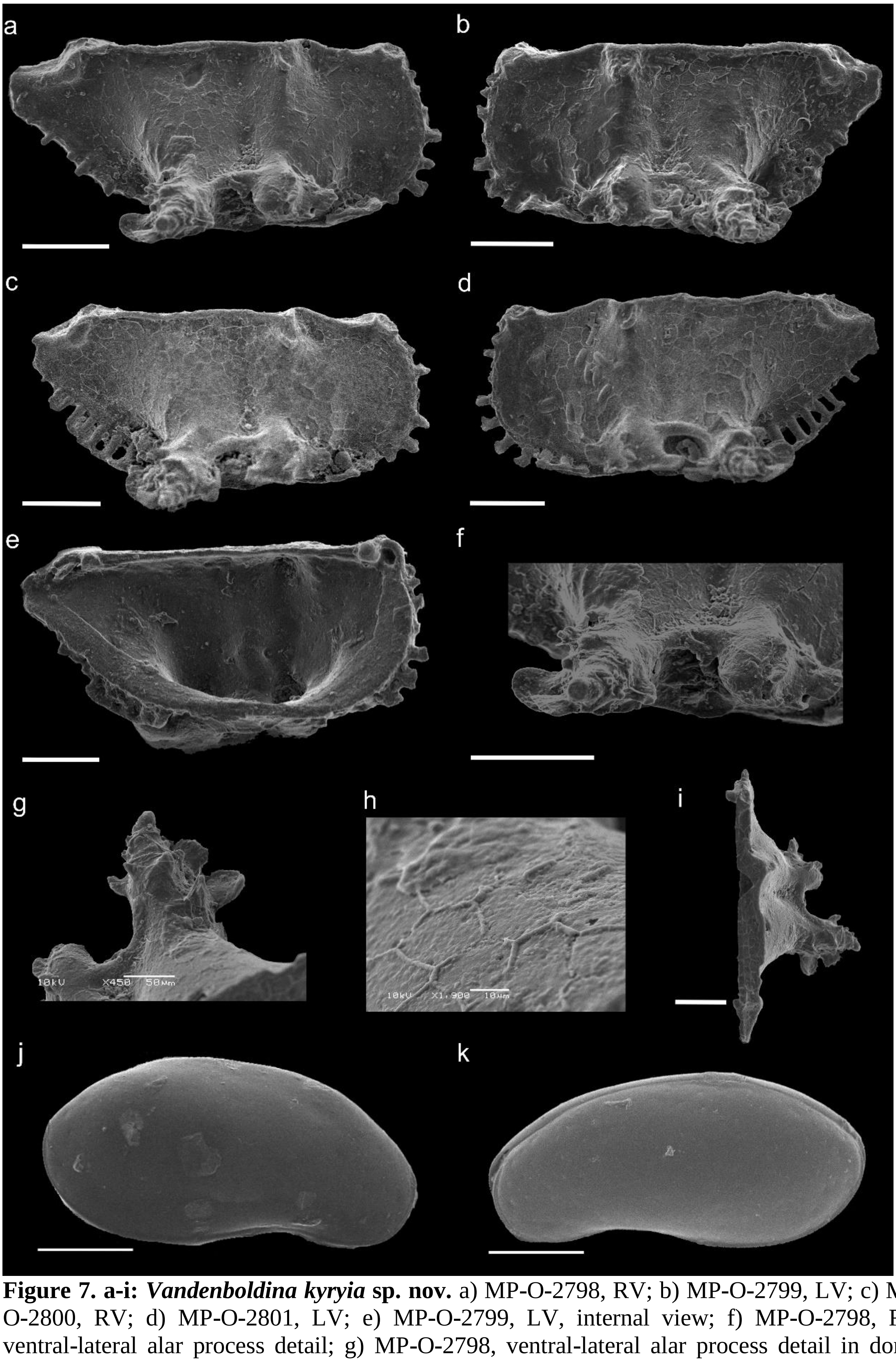

Figure 7. a-i: *Vandenboldina kyryia* sp. nov. a) MP-O-2798, RV; b) MP-O-2799, LV; c) MP-O-2800, RV; d) MP-O-2801, LV; e) MP-O-2799, LV, internal view; f) MP-O-2798, RV, ventral-lateral alar process detail; g) MP-O-2798, ventral-lateral alar process detail in dorsal view; h) MP-O-2798, ornament detail; i) MP-O-2798, dorsal view. **j-k: *Sclerochilus* sp.** j) MP-O-2802, carapace, RV; 11) MP-O-2802, carapace, LV. Scale bar = 100µm.

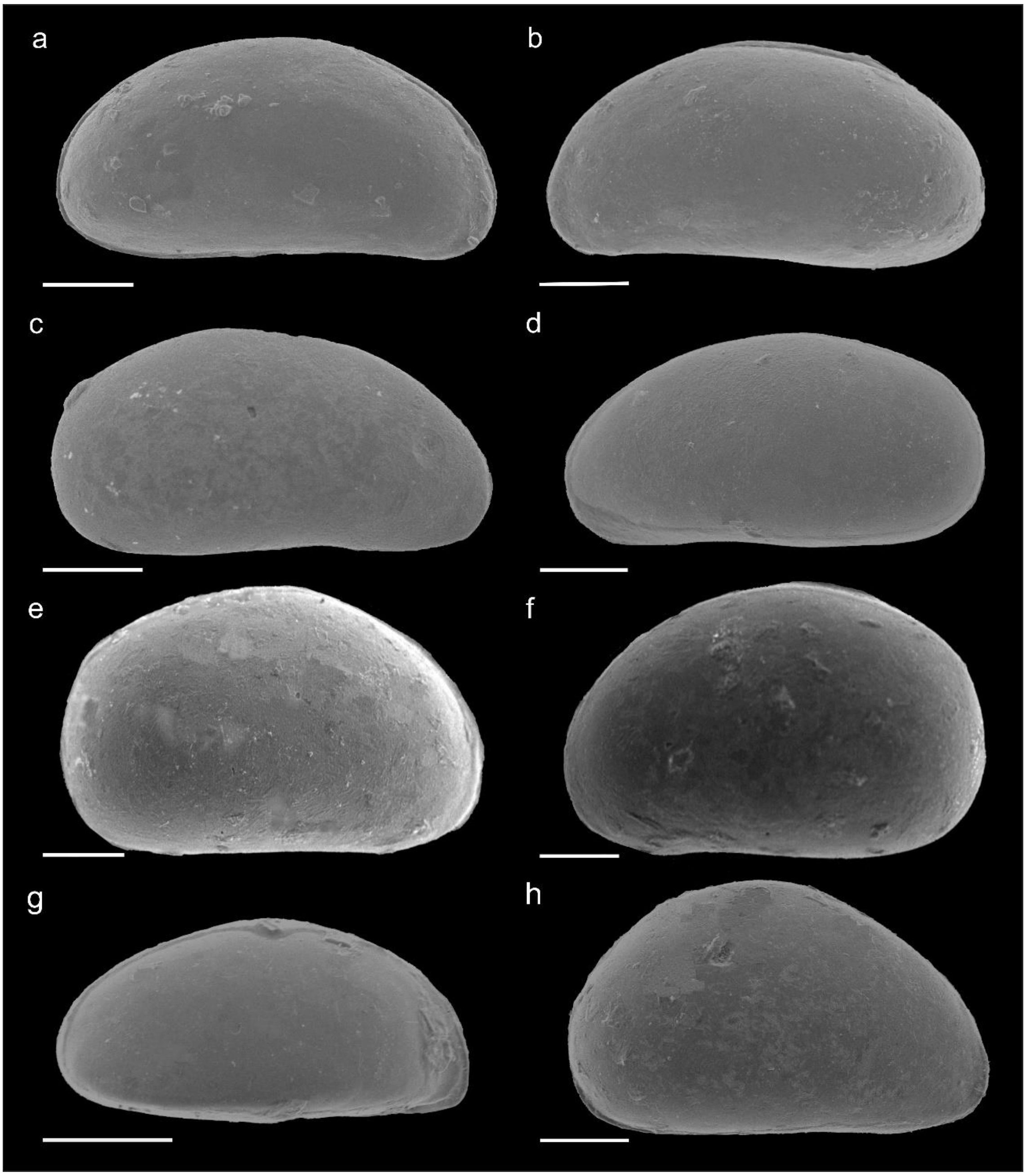

Figure 8. a-b: ***Semixestoleberis* sp.** a) MP-O-2803, carapace, RV; b) MP-O-2803, carapace, LV. **c-d:** ***Xestoleberis brasilinsularis*.** c) MP-O-2804, RV; d) MP-O-2805, LV. **e-f:** ***Xestoleberis inesae*.** e) MP-O-2806, RV; f) MP-O-2807, LV. **g)** ***Xestoleberis machadoae***, MP-O-2808, RV. **h)** ***Xestoleberis subtriangularis***, MP-O-2809, juvenile, RV. Scale bar = 100µm.

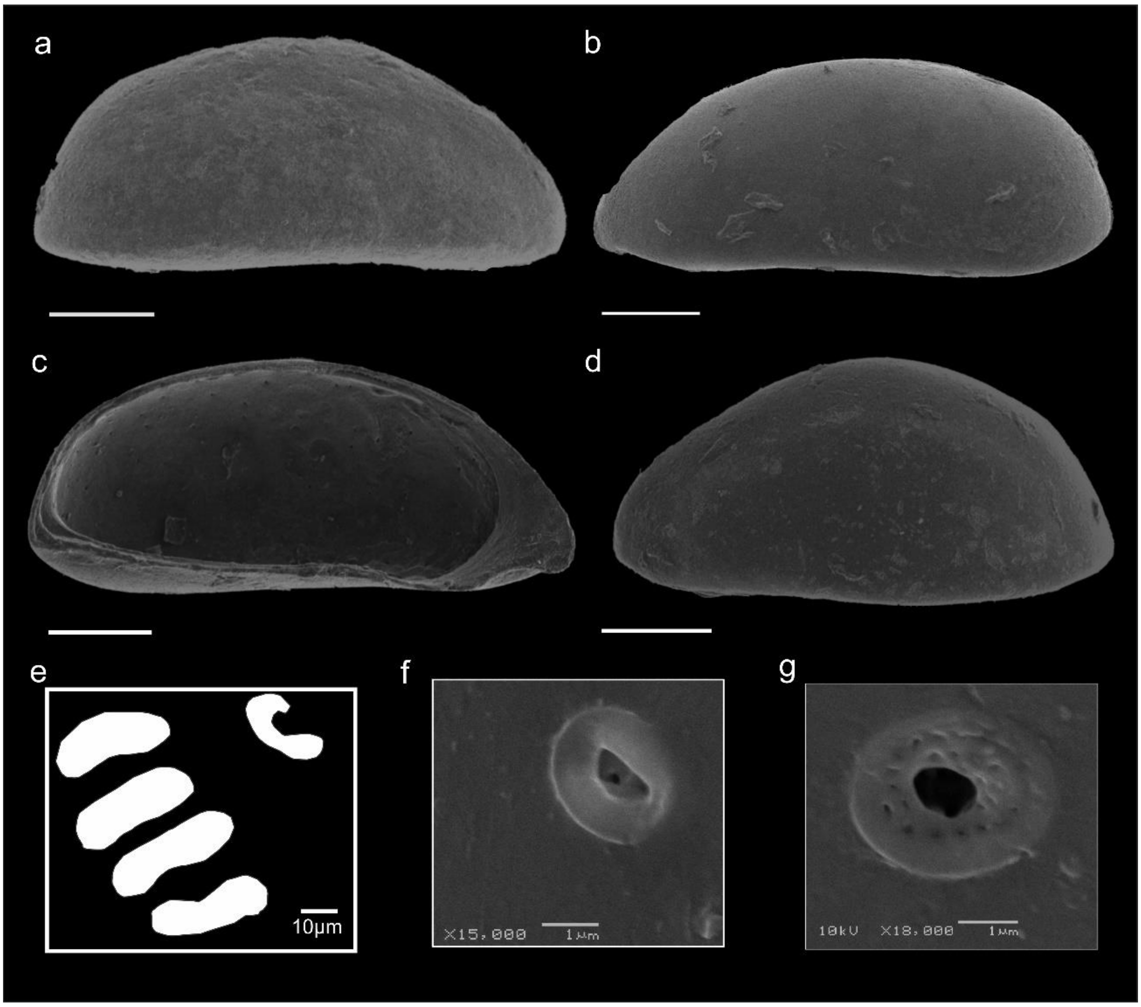

Figure 9. a-h: ***Xestoleberis acuminata*** **sp. nov.** a) MP-O-2811, male, RV; b) MP-O-2810, male, LV; c) MP-O-2810, internal view; d) MP-O-2812, female, LV; e) MP-O-2813, juvenile, LV, central muscle scars; f) MP-O-2813, lip-type normal pore canals; g) MP-O-2813, sieve-type normal pore canals. Scale bar = 100µm.

