Universidade Federal do Amapá
Pró-Reitoria de Pesquisa e Pós-Graduação
Programa de Pós-Graduação em Biodiversidade Tropical
Mestrado e Doutorado
UNIFAP / EMBRAPA-AP / IEPA / CI-Brasil

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COMO A EXPANSÃO DE HIDRELÉTRICAS, PERDA FLORESTAL E MUDANÇAS CLIMÁTICAS AMEAÇAM A ÁREA DE DISTRIBUIÇÃO DE ANFÍBIOS NA AMAZÔNIA BRASILEIRA

MACAPÁ, AP
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Dissertação apresentada ao Programa de Pós-Graduação em Biodiversidade Tropical (PPGBIO) da Universidade Federal do Amapá, como requisito parcial à obtenção do título de Mestre em Biodiversidade Tropical.

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Co-Orientador: Dr. Rafael Loyola

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À minha família, meus amigos, meu amor e ao meu pequeno Sebastião.

AGRADECIMENTOS

Agradeço a CAPES pela conceção de uma bolsa durante os dois anos de mestrado, ao Programa de Pós-Graduação em Biodiversidade Tropical (PPGBio) pelo apoio logístico durante a pesquisa realizada. Obrigado aos professores do PPGBio por todo o conhecimento compartilhado. Agradeço aos Doutores, membros da banca avaliadora, pelas críticas e contribuições construtivas ao trabalho.

Obrigado à toda equipe do Laboratório de Ecologia e Conservação de Vertebrados (LECOV), em especial à minha orientadora, Dra. Fernanda Michalski e meus companheiros Omar Landazuri e Victor Rodriguez. Agradeço também à equipe do Laboratório de Biogeografia da Conservação (CBLab) da Universidade Federal de Goiás, em especial ao meu co-orientador, Dr. Rafael Loyola e aos amigos que me receberam muito bem em Goiânia.

Agradeço à todos os companheiros da turma PPGBio 2015, pelos momentos sérios de trabalho e também os de descontração, desejo que todos possam trilhar um ótimo caminho. Obrigado aos meus amigos/irmãos que ajudaram nesses longos dois anos de mestrado incentivando e criticando cada momento. Agradeço à minha família que foi fundamental para manter o foco e o equilíbrio durante essa caminhada. À minha companheira e nosso pequenino Sebastião, obrigado por serem minha grande motivação.

RESUMO

Silva e Silva, Yuri. Como a expansão de hidrelétricas, perda florestal e mudanças climáticas ameaçam a área de distribuição de anfíbios na Amazônia brasileira. Macapá, 2017. Dissertação (Mestre em Biodiversidade Tropical) - Programa de Pós-graduação em Biodiversidade Tropical – Pró-Reitoria de Pesquisa e Pós-Graduação - Universidade Federal do Amapá.

Por ser um grupo muito sensível às alterações ambientais, atualmente os anfíbios estão entre os vertebrados mais ameaçados. Podemos listar as mudanças climáticas, desmatamento e hidrelétricas como ameaças constantes ao grupo, mesmo em áreas muito protegidas como a Amazônia. A Amazônia Brasileira abriga 20 famílias de anfíbios abrangendo um total de 308 espécies, das quais 14% possui status desconhecido ou está classificada em alguma categoria de ameaça (quase ameaçada, vulnerável e ameaçada). Neste estudo, investigamos como estas ameaças poderão afetar a área de distribuição geográfica de anfíbios na Amazônia. Para isso, sobrepomos a área de distribuição geográfica das espécies com a localização de hidrelétricas (em atividade, em construção ou inventariadas) e com mapas de cenários de desmatamento e de mudanças climáticas para o futuro (2030 e 2050). Encontramos que 67.2% das espécies de anfíbios Amazônicos poderão perder área de distribuição devido a sobreposição com hidrelétricas. Além disso, o desmatamento também é uma ameaça potencial aos anfíbios, mas possui um impacto menor comparado às mudanças no clima. Em 2030, 180 espécies poderão perder área para o desmatamento, entretanto, somente 10 espécies perderão mais do que 10% de seu território. Em 2050 o número de espécies ameaçadas pelo desmatamento aumenta para 200, dessas, *Pseudopaludicola saltica* deverá ser a mais ameaçada, com 38% de perda de área. A maior perda potencial de área de distribuição foi causada por mudanças climáticas, principalmente por meio do aumento da temperatura. Nós encontramos que, três famílias de anfíbios deverão ter mais da metade das espécies com 50% de área de distribuição potencialmente ameaçada pelas mudanças climáticas em 2030; em 2050 esse número aumenta para 13 famílias. A construção de hidrelétricas e o desmatamento ameaçam populações locais de anfíbios amazônicos com possíveis declínios populacionais, extinções locais e redução na diversidade genética das populações. Além disso, em todo o mundo, mudanças climáticas têm sido relacionadas com a redução da sobrevivência e mudanças na distribuição geográfica de anfíbios. Diante desse cenário, sugerimos que o país retome a liderança nas decisões sobre temas ambientais, além de definir medidas de conservação de curto e médio prazo para impedir o avanço do desmatamento e futuras extinções.

Palavras-chave: Anfíbios; Perda de habitat; Amazônia; Hidrelétricas; Desmatamento; Mudança climática.

ABSTRACT

Silva e Silva, Yuri. How hydroelectric expansion, forest loss and climate change threats amphibians' distribution range in the Brazilian Amazon. Macapá, 2017. Dissertação (Mestre em Biodiversidade Tropical) - Programa de Pós-graduação em Biodiversidade Tropical – Pró-Reitoria de Pesquisa e Pós-Graduação - Universidade Federal do Amapá.

Amphibians are a very sensitive group to environmental changes so they are currently among the most threatened vertebrates. We can list climate change, deforestation, and hydroelectric dams as constant threats to the group, even in highly protected areas such as the Amazon. The Brazilian Amazon is home to 20 families of amphibians covering a total of 308 species, of which 14% have unknown status or are classified in some category of threat (near threatened, vulnerable and endangered). In this study, we investigated how these threats could affect the distribution range of amphibians in the Amazon. To do this, we overlap the geographic distribution of the species with the location of hydroelectric dams (in activity, under construction or inventories) and with maps of deforestation scenarios and future climate changes (2030 and 2050). We found that 67.2% of species may lose distribution area due to overlapping with hydroelectric dams. In addition, deforestation is also a potential threat to amphibians, but has a smaller impact compared to changes in climate. By 2030, 180 species may lose area for deforestation, however, only 10 species will lose more than 10% of their territory. By 2050 the number of species threatened by deforestation increases to 200, of which *Pseudopaludicola saltica* is expected to be the most threatened, with 38% loss of area. The largest potential loss of area of distribution was caused by climate change, mainly by increasing temperature. We found that, three amphibian families are expected to have more than half of the species with 50% of the distribution area potentially threatened by climate change in 2030; In 2050 this number increases to 13 families. Hydroelectric construction and deforestation threaten local populations of Amazonian amphibians with possible population declines, local extinctions, and reduced population genetic diversity. In addition, worldwide, climate change has been linked to reduced survival and changes in geographic distribution of amphibians. Given this scenario, we suggest that the country take the lead in decisions on environmental issues, in addition to defining short- and medium-term conservation measures to prevent further deforestation and future extinctions.

Keywords: Amphibians; Habitat loss; Amazon; Hydropower; Deforestation; Temperature change.

SUMÁRIO

1. INTRODUÇÃO GERAL

O grupo dos anfíbios é a classe mais primitiva dos tetrápodes terrestres, sendo classificado atualmente em três ordens: Anura (sapos, rãs e pererecas), Caudata (salamandras) e Gymnophiona (cobras cegas), que correspondem a 7604 espécies em todo o mundo (Frost 2016) e 1080 espécies com ocorrência no Brasil (Segalla et al. 2016). A maioria das espécies é altamente dependente da água, com desenvolvimento inicial exclusivamente aquático e vida adulta terrestre, pelo menos na maior parte do grupo (Wells 2010). Por apresentar dois estágios bem marcados (aquático e terrestre), o grupo recebeu o nome Amphibia, do grego αμφι, *amphi* ('ambos') e βιο, *bio* ('vida'), que significa ambas vidas. As distribuições geográficas das espécies, sua ecologia, comportamento e ciclos de vida são fortemente influenciados pelas condições ambientais, especialmente devido as características morfológicas e fisiológicas do grupo (McDiarmid 2001). As três ordens dos anfíbios compartilham características morfofisiológicas bastante significativas como, a ausência de escamas, a permeabilidade da sua pele, que é fundamental na respiração cutânea e manutenção da temperatura corporal, seus ovos desprovidos de proteção rígida e por isso dependem de ambientes úmidos, para evitar a dessecação (Wells 2010). Além disso, seu desenvolvimento larval (aquático) e adulto (terrestre) fazem do grupo um bom indicador de estresse ambiental (Blaustein 1994), já que esses animais respondem às alterações em ambos ambientes.

Os anuros são os representantes mais populares do grupo dos anfíbios, são especializados para pular, com pernas longas, corpos curtos e sem caudas durante a vida adulta (Wells 2010), são reconhecidos principalmente por sua vocalização nos períodos de chuva. Até o momento, são conhecidas 6678 espécies de anuros no mundo todo (Frost 2016), e no Brasil já foram registradas 1039 espécies (Segalla et al. 2016). Os Caudata são animais com corpos alongados, pernas curtas e uma cauda presente (Wells 2010), são a segunda ordem mais abundante dentre os anfíbios, com 703 espécies catalogadas em todo o mundo (Frost 2016) e apenas 5 com ocorrência no Brasil (Segalla et al. 2016). As Gymnophionas, são animais com hábitos fossoriais, seus corpos são semelhantes ao das cobras, alongados e com pernas ausentes, e seus olhos bastante reduzidos (Wells 2010), possuem somente 205 espécies descritas (Frost 2016) e 36 delas no Brasil (Segalla et al. 2016). Toda essa diversidade de espécies pode estar ameaçada em todo o mundo por alterações ambientais causadas pelo homem.

Durante a década de 80, reduções populacionais de anfíbios foram identificadas em diferentes países, entretanto, o fato não despertou grande preocupação, por não haver confirmação se reduções faziam parte, ou não, das flutuações populacionais naturais (Heyer et al. 2001). Apenas em 1990 foram confirmados preocupantes declínios nas populações de anfíbios em muitas partes do mundo e o tema passou a ser estudado mais ativamente (Heyer et al. 2001). Essas reduções se tornaram um alerta para a comunidade científica que passou a considerar os anfíbios como um grupo que compõe a sexta extinção em massa da história da Terra (Wake and Vredenburg 2008). Entretanto, por atuarem em sinergia, as causas das reduções populacionais e extinções são difíceis de serem identificadas, mas é possível listar a destruição de habitats, introdução de espécies exóticas, poluição ambiental, doenças infecciosas e mudanças climáticas (Alford and Richards 1999) como principais ameaças aos anfíbios. Segundo a Lista Vermelha de Espécies Ameaçadas da União Internacional para a Conservação da Natureza (IUCN, sigla em inglês), das 6.260 espécies de anfíbios com informações disponíveis, 32% (2.030) estão ameaçadas ou extintas (IUCN 2016b), e os anfíbios são o taxa menos representado em Unidades de Conservação (UCs) (Nori et al. 2015). Além disso, há mais de 24% de espécies de anfíbios com deficiência de dados (DD) no mundo todo (IUCN 2016b). As espécies DD são um caso especial, pois além da falta de informação sobre as espécies, menos de 20% da sua área de distribuição geográfica é protegida por Unidades de Conservação (UCs) (Nori and Loyola 2015). Nesse cenário, as extinções e reduções populacionais de anfíbios tendem a ser cada vez maiores.

Devido sua alta diversidade e alto número de endemismos, os países da América do Sul possuem uma responsabilidade mundial na conservação dos anfíbios. Além disso, cinco deles devem ter papéis estratégicos na proteção desse grupo, já que estão entre os dez países com maior número de espécies de ameaçadas: Colômbia (1º com 214 spp.), Equador (3º com 171 spp.), Brasil (4º com 116 spp.), Peru (5º com 96 spp) e Venezuela (8º com 80 spp.) (IUCN 2016b). Dessa lista, o Brasil deve ter um papel fundamental, principalmente por deter a maior diversidade de anfíbios do mundo (IUCN 2016b), entretanto, grande parte dessa diversidade segue desconhecida, com pouca informação sobre ecologia e distribuição geográfica das espécies (Silvano and Segalla 2005).

Uma das regiões mais importantes para a conservação de anfíbios no Brasil é a Amazônia Legal Brasileira, que, devido suas proporções, ainda possui muitos lugares sub-amostrados para o grupo de anfíbios e com estudos predominando em áreas de fácil acesso (Azevedo-Ramos and Galatti 2002). A única estimativa de diversidade de espécies de anfíbios da Região

Amazônica indicava apenas 163 espécies na região (Azevedo-Ramos and Galatti 2002), entretanto, esse número deve ser bem maior, já que o estudo não considerou trabalhos com identificação somente até o nível de gênero e tratou possíveis grupos de espécies como somente uma. A principal ameaça aos anfíbios brasileiros tem sido a destruição de seus habitats, principalmente devido desmatamento e projetos de desenvolvimento como, barragens, estradas e indústrias (Silvano and Segalla 2005).

Grandes obras de infraestrutura, especialmente a instalação de centrais hidrelétricas, e consequentemente suas barragens e lagos, representam uma intervenção com sérios impactos e custos sociais e ambientais para o local onde serão instalados (Fearnside 2005, Verdum 2012). Essas obras têm se tornado cada vez mais comum no Brasil, visto que atualmente está em curso a segunda fase do Programa de Aceleração do Crescimento (PAC) que representa uma série de investimentos em infraestrutura em todo o país (MPOG 2016). Dentro deste contexto, a Amazônia Brasileira está recebendo grandes obras como pavimentação de estradas, hidrovias e hidrelétricas que já enfrentam críticas e polêmicas (Verdum 2012).

Atualmente, existem cerca de 520 hidrelétricas (HEs) planejadas ou em fase de construção na Amazônia Brasileira (ANEEL 2016). Essas intervenções podem causar mudanças na riqueza e abundância de espécies de diversos grupos da fauna amazônica resultando até mesmo em extinção local (Cosson et al. 1999, Brandao and Araujo 2008), especialmente para grupos sensíveis a alterações ambientais, como é o caso dos anfíbios. No Brasil, já há registros de HEs que causaram declínios populacionais e extinções locais de anfíbios após sua construção (Brandao and Araujo 2008, Lima et al. 2015a). Na Índia, comunidades de anfíbios foram alteradas, em composição e abundância, após o barramento dos Rios Banathirtan e Valayar, com impactos mais fortes sobre espécies endêmicas (Naniwadekar and Vasudevan 2014). Além disso, os estudos de impacto ambiental para obras de infraestrutura no Brasil, não incluem medidas intra-específicas de biodiversidade, como por exemplo a variação genética das espécies (Simoes et al. 2014). Pesquisas indicam que linhagens genéticas únicas e zonas importantes de dinâmica evolutiva de anfíbios podem ser impactadas pelas barragens planejadas para a Amazônia (Simoes et al. 2012, Simoes et al. 2014).

Outra ameaça aos anfíbios brasileiros é o desmatamento, que atualmente está em alta na região amazônica. Dados recentes publicados pelo Projeto de Monitoramento do Desmatamento na Amazônia Legal por Satélite (PRODES) indicam uma área desmatada de 7.989 km² entre o período de agosto de 2015 e julho de 2016 (INPE 2016). Esses dados equivalem a um aumento de 29% do desmatamento na Amazônia, em comparação com 2015.

A fragmentação dos habitats, causada pelo desmatamento ou pela mudança de uso da terra, é uma ameaça às espécies de anfíbios, especialmente às de desenvolvimento larval aquático (Becker et al. 2007), que precisam migrar entre os fragmentos para completar seu ciclo de vida, e acabam expostas à um maior número de predadores, causando reduções populacionais e extinções locais. Apesar de não haver grandes quantidades de extinções documentadas na Amazônia, Wearn et al. (2012) preveem que o desmatamento na Amazônia cria uma dívida de extinção, podendo extinguir cerca de 80 a 90% de mamíferos, aves e anfíbios da região até 2050. Essa dívida tende a crescer com a ocupação de novas terras e aumento do desmatamento.

Outra ameaça aos anfíbios são as mudanças climáticas, especialmente o aumento da temperatura na Amazônia. A variação da temperatura é um fator importante na ecologia dos anfíbios, pois, além de aumentar as perdas hídricas (Tracy et al. 2010), afeta a fisiologia digestiva (Benavides et al. 2005), hepática (Santos et al. 2014), a atividade de reprodutiva (Lingnau and Bastos 2007) e até mesmo sua susceptibilidade a infecções (Raffel et al. 2006). Estudos indicam que, mesmo com seus territórios dentro de Áreas Protegidas, as mudanças climáticas podem reduzir a riqueza de anfíbios na Mata Atlântica (Lemes et al. 2014), demosntrando que a rede de Unidades de Conservação da Amazônia, pode não ser suficiente para salvaguardar os anfíbios da região. A situação é mais delicada para as espécies mais recentes, sob uma ótica evolutiva, que poderão perder grandes áreas de sua atual distribuição (Loyola et al. 2014).

Considerando a ameaça da instalação de hidrelétricas na Amazônia, a perda potencial de área de distribuição geográfica das espécies de anfíbios causada pelo aumento no desmatamento e as mudanças climáticas na região, buscamos apresentar um panorama sobre as principais consequências de mudanças na paisagem da Amazônia, sejam elas mudanças antrópicas ou naturais.

2. HIPÓTESES

- A instalação de hidrelétricas na Amazônia representa uma grande sobreposição com as áreas de distribuição da maioria das espécies de anfíbios deste bioma.
- O desmatamento entre o presente e os anos de 2030 e 2050 na Amazônia causará grandes perdas de área de distribuição geográfica de anfíbios.
- O aumento de temperatura entre o presente e os anos de 2030 e 2050 reduzirá significaticavamente a distribuição das espécies de anfíbios amazônicos.

3. OBJETIVOS

3.1. GERAL

Apresentar um panorama dos possíveis impactos da instalação de hidrelétricas, desmatamento e mudanças climáticas na Amazônia Legal sobre os padrões de distribuição geográfica de anfíbios amazônicos.

3.2. ESPECÍFICOS

- Apresentar um mapas de distribuição das hidrelétricas planejadas para a Amazônia, do cenário de uso da terra e das mudanças climáticas para 2030 e 2050;
- Estimar a perda potencial de área distribuição geográfica de cada espécie de anfíbio em decorrência das mudanças causadas na Amazônia Legal (hidrelétricas, desmatamentoe clima);
- Identificar quais espécies são mais vulneráveis aos possíveis impactos a partir da instalação de reservatórios de hidrelétricas, desmatamento e mudanças climáticas;

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5. ARTIGO CIENTÍFICO

Combined exposure to hydroelectric expansion, climate change and forest loss menace amphibians in the Brazilian Amazon

Artigo submetido ao periódico "Global Change Biology"

Combined exposure to hydroelectric expansion, climate change and forest loss menace amphibians in the Brazilian Amazon

Threats to Amazonian Amphibians

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Keywords: Conservation science, Distribution range, Extinction risk, Habitat loss, Land cover, Range shift, South America

Primary research article

5.1. Abstract

Human-driven impacts constantly threat amphibians, even in highly protected areas such as the Amazon. The Brazilian Amazon is home to 20 families of amphibians covering a total of 308 species, of which 14% have unknown status or are classified in some category of threat. Here, we investigated how climate change, deforestation and establishment of hydroelectric dams could affect the geographical distribution of Amazonian amphibians in the 21st Century. For this, we overlapped the geographic distribution of 308 species with the location of hydroelectric dams (operation, under construction or planned), models of deforestation and climate change scenarios for the future (2030 and 2050). We found that 67.2% of species could lose range due to the hydroelectric overlapping. In addition, deforestation is also a potential threat to amphibians, but had a smaller impact compared to the likely changes in climate. By 2030, 180 species may lose area for deforestation, however; only 10 species will lose more than 10% of their range. The largest potential range loss would be caused by the likely increase in temperature. We found that 13 amphibian families had more than half of the species with 50% of potential distribution range threatened by climate change between 2030 and 2050. We show how environmental and landscape changes threaten Amazonian amphibians for the next decades. Besides that, the Amazon is an area of high vulnerability to climate change for amphibians, which may cause, directly or indirectly, deleterious biological changes for the group. In this scenario, the Brazilian Government needs to plan the development of the Amazon prioritizing landscape changes of low environmental impact and economic development to ensure that such changes do not cause major impacts on amphibian species and reduce the emission of greenhouse gases.

