Herpetologia Segundo as Herpetólogas: A breath of female representation in Brazilian science

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ABSTRACT

Scientific dissemination plays a fundamental role in establishing the dialogue between science and the scientist with the citizen. The 'Herpetologia Segundo as Herpetólogas' (H2H; English translation – Herpetology According to Women Herpetologists) initiative appears in a scenario where women are not recognized or encouraged in Science, Technology, Engineering, and Mathematics - STEM, feeling insecure and intimidated in their academic career. These feelings often impair women's career continuity. In addition, gender gap in Brazilian herpetological community reflects unconscious perceptions of sexist stereotypes and the lack of references or role models. At the same time that the gender gap in STEM is a hot topic of discussion, Brazilian government is threatening progress of science in the country. There is a need to develop actions to disseminate research on herpetology and educate the population on the Brazilian herpetofauna (amphibians and reptiles). When the role of women herpetologists is promoted, it generates greater representation so that young researchers, women, and other transfeminine minorities feel encouraged to dedicate themselves to science. To this end, the H2H initiative promotes research and other initiatives that involve the participation of at least one Brazilian herpetologist and elaborates several social media posts with themes on environmental education and herpetofauna. These publications have a colloquial and didactic character accessible to a diverse audience but always maintaining scientific rigor. The popularization of studies in herpetology and the reduction of prejudice against herpetofauna in Brazil, in addition to the reduction of gender bias in science, can lead to increased diversity in research groups and contribute to more effective and inclusive science.

INTRODUCTION

The Instituto Nacional de Comunicação Pública da Ciência e Tecnologia – INCT-CPCT (National Institute of Public Communication of Science and Technology, in English) conducted a survey to summarize the opinions of young Brazilians (15 to 24 years old) regarding science and technology, including their perceptions of fake news, and how they access general knowledge (INCT-CPCT 2019). They found that science and technology is the third most relevant topic of interest under a wide range of themes, such as religion, sports, and politics, suggesting that this audience has a great interest in the theme (INCT-CPCT 2019). However, being interested does not necessarily equate to being informed about a given

subject. The same study showed that 93% of the young people interviewed reported not remembering the name of any Brazilian scientist, and 87% could not name any national research institution. This lack of knowledge is especially worrying when 68% of the respondents reported difficulty in identifying whether science-related news is trustworthy or not (INCT-CPCT 2019). However, this result is not surprising since Brazil is the country that most prolifically uses social media across Latin America, with primary access via mobile devices (Dourado 2019).

Even though the use of social media for science communication has grown considerably in recent years, there is still a distinct lack of scientists engaged in outreach activities on social media (Massarani & Moreira 2016). The increased consumption of scientific content by the non-specialized public during the COVID-19 pandemic made the engagement of Brazilian scientists with science communication an urgent matter (Chagas & Massarani 2020). Scientific dissemination relies on the active and continuous contact of the scientific culture-sphere with the citizen (Lima et al. 2016) and, consequently, with the greater engagement of the society in issues that deal with science and technology critically and reflectively (Cabral & Perreira 2011). The scientific dissemination work encompasses, among others, activities developed in institutions and the production of content for social media (Adabo 2017). Similar to academia in general, science communication has a historically patriarchal structure that favors cisnormative male scientists (Holman et al. 2018; Astegiano et al. 2019), facing dilemmas in representativeness, with few women[1] taking positions in outreach activities (Pupo et al. 2017; Astegiano et al. 2019). Fortunately, this scenario has shown significant progress in the last decade, with growing representation and participation of women in the fields of Science, Technology, Engineering, and Math – STEM (Holman et al. 2018; Shannon et al. 2019). Yet, the expressive performance of women in scientific dissemination has not been followed by their due recognition. An example is the Prêmio José Reis de Divulgação Científica (José Reis Award for Scientific Dissemination, in English), the most renowned accolade in this area, which has only been awarded to six women in the previous 40 editions, showing an evident male prevalence (Adabo 2017).

1 We would like to emphasize that, throughout the text, when we use the term woman/women, we include all cisgender women, transgender women, non-binary transfeminine persons, women of all races and ethnicities. And when we use the term male/man it refers to cis men. We have not changed the term used in the publications we cite in the text and we do not know whether the terms woman/women and male/man in these texts refers to the same audience that we have chosen to include under the same term. We also encourage other researchers to pay attention to the use of the term and to the public that they include in their research, as it is a common clipping error in the work of treating woman/women as only cisgender women.