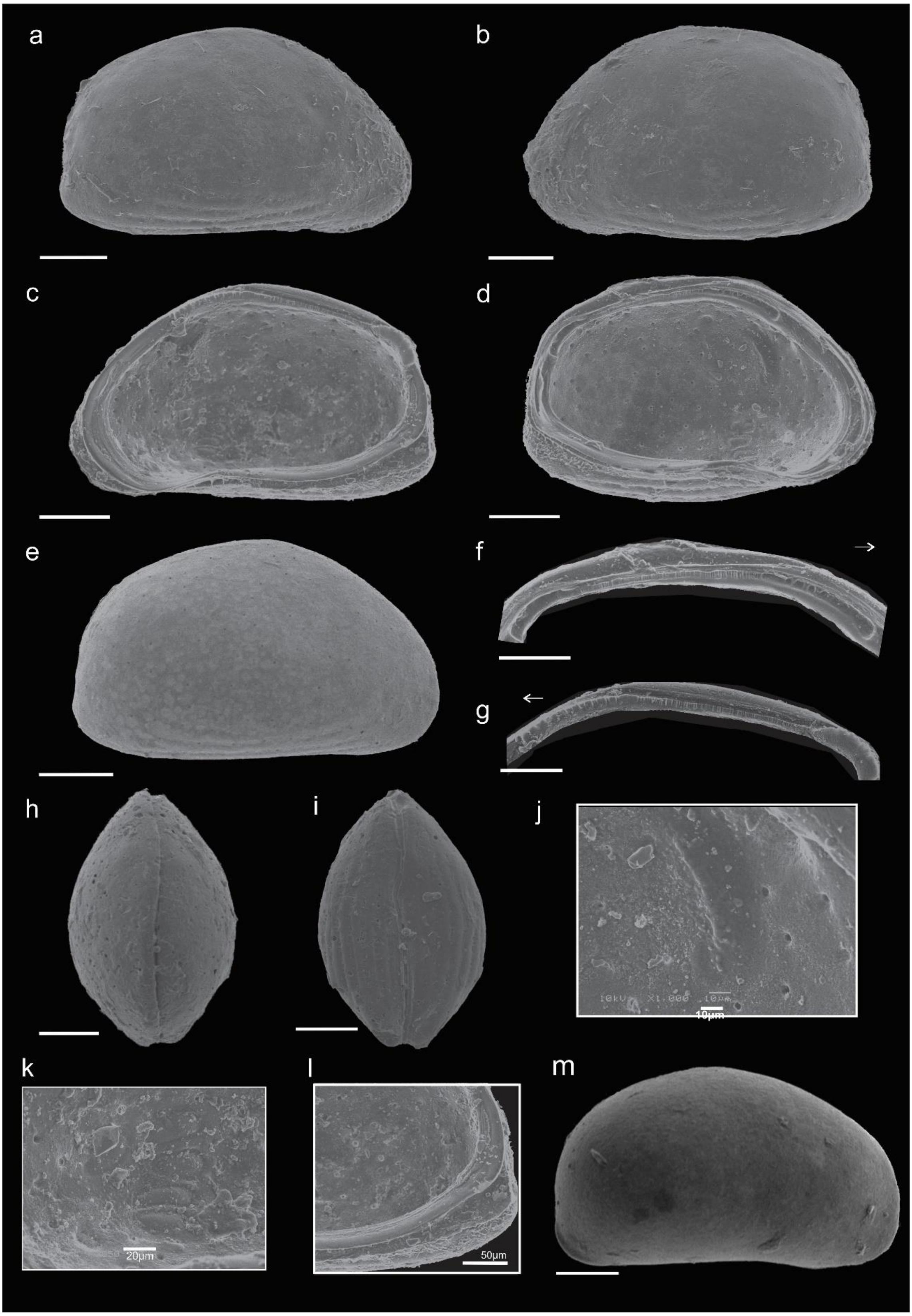

Figure 10. a-l: ***Xestoleberis caperata*** **sp. nov.** a) MP-O-2814, female, RV; b) MP-O-2814, female, LV; c) MP-O-2814, female, RV, internal view; d) MP-O-2814, female, LV, internal view; e) MP-O-2815, male, RV; f) MP-O-2814, female, RV, hingement detail; g) MP-O-2814, female, LV, hingement detail; h) MP-O-2816, carapace, juvenile, dorsal view; i) MP-O-2816, ventral view; j) MP-O-2814, female, LV, *Xestoleberis*-spot detail; k) MP-O-2814, female, LV, central muscle scars; l) MP-O-2814, female, RV, internal view wrinkles detail. **m)** ***Xestoleberis*** **sp.**, MP-O-2870, RV. Scale bar = 100µm.

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CAPÍTULO II

Potencial de Preservação dos Ostracodes da Cadeia Vitória-Trindade

ARTIGO 3: HOTSPOTS OF FIDELITY: LIVE-DEAD FAITHFULLY OF MARINE OSTRACODS SHED LIGHT ON THE STRUCTURE OF THE MICROFOSSIL RECORD

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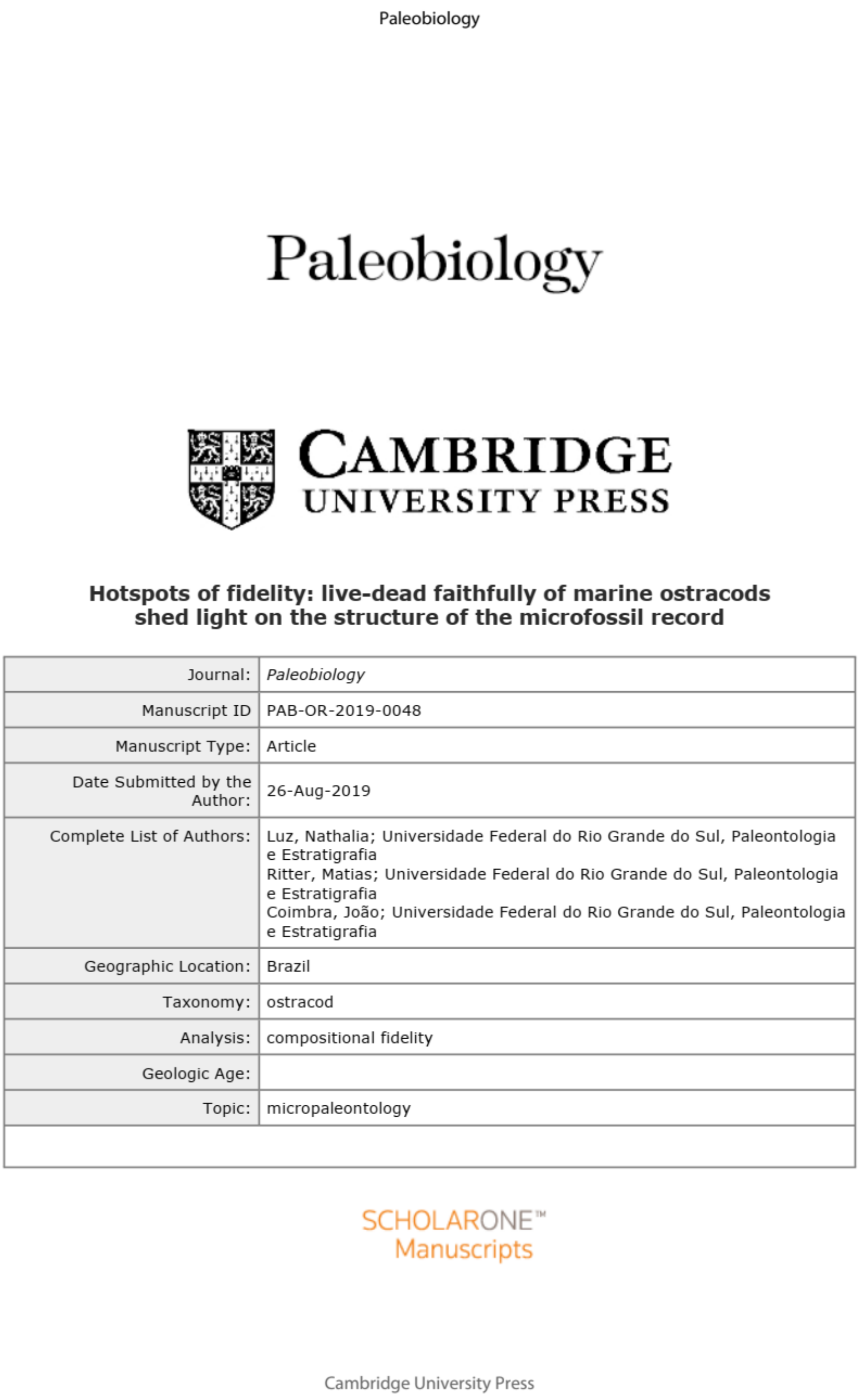

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Hotspots of fidelity: live-dead faithfully of marine ostracods shed light on the structure of the microfossil record

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Hotspots of fidelity: live-dead faithfully of marine ostracods shed light on the structure of the microfossil record

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Abstract. Death assemblages provide excellent data on the species composition and structure of communities in diverse settings, even though temporally coarse. Their assessment is essential to determine the trustworthiness of the fossil record as biological evidence. We present herein comparisons of species assemblages characteristics in living and dead ostracods from the Vitória-Trindade Chain, encompassing Trindade Island and four seamounts (Vitória, Jaseur, Davis, and Dogaressa). The seamounts were richest, though less abundant than the island. Rank abundance tests have shown that life and death assemblages differ substantially in the composition of their dominant species, both on the island and in the seamounts. The live-dead agreement is higher in Trindade, mainly in samples of beach, cove, and islet.

The live-dead mismatch in the seamounts may be related to the greater number of juveniles in the life assemblage. This situation possibly arises from the rapid destruction of fragile juveniles carapaces by post-mortem changes.

Keywords: Quantitative fidelity, Oceanic islands, Seamounts, Ostracoda, Paleoecology

INTRODUCTION

Islands are considered hot spots of biodiversity (Gove et al. 2016; Pouteau and Birnbaum 2016; Cartwright 2019). They are spotlights for biogeographical, conservation, dispersion rates, among other studies being natural labs for testing several scientific hypotheses (e.g., Steinbauer et al. 2013; Rominger et al. 2016). Despite this, to our best knowledge, there are no studies concerning live-dead studies on marine ostracods in linked seamounts-islands habitats, testing how faithfully outputs are linked to several spatial scales.

Currently, one of the main approaches to taphonomy is the biological signal quantification preserved in conchiferous accumulations after the influence of biotic, physical and time-averaging factors, as well as the variation of preservation capacity in space and time. This assessment of the fidelity degree between the living community and its corresponding dead and fossil associations (when possible) allows the recognition of the limitations regarding the use of these preserved associations in the reconstruction of ancient ecosystems (Fürsich 1978; Kidwell and Flessa 1995, 1996; Jablonski 1999; Archuby et al. 2015).

Death assemblages (DAs) are evidence of past generation populations of living or recently extinct species in a locality, such as shells or other resistant skeleton types (Kidwell and Tomašových 2013). They are able to provide a more complete sketch of the communities and habitat type than a single life assemblages (LAs) census. Despite the post-mortem changes suffered by these associations, their evaluation is fundamental to determine the reliability of the fossil record as a biological information archive (Kidwell and Bosence 1991; Kidwell 2007, 2013).

A large number of papers have been published in the last decades evaluating the fidelity between living and dead mollusks assemblages, especially in marine sedimentary environments (Kidwell 1991; Kidwell et al. 2001; Valentine et al. 2006; Kidwell 2007, 2008; Tomašových and Kidwell 2009, 2010). Such studies, which usually show a good representation of the proportional abundance of species living in the local dead association, have encouraged several other studies to use this set of meta-analyzes for paleoecological and conservation biology purposes (Pandolfi and Minchin 1995; Greenstein and Pandolfi 1997; Kowalewski et al. 2003; Alin and Cohen 2004; Krause Jr. et al. 2010; Albano and Sabelli 2011; Erthal et al. 2011; Michelson and Park 2013; Korpanty and Kelley 2014; Hassan 2015; Tomašových and Kidwell 2017; Michelson et al. 2018; Martello et al. 2018).

As far we know, the first work addressing quantitative comparisons between living, dead and fossil ostracod associations was performed by Alin and Cohen (2004) with samples from Lake Tanganyika. They evaluate the anthropogenic impact on ostracod populations by comparing the taxonomic composition, abundance, and richness of recovered fauna in surface sediments and cores. The dead and fossil association of Lake Tanganyika showed greater similarity in taxonomic composition, but also preserved the characteristics of the living association with high fidelity. Other studies in this field were developed by Michelson and Park (2013) and (Michelson et al. 2018) in lakes (brackish to hypersaline) of San Salvador Island (Bahamas). The authors also tested the live-dead agreement in locations impacted by human occupation and pristine locations. In both studies, dead associations showed high fidelity to the living community on a habitat scale.

Therefore, understanding the specificities of each group and their behavior in different types of environments is important for the improvement of such studies. Several effects may influence the final composition of an ostracod fauna, which is often overlooked in paleoecological reconstructions. Life cycle variation, mortality rates, dissolution of early stages (poorly calcified), and random accumulation of shells of different generations (time-averaging) imply that a dead association does not completely reflect the original population, even collected from a culture. Thus, quantifying the preservation biases that acted in a community allows a more accurate interpretation of the fossil record, since it is possible to differentiate changes in biological information from a taphonomic process and an ecological variation.

Here we compared the structure and composition of the community of ostracods from Trindade Island and four seamounts of Vitória-Trindade Chain.This is the first study that uses the approach of live-dead fidelity employing ostracods from oceanic islands, encompassing wider spatial scales. Our results highlight the importance of these approaches for understanding how ontogenetic stages and the life cycle can influence the preservation potential of ostracods, shedding light on how the contribution of young stages can bias paleoecology analyses.