5.2. Introduction

The world's tropical biodiversity remains strongly threatened directly or indirectly by human impacts (Newbold *et al.*, 2014). Land-use and climate changes along with infrastructure development (e.g., establishment of hydroelectric dams) are major threats to tropical biodiversity (Finer & Jenkins, 2012; Khaliq *et al.*, 2014; Newbold *et al.*, 2014). Among critical impacts are changes in the structure of ecological assemblages (Echeverría-Londoño *et al.*, 2016; Newbold *et al.*, 2016) and in native vegetation structure (Aleman *et al.*, 2016), which cause loss of biodiversity and ecossystem functions. Considering the synergistic effects of land-use and climate change, it is essential to understand their real impacts on biodiversity (Brodie, 2016) and enable the creation of conservation policies and management strategies that safeguard Earth's natural heritage (Titeux *et al.*, 2016).

The Brazilian Amazon currently faces several threats to its conservation; it is the richest rainforest on Earth and among all its biodiversity, amphibians are one of the vertebrate groups most sensitive to environmental changes (Nori *et al.*, 2015; Wells, 2010). The establishment of hydroelectric dams has been listed as a threat to amphibian populations in the Amazon (IUCN, 2016) and over the next years, a set of new hydroelectric are planned to be built in the region (Castello & Macedo, 2016; Finer & Jenkins, 2012). These new hydroelectric may potentially cause social and environmental impacts (Fearnside, 2016; Prado *et al.*, 2016), such as fragmentation and habitat loss, fragmentation of populations and local extinctions. In Brazil, the construction of hydroelectric plants has already caused population declines and local extinctions of amphibians (Brandão & Araújo, 2008; Lima *et al.*, 2015; Moraes *et al.*, 2016) in addition to threatening important, but not well known evolutionary systems of amphibians such as hybrid zones (Simoes *et al.*, 2012). The establishment of new hydroelectric plants also has indirect impacts such as deforestation caused by the construction itself and their reservoirs, which are also critical to the survival of amphibians (Finer & Jenkins, 2012).

Deforestation monitoring data shown that deforestation have increased in the Amazon over the last years (Fearnside, 2015b). Deforestation and habitat fragmentation can limit dispersion of amphibian species causing a decrease in gene flow and, as a consequence, loss of genetic diversity (Cushman, 2006; Dixo *et al.*, 2009). Land-use changes has also serious impacts on amphibians, especially when forest areas are converted to agricultural practices, changing environmental quality, richness and abundance of some amphibian species (Schmutzer *et al.*, 2008). Also, land-use is an important biogeographic factor to determine the spatial distribution and evolution of amphibian species. Thus, the land-use change it is a threat, which can affect the conservation of entire lineages of the group (Brum *et al.*, 2013).

The construction of hydroelectric dams and land-use changes also contribute to climate warming (Fearnside, 2015a; Lejeune *et al.*, 2015). All over the world, temperature increase has been related to species survival reduction, changes in the reproductive characteristics of amphibians, and the advance of infectious diseases (Pounds *et al.*, 2006; Reading, 2007; Ron *et al.*, 2003). Despite all these threats no amphibian extinction has been recorded in the Amazon until now, an increasing amount of studies highlighted the high vulnerability of amphibians to climate change in the Brazilian Atlantic Forest (Lemes & Loyola, 2013; Lemes *et al.*, 2014; Loyola *et al.*, 2014) and in the Amazon.

Here we quantified how the expansion of hydropower, forest loss and climate change affects the distribution of Amazonian amphibians. By considering different threats to amphibians we could assess the direct and indirect effects of these changes and inform decision making for the conservation of this imperiled group.

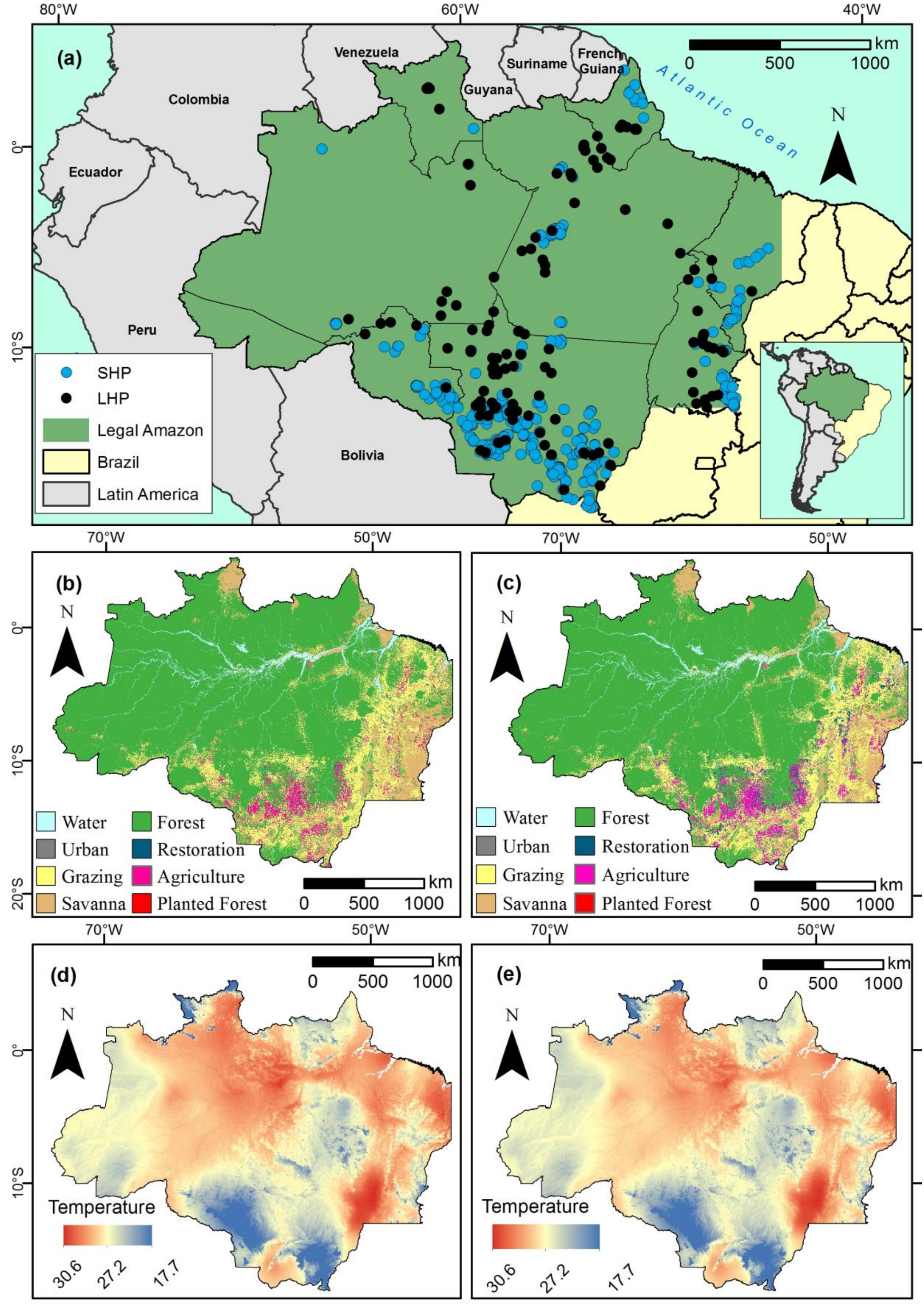
5.3. Materials and Methods

5.3.1. Species' data

Data on amphibian distribution were obtained at the International Union for the Conservation Nature website (IUCN version 2015.4; www.iucnredlist.org). We only selected species that had any portion of their distribution inside the Brazilian Legal Amazon limits, corresponding to a total of 308 species. These extent of occurrence maps are usually used in an initial approach in areas with high biodiversity levels and low information of presence and absence of species (Lemes *et al.*, 2011). Furthermore, these data are a good representation of the distribution of amphibian species and have a good accuracy in large-scale analyses (Ficetola *et al.*, 2014).

5.3.2. Hydroelectric data

We obtained information on the location points of 3176 hydroelectric plants for the Brazilian territory at the National Electric Energy Agency of Brazil website (ANEEL; sigel.aneel.gov.br). From these total, 474 were large hydroelectric plants (LHP, >30MW) and 2702 were small hydroelectric plants (SHP, >1MW <30MW). We only included in the analysis three categories of hydroelectric: (1) planned, (2) under construction, and (3) in operation within the Legal Brazilian Amazon corresponding to a total of 520 hydroelectric plants (131 LHP and 389 SHP) (Fig. 1a).



(a)
Venezuela
Colombia
Guyana
Suriname
French Guiana
Ecuador
Peru
Bolivia
Atlantic Ocean
SHP
LHP
Legal Amazon
Brazil
Latin America
(b)
(c)
Water
Forest
Urban
Restoration
Grazing
Agriculture
Savanna
Planted Forest
(d)
(e)
Temperature
30.6
27.2
17.7

Fig. 1. Location of the study area. (a) Legal Brazilian Amazon geographical limits and hydroelectric points (blue and black circles represent small (SHP) and large (LHP) hydroelectric plants, respectively); (b and c) Land use scenarios for the Amazon according to Soares-Filho et al. (2016), for 2030 and 2050, respectively; (d and e) Climatic scenarios according to an ensemble of three models for 2030 and 2050, respectively.

5.3.3. Land-use data

We obtained current (2012) and projected (2030 and 2050) land use maps at 500 meters of resolution from Soares-Filho et al. (2016). These dataset were derived from a suite of models and some geographic dataset information (e.g. maps of suitable land for mechanized agricultural expansion and data of land titling and information of priority conservation and exploration areas) to obtain scenarios of demands and supplies of the Environmental Reserve Quotas (Portuguese acronym, CRA). These scenarios were associated with land price and used to evaluate the regional markets of CRA and then, were identified potential areas for deforestation. To use these maps, we considered only the forested areas as potential habitat; deforested areas such as urban or grazing zones were not considered in the analysis.

5.3.4. Climatic data

We obtained data on mean annual temperature for current (1950-2000) from the WorldClim database (version 1.4; www.worldclim.org) and for projections for the future (2030 and 2050) from the Consortium of International Agricultural Research Centers website (CGIAR; ccafs-climate.org).

The current mean annual temperature is the result of the interpolation of global monthly climate data (for further details see Hijmans *et al.* (2005)). To create the interpolation, Hijmans *et al.* (2005) used data from 24,542 weather stations around the world. The WorldClim data resolution for this study was in 5 minutes. Data on future climate projections derived from three alternative models (GISS, MIROC, MRI) for 2030 and 2050 at a spatial resolution of 5 minutes of latitude/longitude based on a high-emission greenhouse gases scenario proposed by Intergovernmental Panel on Climate Change (IPCC) (Representative Concentration Pathway; RCP 8.5). According to this scenario, emissions of greenhouse gas continue to rise throughout the 21st century.

5.3.5. Species' vulnerability analysis

To evaluate the threats of hydroelectric plants, we overlapped the location points to each species' range and calculated the number of hydroelectric within each species' range. To assess the species vulnerability to land-use changes, we identified the current forest cover within each species' range according to land-use model for the current period (Soares-Filho *et al.*, 2016). We considered as specie ranges only cells containing areas of forest cover. For each species' range cell, we identified the forest cover change in the future for each period (2030 and 2050), and considered vulnerable cells that might be deforested in the future. In order to assess amphibian vulnerability to climate change, we computed for the entire species' range (not only species range within Amazon extent) the maximum value of temperature at which species is currently exposed. Since data on species' physiological limits are scarce, the maximum values of temperature could represent a good proxy to species tolerances (Foden *et al.*, 2013).

For each cell overlapping amphibian species range we first calculated an average future temperature based on three climate models for each period (2030 and 2050). We only computed future temperatures within cells of species range if any part was covered by forest land-use. We considered that species would potentially be exposed to climate change in those cells where future climate temperature exceeds the maximum current temperature at which a species is already exposed.

Finally, we overlapped the exposition and the forest loss maps to identify areas where species may potentially be exposed to all threats simultaneously. All analyzes and figures were performed in ArcGis10.4 (ESRI, 2015) and R version 3.3.1 (R Core Team, 2016) using the *raster* package (Hijmans, 2016).

5.4. Results

The 308 species studied correspond to 20 families of Amazonian amphibians and 14% of species has unknown status or is classified into some category of threat (IUCN, 2016). For the entire Brazilian Amazon, 520 hydroelectric plants are predicted, and most of these constructions are planned to be built near the Arch of Deforestation, on the East and South regions of the Amazon (Fig. 1a).

Out of the 308 species of Amazonian amphibians, 207 species (67.2%) overlapped their distribution with hydroelectric plants (Table 1). *Pseudopaludicola saltica* is one of species with smaller geographic distribution areas within the Amazon and could be threatened by 10 hydroelectric dams (Table S1) that are to be built in its distribution range. Families that would be less threatened are Centrolenidae (2 spp) and Hemiphractidae (3 spp), which would not lose area due to the establishment of hydroelectric plants, and Odontophrynidae (3 spp) and Rhinatrematidae (1 spp) that would have only one hydroelectric plant on their distributions. However, 16 out of the 20 amphibian families that occur in the Brazilian Legal Amazon will have 50% or more of their species with potential losses in area caused by hydroelectric plants (Table 1).

Table 1. Total number of amphibian species and future threats in the Amazon (hydroelectric, deforestation and climate change) for each family of amphibians.

		# of species affected by		
Family	**# of species**	**Hydroelectric**	**Land-use change 2030 / 2050**	**Climate change 2030 / 2050**
Allophrynidae	1	1	1 / 1	1 / 1
Aromobatidae	16	8	8 / 10	15 / 15
Bufonidae	24	12	12 / 14	20 / 21
Caeciliidae	2	2	2 / 2	2 / 2
Centrolenidae	2	0	0 / 0	2 / 2
Ceratophryidae	1	1	1 / 1	1 /1
Craugastoridae	32	14	6 / 7	30 / 31
Dendrobatidae	20	13	10 / 11	19 / 19

Eleutherodactylidae	2	2	1 / 1	2 / 2
Hemiphractidae	3	0	0 / 0	3 / 3
Hylidae	108	78	68 / 77	100 / 102
Leptodactylidae	58	47	43 / 44	56 / 58
Microhylidae	23	17	16 / 19	21 / 22
Odontophrynidae	3	1	1 / 2	3 /3
Pipidae	3	3	3 / 3	3 / 3
Plethodontidae	2	1	2 / 2	2 / 2
Ranidae	1	1	1 / 1	1 / 1
Rhinatrematidae	1	1	0 / 0	0 / 1
Siphonopidae	3	3	3 / 3	3 / 3
Typhlonectidae	3	2	2 / 2	2 / 2
Total	**308**	**207**	**180 / 200**	**286 / 294**

Bufonidae, Hylidae, Leptodactylidae, Microhylidae, Siphonopidae are the families that should be most threatened with the construction of hydroelectric (Fig. 2a). Species of those families might be already suffering loss of area due to the construction and operation of at least 162 hydroelectric power plants (Table S1). If all the planned hydroelectric plants get executed, there will be 520 constructions overlapping those families' territories.

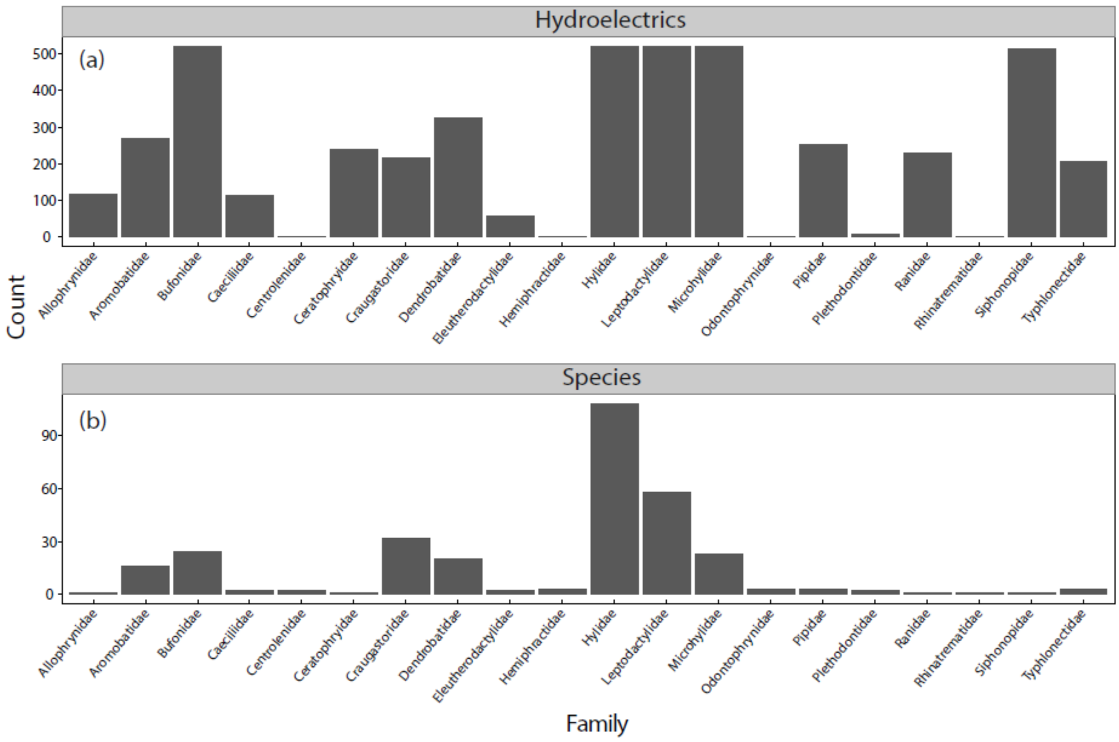


Fig. 2. Overlap of hydroelectric plants over the distribution of amphibian species in the Brazilian Amazon.

According to land-use change models, agriculture and livestock are responsible for the highest deforestation indexes in the Brazilian Legal Amazon (Fig. 1b, c). Between 2030 and 2050, 200 species will likely to lose area due to deforestation, in which 10 species may lose more than 10% of their distribution (Table S2). *Pseudopaludicola saltica* is the species most threatened by land-use change in 2050, with 38% of potential loss in its distribution area (Table S3). Even though deforestation is a local change, it is possible that the potential loss of amphibians' range will increase due this threat (Fig. 3).