The gender gap in academia represents a subject of growing discussion (Ceci & Williams 2011; O'Brien & Hapgood 2012; Shaw & Stanton 2012; Sheltzer & Smith 2014). When we look at the reality for transgender women, *travestis* (Brazilian term for exclusive gender of transfeminine persons, but not necessarily self-identified as a transgender woman), and other transfeminine individuals, the reality is challenging and require further studies. The gender difference regarding the entry and progression within academia is a reported problem to any transgender person that tries to surpass the oppressive barriers that exist in our society and consequently in the academic environment (Vergueiro 2016; Gibney 2019; O'Quinn & Fields 2020; Turney et al. 2020). Gender bias has also been documented in the Brazilian herpetology community (Carnaval 2016; Werneck et al. 2019), where stereotypes of vanity, emotional fragility, insecurity, and lack of physical strength are used as arguments to discourage women from collecting data in the field. Although many women start their studies and scientific careers in herpetology, their scientific progression and persistence are affected by several factors, possibly related to implicit judgment bias involving academic and social spheres (Buckles 2019; Werneck et al. 2019; Montesinos et al. 2021). Unequal opportunities, lack of representation in certain areas, and motherhood are among the main factors responsible for the non-permanence or challenges to the progression of women in this profession (Benício & Fonseca 2019; Cyriac et al. in press; Mohan & Dharwadkar, 2021). This phenomenon of specific groups abandoning careers along their professional path is called "the leaky pipeline" (Pell 1996). Still, women's scientific production has been strongly negatively impacted, especially compared to men, during the COVID-19 pandemic, with even more severe impacts observed among black women (Parent in Science 2020).

In addition to the gender bias issue, science in Brazil is passing through a time of extreme hardship, with a dramatic reduction of science funding by the Brazilian government since 2016. Although scientific entities have spoken out against budget cuts, investment in science and technology has been halved (Petherick 2017; Leta et al. 2018; Barbosa 2019). The discontinuity and extinction of programs aimed at science, technology, and innovation call for the scientific community to take action and increase their dialogue with society. In response, a group of female scientists observed this need to disseminate the importance of studies in their working area and contribute to the conservation of reptiles and amphibians by raising society's awareness of environmental education. Additionally, there was a desire to highlight the excellent research conducted by Brazilian scientists in the field and promote greater female participation in Brazilian herpetology. That is how the Herpetologia Segundo as Herpetólogas – H2H (Herpetology According to Women Herpetologists, in English) was created. The H2H initiative was conceived by Daniella

França and founded in August 2018 along with six other female scientists. The team currently includes 9 participants working voluntarily, but another eight participants have previously been active in the initiative (Fig. 1). On May 27, 2021, the initiative had many followers on the H2H social media pages (8425 likes and 8636 followers on Facebook, 9766 on Instagram, 3580 on Twitter, but these numbers continue to grow). Different actions are developed to reach a broad audience, mostly taken via social media; by giving lectures and courses at schools, universities, and museums; and participating in scientific meetings. In addition, H2H shares scientific discoveries made by women, highlighting their performance in herpetology and academia in general. For example, 'Perereca Talks' are a series of interviews periodically held online where the public has the chance to meet with Brazilian women herpetologists. Thus, these events represent a moment to share information, inspiration, and humanization of science. The initiative also promotes awareness of human



Figure 1. The team of female herpetologists that work voluntarily in the Herpetologia Segundo as Herpetólogas (H2H) initiative. A - Beatriz Diogo Vasconcelos; B - Ana Paula Vitoria Costa-Rodrigues; C - Anna Virginia Albano de Mello; D - Carla Santana Cassini; E - Clara Araújo Salvino; F - Daniela Gennari Pires de Toledo; G - Jéssica Fenker; H - Herpetologia Segundo as Herpetólogas (H2H) initiative's logo; I - Jessica Albuquerque Pereira; J - Laura Rodrigues Vieira de Alencar; K - Lucy Gomes de Souza; L - Marcélia Basto da Silva; M - Natália Ferreira Torello-Viera; N - Natália Rizzo Friol; O - Sarah Mângia; P - Tainara de Alencar; Q - Yasmim Caroline Mossioli de Souza; R - Daniella Pereira Fagundes de França.

