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COMMENT

The dangers of misrepresenting wildlife trade: response to Natusch et al. 2021

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Article Impact Statement: Adequately understanding the implications of wildlife trade requires rigorous scientific study and scrutiny.

The global trade in wildlife affects most major taxonomic groups (Fukushima et al., 2020; Scheffers et al., 2019). Managing wildlife trade requires an accurate understanding of the dimensions of trade and its impacts (positive, neutral, or negative) on the conservation of native wildlife populations. We are concerned that assertions made by Natusch et al. (2021) in "The Perils of Flawed Science in Wildlife Trade Literature" undermine efforts to obtain a representative and accurate understanding of the dimensions, sustainability, and conservation implications of wildlife trade.

Natusch et al. propose that suggestions of negative impacts of trade on species reflect that "philosophical biases are common in the scientific literature on trade in wildlife." They draw this conclusion from a series of poorly evidenced and misleading assertions based on a report on the luxury and fashion trade in wildlife (Sosnowski & Petrossian, 2020). They present Sosnowski and Petrossian (2020) as "a key example … to illustrate the threat of philosophical bias in research on the wildlife trade" in reference to what they claim to be biases on the part of researchers seeking to better understand accurate measures of traded wildlife. We focused on misleading assertions in Natusch et al. that relate to several other studies that quantify impacts and dimensions of wildlife trade.

First, Natusch et al. claim Auliya et al. (2016) generalized that all commercial trade in pet reptiles is unsustainable: "although the study usefully highlights several instances of illegal or unsustainable trade, generalizing the conclusion so broadly goes beyond the available data and is, in our view, misleading" (p. x). However, Natusch et al. ignore the context-specific examples highlighted by Auliya et al. (2016); cite only parts of Auliya et al. (2016) (i.e., "the legal and illegal trade in various reptile species … should be considered detrimental to their survival"); and remove crucial context. The full statement—"legal and illegal trade in various reptile species, largely endemic to megadiversity countries and biodiversity hotspots, should be considered detrimental to their survival"—indicates that Auliya et al. (2016) are referring to a specific subset of reptile species in the commercial trade. In their literature review, Auliya et al. (2016) found

no published examples of small, endemic populations that were sustainably harvested.

Second, and more broadly, Natusch et al. are being misleading when they state that "many articles on wildlife trade imply that all commercial trade in wildlife is negative for biodiversity conservation, yet do not provide the evidence to support this broad implication (Auliya et al., 2016; D'Cruze & Macdonald, 2016; Marshall et al., 2020; Petrossian et al., 2016; Scheffers et al., 2019)." Although each article they cite to support this statement is clearly critical of different aspects of commercial wildlife trade, each set of authors based their conclusions that trade drives extinction risk in many species on clear evidence from extensive literature review or detailed analyses of primary data; none refer to the commercial trade as being entirely detrimental. Natusch et al.'s own broad inference of sustainability in trade is poorly substantiated due to the lack of species, geographies, and trade purposes and trade dynamics studied. Thirty-three percent of case studies Natusch et al. provide are on crocodilians, the only group for which the majority of traded individuals are purported to be bred in captivity (Marshall et al., 2020). This subset of unrepresentative case studies risks oversimplifying the serious biodiversity conservation problems posed by overexploitation.

In their study on the European trade in live reptiles, Auliya et al. (2016) showcase "… a plethora of cases in which legislation and enforcement are insufficient, and species and populations are being depleted because of wildlife trafficking." Similarly, in their study focused on confiscations of CITES-listed species, D'Cruze and Macdonald (2016) call for "improved data reporting and enforcement activity, in combination with existing recommendations to increase political will and reduce consumer demand." In their assessment of global wildlife trade, Scheffers et al. (2019) state the need for "a strategic plan to combat trade with policies that are proactive rather than reactive, which is especially important because species can quickly transition from being safe to being endangered as humans continue to harvest and trade across the tree of life." Finally, Marshall et al. (2020) underline the fact that the majority of reptile species in commercial trade are not covered by international trade regulations and state that "pronounced gaps in regulation imply trade is having unknown impacts on numerous threatened species," which "demand a reconsideration of international reptile trade regulations." Authors of these four studies make nuanced conclusions and policy proposals that contrast with Natusch et al.'s blanket suggestion that in each of these articles it is implied that all commercial trade in wildlife is negative for biodiversity conservation.