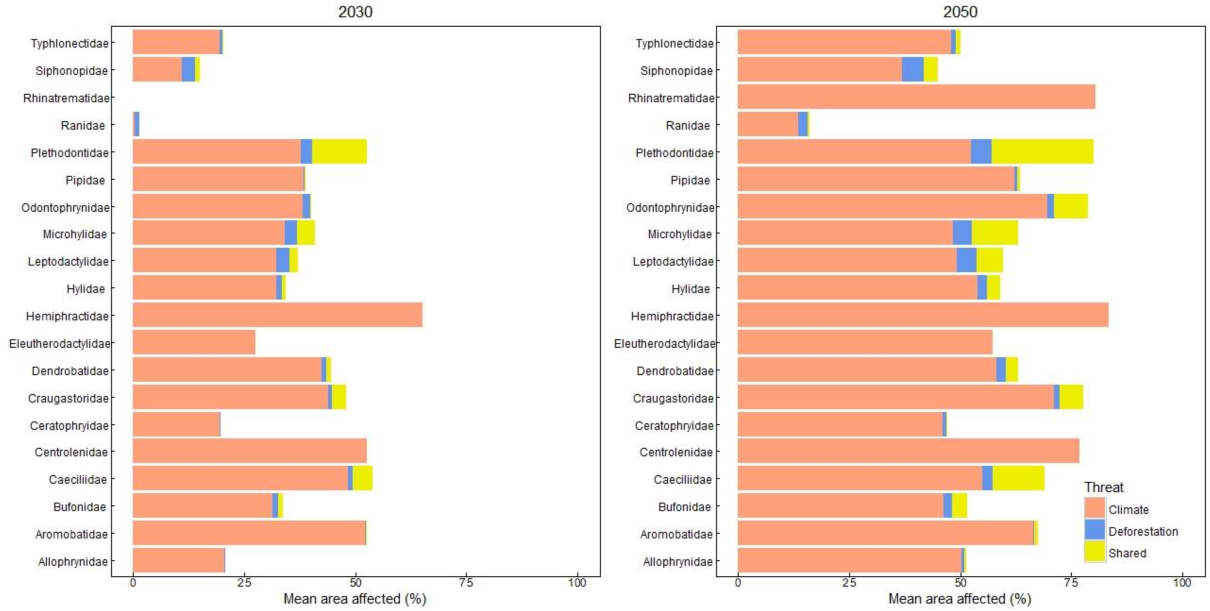


Fig 3. Future threats for amphibians in the Brazilian Amazon. Chart bar showing the average percentage of threat by family, in 2030 and 2050.

The greatest potential loss of distribution area was caused by climate change (Fig. 4a, c). We found that 13 amphibian families would have more than half of their species with 50% of distribution area potentially threatened by the climatic changes between 2030 and 2050 (Tables S2; S3). The amphibian species would have on average 34.7 and 54.2% of area potentially exposed to increasing temperatures in 2030 and 2050, respectively.

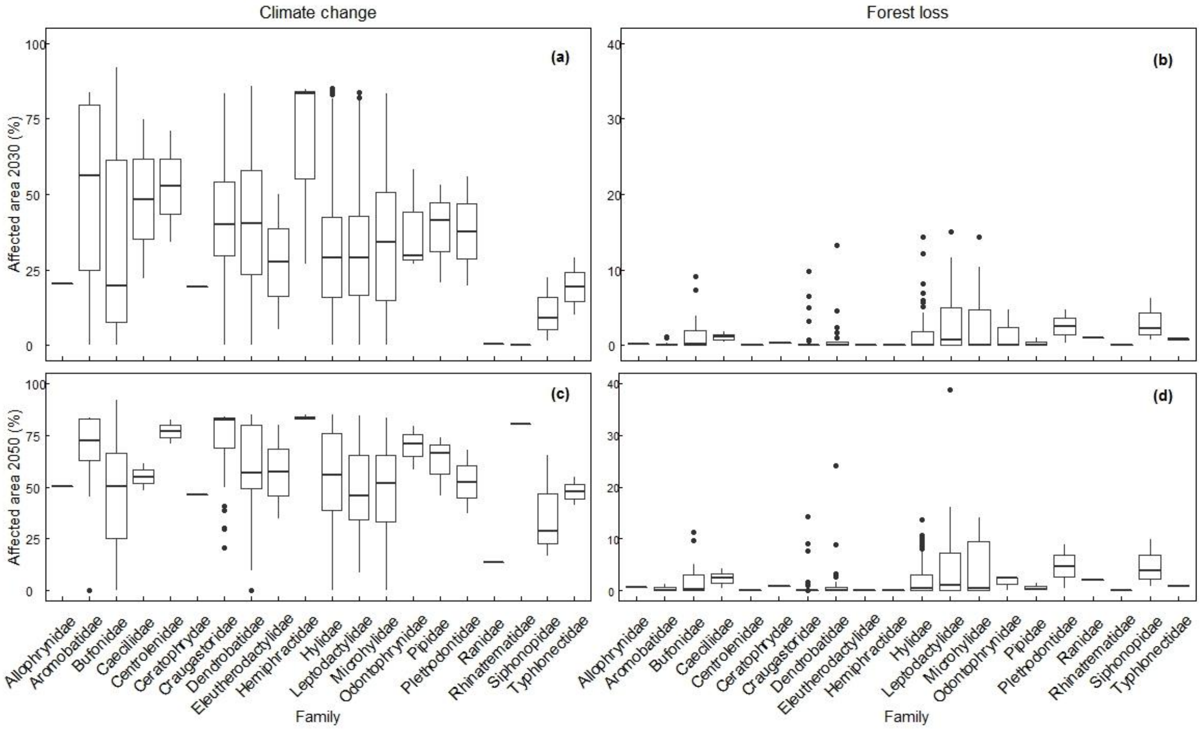


Fig 4. Percentage of amphibian's distribution potentially threatened in the Brazilian Amazon. (a) climate and (b) land-use changes in 2030. (c) climate and (d) land-use changes in 2050.

5.5. Discussion

Our study evaluated the threats caused by environmental and landscape changes over Brazilian Amazonian amphibians throughout the next three decades. We considered Brazilian government planning to use the potential of the Amazon basin to increase energy production by 60% until 2030 (MME, 2008) and the growth in hydroelectric numbers in the Brazilian Amazon (Castello & Macedo, 2016). Further, the potential loss of species is certainly underrated because of the low taxonomic knowledge and patterns of intraspecific diversity in tropical regions (Diniz *et al.*, 2013; Fouquet *et al.*, 2007; Simoes *et al.*, 2014).

The increase in the number of hydroelectric plants in the Brazilian Legal Amazon also brings an indirect concern, the increase in deforestation. The establishment of new hydroelectric plants has the potential to increase the deforestation rates due to the formation of the reservoir and construction of new roads and transmission lines (Fearnside, 2008; Finer & Jenkins, 2012). These interventions are well documented as important factors in the deforestation of tropical forests (Chen *et al.*, 2015; Laurance *et al.*, 2009).

We showed that, despite localized, deforestation advances over the distribution area of amphibians, having agriculture and livestock as the main drivers, which have been observed previously (Almeida *et al.*, 2016). The conversion of forests to pastures is an important factor and influences the richness and diversity of amphibians (Bernarde & Macedo, 2008; da Silva *et al.*, 2012) because it has an effect over the availability of food and reproductive sites, and it can cause microclimatic alterations as well as a decrease in the dispersion, that limit the survival of some amphibian species. Land-use change and the long-term deforestation create an extinction debt on native species which could increase species losses in the Amazon (Rosa *et al.*, 2016).

Our work also highlights that, among the species with the smaller distribution in the Amazon region, the *Pseudopaludicola saltica* species is the most threatened by the construction of hydroelectric plants and loss of habitat. These factors are listed as great threats to the local populations of this species (Colli & Lavilla, 2004). For this reason, to protect this and other amphibian species, the Brazilian Government needs to evaluate new alternatives for the generation of energy in the Amazon, besides expanding the efforts to reduce deforestation in the region.

We found that the exposure to temperature rise represents the greatest threat to the distribution area of Amazonian amphibians, because it happens at a scale higher than deforestation or the effects of the hydroelectric plants. Studies characterize the Amazon as an area of high vulnerability to climatic changes for amphibians (Foden *et al.*, 2013) and other groups (Ribeiro *et al.*, 2016), especially because of the great diversity of species that occur in this biome. It is important to consider the direct and indirect effects of temperature rise in various aspects of the amphibians' lives (Carey & Alexander, 2003). Studies observed that global warming can harm amphibians physiology, causing an increase in the susceptibility to infections (Raffel *et al.*, 2006), as well as higher mortality rate and decrease in fertility (Reading, 2007). Taking into account the limits of physiological tolerance of the species, especially the temperature, is a key point for the conservation of species in the current scenario of climate changes (Seebacher & Franklin, 2012). Considering the possibility of extreme thermal events occurring in the future, the low thermal tolerance (Gutierrez-Pesquera *et al.*, 2016) and limited dispersion capacity of amphibians (Sinsch, 1991), studies focusing on the conservation of these groups become priority. In the Amazon, most of the amphibian species with potential loss of range due to climatic changes are not listed in any category of threat (IUCN, 2016), for this reason, studies and projects of conservation must prioritize these species under greater threat in the future (Foden *et al.*, 2013).

In some cases, it is important to highlight the evolution of the threats studied on some specific families and species. For example, the Ranidae and Rhinatrematidae families, both with one species, will have a low potential climatic threat in 2030, however, by 2050, more than 75% of the family range of Rhinatrematidae may have its area affected by climate change. Even with this potential threat, species of these families are not listed in any status of threat and have no major threats highlighted by the IUCN (Gaucher *et al.*, 2004; La Marca *et al.*, 2010).

We showed the potential synergistic threat of the hydroelectric plants installation, the loss of forest cover and temperature rise on the diversity of Amazonian amphibians. The installation of hydroelectric plants and land-use changes generates an impact concentrated in the local populations through habitat loss and fragmentation. Both impacts generate the release of greenhouse gases, contributing to global temperature changes. The complex simultaneous action of several factors, environmental and anthropic, should be considered as an important driver for the conservation of amphibians (Sodhi *et al.*, 2008; Whitfield *et al.*, 2007).

All these changes in landscape should be part of the planning of the region, aiming to avoid large losses in the local biodiversity and in order to reduce the release of greenhouse gases and consequently the temperature rise. Global warming is a large-scale threat, especially in the Amazon, and that is why Brazil must retake leadership (Loyola 2014) when it comes to environmental issues. Diversification of energy sources should be a key factor in ensuring that Brazil can expand its energetic production (Corrêa da Silva et al. 2016; Herreras Martínez et al. 2015) without contributing to forest loss and climate warming. Such expansion should prioritize renewable sources of energy, such as solar or wind, review investments in large hydroelectric plants, manage measures that can reduce the impact of large constructions, reduce deforestation rates and climatic changes in the region.

5.6. Acknowledgements

We would like to acknowledge the Ecology and Conservation of Amazonian Vertebrates Group team (LECoV-UNIFAP) and Conservation Biogeography Lab team (CB-LabUFG) for their comments and suggestions. YBSS received a MSc scholarship from the Federal Agency for Support and Evaluation of Graduate Education, Ministry of Education ("Coordenação de Aperfeiçoamento de Pessoal de Nível Superior" - CAPES). FM receives a productivity scholarship from CNPq (Process 403679/2016-8). RL research has been constantly funded by CNPq (grants #308532/2014-7, 479959/2013-7, 407094/2013-0, 563621/2010-9), and by O Boticário Group Foundation for the Protection of Nature (grant #PROG_0008_2013). This paper is a contribution of the Brazilian Network on Global Climate Change Research funded by CNPq (grant #437167/2016-0) and FINEP (grant #01.13.0353.00), both awarded to RL.

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5.8. Support Information Captions

Tables S1-S3. This file contains three supplementary tables including details on the 308 amphibian species inhabiting the Brazilian Amazon analyzed in this study, including the number of overlapped hydroelectric dams and species' ranges (Table S1), the percentage of species' ranges exposed to threats in 2030 (Table S2) and the percentage of species' ranges exposed to threats in 2050 (Table S3).

6. CONCLUSÕES

- Houve grande sobreposição das hidrelétricas previstas para a Amazônia, indicando uma forte ameaça sob as populações locais de anfíbios, podendo causar reduções e extinções locais;
- Apesar de ser uma ameaça crescente, o desmatamento não terá impactos tão significativos sobre os anfíbios amazônicos, dessa forma, não reduzirá em grandes proporções a área de distribuição geográfica do grupo. Entretanto, o avanço do desmatamento poderá reduzir populações locais e devem ser tratados em maiores detalhes com análises em menor escala;
- O aumento da temperatura na região Amazônica é a maior ameaça aos anfíbios, com possível redução de grandes áreas de distribuição geográfica dos anfíbios na região. Por isso o Governo Federal e dos Estados devem somar esforços para implementar políticas de controle climático como, o cmbate ao desmatamento, diminuição das emissões de gases e priorização de energia elétrica renovável em território nacional, além de influenciar que medidas semelhantes sejam praticadas em outros países.

7. APÊNDICE

7.1. Supporting Information

Title: Combined exposure to hydroelectric expansion, climate change and forest loss menace amphibians in the Brazilian Amazon

Authors: Yuri B. da Silva e Silva, Bruno Ribeiro, Fernanda Thiesen Brum, Britaldo Soares-Filho, Rafael Loyola and Fernanda Michalski

Content:

Supplemental Table S1. List of 308 amphibian species inhabiting the Brazilian Amazon analyzed in this study and number of hrydroelectric dams that overlapped species' ranges.

Supplemental Table S2. List of 308 amphibian species inhabiting the Brazilian Amazon analyzed in this study and percentage of the species' range exposed to threats in 2030.

Supplemental Table S3. List of 308 amphibian species inhabiting the Brazilian Amazon analyzed in this study and percentage of the species' range exposed to threats in 2050.

Table S1: List of 308 amphibian species inhabiting the Brazilian Amazon analyzed in this study and number of hrydroelectric dams that overlapped species' ranges. Status: Red list category according to IUCN (NE: Not Evaluated, DD: Data Deficient, LC: Least Concern, NT: Near Threatened, VU: Vulnerable, EN: Endangered, CR: Critically Endangered, EW: Extinct in the Wild, EX: Extinct), and number of hydroelectric dams (in construction and operation, inventoried and total number of hydroelectrics) that overlapped species' ranges.

				Hydroelectric dams		
Species	Family	Order	Status	Construction and operation	Inventoried	Total number
Allophryne ruthveni	Allophrynidae	Anura	LC	32	83	115
Allobates brunneus	Aromobatidae	Anura	LC	68	107	175
Allobates caeruleodactylus	Aromobatidae	Anura	DD	0	0	0
Allobates conspicuus	Aromobatidae	Anura	DD	0	0	0
Allobates crombiei	Aromobatidae	Anura	DD	1	0	1
Allobates femoralis	Aromobatidae	Anura	LC	61	111	172
Allobates fuscellus	Aromobatidae	Anura	DD	7	6	13
Allobates gasconi	Aromobatidae	Anura	DD	0	0	0
Allobates marchesianus	Aromobatidae	Anura	LC	46	78	124
Allobates masniger	Aromobatidae	Anura	DD	0	2	2
Allobates nidicola	Aromobatidae	Anura	DD	0	0	0
Allobates paleovarzensis	Aromobatidae	Anura	NT	0	0	0
Allobates subfolionidificans	Aromobatidae	Anura	VU	0	0	0
Allobates sumtuosus	Aromobatidae	Anura	DD	1	7	8
Allobates vanzolinius	Aromobatidae	Anura	DD	0	0	0

Anomaloglossus baeobatrachus	Aromobatidae	Anura	DD	4	9	13
Anomaloglossus stepheni	Aromobatidae	Anura	LC	0	0	0
Amazophrynella bokermanni	Bufonidae	Anura	LC	0	0	0
Amazophrynella minuta	Bufonidae	Anura	LC	49	101	150
Atelopus spumarius	Bufonidae	Anura	VU	4	5	9
Oreophrynella quelchii	Bufonidae	Anura	VU	0	0	0
Oreophrynella weiassipuensis	Bufonidae	Anura	DD	0	0	0
Rhaebo anderssoni	Bufonidae	Anura	LC	0	0	0
Rhaebo guttatus	Bufonidae	Anura	LC	129	275	404
Rhinella acutirostris	Bufonidae	Anura	LC	0	0	0
Rhinella castaneotica	Bufonidae	Anura	LC	22	67	89
Rhinella ceratophrys	Bufonidae	Anura	LC	1	0	1
Rhinella cerradensis	Bufonidae	Anura	DD	0	0	0
Rhinella dapsilis	Bufonidae	Anura	LC	0	0	0
Rhinella granulosa	Bufonidae	Anura	LC	162	358	520
Rhinella jimi	Bufonidae	Anura	LC	0	0	0
Rhinella magnussoni	Bufonidae	Anura	LC	0	0	0
Rhinella margaritifera	Bufonidae	Anura	LC	147	319	466
Rhinella marina	Bufonidae	Anura	LC	134	311	445
Rhinella martyi	Bufonidae	Anura	LC	1	3	4
Rhinella ocellata	Bufonidae	Anura	LC	28	37	65
Rhinella proboscidea	Bufonidae	Anura	LC	0	0	0
Rhinella roqueana	Bufonidae	Anura	LC	0	0	0
Rhinella rubescens	Bufonidae	Anura	LC	19	56	75
Rhinella schneideri	Bufonidae	Anura	LC	137	271	408
Rhinella veredas	Bufonidae	Anura	LC	0	0	0

Teratohyla midas	Centrolenidae	Anura	LC	0	0	0
Vitreorana ritae	Centrolenidae	Anura	DD	0	0	0
Ceratophrys cornuta	Ceratophryidae	Anura	LC	82	155	237
Barycholos ternetzi	Craugastoridae	Anura	LC	10	23	33
Hypodactylus nigrovittatus	Craugastoridae	Anura	LC	0	0	0
Noblella myrmecoides	Craugastoridae	Anura	LC	0	0	0
Oreobates crepitans	Craugastoridae	Anura	DD	0	1	1
Oreobates heterodactylus	Craugastoridae	Anura	DD	0	0	0
Oreobates quixensis	Craugastoridae	Anura	LC	0	5	5
Pristimantis acuminatus	Craugastoridae	Anura	LC	0	0	0
Pristimantis altamazonicus	Craugastoridae	Anura	LC	1	6	7
Pristimantis aureoventris	Craugastoridae	Anura	EN	0	0	0
Pristimantis buccinator	Craugastoridae	Anura	LC	0	0	0
Pristimantis carvalhoi	Craugastoridae	Anura	LC	0	0	0
Pristimantis chiastonotus	Craugastoridae	Anura	LC	5	14	19
Pristimantis conspicillatus	Craugastoridae	Anura	LC	0	0	0
Pristimantis diadematus	Craugastoridae	Anura	LC	0	0	0
Pristimantis dundeei	Craugastoridae	Anura	DD	3	2	5
Pristimantis eurydactylus	Craugastoridae	Anura	LC	0	0	0
Pristimantis fenestratus	Craugastoridae	Anura	LC	60	106	166
Pristimantis gutturalis	Craugastoridae	Anura	LC	4	14	18
Pristimantis lacrimosus	Craugastoridae	Anura	LC	0	0	0
Pristimantis lanthanites	Craugastoridae	Anura	LC	0	0	0
Pristimantis malkini	Craugastoridae	Anura	LC	0	0	0
Pristimantis marmoratus	Craugastoridae	Anura	LC	4	18	22
Pristimantis martiae	Craugastoridae	Anura	LC	4	6	10

