Social and Policy Dimensions of Freshwater Turtle Trade in the US

by

Tara Skye Easter

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
(Environment and Sustainability)
in the University of Michigan
2023

Doctoral Committee:

Associate Professor Neil H. Carter, Chair
Assistant Professor Derek B. Van Berkel
Associate Professor Meredith Gore, University of Maryland
Professor Shobita Parthasarathy

Tara Skye Easter

tseaster@umich.edu

ORCID iD: 0000-0002-4694-9700

© Tara Skye Easter 2023

Dedication

To Mom, and to Myles.

Acknowledgements

I am immensely grateful for the help and support of so many people who made this dissertation possible.

I first want to sincerely thank everyone I interviewed, visited, and spoke with for this research. Thank you for sharing your time, knowledge, perspectives, and experiences with me. Each of your contributions were all invaluable to this dissertation, in more ways than you know.

I am grateful for my disciplinarily diverse committee: Dr. Neil Carter, Dr. Derek Van Berkel, Dr. Shobita Parthasarathy, and Dr. Meredith Gore. Thank you all for your wisdom, guidance, and patience as I navigated your respective fields of expertise and attempted to integrate them. I also want to thank the other faculty of SEAS, particularly Dr. Maria Carmen Lemos and Dr. Bilal Butt, whose teaching introduced me to completely new (to me) ways of thinking and were formative in launching a very different dissertation than what I had originally imagined. With all of your advice and support, I have become a better and more critical conservationist and researcher.

Neil, I am especially grateful for your mentorship, friendship, and encouragement throughout this process and the seven years we have worked together. Thank you for always being there, ready to help whenever I needed it, kindly talking me through times when I felt stuck. I greatly appreciate the countless opportunities you created for me, your understanding of life outside of work, and the friendly and unintimidating environment you have created for all your students.

To my wildlife-loving CoCo research family, thank you for your support, enthusiasm, silliness at our frolics, and friendship. For those of you in the later years of my journey, I especially appreciate your quick and thoughtful feedback on my many drafts and your overall attention to the issue of turtle trade, which was an admitted deviation from the usual topics in Neil's lab.

And to my SEAS PhD and DOC crew, thank you for the countless words of wisdom, walks, writing sessions, game nights, backyard gatherings, paddleboard breaks, and happy hours that kept spirits high even in the most difficult of times.

Last but certainly not least, I would have been completely lost without the love and support of my family and friends outside of graduate school, who thankfully are too many to name, though I must give a special shout out to my husband, Jason, and my sister, Bre. Jason, I do not have the words to describe everything you mean to me and everything you have done for me. Thank you for picking up and moving states, riding right along with me on this emotional roller coaster, making sure I was fed, playing so many games, always, always making me laugh, and always having my back. Bre, thank you for being my rock, for the drop everything yelling vent sessions, and seeing me through every tough decision and milestone. And of course, thank you to my cat Bucket for bringing constant joy and entertainment.

Finally, I am grateful for the financial support provided by the National Science Foundation, Society for Conservation Biology, School for Environment and Sustainability, the Courtney R. Wilson Award, and the Rackham Graduate School.

Onward!

Table of Contents

Dedication ii

Acknowledgements iii

List of Tables viii

List of Figures x

List of Appendices xii

Abstract xiii

Chapter 1 Introduction 1

1.1 Chapter Summaries 4

Chapter 2 Media Portrayal of the Illegal Trade in Wildlife: The Case of Turtles in the US and Implications for Conservation 8