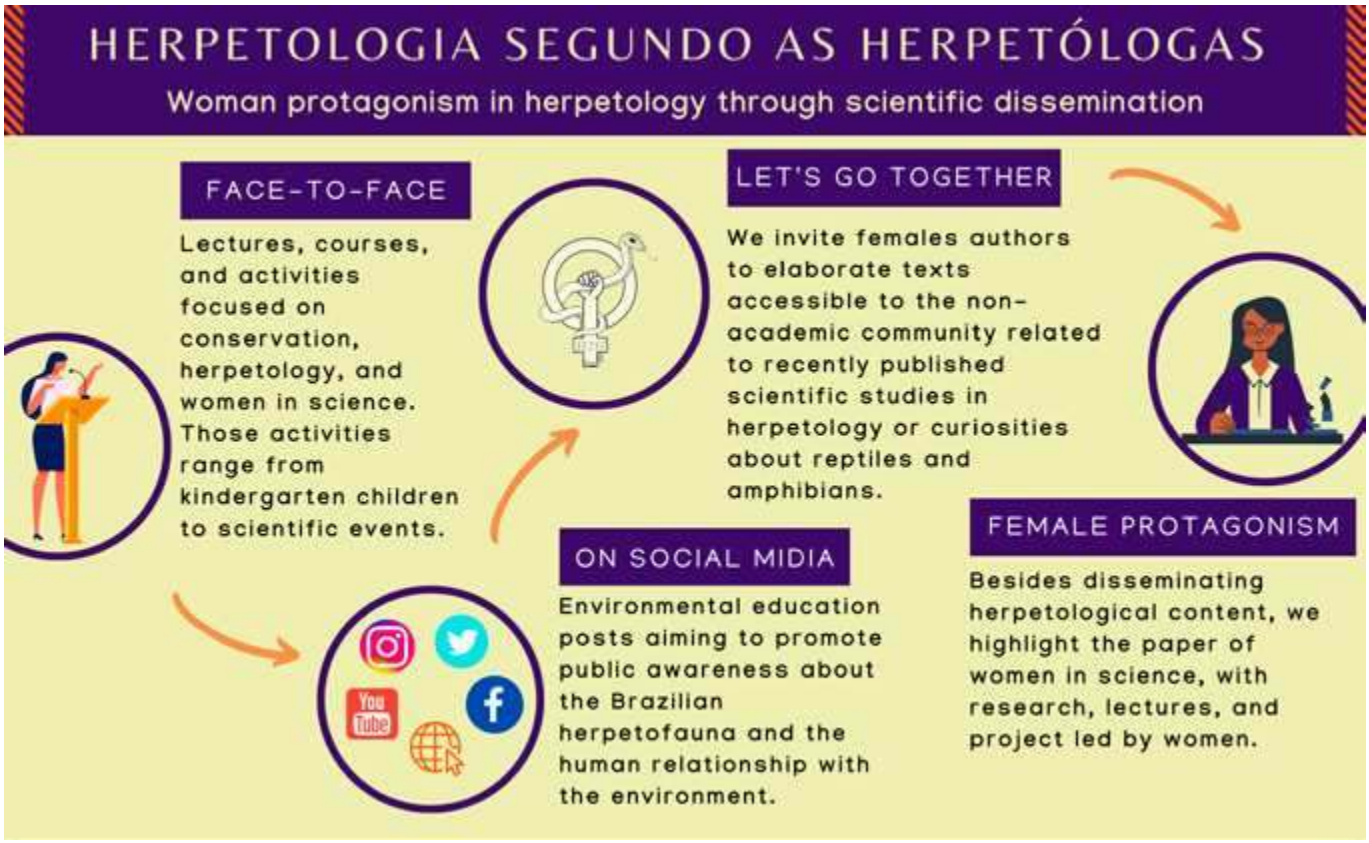


Figure 2. The main actions of Herpetologia Segundo as Herpetólogas (H2H) initiative.

actions around reptiles and amphibians. A summary of the main activities can be seen in Figure 2.

Aiming to better understand the audience, offer a space of support and visibility, and contemplate general interest in the initiative, four surveys were conducted – two in 2019 and two in 2020. All questionnaires were carried out through the Google Forms platform and shared on the H2H initiative's social media and other social networks (Whatsapp, Twitter, Instagram, and Facebook). The surveys were available for 15 days. It is important to note that during the first two attempts to conduct the online surveys, the transgender community was unconsciously unconsidered. In 2020, however, discussions related to transgender equity became more prominent, aiming to construct as equalitarian a scientific communication environment as possible.