Pristimantis ockendeni	Craugastoridae	Anura	LC	0	0	0
Pristimantis peruvianus	Craugastoridae	Anura	LC	0	0	0
Pristimantis skydmainos	Craugastoridae	Anura	LC	0	0	0
Pristimantis toftae	Craugastoridae	Anura	LC	0	0	0
Pristimantis variabilis	Craugastoridae	Anura	LC	0	6	6
Pristimantis vilarsi	Craugastoridae	Anura	LC	1	4	5
Pristimantis zeuctotylus	Craugastoridae	Anura	LC	5	16	21
Pristimantis zimmermanae	Craugastoridae	Anura	LC	1	0	1
Strabomantis sulcatus	Craugastoridae	Anura	LC	0	0	0
Adelphobates castaneoticus	Dendrobatidae	Anura	LC	1	0	1
Adelphobates galactonotus	Dendrobatidae	Anura	LC	5	30	35
Adelphobates quinquevittatus	Dendrobatidae	Anura	LC	31	21	52
Ameerega berohoka	Dendrobatidae	Anura	LC	1	7	8
Ameerega braccata	Dendrobatidae	Anura	LC	37	65	102
Ameerega flavopicta	Dendrobatidae	Anura	LC	17	39	56
Ameerega hahneli	Dendrobatidae	Anura	LC	18	76	94
Ameerega macero	Dendrobatidae	Anura	LC	0	0	0
Ameerega petersi	Dendrobatidae	Anura	LC	0	0	0
Ameerega picta	Dendrobatidae	Anura	LC	73	91	164
Ameerega pulchripecta	Dendrobatidae	Anura	DD	0	0	0
Ameerega trivittata	Dendrobatidae	Anura	LC	17	73	90
Dendrobates leucomelas	Dendrobatidae	Anura	LC	0	5	5
Dendrobates tinctorius	Dendrobatidae	Anura	LC	1	20	21
Hyloxalus chlorocraspedus	Dendrobatidae	Anura	DD	0	0	0
Hyloxalus peruvianus	Dendrobatidae	Anura	LC	1	6	7
Ranitomeya sirensis	Dendrobatidae	Anura	LC	0	0	0

Ranitomeya uakarii	Dendrobatidae	Anura	LC	0	0	0
Ranitomeya vanzolinii	Dendrobatidae	Anura	LC	0	0	0
Ranitomeya ventrimaculata	Dendrobatidae	Anura	LC	11	69	80
Adelophryne gutturosa	Eleutherodactylidae	Anura	LC	0	6	6
Phyzelaphryne miriamae	Eleutherodactylidae	Anura	LC	11	40	51
Hemiphractus helioi	Hemiphractidae	Anura	LC	0	0	0
Hemiphractus johnsoni	Hemiphractidae	Anura	EN	0	0	0
Hemiphractus scutatus	Hemiphractidae	Anura	LC	0	0	0
Aparasphenodon venezolanus	Hylidae	Anura	LC	0	0	0
Bokermannohyla pseudopseudis	Hylidae	Anura	LC	14	28	42
Corythomantis greeningi	Hylidae	Anura	LC	0	0	0
Cruziohyla craspedopus	Hylidae	Anura	LC	0	6	6
Dendropsophus acreanus	Hylidae	Anura	LC	27	9	36
Dendropsophus anataliasiasi	Hylidae	Anura	LC	7	14	21
Dendropsophus araguaya	Hylidae	Anura	DD	0	0	0
Dendropsophus bifurcus	Hylidae	Anura	LC	0	0	0
Dendropsophus bokermanni	Hylidae	Anura	LC	1	0	1
Dendropsophus branneri	Hylidae	Anura	LC	0	3	3
Dendropsophus brevifrons	Hylidae	Anura	LC	1	4	5
Dendropsophus cachimbo	Hylidae	Anura	DD	0	0	0
Dendropsophus cruzi	Hylidae	Anura	LC	5	12	17
Dendropsophus decipiens	Hylidae	Anura	LC	0	0	0
Dendropsophus haraldschultzi	Hylidae	Anura	LC	0	5	5
Dendropsophus koechlini	Hylidae	Anura	LC	0	0	0
Dendropsophus leali	Hylidae	Anura	LC	28	18	46
Dendropsophus leucophyllatus	Hylidae	Anura	LC	62	112	174

Dendropsophus marmoratus	Hylidae	Anura	LC	46	102	148
Dendropsophus melanargyreus	Hylidae	Anura	LC	121	257	378
Dendropsophus microcephalus	Hylidae	Anura	LC	74	147	221
Dendropsophus minimus	Hylidae	Anura	DD	0	0	0
Dendropsophus minutus	Hylidae	Anura	LC	162	358	520
Dendropsophus miyatai	Hylidae	Anura	LC	0	0	0
Dendropsophus nanus	Hylidae	Anura	LC	155	334	489
Dendropsophus parviceps	Hylidae	Anura	LC	54	81	135
Dendropsophus pauiniensis	Hylidae	Anura	LC	0	6	6
Dendropsophus rhodopeplus	Hylidae	Anura	LC	0	0	0
Dendropsophus riveroi	Hylidae	Anura	LC	16	11	27
Dendropsophus rossalleni	Hylidae	Anura	LC	0	6	6
Dendropsophus rubicundulus	Hylidae	Anura	LC	137	263	400
Dendropsophus sarayacuensis	Hylidae	Anura	LC	1	6	7
Dendropsophus schubarti	Hylidae	Anura	LC	29	8	37
Dendropsophus soaresi	Hylidae	Anura	LC	18	64	82
Dendropsophus timbeba	Hylidae	Anura	LC	0	0	0
Dendropsophus tintinnabulum	Hylidae	Anura	DD	0	0	0
Dendropsophus triangulum	Hylidae	Anura	LC	10	21	31
Dendropsophus tritaeniatus	Hylidae	Anura	LC	19	18	37
Dendropsophus walfordi	Hylidae	Anura	LC	36	60	96
Dendropsophus xapuriensis	Hylidae	Anura	LC	0	0	0
Dryaderces inframaculata	Hylidae	Anura	DD	0	0	0
Dryaderces pearsoni	Hylidae	Anura	LC	1	0	1
Ecnomiohyla tuberculosa	Hylidae	Anura	LC	0	0	0
Hyla imitator	Hylidae	Anura	DD	0	0	0

Hypsiboas albopunctatus	Hylidae	Anura	LC	145	253	398
Hypsiboas boans	Hylidae	Anura	LC	84	162	246
Hypsiboas calcaratus	Hylidae	Anura	LC	18	40	58
Hypsiboas cinerascens	Hylidae	Anura	LC	37	98	135
Hypsiboas crepitans	Hylidae	Anura	LC	0	0	0
Hypsiboas dentei	Hylidae	Anura	LC	1	8	9
Hypsiboas fasciatus	Hylidae	Anura	LC	75	143	218
Hypsiboas geographicus	Hylidae	Anura	LC	162	358	520
Hypsiboas hobbsi	Hylidae	Anura	LC	1	0	1
Hypsiboas lanciformis	Hylidae	Anura	LC	40	77	117
Hypsiboas leucocheilus	Hylidae	Anura	DD	1	0	1
Hypsiboas microderma	Hylidae	Anura	LC	0	0	0
Hypsiboas multifasciatus	Hylidae	Anura	LC	10	39	49
Hypsiboas ornatissimus	Hylidae	Anura	LC	4	11	15
Hypsiboas punctatus	Hylidae	Anura	LC	162	358	520
Hypsiboas raniceps	Hylidae	Anura	LC	161	353	514
Hypsiboas tepuianus	Hylidae	Anura	LC	0	0	0
Hypsiboas wavrini	Hylidae	Anura	LC	32	66	98
Lysapsus boliviana	Hylidae	Anura	DD	35	51	86
Lysapsus caraya	Hylidae	Anura	LC	107	206	313
Lysapsus laevis	Hylidae	Anura	LC	0	0	0
Lysapsus limellum	Hylidae	Anura	LC	0	0	0
Osteocephalus buckleyi	Hylidae	Anura	LC	18	77	95
Osteocephalus cabrerai	Hylidae	Anura	LC	4	24	28
Osteocephalus leprieurii	Hylidae	Anura	LC	35	48	83
Osteocephalus oophagus	Hylidae	Anura	LC	8	28	36

Osteocephalus subtilis	Hylidae	Anura	LC	0	0	0
Osteocephalus taurinus	Hylidae	Anura	LC	40	124	164
Phyllomedusa atelopoides	Hylidae	Anura	LC	0	0	0
Phyllomedusa azurea	Hylidae	Anura	DD	56	125	181
Phyllomedusa bicolor	Hylidae	Anura	LC	30	104	134
Phyllomedusa boliviana	Hylidae	Anura	LC	56	46	102
Phyllomedusa camba	Hylidae	Anura	LC	21	8	29
Phyllomedusa centralis	Hylidae	Anura	DD	0	0	0
Phyllomedusa hypochondrialis	Hylidae	Anura	LC	161	358	519
Phyllomedusa palliata	Hylidae	Anura	LC	7	0	7
Phyllomedusa tarsius	Hylidae	Anura	LC	24	31	55
Phyllomedusa tomopterna	Hylidae	Anura	LC	73	124	197
Phyllomedusa vaillantii	Hylidae	Anura	LC	61	102	163
Pseudis bolbodactyla	Hylidae	Anura	LC	5	21	26
Pseudis paradoxa	Hylidae	Anura	LC	144	295	439
Pseudis platensis	Hylidae	Anura	DD	0	0	0
Pseudis tocantins	Hylidae	Anura	LC	4	10	14
Scarthyla goinorum	Hylidae	Anura	LC	7	9	16
Scinax acuminatus	Hylidae	Anura	LC	18	13	31
Scinax boesemani	Hylidae	Anura	LC	40	99	139
Scinax cruentommus	Hylidae	Anura	LC	10	34	44
Scinax eurydice	Hylidae	Anura	LC	0	0	0
Scinax funereus	Hylidae	Anura	LC	0	0	0
Scinax fuscomarginatus	Hylidae	Anura	LC	138	274	412
Scinax fuscovarius	Hylidae	Anura	LC	137	238	375
Scinax garbei	Hylidae	Anura	LC	22	24	46

Scinax lindsayi	Hylidae	Anura	LC	0	0	0
Scinax nasicus	Hylidae	Anura	LC	3	13	16
Scinax nebulosus	Hylidae	Anura	LC	108	216	324
Scinax ruber	Hylidae	Anura	LC	148	320	468
Scinax trilineatus	Hylidae	Anura	LC	0	0	0
Scinax x-signatus	Hylidae	Anura	LC	162	358	520
Sphaenorhynchus carneus	Hylidae	Anura	LC	0	0	0
Sphaenorhynchus dorisae	Hylidae	Anura	LC	0	6	6
Sphaenorhynchus lacteus	Hylidae	Anura	LC	56	105	161
Trachycephalus coriaceus	Hylidae	Anura	LC	26	19	45
Trachycephalus resinifictrix	Hylidae	Anura	LC	58	101	159
Trachycephalus venulosus	Hylidae	Anura	LC	162	358	520
Adenomera andreae	Leptodactylidae	Anura	LC	68	117	185
Adenomera heyeri	Leptodactylidae	Anura	LC	0	0	0
Adenomera hylaedactyla	Leptodactylidae	Anura	LC	162	358	520
Adenomera martinezi	Leptodactylidae	Anura	LC	7	14	21
Edalorhina perezi	Leptodactylidae	Anura	LC	1	6	7
Engystomops freibergi	Leptodactylidae	Anura	LC	41	67	108
Hydrolaetare dantasi	Leptodactylidae	Anura	LC	0	0	0
Hydrolaetare schmidti	Leptodactylidae	Anura	LC	84	190	274
Leptodactylus bolivianus	Leptodactylidae	Anura	LC	64	122	186
Leptodactylus bufonius	Leptodactylidae	Anura	LC	0	0	0
Leptodactylus chaquensis	Leptodactylidae	Anura	LC	0	0	0
Leptodactylus diedrus	Leptodactylidae	Anura	LC	1	0	1
Leptodactylus discodactylus	Leptodactylidae	Anura	LC	2	0	2
Leptodactylus elenae	Leptodactylidae	Anura	LC	94	192	286

Leptodactylus furnarius	Leptodactylidae	Anura	LC	21	53	74
Leptodactylus fuscus	Leptodactylidae	Anura	LC	162	358	520
Leptodactylus knudseni	Leptodactylidae	Anura	LC	39	99	138
Leptodactylus labyrinthicus	Leptodactylidae	Anura	LC	113	206	319
Leptodactylus latinasus	Leptodactylidae	Anura	LC	0	0	0
Leptodactylus latrans	Leptodactylidae	Anura	LC	160	354	514
Leptodactylus lauramiriamae	Leptodactylidae	Anura	DD	1	0	1
Leptodactylus leptodactyloides	Leptodactylidae	Anura	LC	33	74	107
Leptodactylus longirostris	Leptodactylidae	Anura	LC	2	5	7
Leptodactylus myersi	Leptodactylidae	Anura	LC	1	5	6
Leptodactylus mystaceus	Leptodactylidae	Anura	LC	159	331	490
Leptodactylus mystacinus	Leptodactylidae	Anura	LC	21	76	97
Leptodactylus pallidirostris	Leptodactylidae	Anura	LC	4	11	15
Leptodactylus paraensis	Leptodactylidae	Anura	LC	3	32	35
Leptodactylus pentadactylus	Leptodactylidae	Anura	LC	58	121	179
Leptodactylus petersii	Leptodactylidae	Anura	LC	135	303	438
Leptodactylus podicipinus	Leptodactylidae	Anura	LC	137	268	405
Leptodactylus pustulatus	Leptodactylidae	Anura	LC	13	39	52
Leptodactylus rhodomystax	Leptodactylidae	Anura	LC	66	114	180
Leptodactylus rhodonotus	Leptodactylidae	Anura	LC	0	0	0
Leptodactylus riveroi	Leptodactylidae	Anura	LC	1	0	1
Leptodactylus sertanejo	Leptodactylidae	Anura	LC	4	10	14
Leptodactylus stenodema	Leptodactylidae	Anura	LC	57	99	156
Leptodactylus syphax	Leptodactylidae	Anura	LC	68	152	220
Leptodactylus troglodytes	Leptodactylidae	Anura	LC	17	63	80
Leptodactylus vastus	Leptodactylidae	Anura	LC	2	18	20

Leptodactylus wagneri	Leptodactylidae	Anura	LC	0	0	0
Lithodytes lineatus	Leptodactylidae	Anura	LC	48	108	156
Physalaemus albonotatus	Leptodactylidae	Anura	LC	73	167	240
Physalaemus biligonigerus	Leptodactylidae	Anura	LC	0	0	0
Physalaemus centralis	Leptodactylidae	Anura	LC	60	133	193
Physalaemus cuvieri	Leptodactylidae	Anura	LC	158	346	504
Physalaemus ephippifer	Leptodactylidae	Anura	LC	11	66	77
Physalaemus marmoratus	Leptodactylidae	Anura	LC	72	162	234
Physalaemus nattereri	Leptodactylidae	Anura	LC	83	189	272
Pleurodema brachyops	Leptodactylidae	Anura	LC	0	5	5
Pleurodema diplolister	Leptodactylidae	Anura	LC	12	40	52
Pleurodema fuscomaculatum	Leptodactylidae	Anura	DD	0	0	0
Pseudopaludicola boliviana	Leptodactylidae	Anura	LC	117	207	324
Pseudopaludicola canga	Leptodactylidae	Anura	DD	0	0	0
Pseudopaludicola ceratophryes	Leptodactylidae	Anura	LC	0	0	0
Pseudopaludicola mystacalis	Leptodactylidae	Anura	LC	23	59	82
Pseudopaludicola saltica	Leptodactylidae	Anura	LC	1	9	10
Pseudopaludicola ternetzi	Leptodactylidae	Anura	LC	17	31	48
Chiasmocleis albopunctata	Microhylidae	Anura	LC	112	251	363
Chiasmocleis avilapiresae	Microhylidae	Anura	LC	10	49	59
Chiasmocleis bassleri	Microhylidae	Anura	LC	8	13	21
Chiasmocleis centralis	Microhylidae	Anura	DD	0	0	0
Chiasmocleis hudsoni	Microhylidae	Anura	LC	8	28	36
Chiasmocleis jimi	Microhylidae	Anura	DD	0	0	0
Chiasmocleis mehelyi	Microhylidae	Anura	DD	19	14	33
Chiasmocleis shudikarensis	Microhylidae	Anura	LC	22	80	102

Chiasmocleis tridactyla	Microhylidae	Anura	LC	0	0	0
Chiasmocleis ventrimaculata	Microhylidae	Anura	LC	0	0	0
Ctenophryne geayi	Microhylidae	Anura	LC	48	99	147
Dermatonotus muelleri	Microhylidae	Anura	LC	69	166	235
Elachistocleis bumbameuboi	Microhylidae	Anura	DD	0	0	0
Elachistocleis carvalhoi	Microhylidae	Anura	LC	0	1	1
Elachistocleis helianneae	Microhylidae	Anura	LC	32	52	84
Elachistocleis matogrosso	Microhylidae	Anura	LC	1	6	7
Elachistocleis ovalis	Microhylidae	Anura	LC	162	358	520
Elachistocleis piauiensis	Microhylidae	Anura	LC	8	23	31
Elachistocleis surumu	Microhylidae	Anura	DD	0	0	0
Hamptophryne boliviana	Microhylidae	Anura	LC	86	166	252
Otophryne pyburni	Microhylidae	Anura	LC	1	0	1
Synapturanus mirandaribeiroi	Microhylidae	Anura	LC	6	25	31
Synapturanus salseri	Microhylidae	Anura	LC	1	0	1
Odontophrynus carvalhoi	Odontophrynidae	Anura	LC	0	0	0
Proceratophrys concavitympanum	Odontophrynidae	Anura	DD	0	0	0
Proceratophrys goyana	Odontophrynidae	Anura	LC	0	1	1
Pipa arrabali	Pipidae	Anura	LC	8	18	26
Pipa pipa	Pipidae	Anura	LC	87	166	253
Pipa snethlageae	Pipidae	Anura	LC	5	42	47
Lithobates palmipes	Ranidae	Anura	LC	80	150	230
Bolitoglossa altamazonica	Plethodontidae	Caudata	LC	2	6	8
Bolitoglossa paraensis	Plethodontidae	Caudata	DD	0	0	0
Caecilia gracilis	Caeciliidae	Gymnophiona	LC	1	0	1
Caecilia tentaculata	Caeciliidae	Gymnophiona	LC	29	83	112

Rhinatrema bivittatum	Rhinatrematidae	Gymnophiona	LC	1	0	1
Brasilotyphlus braziliensis	Siphonopidae	Gymnophiona	LC	3	3	6
Siphonops annulatus	Siphonopidae	Gymnophiona	LC	162	351	513
Siphonops paulensis	Siphonopidae	Gymnophiona	LC	134	235	369
Potomotyphlus kaupii	Typhlonectida	Gymnophiona	LC	13	58	71
Typhlonectes compressicauda	Typhlonectida	Gymnophiona	LC	69	131	200
Typhlonectes cunhai	Typhlonectida	Gymnophiona	DD	0	0	0

Table S2: List of 308 amphibian species inhabiting the Brazilian Amazon analyzed in this study and percentage of the species' range exposed to threats in 2030. Status: Red list category according to IUCN (NE: Not Evaluated, DD: Data Deficient, LC: Least Concern, NT: Near Threatened, VU: Vulnerable, EN: Endangered, CR: Critically Endangered, EW: Extinct in the Wild, EX: Extinct), and Percentage of species range exposed to threats in 2030.