2.1 Introduction 8

2.2 Materials and Methods 12

2.2.1 Sampling 12

2.2.2 Summarizing Case Characteristics 14

2.2.3 Analyzing Media Frames 15

2.3 Results 17

2.3.1 Media Coverage 17

2.3.2 Offenses and Prosecutions 18

2.3.3 Trade Flows 19

2.3.4 Volume and Species Traded 20

2.3.5 Main Themes in Case Articles 24

2.3.6 Problem Drivers 27
2.3.7 Problem Impacts 28
2.3.8 Neutralizations 28
2.3.9 Solutions 28
2.4 Discussion 29
2.4.1 Scale of Illegal Turtle Trade 29
2.4.2 Problematizing Illegal Turtle Trade 31
2.4.3 Addressing Illegal Turtle Trade 33
2.4.4 Neutralizing Illegal Turtle Trade 35
2.5 Conclusion 37
Chapter 3 Analysis of 20 Years of Turtle Exports from the US Reveals Mixed Effects of CITES and a Need for Better Monitoring 38
3.1 Introduction 38
3.2 Methods 42
3.3 Results 46
3.3.1 Export Volumes 46
3.3.2 Importers of US Turtles 47
3.3.3 Ports of Export for US Turtles 48
3.3.4 Before-After Trends of CITES-listed Species 52
3.4 Discussion 58
3.5 Conclusion 66
Chapter 4 Regulatory Perceptions and Priorities at the Nexus of Legal and Illegal Trade of Freshwater Turtles in the US 67
4.1 Introduction 67
4.2 Methods 70
4.2.1 Q Study Design and Analysis 71

4.3 Results 74
4.3.1 Legal Trade Skeptics 78
4.3.2 Targeted Interventionists 81
4.3.3 Sustainable Trade Advocates 83
4.3.4 Ex-Situ Conservationists 84
4.4 Discussion 87
4.4.1 Values-Based Judgments Underly Management Considerations 87
4.4.2 Trade Drivers, Intervention Goals, and Impacts are Perceived Differently 88
4.4.3 Perceptions of Trust and Legitimacy Complicate Management 90
4.4.4 Beyond Stakeholder Siloes and Other Considerations 91
4.5 Conclusion 92
Chapter 5 Discussion 94
5.1 Characterizing Turtle Trade Dynamics 94
5.2 Examining Social Dimensions of Trade Interventions 96
Appendices 100
Bibliography 147

List of Tables

Table 2-1: Contextual information that was coded from all articles and their associated descriptions. 15

Table 2-2: Framing categories and codes with example statements.. 24

Table 3-1: CITES listings of US freshwater turtles. 44

Table 3-2: Before-after model coefficient estimates with 95% confidence intervals for models measuring change in export volume and Shannon Diversity Index (H). 54

Table 4-1: Criteria used to determine the number of factors to extract. 75

Table 4-2: Demographics, roles, and affiliations of study participants (total=29). 75

Table 4-3: Statement rankings by each factor. 76

Table 4-4: Participant associations with each factor and factor loadings. 85

Supplementary Table 1: Final codebook. 101

Supplementary Table 2: Summary of the violations and prosecutions of each case. 103

Supplementary Table 3: Summary of turtle species illegally traded, the exact and approximated number of turtles traded, year(s) that illegal activity occurred, activity timelines, and illegal trading locations (source, transit, and destination) where known for each case. 106

Supplementary Table 4: Additional examples of content coded to the "Neutralizations" frame. 111

Supplementary Table 5: News article citations. 112

Supplementary Table 6: Month and year of Department of Justice Monthly Bulletins with identified cases. 121

Supplementary Table 7: Reviewed CITES policy documents, working group reports, and other grey literature relevant to Chapter 3. 126

Supplementary Table 8: LEMIS codes and definitions found in turtle export data and how we re-labeled them. 137

Supplementary Table 9: Correlations between factors. 139

Supplementary Table 10: Factors z-scores for each statement. 139

List of Figures

Figure 2-1: Number of news articles associated with each case, with the cases ordered on the x-axis by the year the offender(s) were charged with illegal trade from 1998 to 2021. 18

Figure 2-2: Total number of unique articles by the year they were published. 18

Figure 2-3: Documented illegal turtle trade routes within the continental US (a) and outside the continental US (b). 20

Figure 2-4: The approximate volume of turtles illegally traded in each case by the timeframe that the illegal activity occurred. 22

Figure 2-5: Timeframe of illegal trade organized by genus of turtle traded in each case. 23

Figure 2-6: Proportion of turtle species (out of 34) illegally traded that are currently listed under the three CITES Appendices (top) and the International Union for the Conservation of Nature (IUCN) Red List (bottom). 23