Natusch et al. also claim that "philosophical bias" has influenced science-based analyses and interpretations in the peer-reviewed wildlife trade literature, resulting in "antitrade" recommendations. Whilst not all commercial wildlife trade is currently unsustainable, there is mounting scientific evidence that it is one of the major drivers of global biodiversity loss (e.g., Eaton et al., 2015; Harris et al., 2017; IPBES, 2019; Mandimbihasina et al., 2020; Morton et al., 2021; Stanford et al., 2020; Symes et al., 2018), raising concerns that it is currently net negative from a conservation perspective. Recent peer-reviewed studies show that the sustainability of commercial trade (in live wild animals or their derivatives) is dependent on baseline data and empirical assessments, both of which are currently lacking for the vast majority of commodified species (e.g., Auliya et al., 2016; Marshall et al., 2020; Rowley et al., 2016). Without significant investment in future monitoring and testing of the efficacy of different harvest and trade models (Wilkie et al., 2019), large swathes of wildlife trade presently rely on the business-as-usual assumption of sustainable use until proven otherwise (Macdonald et al., 2021).

We agree with Natusch et al. that the "growing importance of global challenges such as climate change, the extinction crisis, and zoonotic pandemics make rigorous scrutiny of the wildlife trade more important than ever" and add equitability (Di Minin et al., 2021) and animal-welfare challenges (Baker et al., 2013) to these concerns. However, in light of the global biodiversity crisis and scant empirical evidence that commercial wildlife trade would be sustainable for the vast majority of species, assertions of sustainability should be approached with caution and subject to at least the same scrutiny expected of studies suggesting unsustainability.

Society must move toward a more precautionary approach to wildlife population management, one that is based on an expectation of rigorous peer-reviewed evidence of sustainability and on a solid foundation of population, off-take, and risk-assessment modeling (e.g., Bennett et al., 2021; Brook et al., 2000) embedded in an interdisciplinary research framework (Blair et al., 2017). Many open-access databases document trade flows (CITES, LEMIS, UN Comtrade, TRAFFIC, etc.), whether legal or illegal, which enables trade in species included in the database to be monitored over time and quantification of trade impacts. These data are particularly useful when combined with other sources of information on species' responses to trade, yet these data are unavailable for the vast majority of species in trade. However, the lack of mandated export–import data on trade for the majority of traded species is obvious. (Only species listed by CITES require reporting, thus most species in trade do not have reporting standards on imports and exports.) This lack of international trade data is unusual because most traded commodities have standard reporting requirements on trade flows, and the lack of such data impairs understanding trade dimensions or monitoring trade in species effectively. It is also essential to informing relevant stakeholders of the legal bases for international wildlife trade, including the potential to conflate legal with sustainable trade, and to conducting quantitative analyses of the potential for philosophical or sampling biases to influence the wildlife trade literature and relevant legislation.

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LITERATURE CITED

Auliya, M., Altherr, S., Ariano Sanchez D, Baard, E. H., Brown, C., Brown, R. M., Cantu J.-C., Gentile G., Gildenhuys P., Henningheim E., Hintzmann J., Kanari K., Krvavac M., Lettink M., Lippert J., Luiselli L., Nilson G., Nguyen T. Q., Nijman V., … Ziegler, T. (2016). Trade in live reptiles, its impact on wild populations, and the role of the European market. *Biological Conservation*, *204*, 103-119.

Baker, S. E., Cain, R., van Kesteren, F., Zommers Z. A., D'Cruze N., Macdonald D. W. (2013). Rough trade: Animal welfare in the global wildlife trade. *Bioscience*, *63*, 928–938.

Bennett, E. L., Underwood, F. M., & Milner-Gulland, E. J. (2021). To trade or not to trade? Using Bayesian belief networks to assess how to manage commercial wildlife trade in a complex world. *Frontiers in Ecology and Evolution*, *9*, 587896.

Blair, M. E., Le, M. D., Sethi, G., Thach H. M., Van, T. H., Nguyen, G. A., Birchette M., Sterling E. J. (2017). The importance of an interdisciplinary research approach to inform wildlife trade management in Southeast Asia. *Bioscience*, *67*, 995-1003.

Brook, B. W., O'Grady J. J., Chapman A. P., Burgman M. A., Akçakaya H. R., Frankham R. (2000). Predictive accuracy of population viability analysis in conservation biology. *Nature*, *4040*, 385-387.