				Percentage of species range exposed in 2030			
Species	Family	Order	Status	Climate change	Forest Loss	Shared climate vs forest loss	Affected area
Allophryne ruthveni	Allophrynidae	Anura	LC	20.55	0.18	0.10	20.82
Allobates brunneus	Aromobatidae	Anura	LC	39.18	1.04	0.00	40.22
Allobates caeruleodactylus	Aromobatidae	Anura	DD	78.77	0.00	0.00	78.77
Allobates conspicuus	Aromobatidae	Anura	DD	21.53	0.00	0.00	21.53
Allobates crombiei	Aromobatidae	Anura	DD	26.15	0.02	0.03	26.21
Allobates femoralis	Aromobatidae	Anura	LC	20.11	1.09	0.34	21.54
Allobates fuscellus	Aromobatidae	Anura	DD	79.37	0.00	0.00	79.38
Allobates gasconi	Aromobatidae	Anura	DD	83.60	0.00	0.00	83.60
Allobates marchesianus	Aromobatidae	Anura	LC	17.02	0.31	0.05	17.37
Allobates masniger	Aromobatidae	Anura	DD	80.96	0.00	0.03	80.99
Allobates nidicola	Aromobatidae	Anura	DD	0.00	0.00	0.00	0.00
Allobates paleovarzensis	Aromobatidae	Anura	NT	80.65	0.25	1.55	82.44
Allobates subfolionidificans	Aromobatidae	Anura	VU	65.46	0.00	0.00	65.46
Allobates sumtuosus	Aromobatidae	Anura	DD	45.57	0.02	0.01	45.60
Allobates vanzolinius	Aromobatidae	Anura	DD	83.43	0.00	0.00	83.43

Anomaloglossus baeobatrachus	Aromobatidae	Anura	DD	46.79	0.02	0.09	46.90
Anomaloglossus stepheni	Aromobatidae	Anura	LC	65.65	0.19	1.25	67.10
Amazophrynella bokermanni	Bufonidae	Anura	LC	70.48	0.00	0.00	70.48
Amazophrynella minuta	Bufonidae	Anura	LC	20.80	0.49	0.15	21.45
Atelopus spumarius	Bufonidae	Anura	VU	14.79	0.22	0.79	15.81
Oreophrynella quelchii	Bufonidae	Anura	VU	0.00	0.00	0.00	0.00
Oreophrynella weiassipuensis	Bufonidae	Anura	DD	0.00	0.00	0.00	0.00
Rhaebo anderssoni	Bufonidae	Anura	LC	0.00	0.00	0.00	0.00
Rhaebo guttatus	Bufonidae	Anura	LC	10.17	1.81	0.34	12.32
Rhinella acutirostris	Bufonidae	Anura	LC	2.54	0.00	0.00	2.54
Rhinella castaneotica	Bufonidae	Anura	LC	28.34	0.42	0.26	29.03
Rhinella ceratophrys	Bufonidae	Anura	LC	19.52	0.00	0.00	19.52
Rhinella cerradensis	Bufonidae	Anura	DD	0.00	0.00	0.00	0.00
Rhinella dapsilis	Bufonidae	Anura	LC	82.98	0.00	0.00	82.98
Rhinella granulosa	Bufonidae	Anura	LC	0.51	2.52	0.15	3.18
Rhinella jimi	Bufonidae	Anura	LC	81.21	0.36	2.79	84.35
Rhinella magnussoni	Bufonidae	Anura	LC	65.95	0.00	0.00	65.95
Rhinella margaritifera	Bufonidae	Anura	LC	7.57	2.06	0.32	9.95
Rhinella marina	Bufonidae	Anura	LC	0.25	2.16	0.10	2.50
Rhinella martyi	Bufonidae	Anura	LC	20.04	0.00	0.00	20.04
Rhinella ocellata	Bufonidae	Anura	LC	8.85	3.83	4.47	17.15
Rhinella proboscidea	Bufonidae	Anura	LC	47.38	0.04	0.20	47.62
Rhinella roqueana	Bufonidae	Anura	LC	77.50	0.00	0.00	77.50
Rhinella rubescens	Bufonidae	Anura	LC	29.33	9.17	12.94	51.44
Rhinella schneideri	Bufonidae	Anura	LC	8.01	7.27	2.04	17.33
Rhinella veredas	Bufonidae	Anura	LC	91.84	0.00	0.00	91.84

Teratohyla midas	Centrolenidae	Anura	LC	34.22	0.00	0.00	34.22
Vitreorana ritae	Centrolenidae	Anura	DD	70.99	0.00	0.00	70.99
Ceratophrys cornuta	Ceratophryidae	Anura	LC	19.44	0.30	0.02	19.75
Barycholos ternetzi	Craugastoridae	Anura	LC	43.59	5.01	20.73	69.32
Hypodactylus nigrovittatus	Craugastoridae	Anura	LC	40.07	0.00	0.00	40.07
Noblella myrmecoides	Craugastoridae	Anura	LC	27.04	0.00	0.00	27.04
Oreobates crepitans	Craugastoridae	Anura	DD	50.66	6.48	28.87	86.02
Oreobates heterodactylus	Craugastoridae	Anura	DD	35.68	9.75	40.17	85.59
Oreobates quixensis	Craugastoridae	Anura	LC	38.25	0.00	0.00	38.25
Pristimantis acuminatus	Craugastoridae	Anura	LC	51.25	0.00	0.00	51.25
Pristimantis altamazonicus	Craugastoridae	Anura	LC	41.39	0.00	0.00	41.39
Pristimantis aureoventris	Craugastoridae	Anura	EN	0.00	0.00	0.00	0.00
Pristimantis buccinator	Craugastoridae	Anura	LC	81.22	0.00	0.00	81.22
Pristimantis carvalhoi	Craugastoridae	Anura	LC	25.39	0.00	0.00	25.39
Pristimantis chiastonotus	Craugastoridae	Anura	LC	32.45	0.00	0.00	32.45
Pristimantis conspicillatus	Craugastoridae	Anura	LC	54.71	0.00	0.00	54.71
Pristimantis diadematus	Craugastoridae	Anura	LC	25.73	0.00	0.00	25.73
Pristimantis dundeei	Craugastoridae	Anura	DD	39.90	3.17	9.05	52.12
Pristimantis eurydactylus	Craugastoridae	Anura	LC	83.48	0.00	0.00	83.48
Pristimantis fenestratus	Craugastoridae	Anura	LC	25.73	0.67	0.26	26.66
Pristimantis gutturalis	Craugastoridae	Anura	LC	37.56	0.00	0.01	37.57
Pristimantis lacrimosus	Craugastoridae	Anura	LC	78.94	0.00	0.00	78.94
Pristimantis lanthanites	Craugastoridae	Anura	LC	62.30	0.00	0.00	62.30
Pristimantis malkini	Craugastoridae	Anura	LC	37.71	0.00	0.00	37.71
Pristimantis marmoratus	Craugastoridae	Anura	LC	9.62	0.00	0.00	9.62
Pristimantis martiae	Craugastoridae	Anura	LC	47.69	0.00	0.00	47.69

Pristimantis ockendeni	Craugastoridae	Anura	LC	53.24	0.00	0.00	53.24
Pristimantis peruvianus	Craugastoridae	Anura	LC	33.50	0.00	0.00	33.50
Pristimantis skydmainos	Craugastoridae	Anura	LC	70.01	0.00	0.00	70.01
Pristimantis toftae	Craugastoridae	Anura	LC	82.28	0.00	0.00	82.28
Pristimantis variabilis	Craugastoridae	Anura	LC	0.00	0.00	0.00	0.00
Pristimantis vilarsi	Craugastoridae	Anura	LC	3.95	0.00	0.00	3.95
Pristimantis zeuctotylus	Craugastoridae	Anura	LC	45.06	0.00	0.00	45.06
Pristimantis zimmermanae	Craugastoridae	Anura	LC	76.32	0.55	2.65	79.53
Strabomantis sulcatus	Craugastoridae	Anura	LC	26.83	0.00	0.00	26.83
Adelphobates castaneoticus	Dendrobatidae	Anura	LC	69.46	0.15	0.25	69.86
Adelphobates galactonotus	Dendrobatidae	Anura	LC	34.94	1.75	3.71	40.41
Adelphobates quinquevittatus	Dendrobatidae	Anura	LC	48.11	0.04	0.00	48.15
Ameerega berohoka	Dendrobatidae	Anura	LC	5.09	13.21	0.76	19.06
Ameerega braccata	Dendrobatidae	Anura	LC	52.07	4.61	8.18	64.86
Ameerega flavopicta	Dendrobatidae	Anura	LC	20.44	2.39	6.79	29.62
Ameerega hahneli	Dendrobatidae	Anura	LC	23.32	0.01	0.02	23.35
Ameerega macero	Dendrobatidae	Anura	LC	83.76	0.00	0.00	83.76
Ameerega petersi	Dendrobatidae	Anura	LC	78.07	0.00	0.00	78.07
Ameerega picta	Dendrobatidae	Anura	LC	0.89	0.99	0.11	2.00
Ameerega pulchripecta	Dendrobatidae	Anura	DD	46.34	0.00	0.00	46.34
Ameerega trivittata	Dendrobatidae	Anura	LC	32.71	0.18	0.15	33.04
Dendrobates leucomelas	Dendrobatidae	Anura	LC	23.64	0.00	0.00	23.64
Dendrobates tinctorius	Dendrobatidae	Anura	LC	27.06	0.00	0.00	27.06
Hyloxalus chlorocraspedus	Dendrobatidae	Anura	DD	0.00	0.00	0.00	0.00
Hyloxalus peruvianus	Dendrobatidae	Anura	LC	45.76	0.00	0.00	45.76
Ranitomeya sirensis	Dendrobatidae	Anura	LC	85.74	0.00	0.00	85.74

Ranitomeya uakarii	Dendrobatidae	Anura	LC	53.86	0.00	0.00	53.86
Ranitomeya vanzolinii	Dendrobatidae	Anura	LC	83.58	0.00	0.00	83.58
Ranitomeya ventrimaculata	Dendrobatidae	Anura	LC	32.09	0.02	0.09	32.20
Adelophryne gutturosa	Eleutherodactylidae	Anura	LC	5.25	0.00	0.00	5.25
Phyzelaphryne miriamae	Eleutherodactylidae	Anura	LC	49.81	0.03	0.02	49.86
Hemiphractus helioi	Hemiphractidae	Anura	LC	84.73	0.00	0.00	84.73
Hemiphractus johnsoni	Hemiphractidae	Anura	EN	83.47	0.00	0.00	83.47
Hemiphractus scutatus	Hemiphractidae	Anura	LC	26.98	0.00	0.00	26.98
Aparasphenodon venezolanus	Hylidae	Anura	LC	0.00	0.00	0.00	0.00
Bokermannohyla pseudopseudis	Hylidae	Anura	LC	36.38	2.62	7.46	46.46
Corythomantis greeningi	Hylidae	Anura	LC	84.41	0.00	0.00	84.41
Cruziohyla craspedopus	Hylidae	Anura	LC	30.99	0.00	0.01	31.01
Dendropsophus acreanus	Hylidae	Anura	LC	44.19	0.06	0.00	44.25
Dendropsophus anataliasiasi	Hylidae	Anura	LC	15.76	5.09	7.73	28.57
Dendropsophus araguaya	Hylidae	Anura	DD	0.00	0.00	0.00	0.00
Dendropsophus bifurcus	Hylidae	Anura	LC	26.23	0.00	0.00	26.23
Dendropsophus bokermanni	Hylidae	Anura	LC	28.77	0.00	0.00	28.77
Dendropsophus branneri	Hylidae	Anura	LC	42.90	14.40	2.27	59.57
Dendropsophus brevifrons	Hylidae	Anura	LC	36.82	0.01	0.04	36.87
Dendropsophus cachimbo	Hylidae	Anura	DD	0.00	0.00	0.00	0.00
Dendropsophus cruzi	Hylidae	Anura	LC	51.21	2.85	11.64	65.70
Dendropsophus decipiens	Hylidae	Anura	LC	82.95	0.47	2.55	85.98
Dendropsophus haraldschultzi	Hylidae	Anura	LC	40.08	0.00	0.00	40.08
Dendropsophus koechlini	Hylidae	Anura	LC	36.67	0.00	0.00	36.67
Dendropsophus leali	Hylidae	Anura	LC	37.75	0.03	0.00	37.77
Dendropsophus leucophyllatus	Hylidae	Anura	LC	28.54	0.71	0.30	29.54

Dendropsophus marmoratus	Hylidae	Anura	LC	20.22	0.10	0.02	20.34
Dendropsophus melanargyreus	Hylidae	Anura	LC	19.16	3.22	1.59	23.97
Dendropsophus microcephalus	Hylidae	Anura	LC	0.16	1.20	0.00	1.36
Dendropsophus minimus	Hylidae	Anura	DD	0.00	0.00	0.00	0.00
Dendropsophus minutus	Hylidae	Anura	LC	7.68	2.10	0.32	10.10
Dendropsophus miyatai	Hylidae	Anura	LC	35.80	0.01	0.06	35.87
Dendropsophus nanus	Hylidae	Anura	LC	23.80	2.28	0.71	26.78
Dendropsophus parviceps	Hylidae	Anura	LC	19.59	0.14	0.02	19.74
Dendropsophus pauiniensis	Hylidae	Anura	LC	67.29	0.00	0.00	67.29
Dendropsophus rhodopeplus	Hylidae	Anura	LC	28.50	0.00	0.00	28.50
Dendropsophus riveroi	Hylidae	Anura	LC	33.69	0.01	0.01	33.71
Dendropsophus rossalleni	Hylidae	Anura	LC	29.41	0.00	0.01	29.42
Dendropsophus rubicundulus	Hylidae	Anura	LC	10.29	5.86	2.22	18.36
Dendropsophus sarayacuensis	Hylidae	Anura	LC	48.99	0.00	0.00	48.99
Dendropsophus schubarti	Hylidae	Anura	LC	48.43	0.21	0.01	48.64
Dendropsophus soaresi	Hylidae	Anura	LC	28.23	12.08	2.06	42.37
Dendropsophus timbeba	Hylidae	Anura	LC	80.03	0.00	0.00	80.03
Dendropsophus tintinnabulum	Hylidae	Anura	DD	65.79	0.00	0.00	65.80
Dendropsophus triangulum	Hylidae	Anura	LC	29.44	0.01	0.03	29.49
Dendropsophus tritaeniatus	Hylidae	Anura	LC	64.05	2.67	7.83	74.55
Dendropsophus walfordi	Hylidae	Anura	LC	32.12	0.17	0.17	32.46
Dendropsophus xapuriensis	Hylidae	Anura	LC	80.03	0.00	0.00	80.03
Dryaderces inframaculata	Hylidae	Anura	DD	0.00	0.00	0.00	0.00
Dryaderces pearsoni	Hylidae	Anura	LC	67.06	0.00	0.00	67.06
Ecnomiohyla tuberculosa	Hylidae	Anura	LC	81.72	0.00	0.00	81.72
Hyla imitator	Hylidae	Anura	DD	0.00	0.00	0.00	0.00

Hypsiboas albopunctatus	Hylidae	Anura	LC	9.60	5.74	2.17	17.51
Hypsiboas boans	Hylidae	Anura	LC	0.32	0.97	0.00	1.30
Hypsiboas calcaratus	Hylidae	Anura	LC	10.16	0.26	0.03	10.45
Hypsiboas cinerascens	Hylidae	Anura	LC	17.04	0.59	0.15	17.78
Hypsiboas crepitans	Hylidae	Anura	LC	0.00	0.00	0.00	0.00
Hypsiboas dentei	Hylidae	Anura	LC	63.29	0.00	0.00	63.29
Hypsiboas fasciatus	Hylidae	Anura	LC	29.11	0.30	0.13	29.54
Hypsiboas geographicus	Hylidae	Anura	LC	10.28	2.03	0.36	12.67
Hypsiboas hobbsi	Hylidae	Anura	LC	49.10	0.00	0.00	49.10
Hypsiboas lanciformis	Hylidae	Anura	LC	20.38	0.09	0.02	20.49
Hypsiboas leucocheilus	Hylidae	Anura	DD	84.91	0.00	0.00	84.91
Hypsiboas microderma	Hylidae	Anura	LC	79.59	0.00	0.00	79.59
Hypsiboas multifasciatus	Hylidae	Anura	LC	41.84	1.85	0.97	44.65
Hypsiboas ornatissimus	Hylidae	Anura	LC	16.04	0.00	0.00	16.04
Hypsiboas punctatus	Hylidae	Anura	LC	7.58	2.07	0.32	9.97
Hypsiboas raniceps	Hylidae	Anura	LC	28.16	1.84	0.76	30.76
Hypsiboas tepuianus	Hylidae	Anura	LC	0.33	0.00	0.00	0.33
Hypsiboas wavrini	Hylidae	Anura	LC	32.61	0.08	0.03	32.71
Lysapsus boliviana	Hylidae	Anura	DD	27.68	0.29	0.41	28.37
Lysapsus caraya	Hylidae	Anura	LC	8.12	4.28	1.14	13.54
Lysapsus laevis	Hylidae	Anura	LC	22.94	0.00	0.00	22.94
Lysapsus limellum	Hylidae	Anura	LC	68.29	0.36	0.99	69.65
Osteocephalus buckleyi	Hylidae	Anura	LC	22.03	0.01	0.02	22.06
Osteocephalus cabrerai	Hylidae	Anura	LC	35.37	0.01	0.06	35.44
Osteocephalus leprieurii	Hylidae	Anura	LC	29.64	0.02	0.02	29.68
Osteocephalus oophagus	Hylidae	Anura	LC	44.55	0.05	0.13	44.73

Osteocephalus subtilis	Hylidae	Anura	LC	80.03	0.00	0.00	80.03
Osteocephalus taurinus	Hylidae	Anura	LC	8.36	1.09	0.15	9.60
Phyllomedusa atelopoides	Hylidae	Anura	LC	18.84	0.00	0.00	18.84
Phyllomedusa azurea	Hylidae	Anura	DD	32.42	8.19	6.26	46.87
Phyllomedusa bicolor	Hylidae	Anura	LC	30.49	0.70	0.35	31.54
Phyllomedusa boliviana	Hylidae	Anura	LC	37.94	1.66	0.07	39.68
Phyllomedusa camba	Hylidae	Anura	LC	55.34	0.01	0.01	55.36
Phyllomedusa centralis	Hylidae	Anura	DD	0.00	0.00	0.00	0.00
Phyllomedusa hypochondrialis	Hylidae	Anura	LC	12.82	2.54	0.45	15.81
Phyllomedusa palliata	Hylidae	Anura	LC	24.15	0.00	0.00	24.15
Phyllomedusa tarsius	Hylidae	Anura	LC	29.40	0.06	0.03	29.49
Phyllomedusa tomopterna	Hylidae	Anura	LC	28.57	0.50	0.20	29.27
Phyllomedusa vaillantii	Hylidae	Anura	LC	29.03	0.35	0.21	29.59
Pseudis bolbodactyla	Hylidae	Anura	LC	24.43	4.22	3.11	31.77
Pseudis paradoxa	Hylidae	Anura	LC	0.40	2.29	0.02	2.71
Pseudis platensis	Hylidae	Anura	DD	83.32	0.00	0.00	83.32
Pseudis tocantins	Hylidae	Anura	LC	49.01	5.14	21.44	75.59
Scarthyla goinorum	Hylidae	Anura	LC	37.84	0.00	0.02	37.87
Scinax acuminatus	Hylidae	Anura	LC	68.56	2.54	7.24	78.34
Scinax boesemani	Hylidae	Anura	LC	17.44	0.30	0.12	17.86
Scinax cruentommus	Hylidae	Anura	LC	25.30	0.01	0.03	25.34
Scinax eurydice	Hylidae	Anura	LC	70.31	2.83	10.69	83.83
Scinax funereus	Hylidae	Anura	LC	20.88	0.00	0.00	20.88
Scinax fuscomarginatus	Hylidae	Anura	LC	8.69	6.96	1.92	17.57
Scinax fuscovarius	Hylidae	Anura	LC	9.21	6.02	2.20	17.43
Scinax garbei	Hylidae	Anura	LC	34.67	0.01	0.02	34.70