STUDY AREA

The Vitória-Trindade Chain (VTC) is a linear arrangement formed by seamounts and the Trindade and Martin Vaz Archipelago, representing the emerged portion of the chain. It is set in the parallel of Vitória (capital of the Espírito Santo State) and is arranged in an east-west direction, along latitude 20 ° 30'S, extending for about 1000 km (Fig. 1). The origin of this chain is related to the passage of the South American plate on the Trindade plume, or Martin Vaz, as cited in some literature (Herz 1977; Motoki et al. 2012). According to this theory, the South American plate on separating from the African plate moved over the Trindade hotspot (under the island), thus reactivating the Vitória-Trindade Fracture Zone (VTFZ; Thomaz Filho and Rodrigues 1999; Almeida 2006; Skolotnev et al. 2010, 2011; Oliveira 2013).

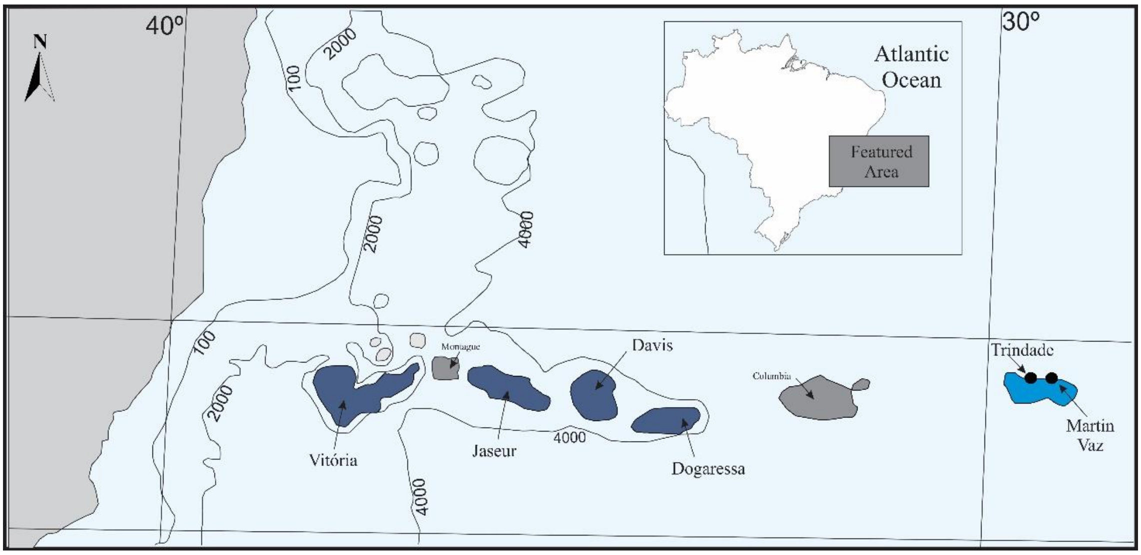

Figure 1. Location map of Vitória-Trindade Chain, South Atlantic Ocean (modified from Almeida 2006).

Ocean circulation in the Vitória-Trindade Chain region is composed in higher levels by Current of Brazil (CB), and the Intermediate Contour Current

(ICC), at intermediate levels, which reach the most coastal portion of the chain. The CB originates from the bifurcation of the Equatorial South Current.

flowing south along with the breaking of the Brazilian continental shelf (Peterson and Stramma 1991; Stramma and England 1999). As the seamounts get very close to the surface, the runoff of both shallow and deep-water bodies is significantly affected, causing a flow deviation in this region and rearranging south of CVT (~23°S). There is no evidence of well-defined surface currents on the outermost hills of the shelf and on Trindade Island itself, thus being influenced by occasional currents from winds, internal waves and tidal currents (Fu 1981; Evans and Signorini 1985; Peterson and Stramma 1991; Stramma and England 1999).

The summits of the seamounts are on average about 50 meters deep, and most of them are covered by rhodolith banks, also quite common on the Trindade and Martin Vaz shelves and in the adjacent coastal region (Pereira-Filho et al. 2011, 2012; Amado-Filho et al. 2012; Dias and Villaça 2012; Pinheiro et al. 2014). Pinheiro et al. (2014) discovered a more complex structure on the tops of the seamounts, formed by encrusting calcareous algae, scleractinian corals and hydrocorals. These structures reach 35 and 17 m from the surface on Vitória Mount and Davis Bank, and 62 and 84 m on the Jaseur and Columbia seamounts. The carbonate shelf below the rhodoliths and reef structures can reach 300 m thick (Skolotnev et al. 2010).

The Trindade and Martin Vaz Archipelago are the easternmost volcanic buildings of the VTC. Trindade Island is about 13 km^2 in area, with extremely rugged relief, resulting from weathering processes in a highly heterogeneous rock mass. The island is the top of a mountain that rises about 5500 meters from the sea floor and its highest points are between 550 and 600 meters from sea level. Its coastal area is composed of algal reefs, narrow beaches, restricted areas of dunes and shoreline-limited river deposits in predominantly volcanic rocks. It is the only place in the Brazilian territory where part of the structure of a volcanic cone is preserved (Almeida 2006).

MATERIAL AND METHODS

Field and Laboratory Methods. The material herein studied comes from four seamounts (Vitória, Jaseur, Davis, and Dogaressa) and Trindade Island. Samples from the seamounts were kindly provided by Professor Jean Christophe Joyeux (Department of Oceanography at UFES) to the 'Laboratório de Microfósseis Calcários – LMC' of the 'Universidade Federal do Rio Grande do Sul'. Sampling was performed in April 2011 using advanced deep diving techniques in depths ranging from 18 to 65 m. These sites are fragmented habitats separated by depths ranging from 2000 to 5000 m.

Trindade Island samples were obtained from four sampling campaigns that took place on February 2002, April to May 2014, August to September 2016, and December 2017 to February 2018, the last three being carried out by the first author. The samples were collected in different environments and depths, from intertidal to subtidal in beaches, coves, islets and non-sheltered areas of the insular shelf. Since the creation of oceanic science programs by CNPq (a Brazilian science development agency) and the Brazilian Navy, such as PROTRINDADE, the access to these remote areas has become relatively easier, allowing annual sampling in a larger area of the Trindade Island (Fig. 2).

The preparation and sorting of the material were performed at the LMC of the ‘Universidade Federal do Rio Grande do Sul. The samples were washed in running water and sieved in 0.84 mm and 0.104 mm meshes, and again fixed in 70% alcohol. Smaller fractions besides retaining little amount sediment contained no organisms. The mesh used to recover the ostracodes was 0.104 mm. A 60 ml volume of sediment was standardized for screening and specimens retrieved from each sample were stored on Flank multi-cell slides. To differentiate live and dead specimens, the criteria used were the presence of soft parts to identify live specimens, and empty carapaces and isolated valves to classify the dead.

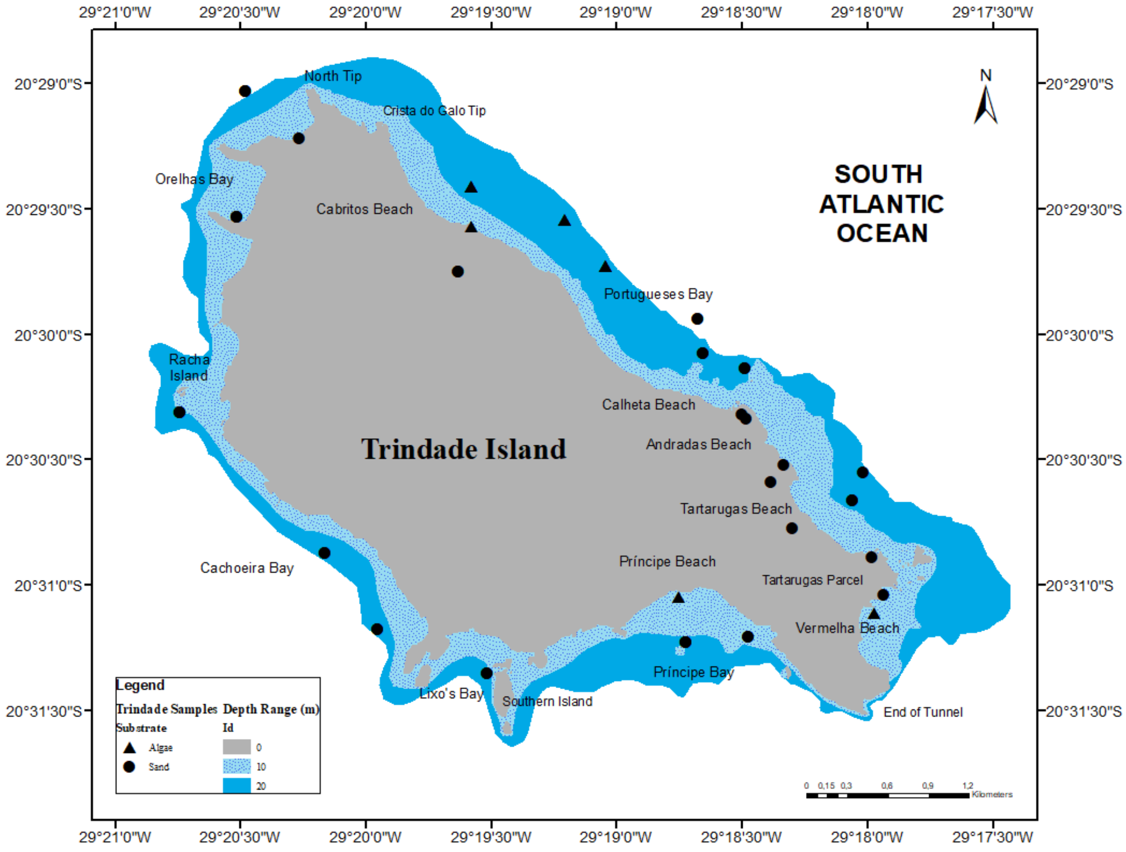

Figure 2. Location map of sampled sites on Trindade Island. Bathymetry based on the nautical chart provided by the ‘Diretoria de Hidrografia e Navegação’ (DHN) of the Brazilian Navy

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Adults and juveniles were counted and used in the live-dead analysis in order to evaluate the influence of the ontogenetic stages. Although the total number of valves and carapaces was accounted, to estimate the number of disarticulated individuals, only the left or right valve was adopted, depending on which had the largest number. Specimens were identified to species level when possible, with higher taxonomic classification based on Liebau (2005).

Live-Dead Comparisons. The resemblance between the LA and its locally associated DA was measured in several ways, following the previous works, described below. The analyses were carried out with live and dead specimens gathered from the same sample (after removing double absences). Samples with a minimum of one living or dead specimens were excluded to avoid misunderstanding due to underrepresentation, as well those with less than four species. Species richness fidelity was obtained by calculating the difference between logarithmic values (base 10) of dead species richness ($\Delta S = \log 10$ (dead S) − log10 (rarefied live S)), where S is species richness of the sample or factor (e.g. substrate, place). The DA was resampled without replacement to the size of the correspondent LA (which is the smallest).

Spearman Rank Correlation between raw abundances of LA and DA in each factor was cross-plotted against Chao’s Jaccard similarity index (Kidwell 2007, 2013). It evaluates the live-dead agreement in the taxonomic composition and relative abundance of species. The samples occupying the upper right quadrant exhibit the highest fidelity between DA and LA, while those in opposite quadrant the poorest.

The first axes of a Principal Coordinate Analysis (PCoA), based on the richness matrix of both DAs and LAs (after excluding double absences) were compared based on Spearman Rank Correlation (Tomašových and Kidwell 2009).

Evenness was evaluated using the Probability of Interspecific Encounter (PIE = [N/(N − 1)][1 − ∑Si=1pi2∑i=1Spi2]), where N = sample size, S = richness, pi = proportion of species (Olszewski and Kidwell 2007). Values of PIE ranges from 0 (one species is dominant) to 1 (all species are equally common). Evenness ostracod fidelity was calculated as the simple difference between that of the DA and that of the corresponding LA. This output a ΔPIE, which ranges between -1 (LA more even than DA) and +1 (DA more even than LA) (Olszewski and Kidwell 2007).

The site scores of the first axis of a PCoA based on live and dead species matrix composition were correlated (Spearman Rank Correlation) as a fidelity metric (Tomašových and Kidwell 2009). Trindade and seamounts samples were spatially ordinated to explore dispersion and their relationship using Non-Metric Multidimensional Scaling (NMDS) based on the Bray–Curtis index (Legendre and Legendre 2012). To determine differences between LA and DA composition of the sites, we employed the Multivariate Analysis of Variance with Permutation (PERMANOVA; Anderson et al. 2006).

All statistical analyses were carried out on language R (version 3.6; R Core Team, 2019). The functions ‘capscale,’ ‘metaMDS,’ ‘specnumber,’ and ‘rarefy’ in the package ‘vegan’ (Oksanen et al. 2018), were used to perform PCoA, NMDS, and DeltaS (rarefaction). PIE was calculated using the function ‘HurlbertPIE’ in the package ‘paleotree’ (Bapst 2012).