Figure 3-1: Total US export volumes of all live, US-native genera for commercial purposes from 1999-2018 (A) and only CITES-listed genera (B). 47

Figure 3-2: Number of live turtles exported from the US from 1999-2018. 48

Figure 3-3: Sankey diagrams showing export flows of turtles by genus through their ports of export and to their regional destinations over four, even time periods. 51

Figure 3-4: Shannon diversity index of the exporting port-importing country pairs for each genus each year (black dots) with trendline (blue) and standard error (grey). 52

Figure 3-5: Negative binomial regressions (blue trendlines) for models with the lowest AIC score (Eq. 2 with the Before-After term or Eq. 3 without the Before-After term ("w/o BA") for each US-native genus listed under CITES with 95% confidence intervals in grey. 55

Figure 3-6: Linear regressions (blue trendlines) for models with the lowest AIC score (Eq. 2 with the Before-After term or Eq. 3 without the Before-After term ("w/o BA") for each US-native genus listed under CITES with 95% confidence intervals in grey 57

Figure 4-1: The Q-sort grid. 73

Supplementary Figure 1: Number of live turtles exported from the US from 1999-2018 134

Supplementary Figure 2: Chord diagram of trade flows in all live, CITES-listed Testudines from 1975-2019 for commercial purposes. 135

Supplementary Figure 3: Number of *Graptemys* (2007-2019) and *Terrapene* (1996-2019) turtles traded from the CITES Trade Database, color-coded by their exporting and importing regions. 136

Supplementary Figure 4: Number of exported turtles marked as "seized" in LEMIS data from 1999-2018 by genus. 137

Supplementary Figure 5: Number of *Graptemys* and *Macrochelys* turtles exported by their source codes. 138

List of Appendices

Appendix A: Supplementary information for Chapter 2 101

Appendix B: Supplementary information for Chapter 3..... 122

Appendix C: Supplementary information for Chapter 4..... 139

Abstract

Unsustainable and illegal wildlife trade is a global threat to biodiversity for which there is no panacea. Efforts to address unsustainable trade are complicated by market and ecological uncertainties, the many ways species are used and valued, and perceptions of policy illegitimacy. These varied challenges necessitate an interdisciplinary approach to untangle conflicts and evaluate the efficacy of management approaches. This dissertation examines the legal and illegal trade of freshwater turtles in the US, where growing concerns over the sustainability of trade has prompted varied regulatory changes and attention to enforcement. The overarching objective is to bring clarity to the scale and dynamics of turtle trade and to situate this emergent conservation issue within the norms, values, and perceptions of reptile trade and wildlife management in the US.

First, in Chapter 2, I characterize the scale and diversity of illegal turtle cases and their portrayals in the media because media framing both reflects and reinforces the perceptions people have toward an issue and its remedies. I used 54 cases of illegal turtle trade in the US and 217 corresponding news articles to synthesize trends and qualitatively analyzed media framing of trade. Despite a diversity in the scale and characteristics of these cases, media framing was relatively unvarying; foreign demand was framed as a main driver of illegal trade, and solutions focused on regulations and enforcement. However, articles also neutralized illegal turtle trade in several ways, reflecting a lack of perceived legitimacy of and necessity for trade rules and enforcement.

In Chapter 3, I examine spatiotemporal and taxonomic trends of 20 years of legal, commercial exports of turtles from the US and analyze the efficacy of listing species under the Convention on International Trade in Endangered Species (CITES) – the primary means for regulating international wildlife trade. I analyzed changes in export volumes and spatial networks before and after CITES listings and further triangulated these findings with qualitative data to better discern direct and indirect drivers of patterns. This study revealed boom-and-bust patterns of trade for individual species and across genera, and mixed effects of CITES listings including unexpectedly higher on-average volumes of trade post-listing. A lack of reliable data, however, precludes understanding the sustainability of trade.