Scinax lindsayi	Hylidae	Anura	LC	31.78	0.00	0.00	31.78
Scinax nasicus	Hylidae	Anura	LC	71.66	1.83	1.12	74.61
Scinax nebulosus	Hylidae	Anura	LC	31.49	1.29	0.32	33.10
Scinax ruber	Hylidae	Anura	LC	0.45	2.25	0.14	2.84
Scinax trilineatus	Hylidae	Anura	LC	30.77	0.00	0.03	30.80
Scinax x-signatus	Hylidae	Anura	LC	0.70	2.23	0.16	3.09
Sphaenorhynchus carneus	Hylidae	Anura	LC	25.23	0.00	0.01	25.24
Sphaenorhynchus dorisae	Hylidae	Anura	LC	34.70	0.00	0.00	34.70
Sphaenorhynchus lacteus	Hylidae	Anura	LC	8.06	0.79	0.09	8.93
Trachycephalus coriaceus	Hylidae	Anura	LC	33.62	0.02	0.00	33.64
Trachycephalus resinifictrix	Hylidae	Anura	LC	29.03	0.37	0.19	29.59
Trachycephalus venulosus	Hylidae	Anura	LC	0.45	2.25	0.14	2.84
Adenomera andreae	Leptodactylidae	Anura	LC	7.59	0.67	0.06	8.32
Adenomera heyeri	Leptodactylidae	Anura	LC	33.08	0.00	0.00	33.08
Adenomera hylaedactyla	Leptodactylidae	Anura	LC	7.56	2.07	0.32	9.95
Adenomera martinezi	Leptodactylidae	Anura	LC	12.90	4.36	6.37	23.63
Edalorhina perezi	Leptodactylidae	Anura	LC	41.95	0.00	0.00	41.95
Engystomops freibergi	Leptodactylidae	Anura	LC	36.55	0.21	0.18	36.93
Hydrolaetare dantasi	Leptodactylidae	Anura	LC	79.47	0.00	0.00	79.47
Hydrolaetare schmidti	Leptodactylidae	Anura	LC	29.28	0.52	0.13	29.92
Leptodactylus bolivianus	Leptodactylidae	Anura	LC	0.16	0.25	0.00	0.41
Leptodactylus bufonius	Leptodactylidae	Anura	LC	80.85	0.00	0.00	80.85
Leptodactylus chaquensis	Leptodactylidae	Anura	LC	79.24	0.00	0.00	79.24
Leptodactylus diedrus	Leptodactylidae	Anura	LC	37.15	0.00	0.00	37.15
Leptodactylus discodactylus	Leptodactylidae	Anura	LC	0.00	0.00	0.00	0.00
Leptodactylus elenae	Leptodactylidae	Anura	LC	18.46	8.56	3.08	30.10

Leptodactylus furnarius	Leptodactylidae	Anura	LC	43.14	7.24	3.30	53.68
Leptodactylus fuscus	Leptodactylidae	Anura	LC	0.48	2.38	0.15	3.00
Leptodactylus knudseni	Leptodactylidae	Anura	LC	8.20	0.10	0.02	8.32
Leptodactylus labyrinthicus	Leptodactylidae	Anura	LC	9.27	8.17	2.56	20.01
Leptodactylus latinasus	Leptodactylidae	Anura	LC	78.98	0.10	0.67	79.75
Leptodactylus latrans	Leptodactylidae	Anura	LC	8.17	2.39	0.37	10.93
Leptodactylus lauramiriamae	Leptodactylidae	Anura	DD	76.65	0.08	0.16	76.89
Leptodactylus leptodactyloides	Leptodactylidae	Anura	LC	24.35	0.33	0.14	24.82
Leptodactylus longirostris	Leptodactylidae	Anura	LC	22.80	0.00	0.00	22.80
Leptodactylus myersi	Leptodactylidae	Anura	LC	42.84	0.00	0.00	42.84
Leptodactylus mystaceus	Leptodactylidae	Anura	LC	19.35	1.85	0.54	21.74
Leptodactylus mystacinus	Leptodactylidae	Anura	LC	31.19	7.88	9.01	48.09
Leptodactylus pallidirostris	Leptodactylidae	Anura	LC	0.25	0.00	0.00	0.25
Leptodactylus paraensis	Leptodactylidae	Anura	LC	28.72	0.66	1.41	30.79
Leptodactylus pentadactylus	Leptodactylidae	Anura	LC	25.94	0.84	0.29	27.07
Leptodactylus petersii	Leptodactylidae	Anura	LC	19.87	1.80	0.54	22.21
Leptodactylus podicipinus	Leptodactylidae	Anura	LC	17.97	4.51	1.66	24.14
Leptodactylus pustulatus	Leptodactylidae	Anura	LC	18.27	5.71	4.87	28.85
Leptodactylus rhodomystax	Leptodactylidae	Anura	LC	20.44	0.54	0.14	21.13
Leptodactylus rhodonotus	Leptodactylidae	Anura	LC	52.19	0.00	0.00	52.19
Leptodactylus riveroi	Leptodactylidae	Anura	LC	49.94	0.00	0.02	49.97
Leptodactylus sertanejo	Leptodactylidae	Anura	LC	38.78	5.23	19.15	63.16
Leptodactylus stenodema	Leptodactylidae	Anura	LC	29.09	0.49	0.24	29.82
Leptodactylus syphax	Leptodactylidae	Anura	LC	16.35	11.56	5.78	33.69
Leptodactylus troglodytes	Leptodactylidae	Anura	LC	34.94	7.26	9.44	51.64
Leptodactylus vastus	Leptodactylidae	Anura	LC	26.47	14.98	2.87	44.32

Leptodactylus wagneri	Leptodactylidae	Anura	LC	83.84	0.00	0.00	83.84
Lithodytes lineatus	Leptodactylidae	Anura	LC	1.04	0.12	0.00	1.17
Physalaemus albonotatus	Leptodactylidae	Anura	LC	36.34	8.17	7.25	51.76
Physalaemus biligonigerus	Leptodactylidae	Anura	LC	81.92	0.28	1.51	83.71
Physalaemus centralis	Leptodactylidae	Anura	LC	27.92	9.82	6.29	44.03
Physalaemus cuvieri	Leptodactylidae	Anura	LC	17.16	3.36	0.96	21.48
Physalaemus ephippifer	Leptodactylidae	Anura	LC	46.22	1.00	0.54	47.76
Physalaemus marmoratus	Leptodactylidae	Anura	LC	37.25	8.40	7.73	53.38
Physalaemus nattereri	Leptodactylidae	Anura	LC	13.43	10.95	3.21	27.59
Pleurodema brachyops	Leptodactylidae	Anura	LC	0.04	0.01	0.00	0.04
Pleurodema diplolister	Leptodactylidae	Anura	LC	29.62	6.79	0.59	37.00
Pleurodema fuscomaculatum	Leptodactylidae	Anura	DD	72.50	0.00	0.00	72.50
Pseudopaludicola boliviana	Leptodactylidae	Anura	LC	17.47	1.41	0.04	18.92
Pseudopaludicola canga	Leptodactylidae	Anura	DD	52.10	0.26	0.47	52.83
Pseudopaludicola ceratophryes	Leptodactylidae	Anura	LC	37.39	0.00	0.00	37.39
Pseudopaludicola mystacalis	Leptodactylidae	Anura	LC	57.42	3.13	5.46	66.01
Pseudopaludicola saltica	Leptodactylidae	Anura	LC	6.43	11.12	0.55	18.10
Pseudopaludicola ternetzi	Leptodactylidae	Anura	LC	40.12	2.35	6.19	48.66
Chiasmocleis albopunctata	Microhylidae	Anura	LC	12.67	9.44	3.96	26.07
Chiasmocleis avilapiresae	Microhylidae	Anura	LC	50.92	0.10	0.14	51.15
Chiasmocleis bassleri	Microhylidae	Anura	LC	34.30	0.00	0.01	34.32
Chiasmocleis centralis	Microhylidae	Anura	DD	63.55	5.25	21.67	90.48
Chiasmocleis hudsoni	Microhylidae	Anura	LC	25.15	0.01	0.05	25.21
Chiasmocleis jimi	Microhylidae	Anura	DD	81.39	0.00	0.00	81.39
Chiasmocleis mehelyi	Microhylidae	Anura	DD	53.84	4.13	8.63	66.59
Chiasmocleis shudikarensis	Microhylidae	Anura	LC	32.61	0.09	0.03	32.72

Chiasmocleis tridactyla	Microhylidae	Anura	LC	83.18	0.00	0.00	83.18
Chiasmocleis ventrimaculata	Microhylidae	Anura	LC	50.53	0.00	0.00	50.53
Ctenophryne geayi	Microhylidae	Anura	LC	17.35	0.38	0.12	17.84
Dermatonotus muelleri	Microhylidae	Anura	LC	23.53	10.29	6.88	40.71
Elachistocleis bumbameuboi	Microhylidae	Anura	DD	0.00	0.00	0.00	0.00
Elachistocleis carvalhoi	Microhylidae	Anura	LC	39.54	10.13	32.94	82.60
Elachistocleis helianneae	Microhylidae	Anura	LC	34.34	0.08	0.06	34.47
Elachistocleis matogrosso	Microhylidae	Anura	LC	45.77	5.78	20.74	72.29
Elachistocleis ovalis	Microhylidae	Anura	LC	0.45	2.25	0.14	2.84
Elachistocleis piauiensis	Microhylidae	Anura	LC	11.56	14.40	0.68	26.63
Elachistocleis surumu	Microhylidae	Anura	DD	0.00	0.00	0.00	0.00
Hamptophryne boliviana	Microhylidae	Anura	LC	28.10	0.68	0.19	28.97
Otophryne pyburni	Microhylidae	Anura	LC	41.28	0.00	0.00	41.28
Synapturanus mirandaribeiroi	Microhylidae	Anura	LC	52.77	0.01	0.04	52.82
Synapturanus salseri	Microhylidae	Anura	LC	1.60	0.01	0.02	1.63
Odontophrynus carvalhoi	Odontophrynidae	Anura	LC	26.80	4.67	0.96	32.42
Proceratophrys concavitympanum	Odontophrynidae	Anura	DD	58.25	0.00	0.00	58.25
Proceratophrys goyana	Odontophrynidae	Anura	LC	29.66	0.00	0.00	29.66
Pipa arrabali	Pipidae	Anura	LC	53.17	0.06	0.07	53.30
Pipa pipa	Pipidae	Anura	LC	20.62	0.94	0.16	21.72
Pipa snethlageae	Pipidae	Anura	LC	41.24	0.06	0.20	41.50
Lithobates palmipes	Ranidae	Anura	LC	0.32	1.03	0.00	1.35
Bolitoglossa altamazonica	Plethodontidae	Caudata	LC	19.69	0.28	0.67	20.64
Bolitoglossa paraensis	Plethodontidae	Caudata	DD	55.74	4.76	24.26	84.76
Caecilia gracilis	Caeciliidae	Gymnophiona	LC	74.65	1.78	8.80	85.23

Caecilia tentaculata	Caeciliidae	Gymnophiona	LC	22.14	0.44	0.18	22.76
Rhinatrema bivittatum	Rhinatrematidae	Gymnophiona	LC	0.00	0.00	0.00	0.00
Brasilotyphlus braziliensis	Siphonopidae	Gymnophiona	LC	22.59	0.67	0.33	23.60
Siphonops annulatus	Siphonopidae	Gymnophiona	LC	1.33	2.24	0.18	3.75
Siphonops paulensis	Siphonopidae	Gymnophiona	LC	8.96	6.25	2.26	17.47
Potomotyphlus kaupii	Typhlonectida	Gymnophiona	LC	9.90	1.01	0.14	11.06
Typhlonectes compressicauda	Typhlonectida	Gymnophiona	LC	28.90	0.58	0.21	29.69
Typhlonectes cunhai	Typhlonectida	Gymnophiona	DD	0.00	0.00	0.00	0.00

Table S3: List of 308 amphibian species inhabiting the Brazilian Amazon analyzed in this study and percentage of the species' range exposed to threats in 2050. Status: Red list category according to IUCN (NE: Not Evaluated, DD: Data Deficient, LC: Least Concern, NT: Near Threatened, VU: Vulnerable, EN: Endangered, CR: Critically Endangered, EW: Extinct in the Wild, EX: Extinct), and Percentage of species range exposed to threats in 2050.

				Percentage of species range exposed in 2050			
Species	Family	Order	Status	Climate change	Forest Loss	Shared climate vs forest loss	Affected area
Allophryne ruthveni	Allophrynidae	Anura	LC	50.25	0.63	0.45	51.33
Allobates brunneus	Aromobatidae	Anura	LC	68.79	1.34	0.96	71.09
Allobates caeruleodactylus	Aromobatidae	Anura	DD	78.77	0.00	0.00	78.77
Allobates conspicuus	Aromobatidae	Anura	DD	83.14	0.00	0.00	83.14
Allobates crombiei	Aromobatidae	Anura	DD	75.71	0.10	0.28	76.08

Allobates femoralis	Aromobatidae	Anura	LC	45.14	1.35	1.80	48.29
Allobates fuscellus	Aromobatidae	Anura	DD	83.17	0.01	0.03	83.21
Allobates gasconi	Aromobatidae	Anura	DD	83.60	0.00	0.00	83.6
Allobates marchesianus	Aromobatidae	Anura	LC	45.22	0.83	0.25	46.31
Allobates masniger	Aromobatidae	Anura	DD	82.52	0.16	0.81	83.49
Allobates nidicola	Aromobatidae	Anura	DD	0.00	0.00	0.00	0.00
Allobates paleovarzensis	Aromobatidae	Anura	NT	78.00	0.81	4.19	83.01
Allobates subfolionidificans	Aromobatidae	Anura	VU	65.46	0.00	0.00	65.46
Allobates sumtuosus	Aromobatidae	Anura	DD	64.93	0.04	0.20	65.17
Allobates vanzolinius	Aromobatidae	Anura	DD	83.43	0.00	0.00	83.43
Anomaloglossus baeobatrachus	Aromobatidae	Anura	DD	61.12	0.05	0.27	61.44
Anomaloglossus stepheni	Aromobatidae	Anura	LC	63.51	0.58	3.40	67.49
Amazophrynella bokermanni	Bufonidae	Anura	LC	70.48	0.00	0.00	70.48
Amazophrynella minuta	Bufonidae	Anura	LC	46.40	0.65	0.86	47.9
Atelopus spumarius	Bufonidae	Anura	VU	53.76	0.38	2.05	56.2
Oreophrynella quelchii	Bufonidae	Anura	VU	0.00	0.00	0.00	0.00
Oreophrynella weiassipuensis	Bufonidae	Anura	DD	0.00	0.00	0.00	0.00
Rhaebo anderssoni	Bufonidae	Anura	LC	0.04	0.00	0.00	0.04
Rhaebo guttatus	Bufonidae	Anura	LC	34.54	2.66	1.64	38.85
Rhinella acutirostris	Bufonidae	Anura	LC	24.74	0.00	0.00	24.74
Rhinella castaneotica	Bufonidae	Anura	LC	57.15	0.49	1.27	58.91
Rhinella ceratophrys	Bufonidae	Anura	LC	65.72	0.00	0.00	65.72
Rhinella cerradensis	Bufonidae	Anura	DD	0.00	0.00	0.00	0.00
Rhinella dapsilis	Bufonidae	Anura	LC	84.30	0.00	0.00	84.30
Rhinella granulosa	Bufonidae	Anura	LC	12.28	4.52	0.96	17.77
Rhinella jimi	Bufonidae	Anura	LC	66.88	2.92	17.12	86.92

Rhinella magnussoni	Bufonidae	Anura	LC	65.21	0.14	0.74	66.09
Rhinella margaritifera	Bufonidae	Anura	LC	32.39	3.02	1.83	37.24
Rhinella marina	Bufonidae	Anura	LC	5.78	3.99	0.60	10.37
Rhinella martyi	Bufonidae	Anura	LC	59.02	0.01	0.03	59.06
Rhinella ocellata	Bufonidae	Anura	LC	27.35	5.13	10.43	42.91
Rhinella proboscidea	Bufonidae	Anura	LC	81.00	0.11	0.55	81.66
Rhinella roqueana	Bufonidae	Anura	LC	82.95	0.00	0.00	82.95
Rhinella rubescens	Bufonidae	Anura	LC	31.62	9.62	28.69	69.93
Rhinella schneideri	Bufonidae	Anura	LC	22.70	11.28	7.20	41.19
Rhinella veredas	Bufonidae	Anura	LC	91.84	0.00	0.00	91.84
Teratohyla midas	Centrolenidae	Anura	LC	82.65	0.00	0.00	82.65
Vitreorana ritae	Centrolenidae	Anura	DD	70.99	0.00	0.00	70.99
Ceratophrys cornuta	Ceratophryidae	Anura	LC	46.09	0.80	0.12	47.00
Barycholos ternetzi	Craugastoridae	Anura	LC	38.69	7.61	35.84	82.14
Hypodactylus nigrovittatus	Craugastoridae	Anura	LC	83.59	0.00	0.00	83.59
Noblella myrmecoides	Craugastoridae	Anura	LC	82.33	0.00	0.00	82.33
Oreobates crepitans	Craugastoridae	Anura	DD	40.82	9.02	38.71	88.55
Oreobates heterodactylus	Craugastoridae	Anura	DD	20.71	14.27	55.13	90.11
Oreobates quixensis	Craugastoridae	Anura	LC	83.03	0.00	0.00	83.03
Pristimantis acuminatus	Craugastoridae	Anura	LC	82.13	0.00	0.00	82.13
Pristimantis altamazonicus	Craugastoridae	Anura	LC	82.86	0.00	0.00	82.87
Pristimantis aureoventris	Craugastoridae	Anura	EN	0.00	0.00	0.00	0.00
Pristimantis buccinator	Craugastoridae	Anura	LC	83.48	0.00	0.00	83.48
Pristimantis carvalhoi	Craugastoridae	Anura	LC	82.68	0.00	0.00	82.68
Pristimantis chiastonotus	Craugastoridae	Anura	LC	69.24	0.00	0.01	69.25
Pristimantis conspicillatus	Craugastoridae	Anura	LC	82.84	0.00	0.00	82.84

Pristimantis diadematus	Craugastoridae	Anura	LC	83.35	0.00	0.00	83.35
Pristimantis dundeei	Craugastoridae	Anura	DD	30.27	9.08	22.21	61.55
Pristimantis eurydactylus	Craugastoridae	Anura	LC	83.69	0.00	0.00	83.69
Pristimantis fenestratus	Craugastoridae	Anura	LC	53.54	1.00	1.35	55.89
Pristimantis gutturalis	Craugastoridae	Anura	LC	70.55	0.01	0.03	70.59
Pristimantis lacrimosus	Craugastoridae	Anura	LC	84.08	0.00	0.00	84.08
Pristimantis lanthanites	Craugastoridae	Anura	LC	84.01	0.00	0.00	84.01
Pristimantis malkini	Craugastoridae	Anura	LC	82.92	0.00	0.00	82.92
Pristimantis marmoratus	Craugastoridae	Anura	LC	49.71	0.00	0.02	49.74
Pristimantis martiae	Craugastoridae	Anura	LC	82.22	0.00	0.02	82.24
Pristimantis ockendeni	Craugastoridae	Anura	LC	82.80	0.00	0.00	82.80
Pristimantis peruvianus	Craugastoridae	Anura	LC	82.36	0.00	0.00	82.36
Pristimantis skydmainos	Craugastoridae	Anura	LC	83.73	0.00	0.00	83.73
Pristimantis toftae	Craugastoridae	Anura	LC	83.56	0.00	0.00	83.56
Pristimantis variabilis	Craugastoridae	Anura	LC	82.79	0.00	0.00	82.79
Pristimantis vilarsi	Craugastoridae	Anura	LC	29.90	0.00	0.00	29.90
Pristimantis zeuctotylus	Craugastoridae	Anura	LC	68.35	0.00	0.01	68.36
Pristimantis zimmermanae	Craugastoridae	Anura	LC	70.35	1.72	8.62	80.69
Strabomantis sulcatus	Craugastoridae	Anura	LC	82.33	0.00	0.00	82.33
Adelphobates castaneoticus	Dendrobatidae	Anura	LC	76.63	0.43	1.84	78.90
Adelphobates galactonotus	Dendrobatidae	Anura	LC	52.88	2.59	9.21	64.68
Adelphobates quinquevittatus	Dendrobatidae	Anura	LC	77.44	0.19	0.06	77.68
Ameerega berohoka	Dendrobatidae	Anura	LC	9.85	24.06	11.29	45.20
Ameerega braccata	Dendrobatidae	Anura	LC	49.72	8.86	18.99	77.58
Ameerega flavopicta	Dendrobatidae	Anura	LC	41.35	3.32	14.33	59.00
Ameerega hahneli	Dendrobatidae	Anura	LC	52.94	0.06	0.10	53.11