RESULTS

Faunal characterization. The analysis of the samples resulted in 54 species in the VTC (see Appendix) from 2577 specimens. All the species found are benthic forms, belonging to the orders Podocopida, Platycopida, and Halocypridida, the last one present only in the seamounts. The families with the highest diversity were Hemicytheridae and Xestoleberididae, with eight species each, and Bairdiidae, with seven species. The families Loxoconchidade, Paracytherideidae, and Thaerocytheridae were the most abundant in the analyzed material, holding almost 50% of the total fauna (Fig. 3).

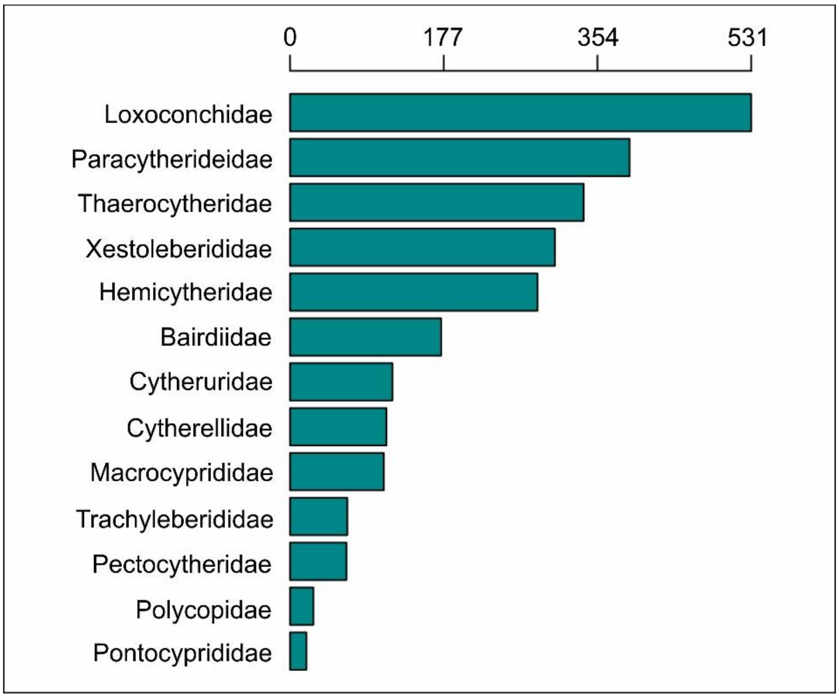

Figure 3. Family numerical abundance in the Vitória-Trindade Chain.

Only 12 species were shared between seamounts and the island. The seamounts were more diverse than the island, with 35 recorded species, although much less abundant, while on the island 30 species were identified (Fig. 4). The difference between the abundances is possibly related to the number of samples analyzed due to the logistical difficulties of collecting in these volcanic buildings.

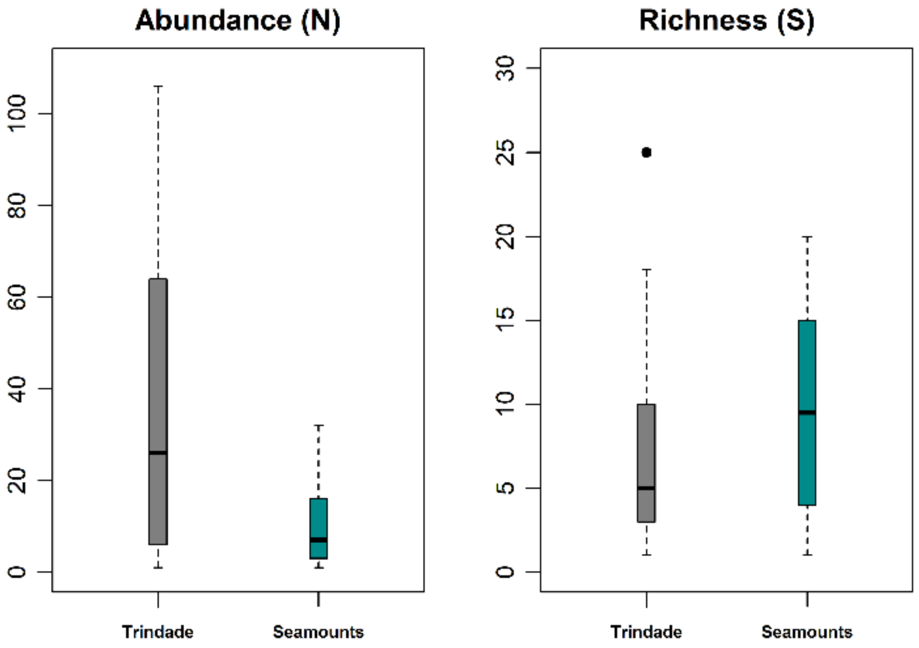

Figure 4. Box-plots showing (A) abundance (N) and richness (S) and abundance of Trindade and seamounts. The boxes (rectangles) indicate the interquartile range, horizontal bars correspond to median, indicating the variability outside the upper and lower quartile and circles represent outliers.

Live-Dead Comparisons. Living and dead specimens were found both on seamounts and around the island and most of the material collected belongs to death assemblages (DA) (N=2379, 92.3%), constituting a set of 53 species, while living assemblage (LA) (N=198, 6.7%) is composed to 30 species. All the species recorded in LA are represented in the dead fauna, except *Paracypris* sp. 2, a seamount species that has no remain in DA. In the Trindade Island, all species found alive were also found dead.

Equitability was low in both seamounts and island and some species were dominant. In the Trindade LA samples, two species dominated the fauna (Fig. 5A), *Caudites seminudus* and *Hemicytherura* sp. (about 60% of the living specimens). In the

DA, three species were dominant: *Loxoconcha foveata*, *Neohornibrookella trindadensis* and *Paracytheridea tschoppi* (about 60% of dead specimens). In seamounts, LA consists essentially of the species *Xestoleberis acuminata* (about 28% of the living specimens), while in the DA the dominant species is *Xestoleberis inesae* (about 33% of the dead specimens) (Fig. 5B).

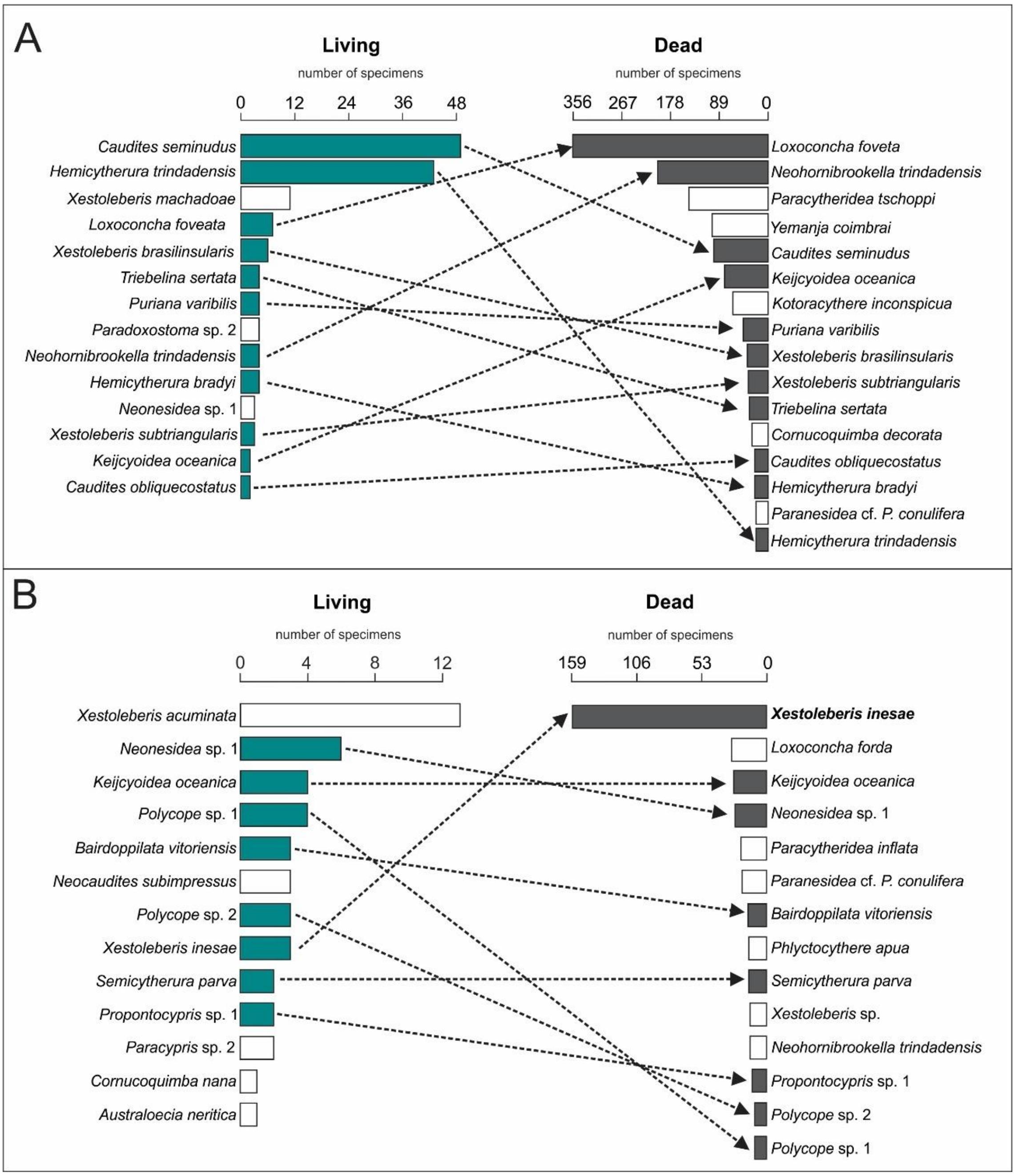

Figure 5. Abundance rank of living and dead fauna from Vitória-Trindade Chain. A) Trindade Island with at least 1,3 % of the total specimens of the corresponding fauna; B) Seamounts

species with at least 3% of the total specimens of the corresponding fauna. Unfilled bar indicates absence or very few specimens of the species in the corresponding LA or DA.

The number of species and abundance varied according to the site sampled in both studied environments. Samples collected less than five meters deep in Trindade showed few or no ostracod specimens, except for the sampling in the intertidal zone of Cabritos Beach, whose substrate is predominantly algae and concentrates a large part of the living specimens found. In this locality, the species *Hemicytherura* sp., almost absent in the other samples, was the second most abundant in LA. The highest abundance of Trindade ostracodes occurred in the samples of Andradas Beach (20 m), Racha Island (25 m) and Lixo's Bay (13 m), respectively. The latter is a protected bay on the south side of the island and presented the greatest diversity, with 26 species, comprising almost all species found in Trindade, while in the other samples with high abundance less than 20 species occurred.

The species *C. seminudus*, the most abundant in LA, is a phytal species occurring from intertidal to the subtidal zone. Its dead specimens were recovered in almost all samples, being relatively well represented in DA. On the other hand, the most abundant species in DA, *Loxoconcha foveata*, is underrepresented in LA. Their living specimens also occurred associated with the algal substrate but in very low abundance. The large abundance of this species in DA may be related to a shorter life cycle and breeding peaks throughout the year, added to its greater resistance to destruction by physical processes, resulting in the introduction of large numbers of specimens into the dead assemblage.

The other abundant species in LA, *Hemicytherura* sp., is poorly represented in DA. Its occurrence (both live and dead specimens) is almost restricted to the algal substrate of the intertidal zone with few specimens in other sampled habitats. This distribution limited to a high energy environment may be one of the factors that hinder its accumulation in the dead association, which is constantly exposed to the incidence of waves and tidal variations, leaving the shells more susceptible to destruction.

Ontogenetic stages were found for most species around the Trindade Island, with the adult stages prevailing. Only the abundance of some species was influenced by juveniles. Among these species is *Yemanja coimbrai*, whose youngs represent the majority of its specimens in DA, and *Xestoleberis machadoae*, consisting mostly of juveniles in both DA and LA.

The fauna of seamounts is composed mainly of species of Bairdiidae and Xestoleberididae, which showed greater diversity and abundance in these environments. The species *X. inesae* occurred in all seamounts and was the most abundant in dead fauna, but poorly represented in LA. Victoria seamount, which presented the greatest diversity (27 species), is the only one in which the species *X. inesae* does not make up a significant portion of the individuals. Jaseur presented the lowest diversity and abundance among the seamounts, with only six species recorded. The fauna of Davis is composed of 20 species, among which *X. inesae* represents 34% of the total recovered specimens. In the Dogaressa, the furthest from the platform, 21 species were recorded and presented greater abundance, holding more than 40% of the individuals found on the seamounts.

Few specimens were recorded in the seamounts LA, which consists mostly of juvenile stages (63.8%). The most abundant species is *Xestoleberis acuminata*, which is quite underrepresented in DA. Considering that DA is predominantly formed by adults, and different species dominate the fauna, the fidelity is lower in such environments. The highest fidelity in the seamounts occurred among the juveniles of Dogaressa.

In all sampled localities, considering both seamounts and Trindade Island, DAs produced more species than the corresponding living associations. Values of ΔS (dead rich minus living rich) of the samples was generally positive (Fig. 6).