The results obtained from the first questionnaire (62 respondents), which was applied only to female herpetologists, suggested that women are not comfortable expressing opinions on social media. This result is related to sexist attitudes. Many women reported having to even stop participating in discussion groups due to *machismo* (common and oppressive behavior of a society where culturally ingrained masculine pride resides; Bernal et al. 2019) and hostile behaviors.

The second questionnaire (58 respondents) was applied only to female herpetologists (mothers and non-mothers). From them, 43.1% reported that their academic career influenced their decision to become mothers, more than they thought they would have been influenced if they had chosen another profession. As a reflection, more than half of the interviewees (55.6%) chose not to have children (or at least not yet). Many women postpone plans to be mothers as they think it is not "the right time" yet, while others wait for a permanent position, which tends to happen only after the age of 30. Nevertheless, 82.6% believe that having children significantly impacts their careers than expected to affect men. Of the interviewed herpetologist mothers, 15.5% report that their academic productivity has decreased since they became mothers and 86% have heard or witnessed unpleasant comments about career-related motherhood. When asked whether there are incentives for women researchers and other professionals in herpetology who wish to be mothers to continue their careers, 36.8% answered no, and 45.6% believed that these incentives are starting to appear, albeit very slowly.

In the third survey (253 respondents), although most of the respondents (38.3%) do not consistently (e.g., every week) follow any scientific dissemination channel, the H2H initiative was found to be one of the most cited channels (4.3%). Among them, 79% reported that they use the channels of scientific dissemination out of curiosity, while 73% of this audience uses the channels to update their knowledge in preparation for classes, courses, and lectures. These data show that working with scientific dissemination on social media is essential to raise awareness among people regarding their environmental impacts.

The fourth and final questionnaire (481 respondents) showed that 45% of the initiative's audience are between 25 and 34 years old, and 32% between 18 and 24 years old, with varying education levels (elementary- and high- school, undergraduate, and graduate). Additionally, 69.2% of the audience was composed of women, 29.5% by men, and 0.2% classified themselves as queer/non-binary, 0.4% as fluid, and 0.6% chose not to answer. The survey participants use the H2H social media channels mostly to search for information and curiosities (65.7%), to help with questions (41.2%), and for fun (22%). In addition, participants mentioned that the initiative offers a collective space, visibility and helps in the search for professional contacts.

The dissemination of science plays an essential role in expanding the general population's knowledge. However, it is paramount to increase the visibility and voices of female references and improve gender equity to stem the unconscious perceptions of sexist stereotypes in Brazilian herpetology. Recognizing this scenario is essential to plan for change and allow more women and girls to feel encouraged to dedicate themselves to science. To achieve this, proposals to increase the representation of women in herpetology, such as

good practices and conduct in the workplace and inclusion of the maternity leave in the curriculum lattes (Werneck et al. 2019), will contribute to a better portrayal of these professionals in STEM."

FUTURE PLANS

The H2H initiative plans to increase face-to-face activities, such as lectures at educational institutions, to encourage girls, teenagers, and young women to pursue their interest in science, especially in herpetology. Another aim is to showcase the initiative at Brazilian and international scientific events, focusing on biology and education, as done during the Brazilian Congress of Herpetology in 2019. H2H's intends that these presentations inspire and encourage more scientists to create similar initiatives, both for the inclusion of women and other social minorities in science.

Another future goal is to expand educational activities, increase female representation in herpetology in all Brazilian states, and promote visits to local communities lacking education and inspirational professionals. There is also a plan to participate more actively in the teaching process, offering nature conservation and science communication courses to school teachers. This training will help school teachers promote educational activities (e.g., games and practical classes), such as creating a profile or channel on social media where students and teachers can publish scientific dissemination content and share their production process. They will be able to discuss content and have reliable and relevant sources. It is a particularly meaningful action that promotes the formation of citizens with critical thinking.

By sharing the collective experience of the H2H initiative, there is an intention to encourage other women to promote spaces of female protagonism in their fields. The hope is that H2H may inspire the development and champion of similar initiatives in other countries, starting an international and collaborative network of women and increasing the visibility of local scientists. We believe that these actions will also increase international research collaborations and contribute to reducing gender bias in the authorship of scientific papers and enhancing diversity in research groups.