Ameerega macero	Dendrobatidae	Anura	LC	83.76	0.00	0.00	83.76
Ameerega petersi	Dendrobatidae	Anura	LC	83.61	0.00	0.00	83.61
Ameerega picta	Dendrobatidae	Anura	LC	28.08	1.66	0.90	30.65
Ameerega pulchripecta	Dendrobatidae	Anura	DD	49.25	0.00	0.00	49.25
Ameerega trivittata	Dendrobatidae	Anura	LC	60.94	0.22	0.76	61.92
Dendrobates leucomelas	Dendrobatidae	Anura	LC	48.62	0.00	0.00	48.62
Dendrobates tinctorius	Dendrobatidae	Anura	LC	52.06	0.00	0.00	52.06
Hyloxalus chlorocraspedus	Dendrobatidae	Anura	DD	0.00	0.00	0.00	0.00
Hyloxalus peruvianus	Dendrobatidae	Anura	LC	78.60	0.00	0.01	78.61
Ranitomeya sirensis	Dendrobatidae	Anura	LC	84.74	0.21	1.00	85.95
Ranitomeya uakarii	Dendrobatidae	Anura	LC	83.55	0.00	0.00	83.55
Ranitomeya vanzolinii	Dendrobatidae	Anura	LC	83.58	0.00	0.00	83.58
Ranitomeya ventrimaculata	Dendrobatidae	Anura	LC	64.32	0.10	0.31	64.74
Adelophryne gutturosa	Eleutherodactylidae	Anura	LC	34.56	0.00	0.00	34.56
Phyzelaphryne miriamae	Eleutherodactylidae	Anura	LC	79.87	0.13	0.16	80.16
Hemiphractus helioi	Hemiphractidae	Anura	LC	84.73	0.00	0.00	84.73
Hemiphractus johnsoni	Hemiphractidae	Anura	EN	83.47	0.00	0.00	83.47
Hemiphractus scutatus	Hemiphractidae	Anura	LC	82.30	0.00	0.00	82.30
Aparasphenodon venezolanus	Hylidae	Anura	LC	8.00	0.00	0.00	8.00
Bokermannohyla pseudopseudis	Hylidae	Anura	LC	50.68	4.27	20.29	75.23
Corythomantis greeningi	Hylidae	Anura	LC	82.03	0.00	2.37	84.41
Cruziohyla craspedopus	Hylidae	Anura	LC	74.28	0.01	0.03	74.32
Dendropsophus acreanus	Hylidae	Anura	LC	68.25	0.39	0.04	68.68
Dendropsophus anataliasiasi	Hylidae	Anura	LC	33.07	5.36	16.99	55.41
Dendropsophus araguaya	Hylidae	Anura	DD	0.00	8.70	0.00	8.70
Dendropsophus bifurcus	Hylidae	Anura	LC	81.41	0.00	0.00	81.41

Dendropsophus bokermanni	Hylidae	Anura	LC	80.17	0.01	0.00	80.18
Dendropsophus branneri	Hylidae	Anura	LC	54.60	8.29	18.97	81.85
Dendropsophus brevifrons	Hylidae	Anura	LC	77.27	0.03	0.13	77.43
Dendropsophus cachimbo	Hylidae	Anura	DD	0.00	0.00	0.00	0.00
Dendropsophus cruzi	Hylidae	Anura	LC	49.07	5.70	27.55	82.32
Dendropsophus decipiens	Hylidae	Anura	LC	77.48	1.55	8.02	87.05
Dendropsophus haraldschultzi	Hylidae	Anura	LC	83.07	0.00	0.00	83.07
Dendropsophus koechlini	Hylidae	Anura	LC	82.38	0.00	0.00	82.38
Dendropsophus leali	Hylidae	Anura	LC	73.66	0.16	0.02	73.84
Dendropsophus leucophyllatus	Hylidae	Anura	LC	54.42	0.88	1.45	56.75
Dendropsophus marmoratus	Hylidae	Anura	LC	48.12	0.41	0.10	48.63
Dendropsophus melanargyreus	Hylidae	Anura	LC	40.79	4.78	5.19	50.76
Dendropsophus microcephalus	Hylidae	Anura	LC	11.20	2.30	0.38	13.88
Dendropsophus minimus	Hylidae	Anura	DD	0.00	0.00	0.00	0.00
Dendropsophus minutus	Hylidae	Anura	LC	32.66	3.10	1.87	37.63
Dendropsophus miyatai	Hylidae	Anura	LC	80.30	0.03	0.18	80.50
Dendropsophus nanus	Hylidae	Anura	LC	48.50	3.16	2.84	54.50
Dendropsophus parviceps	Hylidae	Anura	LC	46.59	0.53	0.12	47.24
Dendropsophus pauiniensis	Hylidae	Anura	LC	83.65	0.00	0.00	83.65
Dendropsophus rhodopeplus	Hylidae	Anura	LC	82.40	0.00	0.00	82.41
Dendropsophus riveroi	Hylidae	Anura	LC	73.80	0.05	0.05	73.90
Dendropsophus rossalleni	Hylidae	Anura	LC	76.53	0.01	0.03	76.56
Dendropsophus rubicundulus	Hylidae	Anura	LC	32.17	9.24	7.05	48.46
Dendropsophus sarayacuensis	Hylidae	Anura	LC	81.84	0.00	0.00	81.85
Dendropsophus schubarti	Hylidae	Anura	LC	62.35	1.06	0.13	63.54
Dendropsophus soaresi	Hylidae	Anura	LC	45.55	10.27	15.88	71.70

Dendropsophus timbeba	Hylidae	Anura	LC	83.74	0.00	0.01	83.75
Dendropsophus tintinnabulum	Hylidae	Anura	DD	70.01	0.00	0.01	70.03
Dendropsophus triangulum	Hylidae	Anura	LC	64.85	0.03	0.12	65.00
Dendropsophus tritaeniatus	Hylidae	Anura	LC	59.14	5.31	17.01	81.46
Dendropsophus walfordi	Hylidae	Anura	LC	55.43	0.77	0.73	56.93
Dendropsophus xapuriensis	Hylidae	Anura	LC	83.74	0.00	0.01	83.75
Dryaderces inframaculata	Hylidae	Anura	DD	0.00	0.00	0.00	0.00
Dryaderces pearsoni	Hylidae	Anura	LC	79.29	0.00	0.00	79.29
Ecnomiohyla tuberculosa	Hylidae	Anura	LC	81.91	0.00	0.00	81.91
Hyla imitator	Hylidae	Anura	DD	0.00	0.00	0.00	0.00
Hypsiboas albopunctatus	Hylidae	Anura	LC	31.11	9.24	6.79	47.15
Hypsiboas boans	Hylidae	Anura	LC	13.74	1.96	0.35	16.05
Hypsiboas calcaratus	Hylidae	Anura	LC	37.65	0.27	0.46	38.38
Hypsiboas cinerascens	Hylidae	Anura	LC	43.20	0.75	1.03	44.98
Hypsiboas crepitans	Hylidae	Anura	LC	0.85	0.00	0.00	0.85
Hypsiboas dentei	Hylidae	Anura	LC	78.92	0.00	0.00	78.92
Hypsiboas fasciatus	Hylidae	Anura	LC	55.48	0.72	0.58	56.78
Hypsiboas geographicus	Hylidae	Anura	LC	34.86	2.93	1.97	39.76
Hypsiboas hobbsi	Hylidae	Anura	LC	78.37	0.00	0.00	78.38
Hypsiboas lanciformis	Hylidae	Anura	LC	48.65	0.40	0.13	49.19
Hypsiboas leucocheilus	Hylidae	Anura	DD	84.91	0.00	0.00	84.91
Hypsiboas microderma	Hylidae	Anura	LC	81.56	0.00	0.00	81.56
Hypsiboas multifasciatus	Hylidae	Anura	LC	56.79	1.20	4.58	62.57
Hypsiboas ornatissimus	Hylidae	Anura	LC	73.69	0.00	0.00	73.70
Hypsiboas punctatus	Hylidae	Anura	LC	32.36	3.06	1.84	37.26
Hypsiboas raniceps	Hylidae	Anura	LC	53.25	2.44	2.90	58.59

Hypsiboas tepuianus	Hylidae	Anura	LC	2.58	0.00	0.00	2.58
Hypsiboas wavrini	Hylidae	Anura	LC	62.54	0.36	0.12	63.03
Lysapsus boliviana	Hylidae	Anura	DD	58.12	0.76	1.64	60.51
Lysapsus caraya	Hylidae	Anura	LC	36.94	6.89	4.32	48.15
Lysapsus laevis	Hylidae	Anura	LC	46.56	0.00	0.00	46.56
Lysapsus limellum	Hylidae	Anura	LC	73.38	0.53	2.56	76.47
Osteocephalus buckleyi	Hylidae	Anura	LC	52.71	0.05	0.08	52.85
Osteocephalus cabrerai	Hylidae	Anura	LC	59.42	0.03	0.17	59.63
Osteocephalus leprieurii	Hylidae	Anura	LC	58.72	0.10	0.07	58.89
Osteocephalus oophagus	Hylidae	Anura	LC	63.88	0.08	0.42	64.38
Osteocephalus subtilis	Hylidae	Anura	LC	83.74	0.00	0.01	83.75
Osteocephalus taurinus	Hylidae	Anura	LC	35.97	1.22	1.38	38.57
Phyllomedusa atelopoides	Hylidae	Anura	LC	81.50	0.00	0.00	81.50
Phyllomedusa azurea	Hylidae	Anura	DD	36.34	13.67	16.32	66.33
Phyllomedusa bicolor	Hylidae	Anura	LC	57.18	0.59	1.67	59.44
Phyllomedusa boliviana	Hylidae	Anura	LC	54.18	3.49	0.91	58.59
Phyllomedusa camba	Hylidae	Anura	LC	78.76	0.12	0.07	78.95
Phyllomedusa centralis	Hylidae	Anura	DD	0.00	8.03	0.00	8.03
Phyllomedusa hypochondrialis	Hylidae	Anura	LC	41.43	3.67	2.47	47.56
Phyllomedusa palliata	Hylidae	Anura	LC	75.60	0.02	0.01	75.63
Phyllomedusa tarsius	Hylidae	Anura	LC	61.95	0.30	0.10	62.35
Phyllomedusa tomopterna	Hylidae	Anura	LC	54.64	0.79	1.01	56.44
Phyllomedusa vaillantii	Hylidae	Anura	LC	54.95	0.62	0.91	56.48
Pseudis bolbodactyla	Hylidae	Anura	LC	55.55	3.99	15.11	74.64
Pseudis paradoxa	Hylidae	Anura	LC	14.97	4.09	0.74	19.8
Pseudis platensis	Hylidae	Anura	DD	83.37	0.01	0.06	83.44

Pseudis tocantins	Hylidae	Anura	LC	41.13	7.63	35.85	84.61
Scarthyla goinorum	Hylidae	Anura	LC	76.71	0.01	0.05	76.78
Scinax acuminatus	Hylidae	Anura	LC	64.15	5.03	15.54	84.71
Scinax boesemani	Hylidae	Anura	LC	43.45	0.66	0.56	44.67
Scinax cruentommus	Hylidae	Anura	LC	58.02	0.03	0.10	58.14
Scinax eurydice	Hylidae	Anura	LC	54.69	6.63	27.14	88.46
Scinax funereus	Hylidae	Anura	LC	81.90	0.00	0.00	81.90
Scinax fuscomarginatus	Hylidae	Anura	LC	25.57	10.61	7.14	43.31
Scinax fuscovarius	Hylidae	Anura	LC	29.69	9.61	6.99	46.28
Scinax garbei	Hylidae	Anura	LC	64.89	0.04	0.09	65.03
Scinax lindsayi	Hylidae	Anura	LC	72.73	0.00	0.00	72.73
Scinax nasicus	Hylidae	Anura	LC	70.59	5.18	5.07	80.85
Scinax nebulosus	Hylidae	Anura	LC	55.28	1.77	1.75	58.80
Scinax ruber	Hylidae	Anura	LC	11.00	4.01	0.86	15.87
Scinax trilineatus	Hylidae	Anura	LC	40.36	0.02	0.18	40.57
Scinax x-signatus	Hylidae	Anura	LC	13.60	3.89	1.01	18.50
Sphaenorhynchus carneus	Hylidae	Anura	LC	75.23	0.00	0.02	75.26
Sphaenorhynchus dorisae	Hylidae	Anura	LC	78.94	0.00	0.00	78.94
Sphaenorhynchus lacteus	Hylidae	Anura	LC	35.77	1.11	0.96	37.84
Trachycephalus coriaceus	Hylidae	Anura	LC	71.69	0.11	0.06	71.86
Trachycephalus resinifictrix	Hylidae	Anura	LC	55.69	0.60	0.98	57.27
Trachycephalus venulosus	Hylidae	Anura	LC	11.00	4.04	0.86	15.90
Adenomera andreae	Leptodactylidae	Anura	LC	33.99	1.18	0.69	35.86
Adenomera heyeri	Leptodactylidae	Anura	LC	61.50	0.00	0.00	61.50
Adenomera hylaedactyla	Leptodactylidae	Anura	LC	32.36	3.06	1.84	37.26
Adenomera martinezi	Leptodactylidae	Anura	LC	32.87	4.33	14.25	51.45

Edalorhina perezi	Leptodactylidae	Anura	LC	83.11	0.00	0.00	83.12
Engystomops freibergi	Leptodactylidae	Anura	LC	66.87	0.56	0.90	68.32
Hydrolaetare dantasi	Leptodactylidae	Anura	LC	83.71	0.00	0.01	83.73
Hydrolaetare schmidti	Leptodactylidae	Anura	LC	58.96	1.11	0.60	60.66
Leptodactylus bolivianus	Leptodactylidae	Anura	LC	10.94	0.72	0.05	11.71
Leptodactylus bufonius	Leptodactylidae	Anura	LC	80.85	0.00	0.00	80.85
Leptodactylus chaquensis	Leptodactylidae	Anura	LC	81.14	0.00	0.00	81.14
Leptodactylus diedrus	Leptodactylidae	Anura	LC	80.16	0.00	0.00	80.16
Leptodactylus discodactylus	Leptodactylidae	Anura	LC	15.41	0.00	0.00	15.41
Leptodactylus elenae	Leptodactylidae	Anura	LC	39.46	10.95	12.41	62.82
Leptodactylus furnarius	Leptodactylidae	Anura	LC	45.95	9.35	15.89	71.19
Leptodactylus fuscus	Leptodactylidae	Anura	LC	11.60	4.26	0.92	16.78
Leptodactylus knudseni	Leptodactylidae	Anura	LC	36.32	0.37	0.07	36.77
Leptodactylus labyrinthicus	Leptodactylidae	Anura	LC	25.56	12.78	8.66	47.00
Leptodactylus latinasus	Leptodactylidae	Anura	LC	81.73	0.45	2.29	84.46
Leptodactylus latrans	Leptodactylidae	Anura	LC	35.15	3.53	2.13	40.80
Leptodactylus lauramiriamae	Leptodactylidae	Anura	DD	73.22	1.01	3.60	77.83
Leptodactylus leptodactyloides	Leptodactylidae	Anura	LC	51.62	0.26	0.94	52.82
Leptodactylus longirostris	Leptodactylidae	Anura	LC	36.72	0.09	0.01	36.82
Leptodactylus myersi	Leptodactylidae	Anura	LC	75.55	0.00	0.00	75.55
Leptodactylus mystaceus	Leptodactylidae	Anura	LC	43.24	2.51	2.35	48.11
Leptodactylus mystacinus	Leptodactylidae	Anura	LC	41.92	10.07	23.73	75.71
Leptodactylus pallidirostris	Leptodactylidae	Anura	LC	16.98	0.00	0.01	16.99
Leptodactylus paraensis	Leptodactylidae	Anura	LC	56.97	1.31	4.42	62.69
Leptodactylus pentadactylus	Leptodactylidae	Anura	LC	53.30	1.26	1.44	56.00
Leptodactylus petersii	Leptodactylidae	Anura	LC	43.69	2.45	2.29	48.44

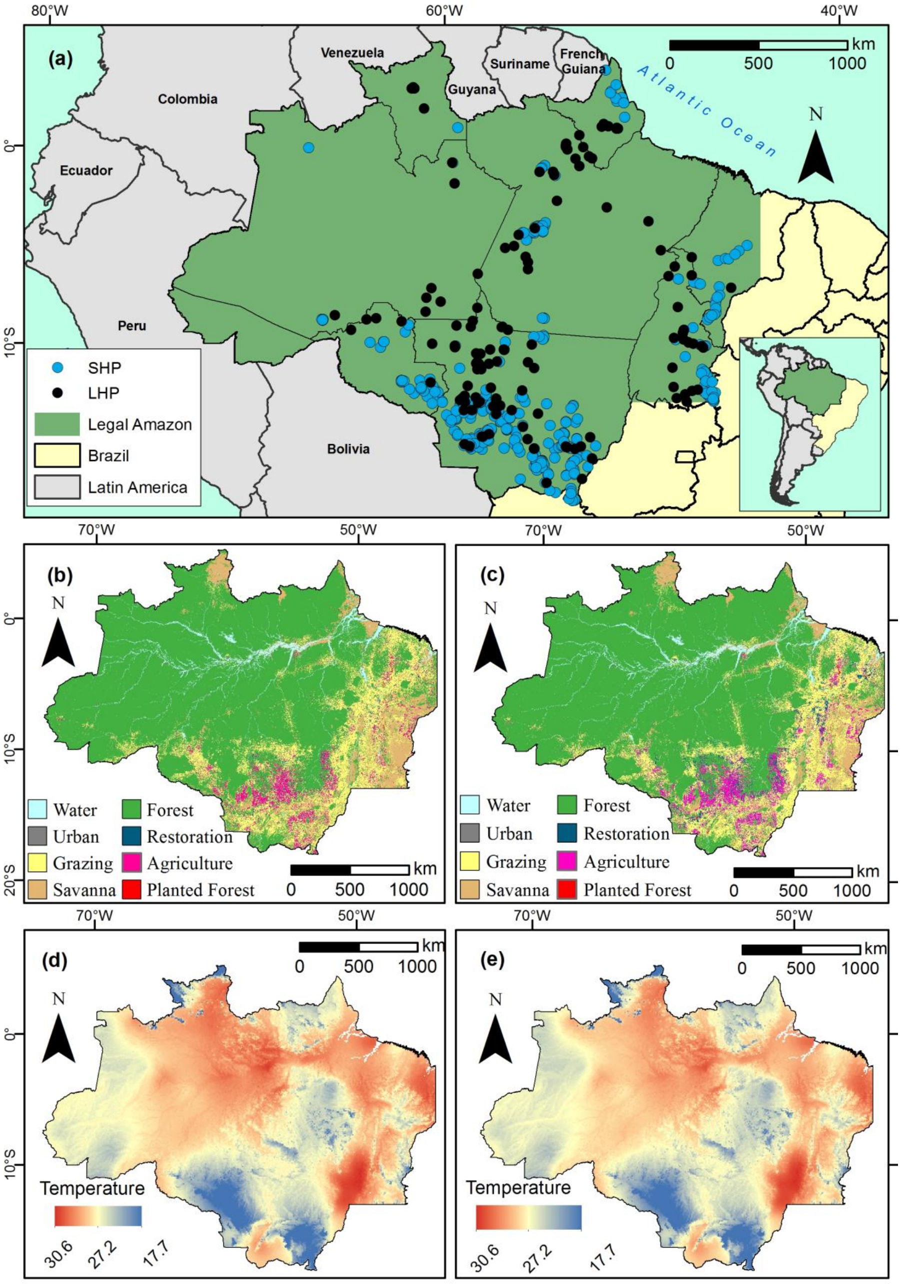
Leptodactylus podicipinus	Leptodactylidae	Anura	LC	37.75	7.25	5.16	50.16
Leptodactylus pustulatus	Leptodactylidae	Anura	LC	34.22	5.29	13.91	53.42
Leptodactylus rhodomystax	Leptodactylidae	Anura	LC	45.49	0.91	0.87	47.26
Leptodactylus rhodonotus	Leptodactylidae	Anura	LC	84.42	0.00	0.00	84.42
Leptodactylus riveroi	Leptodactylidae	Anura	LC	69.74	0.01	0.05	69.80
Leptodactylus sertanejo	Leptodactylidae	Anura	LC	31.93	8.45	39.91	80.29
Leptodactylus stenodema	Leptodactylidae	Anura	LC	54.87	0.67	1.19	56.73
Leptodactylus syphax	Leptodactylidae	Anura	LC	29.92	15.35	17.04	62.32
Leptodactylus troglodytes	Leptodactylidae	Anura	LC	47.19	7.98	22.60	77.77
Leptodactylus vastus	Leptodactylidae	Anura	LC	45.91	11.45	20.48	77.84
Leptodactylus wagneri	Leptodactylidae	Anura	LC	83.84	0.00	0.00	83.84
Lithodytes lineatus	Leptodactylidae	Anura	LC	18.02	0.45	0.07	18.53
Physalaemus albonotatus	Leptodactylidae	Anura	LC	39.27	11.85	18.41	69.53
Physalaemus biligonigerus	Leptodactylidae	Anura	LC	79.28	0.99	4.86	85.13
Physalaemus centralis	Leptodactylidae	Anura	LC	37.03	13.94	17.56	68.53
Physalaemus cuvieri	Leptodactylidae	Anura	LC	39.62	4.57	4.26	48.45
Physalaemus ephippifer	Leptodactylidae	Anura	LC	59.68	0.74	2.54	62.96
Physalaemus marmoratus	Leptodactylidae	Anura	LC	37.45	13.38	19.21	70.04
Physalaemus nattereri	Leptodactylidae	Anura	LC	29.08	16.03	11.26	56.37
Pleurodema brachyops	Leptodactylidae	Anura	LC	27.36	0.00	0.01	27.37
Pleurodema diplolister	Leptodactylidae	Anura	LC	49.83	9.19	8.73	67.75
Pleurodema fuscomaculatum	Leptodactylidae	Anura	DD	72.50	0.00	0.00	72.50
Pseudopaludicola boliviana	Leptodactylidae	Anura	LC	50.10	2.70	0.47	53.26
Pseudopaludicola canga	Leptodactylidae	Anura	DD	56.19	0.90	2.72	59.81
Pseudopaludicola ceratophryes	Leptodactylidae	Anura	LC	83.64	0.00	0.00	83.64
Pseudopaludicola mystacalis	Leptodactylidae	Anura	LC	55.15	7.39	13.98	76.52