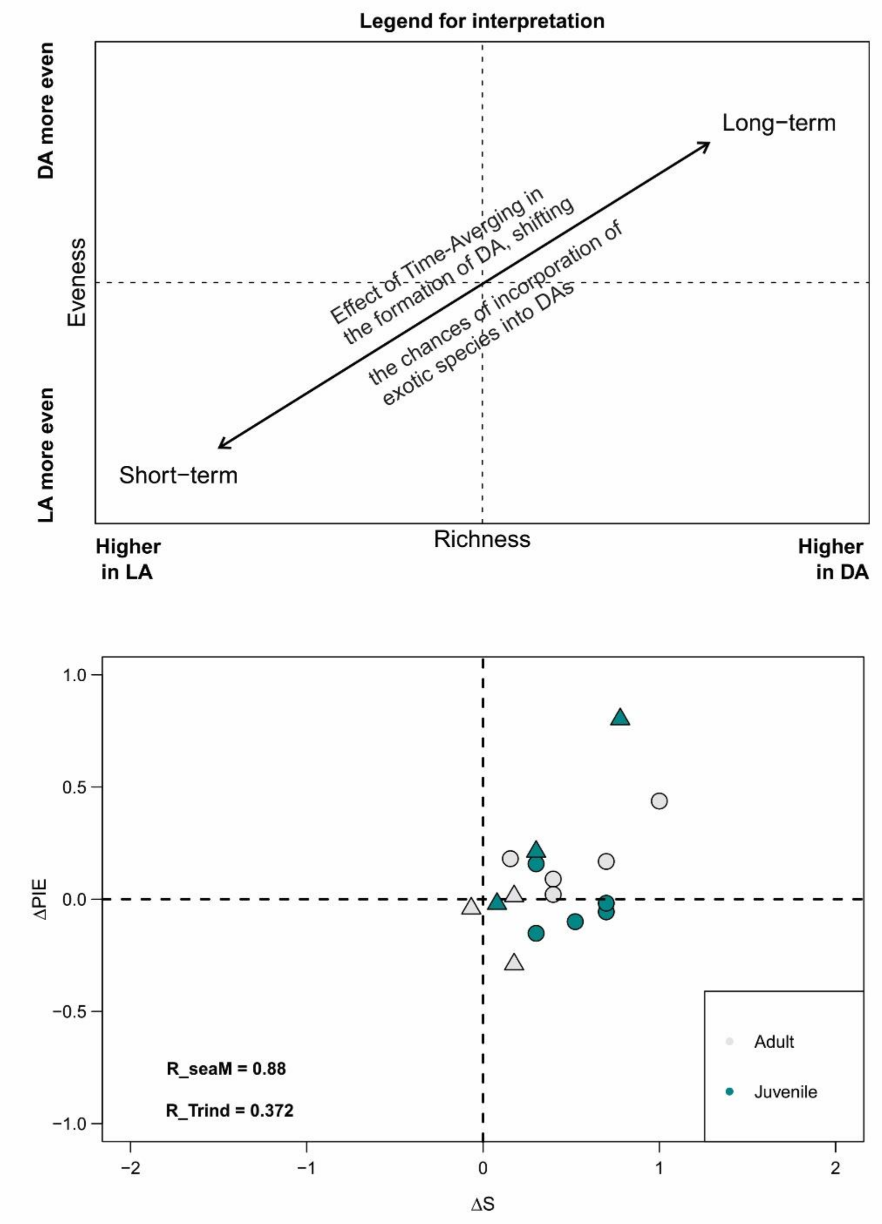

Figure 6. Cross plot of live-dead differences in assemblage richness (ΔS) and evenness (ΔPIE), considering adults and juveniles stages. Trindade samples are indicated by circles and seamounts by triangles (Legend for interpretation figure from Martello et al. 2018).

The highest fidelity between LA and DA is observed in sediments of a Trindade islet (named Racha Island) (Fig. 7). The most part of samples with high fidelity was obtained from the algal substrate, except for Racha Island and Lixo's Bay. In the seamounts, in general, the samples showed a low similarity between living and dead associations. Only the adults of Davis and the juveniles of Dogaressa are among the samples with the highest fidelity.

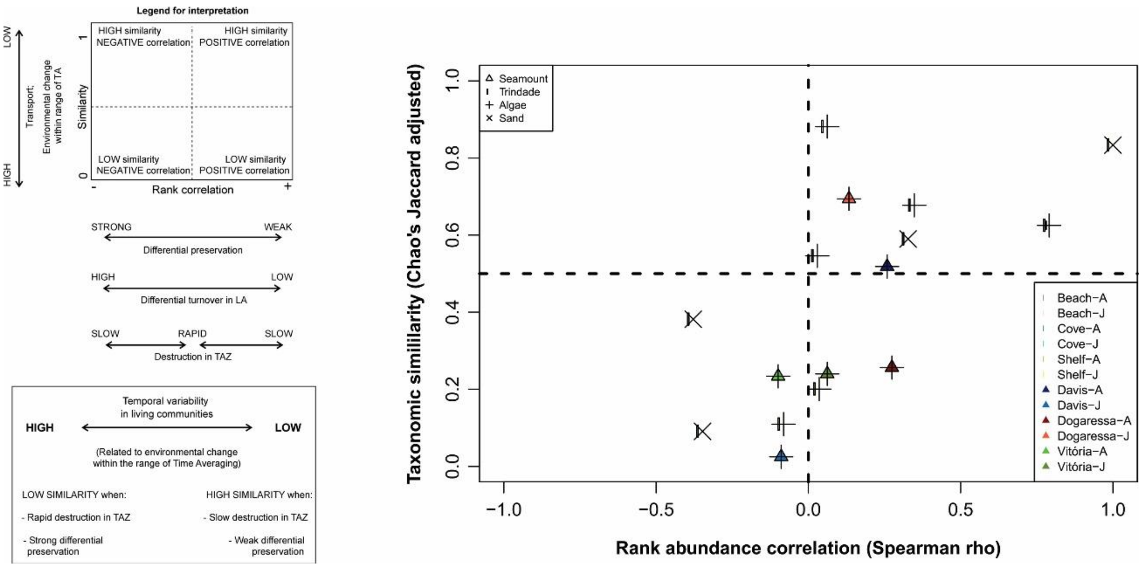

Figure 7. Live-dead agreement based on site-level Spearman rank-abundance correlation and species composition (Jaccard–Chao index of taxonomic similarity). Legend for interpretation figure from Martello et al. 2018.

The spearman rank correlation between live and dead-site scores of a PCoA (with Bray–Curtis distance after square-root transformation of proportional species abundances) showed a negative correlation (Fig. 8; both with p values higher than 0.05).

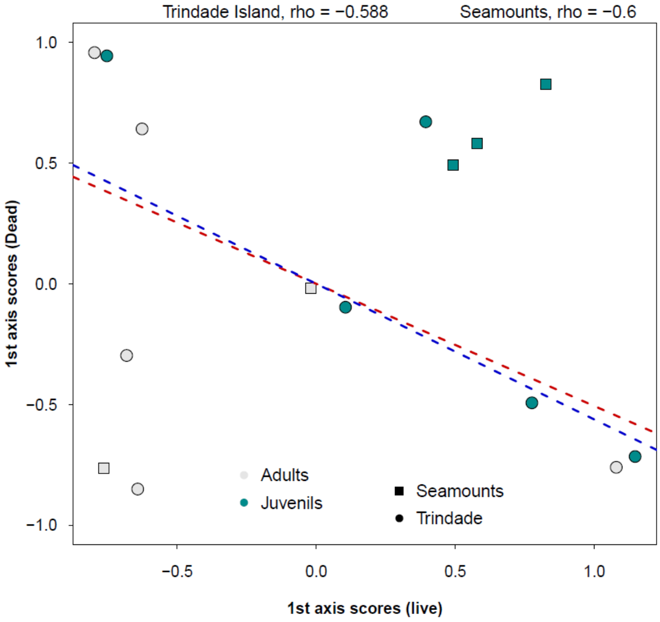

Figure 8. Correlation of PCoA first scores (Bray–Curtis distance of square-root transformed proportional abundances) of live (horizontal axis) and dead assemblages (vertical axis) from Trindade Island and seamounts, comparing adults and juveniles. PCoa-Live 1st eigenvalue explain 29.62% while dead first axis explains 44.16% (Trindade Island). For the seamounts, the power is 37.06 % (live) and 36.49 (dead).

DISCUSSION

The Trindade Island supports a variety of environments, allowing ostracods to occupy a variety of niches. Species such as *C. seminudus* (most abundant in LA) and *L. foveata* (most abundant in DA) are present in habitats ranging from intertidal to subtidal zones, while other species, such as *Hemicytherura* sp., are restricted to the intertidal zone associated with algal substrate. This distribution of species reflects their preservation in the dead fauna, since species that occupy different environments are better represented in the dead fauna than species with restricted occurrence. Between the seamounts the habitats are similar, even located at different depths and most species are shared among them.

The seamounts and the island showed differences in proportional abundance between LA and DA. The overrepresentation in DA of species with low specimens in LA may be the result of a life span bias, causing short-lived species to introduce several individuals into DA at a time when long-lived species introduce very few. The data set analyzed showed that in most of the sampled localities the richness and evenness were higher in DA than in LA (ΔS and $\Delta PIE > 0$), observed mainly among Trindade adults. These values suggest that time-averaging is capable of capturing long-term changes in the living community (as discussed by Olszewski and Kidwell 2007). According to the authors, in this type of association is expected the introduction of out of within-habitat material, adding different taxa than those observed in the living association, increasing the uniformity of dead species abundance. However, in Trindade, what we observe is a spatial condensation, as species that in life occupy different niches after death are accumulated together preferentially in deeper areas.

Michelson et al. (2018) found consistent values of high concordance between living and dead in pristine lakes on the Bahamas islands (all pristine lakes samples fall in the upper right cross-plot of taxonomic similarity and rank abundance correlation). The authors associate variation in live-dead agreement to stressed lakes, although they did not observe a significant correlation with human population density. In the marine environment analyzed here, the variation in live-dead agreement is probably related to a combination of natural habitat conditions and ostracod intrinsic factors.

CONCLUSIONS

- The ostracod fauna of the Vitória-Trindade Chain is quite diverse, even being remote environments. Seamounts generally had higher richness, although much less abundant than Trindade Island;
- Even though the seamounts and island are relatively close, only 12 species are shared between them;
- The living and dead assemblages recorded for both the seamounts and the island showed substantial differences. Overall, DA was richer and more abundant than living association;
- In Trindade Island, living specimens are mainly associated with the algal substrate. However, the dead fauna is not as diverse and abundant in this same substrate. The greatest richness and abundance of DA were found on sediments of deeper sites, summarizing the association of various habitats of the island;
- The reduced number of juveniles in DA's of some species may be related to the rapid loss of these specimens due to their more fragile carapace, while adults may resist longer in dead fauna;
- The seamounts and the island showed differences in proportional abundance between LA and DA. The overrepresentation in DA of species with low specimens in LA may be the result of a life span bias, causing short-lived species to introduce several individuals into DA at a time when long-lived species introduce very few.

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APPENDIX

List of living and dead ostracode species identified in this study.

Family	**Species**
BAIRDIIDAE	*Bairdoppilata vitorienisis* *Neonesidea longisetosa* (Brady, 1902) *Neonesidea* sp. 1 *Neonesidea* sp. 2 *Paranesidea* cf. *P. conulifera* (Bonaduce, Masoli and Pugliese, 1976) *Triebelina sertata* Triebel, 1948 *Triebelina* sp.
BYTHOCYTHERIDAE	*Sclerochilus* sp. *Vandenboldina kyryia*.
CANDONIDAE	*Paracypris* sp. 1 *Paracypris* sp. 2
CYTHERELLIDAE	*Keijcyoidea oceanica*
CYTHERURIDAE	*Hemicytherura bardyi* (Puri, 1960) *Hemicytherura trindadensis* *Semicytherura parava* *Semicytherura* sp.
HEMYCYTHERIDAE	*Auradilus convolutus* (Brady, 1868) *Caudites exmouthensis* Hartmann, 1978 *Caudites obliquecostatus* Bold, 1963 *Caudites seminudus* Whatley and Keeler, 1989 *Coquimba* cf. *C. punctata* Ramos, 1994 *Cornucoquimba decorata* Ramos, 1996 *Cornucoquimba nana* Ramos, 1996 *Neocaudites subimpressus* (Edwards, 1944)
LEPTOCYTHERIDAE	*Callistocythere cranekeyensis* (Puri, 1960)
LOXOCONCHIDAE	*Loxoconhcha forda* Bold, 1968 *Loxoconcha foveata* Hartmann, 1956 *Loxocorniculum micropapillosum* *Phlyctocythere apua* *Phlyctocythere christophei*
MACROCYPRIDIDAE	*Yemanja coimbrai* (Brandão, 2005)
PARACYTHERIDEIDAE	*Paracytheridea inflata* Purper and Ornellas, 1987 *Paracytheridea tschoppi* Bold, 1946
PARADOXOSTOMATIDAE	*Paradoxostoma* sp. 1 *Paradoxostoma* sp. 2 *Paradoxostoma*? sp. 3
PECTOCYTHERIDAE	*Kotoracythere inconspicua* (Brady, 1880)
POLYCOPIDAE	*Polycope* sp. 1 *Polycope* sp. 2
PONTOCYPRIDIDAE	*Australoecia neritica* Sartori and Coimbra, 2010 *Propontocypris* sp. 1 *Propontocypris* sp. 2 *Propontocypris* sp. 3
THAEROCYTHERIDAE	*Neohornibrookella trindadensis* (Coimbra and Carreño, 2012)
TRACHYLEBERIDIDAE	*Australimoosella polypleuron* Coimbra, Ramos, Whatley and Bergue, 2004 *Puriana variabilis* Chukewiski and Purper, 1985
XESTOLEBERIDIDADE	*Xestoleberis brasilinsularis* Luz and Coimbra, 2014 *Xestoleberis inesae* Luz and Coimbra, 2015 *Xestoleberis machadoae* Luz and Coimbra, 2014 *Xestoleberis subtriangularis* Luz and Coimbra, 2015 *Xestoleberis acuminata* *Xestoleberis caperata* *Xestoleberis* sp.

