Despite being a source of human curiosity for centuries (e.g., Wurffbain 1683; Vallisneri 1706; De Superville 1740; Geoffroy Saint-Hilaire 1832, 1836), interest in amphibian anomalies in natural populations really came on the scene about 150 years ago (Henle and Dubois 2017). Increased environmental awareness, the global decline of amphibians (e.g., Henle and Streit 1990; Stuart et al. 2004), and the recent rediscovery of populations exhibiting mass anomalies (Burkhart et al. 2000; Souder 2002; Lannoo 2008, 2009) have instigated renewed interest in amphibian anomalies as potential indicators of environmental perturbations, with potential implications for human health (e.g., Tyler 1983; Burkhart et al. 2000; Ouellet 2000; Souder 2002; Vershinin 2002). Malformations represent primary errors in development, errors in chemical communication or translation of generic information (Meteyer 2000). Johnson et al. (2001) described malformation as abnormal development triggered when external factors affect metamorphosis, disrupt hormonal systems (Orton and Tyler 2015), and cause permanent structural defects. Anophthalmia, a common ocular malformation in amphibians, is characterized by the absence of one or both eyes (Meteyer 2000; Mitchell et al. 2004; Ramalho et al. 2017). Herein I report anophthalmia (missing eye) in a Greater Stream Horned Frog (Xenophrys major).

Xenophrys major, listed by the IUCN as being of Least Concern (LC) (van Dijk et al. 2004), is known definitely...
only from northeastern India (Arunachal Pradesh, Assam, Meghalaya, Manipur, Mizoram, and Nagaland), although currently undelimited members of the species complex are found from northeastern India through Myanmar and western Thailand to the highlands of Laos and Vietnam as well as China and extreme northeastern Cambodia (Frost 2022). It exclusively inhabits evergreen forest areas, breeds in streams, and tadpoles live in clear, swift-flowing streams during monsoons and in perennial rain climates (van Dijk et al. 2004). After a shower at 1900 h on 11 September 2015 during a herpetofaunal survey in the Tamdil National Wetland in Saitual District, Mizoram, India (23.741219°N, 92.948176°E; 910 m asl), I encountered an anophthalmic adult male *Xenophrys major* (SVL 70.4 mm) sitting on an exposed boulder in a stream (Fig. 1). The left eye was completely absent, although the upper eyelid covered the orbit. The frog appeared to be healthy and was active. As no signs of injury were detected, I assumed that the loss of the eye was not a recent incident. To the best of my knowledge, this is the first recorded case of anophthalmia in *Xenophrys major*. The specimen was collected and deposited in the Departmental Museum of Zoology, Mizoram University (MZMU2059).

Regmi et al. (2021) noted that malformations often are caused by environmental factors that affect development during larval stages and that the worldwide degree of variation in malformations suggests multiple causes. Major causes that have been identified include alien species, overexploitation, environmental degradation, UV radiation, contaminants, and diseases (e.g., Oueller 2000; Alsop et al. 2004; Hussain and Pandit 2012; Henle et al. 2017). Of these, however, environmental degradation and pollution, especially from the agricultural sector, appear to be the major causes of malformation (Oueller et al. 1997; Britson and Threlkeld 1998; Marco et al. 1999; Sparling et al. 2015; Koleshka and Jablonski 2016). Unlike the previous reports of anophthalmia in the Common Asian Toad (*Duttaphrynus melanostictus*) and the Marbled Globular Frog (*Uperodon systoma*), for which the trigger was thought to be surface runoff from agricultural fields sprayed with pesticides or other environmental pollutants (Ashaharraza and Mahapatra 2020; Regmi et al. 2021), the present incident occurred in a pristine forest in a protected area (Fig. 2). Moreover, no agricultural areas exist around the hilly catchment area of the stream or the headwaters of tributaries. Also, recent reports of hindlimb anomalies in other anurans (Nagaland Montane Torrent Toad, *Duttaphrynus chandai*; Mawphlang Odorous Frog, *Odorrana mawphlangensis*; and Tamenglong Horned Frog, *Xenophrys numthumaeng*) from the Hmuifang Community Reserve Forest (Siammawii et al. 2021a, 2021b, 2021c) and in skinks (Indian Forest Skink, *Sphenomorphus indicus*, and Spotted Forest Skin, *S. maculatus*) from the core area of the Dampa Tiger Reserve (Decemson et al. 2021) were in uncontaminated areas. Many authors have reported that anophthalmia in tadpoles can result from attacks by predators (e.g., Martof 1956; Ballengee and Sessions 2009; Gollmann and Gollmann 2012; Grosse and Simon 2015). Although developmental failure resulting from these may not result in immediate death, deformities often lead to reproductive failure (Hayes et al. 2010) and hence population declines. Although many factors appear to have the potential to cause anomalies in amphibians, the relevance of many of these factors in natural populations is unsettled (Sessions and Ballengee 2010; Skelly and Benard 2010). However, without a clear understanding of the causes of amphibian malformations, any link between malformations and widespread amphibian declines remains uncertain.

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**Literature Cited**


De Superville, D. 1740. Some reflections on generation, and on monsters, with a
historical perspective on amphibian deformities, and the role of environmental toxins in causing malformations. This includes discussions on the occurrence of malformations in various species of amphibians, the influence of pollution and chemical exposure on amphibian health, and the impact of these deformities on population dynamics and ecosystem function. The text highlights the importance of ongoing research to understand the complex interplay between environmental stressors and amphibian health, with a focus on the need for further studies to elucidate the causes of deformities and their implications for conservation efforts.

This presentation will cover key findings from recent studies, including:
- Analysis of amphibian deformities in different regions and habitats
- Identification of specific environmental factors contributing to malformations
- Case studies illustrating the effects of pollution on amphibian populations
- Discussion of conservation strategies to mitigate the impacts of deformities

The presentation aims to provide a comprehensive overview of the current understanding of amphibian deformities and the challenges faced in addressing this global issue.