Pseudopaludicola saltica	Leptodactylidae	Anura	LC	8.55	38.84	9.41	56.81
Pseudopaludicola ternetzi	Leptodactylidae	Anura	LC	54.33	3.84	17.10	75.27
Chiasmocleis albopunctata	Microhylidae	Anura	LC	29.43	14.10	11.96	55.49
Chiasmocleis avilapiresae	Microhylidae	Anura	LC	72.54	0.31	0.66	73.50
Chiasmocleis bassleri	Microhylidae	Anura	LC	75.12	0.04	0.05	75.21
Chiasmocleis centralis	Microhylidae	Anura	DD	26.11	11.17	59.11	96.39
Chiasmocleis hudsoni	Microhylidae	Anura	LC	51.81	0.03	0.15	51.99
Chiasmocleis jimi	Microhylidae	Anura	DD	81.34	0.01	0.05	81.40
Chiasmocleis mehelyi	Microhylidae	Anura	DD	52.30	6.95	19.35	78.60
Chiasmocleis shudikarensis	Microhylidae	Anura	LC	60.08	0.20	0.23	60.51
Chiasmocleis tridactyla	Microhylidae	Anura	LC	83.18	0.00	0.00	83.18
Chiasmocleis ventrimaculata	Microhylidae	Anura	LC	82.99	0.00	0.00	82.99
Ctenophryne geayi	Microhylidae	Anura	LC	43.74	0.56	0.79	45.09
Dermatonotus muelleri	Microhylidae	Anura	LC	36.85	11.48	20.12	68.45
Elachistocleis bumbameuboi	Microhylidae	Anura	DD	12.50	12.50	12.50	37.50
Elachistocleis carvalhoi	Microhylidae	Anura	LC	21.10	13.61	60.13	94.85
Elachistocleis helianneae	Microhylidae	Anura	LC	60.39	0.48	0.28	61.16
Elachistocleis matogrosso	Microhylidae	Anura	LC	41.00	7.76	34.74	83.50
Elachistocleis ovalis	Microhylidae	Anura	LC	11.01	4.04	0.86	15.91
Elachistocleis piauiensis	Microhylidae	Anura	LC	41.94	13.32	18.11	73.37
Elachistocleis surumu	Microhylidae	Anura	DD	0.00	0.00	0.00	0.00
Hamptophryne boliviana	Microhylidae	Anura	LC	53.85	1.11	1.04	55.99
Otophryne pyburni	Microhylidae	Anura	LC	58.59	0.00	0.00	58.59
Synapturanus mirandaribeiroi	Microhylidae	Anura	LC	70.08	0.02	0.11	70.22
Synapturanus salseri	Microhylidae	Anura	LC	47.08	0.01	0.06	47.15
Odontophrynus carvalhoi	Odontophrynidae	Anura	LC	71.07	2.37	13.32	86.76

Proceratophrys concavitympanum	Odontophrynidae	Anura	DD	58.25	0.00	0.00	58.25
Proceratophrys goyana	Odontophrynidae	Anura	LC	79.24	2.54	9.75	91.53
Pipa arrabali	Pipidae	Anura	LC	73.82	0.24	0.36	74.42
Pipa pipa	Pipidae	Anura	LC	46.02	1.50	1.09	48.61
Pipa snethlageae	Pipidae	Anura	LC	66.54	0.24	0.69	67.46
Lithobates palmipes	Ranidae	Anura	LC	13.61	2.06	0.35	16.02
Bolitoglossa altamazonica	Plethodontidae	Caudata	LC	67.88	0.48	1.82	70.19
Bolitoglossa paraensis	Plethodontidae	Caudata	DD	37.05	8.93	43.78	89.76
Caecilia gracilis	Caeciliidae	Gymnophiona	LC	61.34	4.28	22.31	87.93
Caecilia tentaculata	Caeciliidae	Gymnophiona	LC	48.50	0.48	1.06	50.04
Rhinatrema bivittatum	Rhinatrematidae	Gymnophiona	LC	80.54	0.00	0.00	80.54
Brasilotyphlus braziliensis	Siphonopidae	Gymnophiona	LC	65.12	0.94	1.35	67.42
Siphonops annulatus	Siphonopidae	Gymnophiona	LC	16.90	3.79	1.16	21.85
Siphonops paulensis	Siphonopidae	Gymnophiona	LC	28.74	9.96	7.00	45.69
Potomotyphlus kaupii	Typhlonectidae	Gymnophiona	LC	41.05	0.99	1.45	43.5
Typhlonectes compressicauda	Typhlonectidae	Gymnophiona	LC	54.88	0.90	1.05	56.83
Typhlonectes cunhai	Typhlonectidae	Gymnophiona	DD	0.00	0.00	0.00	0.00

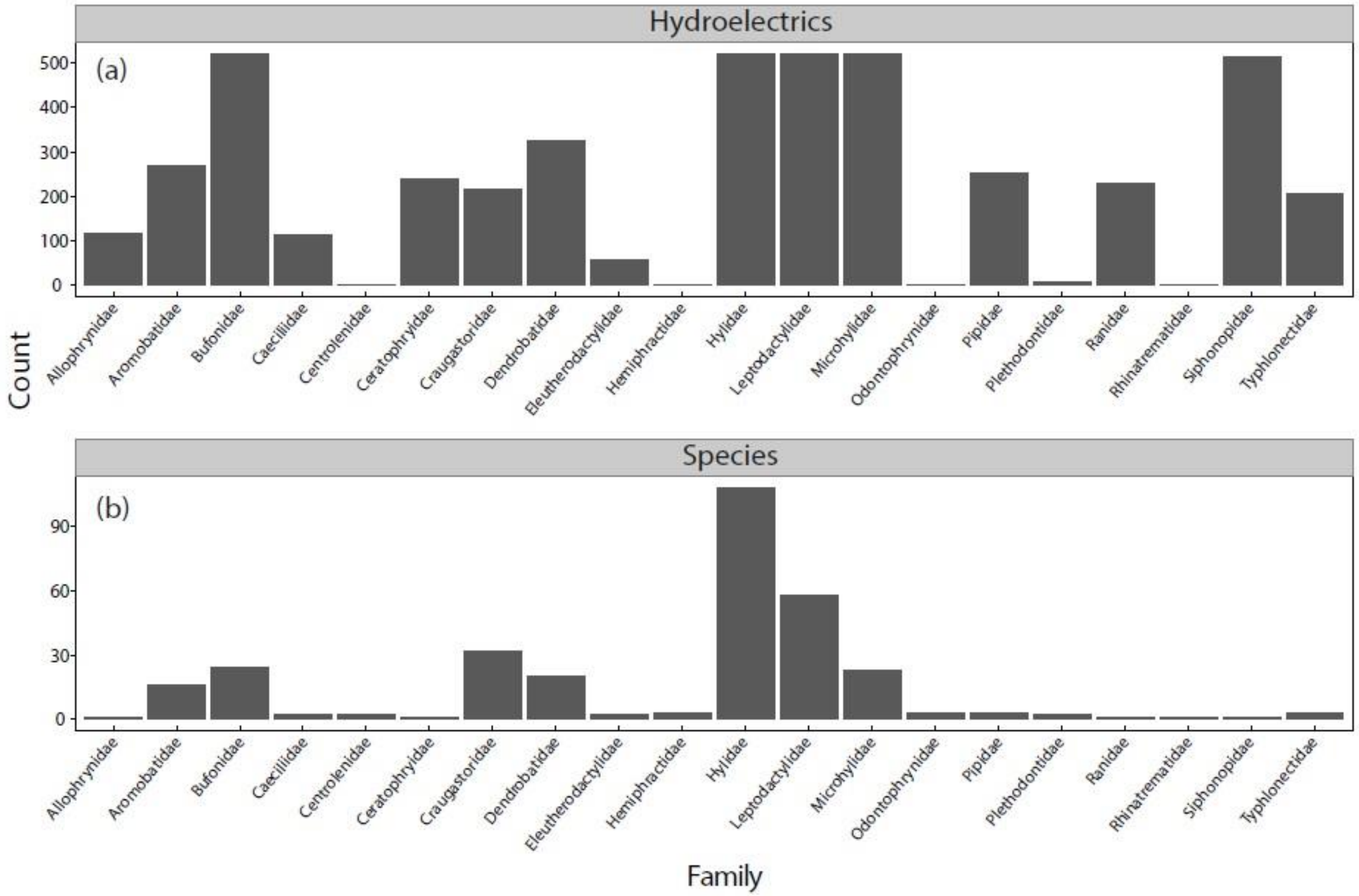
7.2. Figure 1

Location of the study area. (a) Legal Brazilian Amazon geographical limits and hydroelectric points (blue and black circles represent small and large hydroelectric plants, respectively); (b and c) Land use scenarios for the Amazon according to Soares-Filho et al. (2016), for 2030 and 2050, respectively; (d and e) Climatic scenarios according to an ensemble of three models for 2030 and 2050, respectively.



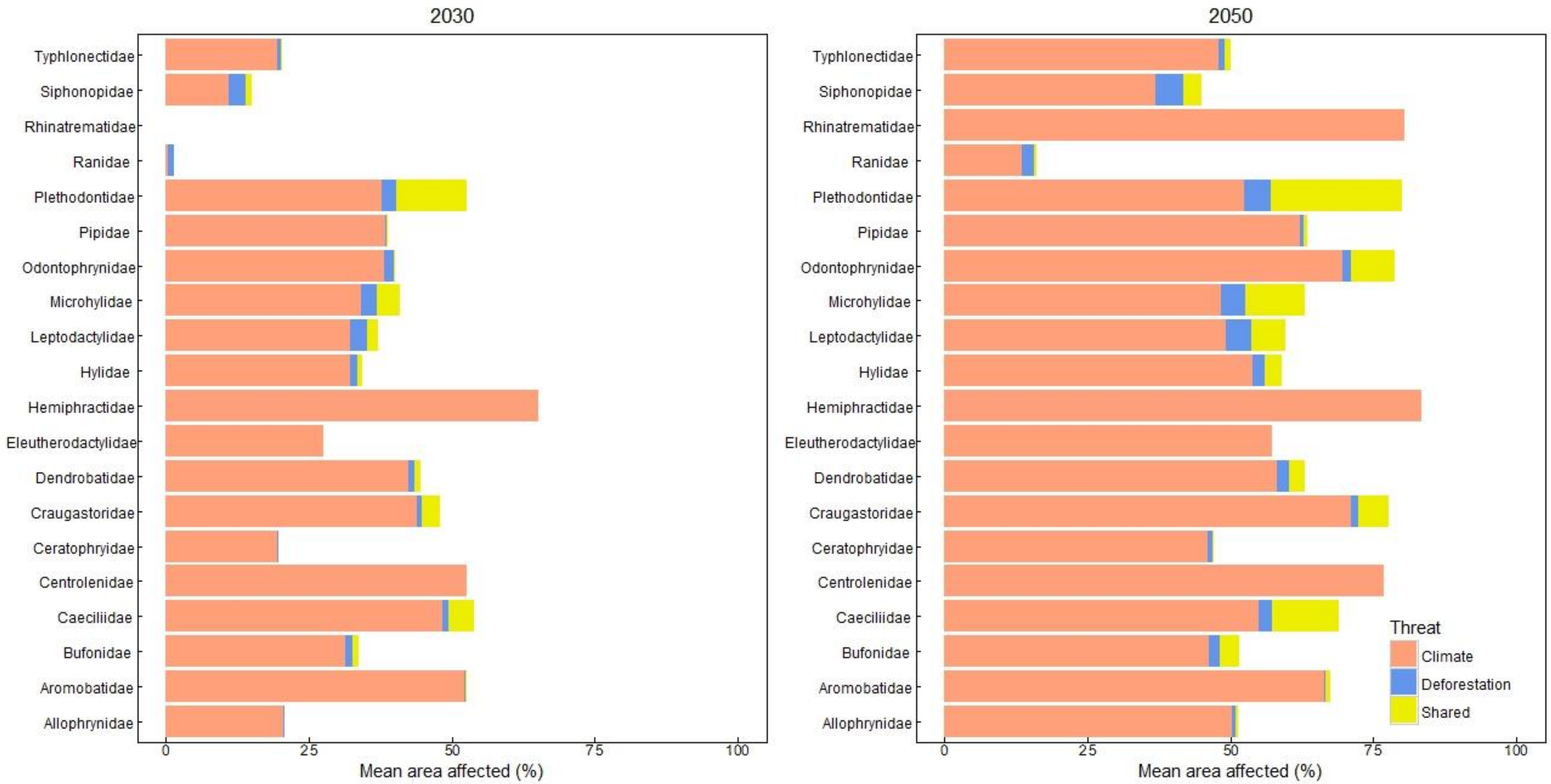
7.3. Figure 2

Overlap of hydroelectric plants over the distribution of amphibian species in the Brazilian Amazon.



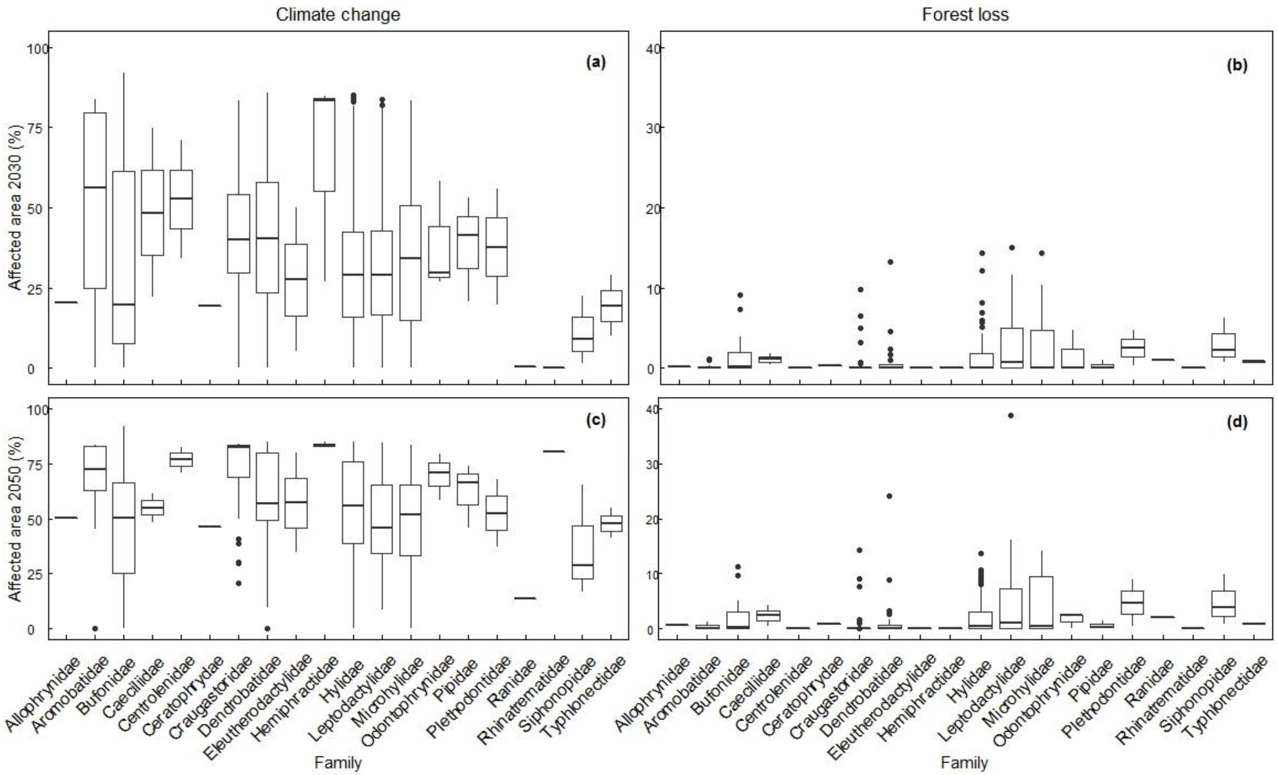
7.4. Figure 3

Future threats for amphibians in the Brazilian Amazon. Chart bar showing the average percentage of threat by family, in 2030 and 2050.



7.5. Figure 4

Percentage of amphibian's distribution potentially threatened in the Brazilian Amazon. (a) climate and (b) land-use changes in 2030. (c) climate and (d) land-use changes in 2050.



8. ANEXO

Comprovante de submisão de artigo para Global Change Biology

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Submission Confirmation

Thank you for your submission

Submitted to	Global Change Biology
Manuscript ID	GCB-17-0247
Title	Combined exposure to hydroelectric expansion, climate change and forest loss menace amphibians in the Brazilian Amazon
Authors	Silva, Yuri Ribeiro, Bruno Brum, Fernanda Soares Filho, Britaldo Loyola, Rafael Michalski, Fernanda
Date Submitted	17-Feb-2017