CAPÍTULO III

Aspectos Zoo- e Paleogeográficos da Fauna da Cadeia Vitória Trindade

OSTRACODES EM ILHAS OCEÂNICAS E MONTES SUBMARINOS

As ilhas oceânicas, que não possuem conexões com outras áreas de terras, apresentam uma biota particular que conseguiu atravessar as barreiras oceânicas. Nem todos os organismos são capazes de vencer tais barreiras, e isso se reflete nas composições desarmônicas da fauna e da flora em ilhas oceânicas. Ilhas formadas recentemente (*e.g.* Surtsey, localizada ao sul da Islândia) e aquelas relativamente mais antigas (*e.g.* Galápagos, Havaí), demonstram que, à medida que as comunidades insulares se tornam mais complexas e estáveis, menos organismos recém-chegados são capazes de estabelecer populações permanentes. Barreiras à dispersão parecem geralmente mais fáceis de superar do que barreiras ao estabelecimento (Smith 2011).

O estabelecimento de faunas isoladas (ilhas oceânicas, montes submarinos ou *guyots*) é um dos assuntos intrigantes da biogeografia dos ostracodes bentônicos, pois o grupo não possui estágio larval pelágico, diferente de outros organismos aquáticos. A dispersão dos ostracodes é determinada pela capacidade de locomoção individual e, principalmente, pela corrente predominante. Já o deslocamento ativo entre os topos de montes submarinos submersos e isolados é mais intrigante. A carapaça carbonática dos ostracodes não suporta profundidade abaixo da CCD (profundidade de compensação do carbonato), onde começa a dissolução das conchas, logo sua dispersão deve ocorrer por rotas muito acima dessa profundidade. Eventos de transporte por animais, plantas flutuantes ou troncos, também devem ser consideradas como mecanismos alternativos para a dispersão destes organismos (Maddocks & Steineck 1987; Boomer & Whatley 1995; Boomer 2002; Coimbra & Carreño 2012). João Carlos Coimbra (comunicação pessoal em 12 de março de 2019) coletou, na praia Cidreira (RS), um chinelo de borracha primariamente colonizado por algas e, secundariamente por briozoários e outros invertebrados. A análise deste material em laboratório evidenciou a presença de ostracodes bentônicos em diferentes estágios de crescimento, os quais se deslocavam passivamente como organismos pseudoplanctônicos.

Poucos estudos foram realizados com ostracodes em ilhas oceânicas, sendo Allison & Holden (1971) um dos trabalhos seminais neste campo, com a caracterização da fauna da Ilha de Clipperton (Pacífico Tropical). A partir deste trabalho, outras pesquisas começaram a ser desenvolvidas em ilhas oceânicas, permitindo traçar o padrão de distribuição e rotas de dispersão de algumas espécies (*e.g.* Bate *et al.* 1981; Titterton & Whatley 1988a,b, 2006, 2007, 2009; Titterton *et al.* 2001; Coimbra &

Carreño 2012; Meireles *et al.* 2012, 2014 a,b). No entanto, a vasta maioria das espécies relatadas estão restritas a uma área limitada, tornando a fauna de algumas destas regiões bastante peculiar, como observado em Galápagos (Bate *et al.* 1981) e Havaí (Hartmann 1991). Sabe-se que as barreiras físicas e a ausência de estágio larval pelágico limitam a dispersão dos ostracodes, como já discutido no parágrafo anterior, o que pode explicar o elevado grau de endemismo observado em grande parte destes estudos. Porém, uma caracterização das áreas adjacentes mais profundas, incluindo os topos de montes submarinos, poderia revelar uma distribuição mais ampla destas faunas (Wilson & Kaufmann 1987; Larwood & Whatley 1993; Boehlert & Genin 2013).

Como a grande maioria dos estudos está concentrada no Pacífico ou Indo-Pacífico, o conhecimento dos ostracodes de ilhas oceânicas do Atlântico ainda é bastante incompleto. Dentre os poucos trabalhos temos Maddocks (1975, Ascensão), Whatley *et al.* (1995b, Malvinas), Keyser & Schöning (2000, Bermudas), Wouters (2003, Cabo Verde), Schornikov & Keyser (2004, Canarias e Madeira) e Meireles *et al.* (2012, 2014a,b, Açores). Cabe ressaltar que a maioria destes autores trabalhou com poucas amostras e, portanto, apresentaram apenas parte da riqueza específica das respectivas ostracofaunas. No que se refere ao Brasil, o conhecimento sobre as ilhas oceânicas foi intensificado na última década com os estudos de Coimbra *et al.* (2009, Trindade e Atol das Rocas), Coimbra & Carreño (2012, Trindade e Atol das Rocas), Antonietto *et al.* (2012, ASPSP), Coimbra *et al.* (2013, ASPSP), Luz & Coimbra (2014, ASPSP) e Coimbra *et al.* (2018, ASPSP). Novamente, nenhum destes trabalhos se propôs a realizar um estudo taxonômico exaustivo, deixando muitas espécies em nomenclatura aberta.

Os trabalhos realizados em montes submarinos e *guyots* são ainda mais escassos. Um dos fatores limitantes para o desenvolvimento de pesquisas nestes ambientes é a dificuldade em obter amostras, visto que a maior parte se encontra em grandes profundidades e/ou em áreas com forte hidrodinâmica. Os poucos trabalhos existentes com ostracodes de montes submarinos estão concentrados no Pacífico, e são baseados em testemunhos ou dragagem realizadas pelo projeto DSDP/ODP. Um estudo importante, abordando aspectos da evolução dos ostracodes nestes ambientes isolados foi realizado por Larwood & Whatley (1993), com dados da cadeia de montes submarinos Emperor e os *guyots* de Horizon e Ita Mai Tai, todos no Oceano Pacífico.

O conhecimento da fauna marinha de ilhas oceânicas brasileiras é especialmente importante para entender a distribuição dos ostracodes bentônicos no

Oceano Atlântico Sul, bem como sua relação com a plataforma e áreas costeiras adjacentes. Deste modo, este tipo de estudo auxilia no esclarecimento de padrões de distribuição e faixas zoogeográficas, que ajudam na compreensão de rotas de dispersão dessa fauna ao longo do tempo geológico, bem como na interpretação de ambientes deposicionais antigos.

O PAPEL DOS MONTES SUBMARINOS NA COLONIZAÇÃO DE ILHAS

A teoria de biogeografia de ilhas proposta por MacArthur & Wilson (1967) reconhece o papel importante de ilhas menores na colonização das "ilhas-alvo" (*target island*). Assumindo que a taxa de colonização depende da distância da área fonte, as ilhas menores podem funcionar como alpondras (*steepping-stone*) para que as espécies consigam atingir áreas mais distantes. Para os organismos marinhos, uma cadeia de montanhas submarinas pode ter grande impacto na colonização das ilhas oceânicas. Os montes submarinos parecem um sistema óbvio para a aplicação desta teoria, pois podem facilitar as trocas com a área fonte, que pode ser o continente ou outra ilha, desde que tenham as condições necessárias para que as espécies ali se estabeleçam (Gilpin 1980; McClain 2007; Simon 2014).

Os montes submarinos respondem a muitos gradientes oceanográficos de larga-escala, como as correntes oceânicas, que atuam significativamente no aumento da conectividade entre áreas próximas. Apesar das potenciais barreiras existentes entre montes submarinos e a limitação de dispersão de cada espécie, existem poucas evidências conclusivas que o isolamento leve à dissimilaridade genética entre eles. Muitos casos de endemicidade podem estar relacionados à falta de caracterização da fauna regional, visto que estudos vêm revelando similaridade entre biotas bentônicas de montes e ilhas (Wilson & Kaufmann 1987; Larwood & Whatley 1993; McClain 2007).

Para organismos que apresentam fase larval pelágica, como muitos moluscos, equinodermas, decápodes e anelídeos, as faunas são virtualmente idênticas em montes com profundidades similares e em um mesmo oceano, confirmando a expectativa de uma ampla distribuição de espécies destes grupos. A similaridade entre a fauna dos montes submarinos e a plataforma adjacente, observada para vários grupos, corrobora com a teoria das alpondras, sugerindo que a composição faunística dos montes submarinos é controlada pela capacidade de dispersão das espécies. Entretanto, se a dispersão ocorre progressivamente ao longo da cadeia ainda é incerto (Hubbs 1959; Wilson & Kaufmann 1987; McClain 2007; O'Hara *et al.* 2010).

FAUNA DE OSTRACODES DA CADEIA VITÓRIA-TRINDADE

A fauna de ostracodes da CVT mostrou-se bastante diversa – considerando o isolamento desta região – compreendendo 17 famílias, 31 gêneros e 54 espécies, e representada por diferentes estágios ontogenéticos. As famílias com maior riqueza específica são: Hemicytheridae, Xestoleberididae, Bairdiidae e Loxoconchidae. A maioria das famílias registradas possui representantes tanto nos montes quanto na ilha, exceto por alguns grupos como pectocytherídeos, leptocytherídeos e trachyleberidídeos, que ocorreram apenas em Trindade, e polycopídeos e pontocyprididídeos, encontrados somente nos montes submarinos.

Em conjunto, os montes submarinos mostraram-se mais diversos que a ilha, com 35 espécies registradas, embora bem menos abundantes, enquanto em Trindade foram identificadas 30 espécies. Considerando que os montes submarinos são pequenas ilhas submersas no ambiente oceânico, separadas por grandes profundidades, a ostracofauna também apresentou variações de um monte para outro. A fauna do monte Vitória, localizado mais próximo da plataforma (~120 km de distância), foi a mais diversa, apresentando 27 espécies em sua composição. O monte Jaseur, a 300 km da plataforma, é composto por apenas seis espécies. A fauna do monte Davis, situado a 350 km da plataforma, apresentou 20 espécies, e o monte Dogaressa, o mais distante (480 km), apresentou maior abundância e sua fauna é composta por 21 espécies.

As famílias Bairdiidae e Xestoleberididae apresentaram maior diversidade, sendo os xestoleberidídeos o grupo mais abundante, estando presente ao longo de toda a cadeia. A fauna da Ilha da Trindade e dos montes diferem substancialmente entre si, apresentando somente 12 espécies em comum, sendo que apenas *Neocaudites subimpressus* ocorre ao longo de toda a cadeia. As famílias Trachyleberididae, Leptocytheridae, Pectocytheridae e Candonidae não estão representadas nos montes. A maioria das espécies encontradas são compartilhadas entre dois ou mais montes, exceto pelas espécies *Semixestoleberis* sp. e *Coquimba* cf. *C. punctata*, que ocorrem apenas no Monte Vitória, *Semicytherura parva*, encontrada somente no Monte Davis, e *Cornucoquimba nana*, *Vandenboldina kyryia* e *Propontocypris* sp. 2, presentes apenas no Monte Dogaressa.

Associação faunística observada na CVT claramente pertence a Província Brasileira, apresentando menos de 40% de espécies endêmicas (**Erro! Fonte de referência não encontrada.**). A maioria possui registro principalmente ao longo da plataforma continental brasileira, de norte a sudeste, mas algumas também estão presentes em outras regiões do globo, como Golfo do México, Caribe, Atlântico Norte, África (oeste e/ou leste), Mediterrâneo, Mar Vermelho e Indo-Pacífico e Pacífico (Anexo 4).

Tabela 1. Distribuição das espécies registradas apenas na Cadeia Vitória-Trindade. TRN = Trindade; DGR = Dogaressa; DVS = Davis; JSR = Jaseur; VTR = Vitória; ✓= presença da espécie; ○ = ausência da espécie.