D'Cruze, N., & Macdonald, D. W. (2016). A review of global trends in CITES live wildlife confiscations. *Nature Conservation*, *15*:47–63.

Di Minin, A., Clements, H. S., Correia, R. A., Cortés-Capano G., Fink C., Haukka A., Hausmann A., Kulkarni R., Bradshaw C. J. A. (2021). Consequences of recreational hunting for biodiversity conservation and livelihoods. *One Earth*, *4*, 238-253.

Eaton, J. A., Shepherd, C. R., Rheindt, F. E., Harris, J. B. C., Van Balen, S. B., Wilcove, D. S., & Collar, N. J. (2015). Trade-driven extinctions and near-extinctions of avian taxa in Sundaic Indonesia. *Forktail*, *31*, 1–12.

Fukushima, C. S., Mammola, S., & Cardoso, P. (2020). Global wildlife trade permeates the tree of life. *Biological Conservation*, *247*: 108503.

Harris, J. B. C., Tingley, M. W., Hua, F., Yong D. L.i, Marion Adeney J., Lee T. M., Marthy W., Prawiradilaga D. M., Sekercioglu C. H., Suyadi, N. W., Wilcove D. S. (2017). Measuring the impact of the pet trade on Indonesian birds. *Conservation Biology*, *31*, 394-405.

Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). (2019). *Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. IPBES Secretariat.

Macdonald, D. W., Harrington, L. A., Moorhouse, T., & D'Cruze, N., (2021). Trading animal lives: Ten tricky issues on the road to protecting commodified wild animals. *Bioscience*, *71*(8), 846–860. https://doi.org/10.1093/biosci/biab035

Mandimbihasina, A. R., Woolaver, L. G., Concannon, L. E., Milner-Gulland E. J., Lewis R. E., Terry A. M. R., Filazaha N., Rabetafika L. L., Young R. P. (2020). The illegal pet trade is driving Madagascar's ploughshare tortoise to extinction. *Oryx*, *54*, 188-196.

Marshall, B. M., Strine, C., & Hughes, A. C. (2020). Thousands of reptile species threatened by under-regulated global trade. *Nature Communications*, *11*, 4738.

Morton, O., Scheffers, B. R., Haugaasen, T., & Edwards, D. P. (2021). Impacts of wildlife trade on terrestrial biodiversity. *Nature Ecology & Evolution*, *5*, 540–548. https://doi.org/10.1038/s41559-021-01399-y

Natusch, D., Aust, P., & Shine, R. (2021). The perils of flawed science in wildlife trade literature. *Conservation Biology*. https://doi.org/10.1111/cobi.13716

Petrossian, G., Pires, S. F., & van Uhm, D. P. (2016). An overview of seized illegal wildlife entering the United States. *Global Crime*, *17*, 181–201.

Rowley, J. J., Shepherd, C. R., Stuart, B. L., Nguyen T. Q., Hoang H. D., Cutajar T. P., Wogan G. O. U., Phimmachak S. (2016). Estimating the global trade in Southeast Asian newts. *Biological Conservation*, *199*, 96-100.

Scheffers, B., Oliveira, B. F., Lamb, I., & Edwards, D. P. (2019). Global wildlife trade across the tree of life. *Science*, *366*, 71–76.

Sosnowski, M. C., & Petrossian, G. A. (2020). Luxury fashion wildlife contraband in the USA. *EcoHealth*, *17*, 94–110.

Stanford, C. B., Iverson, J. B., Rhodin, A. R., van Dijk P. P., Mittermeier R. A., Kuchling G., Berry K. H., Bertolero A., Bjorndal K. A., Blanck T. E. G., Buhlmann K. A., Burke R. L., Congdon J. D., Diagne T., Edwards T., Eisemberg C. C., Ennen J. R., Forero-Medina G., Frankel M., … Walde A. D. (2020). Turtles and tortoises are in trouble. *Current Biology*, *30*, R721-R735.

Symes, W. S., Edwards, D. P., Miettinen, J., Rheindt F. E., & Carrasco L. R. (2018). Combined impacts of deforestation and wildlife trade on tropical biodiversity are severely underestimated. *Nature Communications*, *9*, 4052.

Wilkie, D. S., Wieland, M., & Poulsen, J. R. (2019). Unsustainable vs. sustainable hunting for food in Gabon: Modeling short- and long-term gains and losses. *Frontiers in Ecology and Evolution*, *7*, 357.

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