Finally, H2H seeks to value activities in herpetology led by women who strive to build a future with gender equality in science. For that, the initiative warmly invites women in herpetology to contribute to the H2H social media channels, sharing their work, scientific findings, or whatever they want. We also welcome help and creative ideas for improving the H2H website as a space to share photos, research, and art related to herpetology, in order that it can be an effective tool for other researchers to communicate and enhance their research. The website also includes means to contact many women herpetologists across Brazil and abroad; monthly updates on scientific publications; suggestions of movies, books, and digital content related to biology, feminism, science for children, and,

of course, herpetology. H2H wants to continue showing that women can be the protagonists of their lives and careers, even (or especially!) if they dream of catching frogs, turtles, lizards, snakes, crocodiles, and do science. H2H enthusiastically encourages anyone to contact the initiative, either through email (*herpetologia2herpetologas@gmail.com*), social media (*@herpgirls* on *Twitter* and Facebook; *@herpetosegundoherpetologas* on Instagram), or by contacting any of the team members and invites everyone to visit the website (*https://herpeto2herpetologas.wixsite.com/-h2h*).

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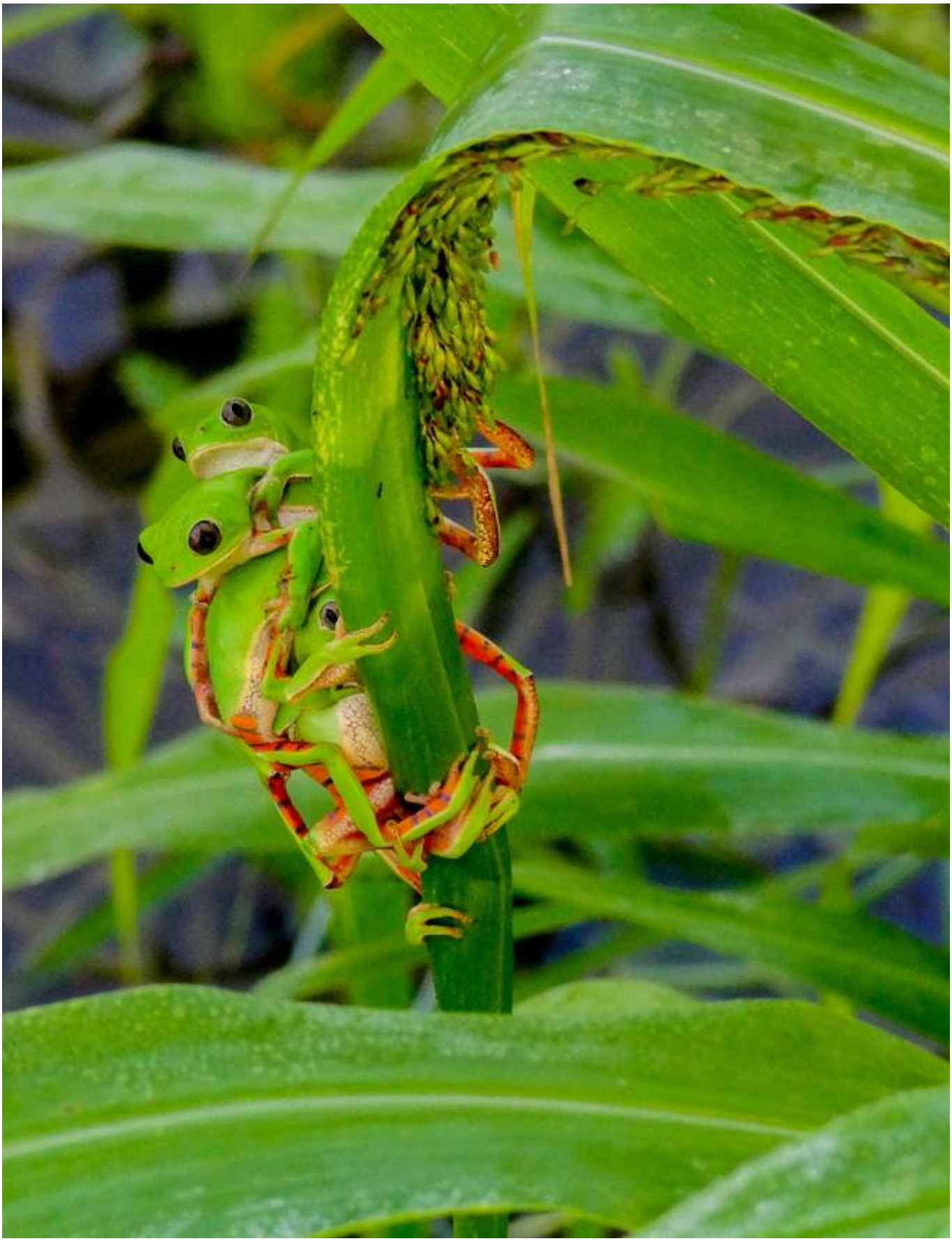
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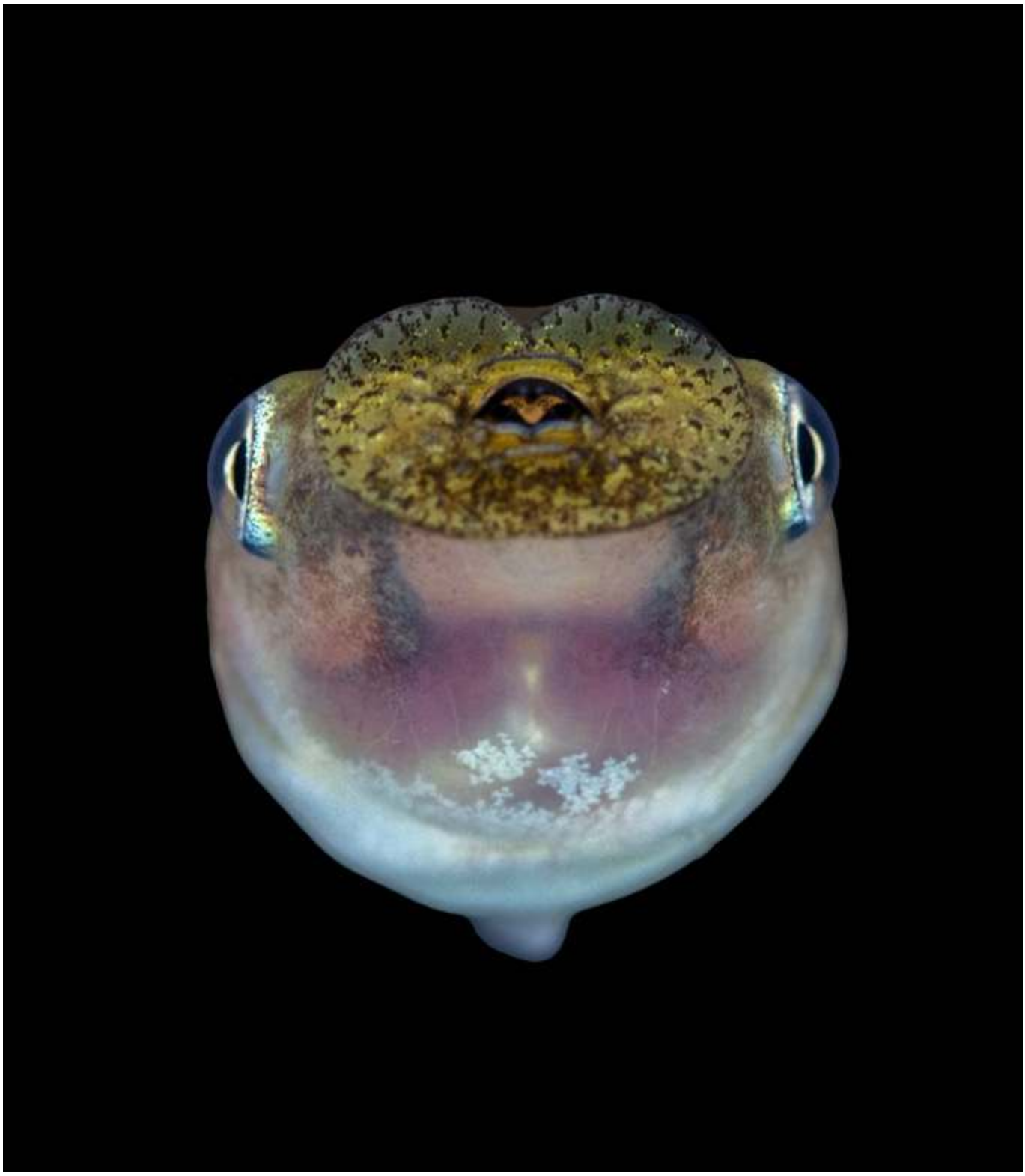
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