	CADEIA VITÓRIA-TRINDADE				
ESPÉCIES	TRN	DGR	DVS	JSR	VTR
Keijcyoidea oceanica	✓	✓	✓	○	✓
Bairdoppilata vitoriensis	✓	○	○	○	✓
Neonesidea sp. 1	✓	✓	✓	○	✓
Neonesidea sp. 2	✓	○	○	○	✓
Triebelina sp.	○	✓	✓	○	✓
Propontocypris sp. 1	○	○	✓	✓	✓
Propontocypris sp. 2	○	✓	○	○	○
Propontocypris sp. 3	○	○	○	○	✓
Paracypris sp. 1	✓	○	○	○	○
Paracypris sp. 2	○	○	○	○	✓
Paradoxostoma sp. 1	○	○	○	○	✓
Paradoxostoma sp. 2	✓	○	○	○	○
Paradoxostoma? sp. 3	✓	○	○	○	○
Semixestoleberis sp.	○	○	○	○	✓
Xestoleberis sp.	○	✓	✓	○	○
Hemicytherura trindadensis	✓	○	○	○	○
Semicytherura parva	○	○	✓	○	○
Semicytherura sp.	✓	○	○	○	○
Phlyctocythere apua	○	○	✓	○	✓
Polycope sp. 1	○	✓	○	○	✓
Polycope sp. 2	○	✓	○	○	✓

Dez espécies registradas na CVT possuem registro fóssil em outras regiões, podendo ser usadas para traçar rotas de dispersão através do tempo geológico. A Ilha da Trindade apresentou espécies comuns em ambiente marinho raso, como *Kotoracythere inconspicua* e *Triebelina sertata*, que apresentam ampla distribuição, ocorrendo em vários oceanos e mares (veja Witte 1993; Coimbra & Carreño 2012). A espécie *K. inconspicua* surgiu no Mioceno no Indo-Pacífico e está presente em águas rasas em todas regiões tropicais. Por sua vez, *T. sertata* também faz parte desse pequeno grupo de espécies com distribuição pantropical, com seu registro mais antigo datando do Neomioceno do Indo-Pacífico (Hartmann 1988; Titterton & Whatley 1988a,b; Witte & van Harten 1991; Witte 1993).

Paracytheridea tschoppi e *Neocaudites subimpressus* são espécies miocênicas consideradas relictas de populações anteriores ao fechamento do Istmo do Panamá (Cronin 1988). Atualmente, estas espécies apresentam ampla distribuição, principalmente no Atlântico. Outras espécies com registro fóssil no Caribe e distribuídas ao longo da plataforma continental brasileira, também foram registradas na CVT: *Hemicytherura bradyi*, *Caudites obliquecostatus*, *Loxoconcha forda*, Neonesidea *longisetosa* e *Neohornibrookella trindadensis*.

A espécie *Auradilus convolutus*, representada por poucos espécimes na CVT (somente na ilha da Trindade), foi descrita pela primeira vez por Brady (1868) para as Ilhas Maurício (sudeste da África). O registro mais antigo da espécie data do Pleistoceno de Taiwan (Hu 1979), sendo também encontrada em águas rasas do Oceano Índico Oeste (Mostafawi *et al.* 2005) e nas regiões costeiras do leste da Austrália (Hartmann 1981), Ilha da Reunião (Whatley & Keeler 1989), Nova Caledônia (Cabioch *et al.* 1986) e Quênia (Jellinek 1993). Fora desta regiões, a espécie é conhecida apenas no Brasil (Dias-Brito *et al.* 1988; Coimbra *et al.* 1999b; Machado 2008; Coimbra & Bergue 2011; Coimbra & Carreño 2012; Morais & Coimbra 2017).

Entre as outras espécies registradas em Trindade, *Caudites exmouthensis* e *Caudites seminudus*, provavelmente originárias no Oceano Indo-Pacífico, são escassas e esparsamente distribuídos nos sedimentos holocênicos da Baía de Tamandaré, no nordeste do Brasil (Coimbra *et al.* 1992). Machado *et al.* (2005) registrou apenas uma valva da espécie *C. seminudus*, enquanto no litoral de São Paulo (Coimbra & Bergue 2011) e de Santa Catarina (Morais & Coimbra 2017) foi encontrada em abundância. A espécie *Callistocythere cranekeyensis*, rara em Trindade, também é rara na plataforma, sendo encontrada em águas rasas da Flórida, Porto Rico, Belize e nos recifes Veracruz e Anton Lizardo, no Golfo do México (Coimbra *et al.* 1995).

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ANEXOS

Anexo 1. Relação das Amostras coletadas na Cadeia Vitória-Trindade.

ID	**Amostra**	**Local**	**Latitude**	**Longitude**	**Ambiente**	**Nome da Localidade**	**Prof. (m)**	**Zona**	**Substrato**	**Amostragem**	**Data da Coleta**
1	MO209	Trindade	-20,514778	-29,2997220	Praia	Tartarugas	1	Intermaré	Areia	Manual	fev/02
2	MO203	Trindade	-20,505333	-29,3083330	Praia	Calheta	1	Intermaré	Areia	Manual	fev/02
3	MO201	Trindade	-20,517278	-29,2988890	Piscina de Maré	Parcel das Tartarugas	1	Intermaré	Areia	Manual	fev/02
4	MO202	Trindade	-20,486944	-29,3377778	Piscina de Maré	Crista do Galo	1	Intermaré	Areia	Manual	fev/02
5	MO207	Trindade	-20,508667	-29,3055560	Plat. Insular	Andradas	3	Inframaré	Areia	Mergulho livre	fev/02
6	MO208	Trindade	-20,512833	-29,3050000	Plat. Insular	Andradas	3	Inframaré	Areia	Mergulho livre	fev/02
7	MO200	Trindade	-20,509174	-29,3003090	Plat. Insular	Andradas	20	Inframaré	Areia	Mergulho Scuba	fev/02
8	MO204	Trindade	-20,505611	-29,3080560	Plat. Insular	Calheta	7	Inframaré	Areia	Mergulho livre	fev/02
9	MO205	Trindade	-20,509778	-29,3063890	Plat. Insular	Calheta	10	Inframaré	Areia	Mergulho livre	fev/02
10	MO206	Trindade	*-20,510556*	*-29,8075000*	Plat. Insular	Calheta	15	Inframaré	Areia	Mergulho livre	fev/02
11	M17020 N	Trindade	-20,492139	-29,341917	Enseada	Orelhas	10	Inframaré	Areia	Dragagem	18/04/2014
12	M17021 N	Trindade	-20,501259	-29,310915	Enseada	Rampa Kabrita	8	Inframaré	Areia	Dragagem	18/04/2014
13	M17022 N	Trindade	-20,522528	-29,325250	Enseada	Lixo	13	Inframaré	Areia	Dragagem	22/04/2014
14	M17024 N	Trindade	-20,490139	-29,326361	Plat. Insular	Cabritos	15	Inframaré	Alga	Dragagem	22/04/2014
15	M17023 N	Trindade	-20,505139	-29,345694	Ilhota	Ilha da Racha	25	Inframaré	Areia	Dragagem	22/04/2014
16	M17025 N	Trindade	-20,520417	-29,312089	Enseada	Príncipe (Pedra do Meio)	14	Inframaré	Areia	Dragagem	23/04/2014
17	M17026 N	Trindade	-20,498972	-29,311278	Plat. Insular	Portugueses	22	Inframaré	Areia	Dragagem	23/04/2014
18	M17028 N	Trindade	-20,502194	-29,308111	Plat. Insular	Calheta	15,6	Inframaré	Areia	Dragagem	28/04/2014
19	M17027 N	Trindade	-20,483806	-29,341333	Enseada	Ponta Norte	17,5	Inframaré	Areia	Dragagem	28/04/2014
20	M1729 N	Trindade	-20,511028	-29,301000	Plat. Insular	Tartarugas	12,6	Inframaré	Areia	Dragagem	29/04/2014
21	M17030 N	Trindade	-20,5144889	-29,336028	Plat. Insular	Cachoeira (EME)	15,3	Inframaré	Areia	Dragagem	05/05/2014
22	M17031 N	Trindade	-20,519553	-29,332567	Enseada	Cachoeira (Farrilhões)	17,2	Inframaré	Areia	Mergulho Scuba	05/05/2014

23	M17033 N	Trindade	-20,495472	-29,317417	Plat. Insular	Portugueses (Pedra do Tubarão)	17	Inframaré	Alga	Dragagem	07/05/2014
24	M17032 N	Trindade	-20,492361	-29,320111	Plat. Insular	Portugueses (Ponto do Valado/Farol)	17,4	Inframaré	Alga	Dragagem	07/05/2014
25	M17034 N	Trindade	-20,520056	-29,307944	Enseada	Príncipe (Pão de Açúcar)	13	Inframaré	Areia	Dragagem	20/05/2014
26	M17051 N	Trindade	-20,501259	-29,310915	Plat. Insular	Rampa da Kabrita	8	Enseada	Areia	Dragagem	23/08/2016
27	M17053 N	Trindade	-20,490139	-29,326361	Plat. Insular	Cabritos	15	Inframaré	Alga	Dragagem	24/08/2016
28	M17061 N	Trindade	-20,492361	-29,320111	Plat. Insular	Portugueses (Ponto do Valado/Farol)	17,4	Inframaré	Alga	Dragagem	24/08/2016
29	M17062 N	Trindade	-20,495472	-29,317417	Plat. Insular	Portugueses (Pedra do Tubarão)	17	Inframaré	Alga	Dragagem	24/08/2016
30	M17050 N	Trindade	-20,492139	-29,341917	Enseada	Orelhas	10	Inframaré	Areia	Dragagem	25/08/2016
31	M17056 N	Trindade	-20,483806	-29,341333	Enseada	Ponta Norte	17,5	Inframaré	Areia	Mergulho livre	25/08/2016
32	M17052 N	Trindade	-20,505139	-29,345694	Ilhota	Ilha da Racha	25	Inframaré	Areia	Dragagem	10/09/2016
33	M17055 N	Trindade	-20,498972	-29,311278	Plat. Insular	Portugueses	22	Inframaré	Areia	Dragagem	11/09/2016
34	M17057 N	Trindade	-20,502194	-29,308111	Plat. Insular	Calheta	15,6	Inframaré	Areia	Dragagem	11/09/2016
35	M17058 N	Trindade	-20,511028	-29,301000	Plat. Insular	Tartarugas	12,6	Inframaré	Areia	Dragagem	11/09/2016
36	M17054 N	Trindade	-20,520417	-29,312089	Enseada	Príncipe (Pedra do Meio)	14	Inframaré	Areia	Dragagem	12/09/2016
37	M17063 N	Trindade	-20,520056	-29,307944	Enseada	Príncipe (Pão de Açúcar)	13	Inframaré	Areia	Dragagem	12/09/2016
38	M17060 N	Trindade	-20,519553	-29,332567	Plat. Insular	Cachoeiras (Farrilhões)	17,2	Inframaré	Areia	Dragagem	28/09/2016
39	M17059 N	Trindade	-20,5144889	-29,336028	Plat. Insular	Cachoeira (EME)	15,3	Inframaré	Areia	Mergulho Scuba	29/09/2016
40	M18009 N	Trindade	-20,517419	-29,3125360	Praia	Príncipe	1	Intermaré	Alga	Manual	18/12/2017
41	M18010 N	Trindade	-20,518500	-29,2995500	Costão Rochoso	Parcel das Tartarugas	0	Intermaré	Alga	Manual	20/12/2017
42	M18002 N	Trindade	-20,522528	-29,325250	Enseada	Lixo	13	Inframaré	Areia	Dragagem	27/12/2017
43	M18011 N	Trindade	-20,495810	-29,3271600	Praia	Cabritos	0	Intermaré	Areia	Manual	28/12/2017
44	M18012 N	Trindade	-20,495810	-29,3271600	Praia	Cabritos	0	Intermaré	Areia	Manual	28/12/2017
45	M18001 N	Trindade	-20,492139	-29,341917	Enseada	Orelhas	10	Inframaré	Areia	Dragagem	04/01/2018
46	M18003 N	Trindade	-20,505139	-29,345694	Ilhota	Ilha da Racha	25	Inframaré	Areia	Dragagem	04/01/2018
47	M18006 N	Trindade	-20,483806	-29,341333	Enseada	Ponta Norte	17,5	Inframaré	Areia	Dragagem	10/01/2018

48	M18005 N	Trindade	-20,520417	-29,312089	Enseada	Príncipe (Pedra do Meio)	14	Inframaré	Areia	Dragagem	11/01/2018
49	M18008 N	Trindade	-20,495472	-29,317417	Plat. Insular	Portugueses (Pedra do Tubarão)	17	Inframaré	Alga	Dragagem	02/02/2018
50	M18004 N	Trindade	-20,490139	-29,326361	Plat. Insular	Cabritos	15	Inframaré	Alga	Dragagem	07/02/2018
51	M18007 N	Trindade	-20,492361	-29,320111	Plat. Insular	Portugueses (Ponto do Valado/Farol)	17,4	Inframaré	Alga	Dragagem	07/02/2018
52	M18017 N	Trindade	-20,492810	-29,3263280	Praia	Cabritos	0	Intermaré	Alga	Manual	13/02/2018
53	M1101 D	Vitória	-20,691011	-37,7695240	Monte Submarino	Vitória	45	Oceânico	Alga	Mergulho Scuba	04/04/2011
54	M1107 D	Vitória	-20,691011	-37,7695240	Monte Submarino	Vitória	45	Oceânico	Alga	Mergulho Scuba	04/04/2011
55	M1104 D	Jaseur	-20,723342	-35,4674340	Monte Submarino	Jaseur	55	Oceânico	Alga	Mergulho Scuba	06/04/2011
56	M1106 D	Jaseur	-20,723342	-35,4674340	Monte Submarino	Jaseur	55	Oceânico	Alga	Mergulho Scuba	06/04/2011
57	M1102 D	Davis	-20,718123	-34,7318870	Monte Submarino	Davis	18	Oceânico	Alga	Mergulho Scuba	09/04/2011
58	M1108 D	Davis	-20,718123	-34,7318870	Monte Submarino	Davis	18	Oceânico	Alga	Mergulho Scuba	09/04/2011
59	M1103 D	Dogaressa	-20,718123	-34,7318870	Monte Submarino	Dogaressa	65	Oceânico	Alga	Mergulho Scuba	11/04/2011
60	M1105 D	Dogaressa	-20,718123	-34,7318870	Monte Submarino	Dogaressa	65	Oceânico	Alga	Mergulho Scuba	11/04/2011

Anexo 2. Comparação das espécies da Ilha da Trindade identificadas neste trabalho com a lista disponível em Coimbra & Carreño (2012).

	Espécies registradas neste trabalho para a Ilha da Trindade	**Espécies registradas por Coimbra & Carreño (2012) para a Ilha da Trindade**
BAIRDIIDAE	*Bairdoppilata vitoriensis* sp. nov.	-
	Neonesidea sp. 1	Bairdiidae Indet. 1
	Neonesidea sp. 2	Bairdiidae Indet. 2
	Paranesidea cf. *P. conulifera*	*Paranesidea parabipustulosa*
	Triebelina sertata	*Triebelina sertata*
BYTHOCYTHERIDAE	*Sclerochilus* sp.	*Sclerochilus* sp.
CANDONIDAE	*Paracypris* sp. 1	*Paracypris* sp.
CYTHERELLIDAE	*Keijcyoidea oceanica* sp. nov.	*Keijcyoidea* sp.
CYTHERURIDAE	*Hemicytherura bradyi*	*Hemicytherura bradyi*
	Hemicytherura trindadensis sp. nov.	-
	Semicytherura sp.	-
HEMICYTHERIDAE	*Auradilus convolutus*	*Auradilus costatus*
	Caudites exmouthensis	*Caudites exmouthensis*
	Caudites obliquecostatus	*Caudites obliquecostatus*
	Caudites seminudus	*Caudites seminudus*
	Cornucoquimba decorata	*Nanocoquimba labyrinthica*
	Neocaudites subimpressus	-
LEPTOCYTHERIDAE	*Callistocythere cranekeyensis*	-
LOXOCONCHIDAE	*Loxoconcha foveata*	*Loxoconcha bullata*
MACROCYPRIDIDAE	*Yemanja coimbrai*	*Macrocyprina* sp.
PARACYTHERIDEIDAE	*Paracytheridea tschoppi*	*Paracytheridea tschoppi*
PARADOXOSTOMATIDAE	*Paradoxostoma* sp. 2	-
	Paradoxostoma? sp. 3	-
PECTOCYTHERIDAE	*Kotoracythere inconspicua*	*Kotoracythere inconspicua*
THAEROCYTHERIDAE	*Neohornibrookella trindadensis*	*Tenedocythere trindadensis*
TRACHYLEBERIDIDAE	*Australimoosella polypleuron*	*Australimoosella polypleuron*
	Puriana variabilis	*Puriana variabilis*
XESTOLEBERIDIDAE	*Xestoleberis brasilinsularis*	-
	Xestoleberis machadoae	-
	Xestoleberis subtriangularis	*Xestoleberis* sp.

Anexo 3. Espécies registradas nos montes submarinos.

Legenda: VTR = Vitória; JSR = Jaseur; DVS = Davis; DGR = Dogaressa. ✓ = ocorrência da espécie; ○ = ausência da espécie.

Família	Espécies	VTR	JSR	DVS	DGR
BAIRDIIDAE	*Bairdoppilata vitoriensis* sp. nov.	✓	○	○	○
	Neonesidea longisetosa	✓	○	✓	○
	Neonesidea sp. 1	✓	○	✓	✓
	Neonesidea sp. 2	✓	○	○	○
	Paranesidea cf. *P. conulifera*	✓	○	○	○
	Triebelina sertata	✓	○	○	○
	Tribelina sp.	✓	○	✓	✓
BYTHOCYTHERIDAE	*Vandenboldina kyryia* sp. nov.	○	○	○	✓
CANDONIDAE	*Paracypris* sp. 2	✓	○	○	○
CYTHERELLIDAE	*Keijcyoidea oceanica* sp. nov.	✓	○	✓	✓
CYTHERURIDAE	*Hemicytherura bradyi*	○	○	✓	○
	Semicytherura parva sp. nov.	○	○	✓	○
HEMICYTHERIDAE	*Cornucoquimba decorata*	○	○	○	✓
	Cornucoquimba nana	○	○	○	✓
	Neocaudites subimpressus	✓	✓	✓	✓
LOXOCONCHIDAE	*Loxoconcha forda*	✓	○	○	✓
	Loxocorniculum micropapillosum sp. nov.	✓	○	✓	○
	Phlyctocythere apua sp. nov.	✓	○	✓	○
	Phlyctocythere christophei sp. nov.	✓	○	✓	✓
MACROCYPRIDIDAE	*Yemanja coimbrai*	✓	○	○	○
PARACYTHERIDEIDAE	*Paracytheridea inflata*	✓	○	✓	✓
	Paracytheridea tschoppi	✓	✓	○	○
PARADOXOSTOMATIDAE	*Paradoxostoma* sp. 1	✓	○	○	○
POLYCOPIDAE	*Polycope* sp. 1	✓	○	○	✓
	Polycope sp. 2	✓	○	○	✓
PONTOCYPRIDIDAE	*Australoecia nerítica*	✓	○	✓	○
	Propontocypris sp. 1	✓	✓	✓	○
	Propontocypris sp. 2	○	○	○	✓
THAEROCYTHERIDAE	*Neohornibrookella trindadensis*	○	○	✓	✓
XESTOLEBERIDIDAE	*Propontocypris* sp. 3	✓	○	○	○
	Xestoleberis acuminata sp. nov.	○	○	✓	✓
	Xestoleberis caperata sp. nov.	✓	○	○	✓
	Xestoleberis inesae	✓	✓	✓	✓
	Xestoleberis sp.	✓	✓	○	○

Anexo 4. Distribuição geográfica e estratigráfica das espécies que ocorrem ao longo da Cadeia Vitória-Trindade.

Legenda TRN = Ilha da Trindade; DGR = Monte Dogaressa; DVS = Monte Davis; JSR = Monte Jaseur; VTR = Monte Vitória; ABR = Arquipélago de Abrolhos; RCS = Atol das Rocas; ASPSP = Arquipélago de São Pedro e São Paulo. ✓ = ocorrência da espécie; ○ = ausência da espécie.

Espécies	**Distribuição Estratigráfica**	**Cadeia Vitória-Trindade**					**Outras ilhas oceânicas brasileiras (Recente)**			**Plataforma Continental Brasileira (Recente)**					**Ambientes marinho-marginais no Brasil (Recente)**	**Outros Registros**
		TRN	DGR	DVS	JSR	VTR	ABR	RCS	ASPSP	N	NE	L	SE	S		
Neonesidea longiseaosa	Mioceno - Recente	○	○	✓	○	✓	○	○	○	✓	✓	○	○	○	○	✓ Mioceno superior: República Dominicana ✓ Recente: Flórida (EUA), Golfo do México, Colon Harbor (Panama), Ilhas Virgens (Caribe), Açores (Portugal)
Paranesidea cf. P. conulifera	Recente	✓	○	○	○	✓	○	○	○	○	○	○	○	○	○	○
Triebelina sertata	Mioceno - Recente	✓	○	○	○	✓	○	✓	✓	○	○	○	○	○	✓ Baía de Tamandaré (PE)	✓ Mioceno superior: Filipinas ✓ Plioceno inferior: Ilhas Andamã (Golfo de Bengala), Norte de Sumatra ✓ Recente: Mar Vermelho, Golfo Pérsico, Madagascar, Indonésia, Malásia, Arquipélago de Socotra, Ilha da Reunião, Caribe
Yemanja coimbrai	Recente	✓	○	○	○	✓	✓	○	○	○	○	○	○	○	○	○
Australoecia neritica	Recente	○	○	✓	○	✓	○	○	○	✓	✓	✓	○	○	○	○
Sclerochilus sp.	Recente	✓	○	○	○	○	○	○	○	○	○	✓	○	○	○	○
Vandenboldina kyryia	Recente	○	✓	○	○	○	○	○	○	○	○	✓	○	○	○	○
Xesaoleberis brasilinsularis	Recente	✓	○	○	○	○	○	✓	✓	○	○	○	○	○	○	○
Xesaoleberis inesae	Recente	○	✓	✓	✓	✓	○	○	○	✓	✓	✓	○	○	○	○
Xesaoleberis machadoae	Recente	✓	○	○	○	○	○	○	✓	○	○	○	○	○	○	○
Xesaoleberis subtriangularis	Recente	✓	○	○	○	○	○	○	○	○	✓	✓	○	○	○	○
Xesaoleberis acuminata	Recente	○	✓	✓	○	○	○	○	○	○	○	✓	○	○	○	○
Xesaoleberis caperata	Recente	○	✓	○	○	✓	○	✓	○	○	○	○	○	○	○	○
Callisaocythere cranekeyensis	Recente	✓	○	○	○	○	○	○	○	✓	○	✓	○	○	○	✓ Recente: Flórida (EUA), Porto Rico, Belize, México (recifes Vera Cruz-Anton Lizardo)

Hemicytherura bradyi	Mioceno - Recente	✓	○	✓	○	○	○	✓	○	✓	○	✓	○	○	○	✓Recente: Flórida (EUA), Golfo do México, Caribe
Paracytheridea inflata	Recente	○	✓	✓	○	✓	○	○	○	✓	✓	✓	○	○	○	○
Paracytheridea tschoppi	Mioceno - Recente	✓	○	○	✓	✓	○	○	○	✓	✓	✓	○	○	○	✓ Mioceno inferior-Recente: Caribe, Costa do Golfo (EUA) ✓ Mioceno superior: Fiji ✓ Plioceno: Okinawa (Japão) ✓ Plioceno-Pleistoceno: Mar de Java (Indo-Pacífico) ✓ Recente: costa oeste de África, Colômbia, Califórnia (EUA), Indo-Pacífico
Loxoconcha foveata	Recente	✓	○	○	○	○	○	○	○	○	○	○	○	○	✓ Litoral de São Paulo	○
Loxoconcha forda	Mioceno - Recente	○	✓	○	○	✓	○	○	○	○	✓	✓	○	○	○	✓ Mioceno Superior-Plioceno: Caribe
Loxocorniculum micropapillosum	Recente	○	○	✓	○	✓	○	○	○	○	✓	○	○	○	○	○
Phlycaocythere chrisaophei	Recente	○	✓	✓	○	✓	○	○	○	✓	○	○	○	○	○	○
Koaoracythere inconspicua	Mioceno - Recente	✓	○	○	○	○	○	✓	○	✓	✓	✓	○	○	✓ Baía de Tamandaré (PE) ✓ Baía de Sepetiba (RJ)	✓ Mioceno inferior: Midway (EUA) ✓ Mioceno médio-superior: Ilhas Andamã ✓ Plioceno-Recente: Okinawa (Japão) ✓ Recente: Oceano Atlântico, Caribe, Indo-Pacífico, Pacífico Sul
Auradilus convolutus	Pleistoceno - Recente	✓	○	○	○	○	○	○	○	✓	✓	✓	○	○	✓ Cabo Frio (RJ) ✓ Baía de Sepetiba (RJ) ✓ Litoral de Santa Catarina	✓ Pleistoceno: Taiwan ✓ Recente: Oceano Índico, Pacífico Oeste
Caudites exmouthensis	Recente	✓	○	○	○	○	○	○	○	○	○	✓	○	○	✓ Baía de Tamandaré (PE)	✓ Recente: Norte da Austrália, Ilha da Reunião, Malásia
Caudites obliquecostatus	Pleistoceno - Recente	✓	○	○	○	○	○	○	○	✓	✓	✓	✓	✓	✓ Baía de Tamandaré (PE) ✓ Litoral de São Paulo ✓ Litoral de Santa Catarina	✓ Pleistoceno-Recente: Caribe
Caudites seminudus	Recente	✓	○	○	○	○	○	✓	○	○	✓	✓	✓	✓	✓ Baía de Tamandaré (PE) ✓ Litoral de São Paulo ✓ Cabo Frio (RJ) ✓ Litoral de Santa Catarina	✓ Ilha da Reunião
Cornucoquimba decorata	Recente	✓	✓	○	○	○	○	○	○	✓	✓	✓	✓	○	✓ Baía de Tamandaré (PE)	○
Cornucoquimba nana	Recente	○	✓	○	○	○	○	○	○	✓	○	✓	○	○	○	○
Neocaudites subimpressus	Plioceno - Recente	✓	✓	✓	✓	✓	○	✓	○	✓	✓	✓	○	○	○	✓ Plioceno: Carolina do Norte (EUA) ✓ Plioceno- Recente: Caribe ✓ Recente: Ilhas Clipperton, Costa Oeste da África
Neohornibrookella trindadensis	Mioceno - Recente	✓	✓	✓	○	○	○	✓	○	✓	○	○	○	○	○	✓ Recente: República Dominicana
Australimoosella polypleuron	Recente	✓	○	○	○	○	○	○	○	✓	✓	✓	○	○	○	○

Puriana variabilis	Recente	✓ ○ ○ ○ ○	○ ○ ○	✓ ✓ ✓ ○ ○	✓ Baía de Tamandaré (PE)	○