Chapter 4 turns to the intersections of legal and illegal trade and explore the roles of values and perceptions in shaping stakeholder viewpoints on turtle trade management. I drew from interviews and participant observation to design a study using Q methodology to elicit diverse perspectives held by those involved in or affected by regulatory decisions. The analysis characterized four distinct viewpoints on management approaches: the legal trade skeptics, sustainable trade advocates, targeted interventionists, and ex-situ conservationists. Results revealed a consensus view that the most important thing is to ensure the continued existence of wild turtle populations, but viewpoints differed on if and how trade could be sustainable, the acceptability of captive breeding and pet keeping, and the efficacy of regulations.

The findings of this dissertation underscore the importance of evaluating the efficacy of wildlife trade interventions from multiple angles, including their actual and perceived tradeoffs to reduce conflicts and identify effective compromises and solutions.

Chapter 1 Introduction

The overexploitation of species for commercial trade is a global phenomenon and leading driver of biodiversity loss (Fukushima et al. 2020; Cardoso et al. 2021; Morton et al. 2021; Hughes et al. 2022). Wildlife trade (both legal and illegal) comprises complex social-ecological systems, with a vast diversity of species used for a variety of experiential, social, functional, financial, and spiritual purposes (Blair et al. 2017; Thomas-Walters et al. 2021). However, *illegal* wildlife trade, specifically, has recently attracted substantial public interest and investments in interdiction and criminalization (Massé & Margulies 2020; Massé et al. 2020). This focus risks overlooking legal or unregulated trade that is unsustainable or delegitimizing enforcement efforts by criminalizing trade that is sustainable or otherwise important to people's cultures or livelihoods (Stoett 2002; Cooney & Jepson 2006; Macdonald et al. 2021). Depending on the value of the species in question and regulatory and enforcement capacities, top-down approaches (i.e., regulation and enforcement) can also push trade into the hands of highly adaptable criminal networks, exacerbating the problem (Ayling 2013; Challender & MacMillan 2014). Further, prevalent uncertainties surrounding the interactions of legal and illegal markets as well as the interplay of social, economic, and ecological factors make it difficult to anticipate species' vulnerabilities to trade (illegal or otherwise) or to determine the efficacy of interventions (Fukushima et al. 2021). Market globalization and shifts from brick-and-mortar shops to online commerce have also increased the speed and efficiency of exploitation, further challenging efforts to prevent or curtail unsustainable trade, especially for species that are not as closely

monitored such as amphibians and reptiles (Jensen et al. 2018; Esmail et al. 2020; Siriwat & Nijman 2020).

Recognizing the social and ecological intricacies of wildlife trade, the urgent need to address overexploitation, and the unintended consequences of past efforts, conservation practitioners and scholars have pushed for more evidence-based actions and meaningful study and incorporation of the social dimensions of wildlife trade (Bennett 2016; Larrosa et al. 2016; Milner-Gulland et al. 2018; ’t Sas-Rolfes et al. 2019; Naito et al. 2022). Additionally, wildlife trade research has typically focused on charismatic megafauna and extraction in Asia and Africa, with significant gaps in knowledge of trade dynamics for other species and regions (Milner-Gulland et al. 2018; Esmail et al. 2020). This dissertation answers the call for interdisciplinary approaches to understanding and addressing the threat of overexploitation in an understudied case: the trade of freshwater turtles. Specifically, I focus on the trade of turtles in and from the US, where wildlife managers and biologists have increasingly scrutinized the sustainability and legality of turtle trade and have called for detailed studies and collaboration among different interest groups to address the issue. However, widely varying regulations on the commodification and possession of turtles at the state and federal level and conflicting perspectives on what should or should not be allowed have complicated these efforts.

This dissertation has two overarching objectives. First, I characterize illegal and legal trade dynamics and assess the effects of regulations on trade patterns (Chapters 2 and 3). Second, I examine the roles of social norms, value plurality, and perceptions of trade dynamics and regulations in identifying acceptable and effective management approaches (Chapters 2 and 4). I use mixed qualitative and quantitative methods, drawing from several fields in the conservation social sciences, including but not limited to conservation criminology, environmental

governance, and human dimensions of wildlife management (Bennett et al. 2017; Gore 2017). As is increasingly recognized by scholars and practitioners, such an interdisciplinary approach is required to evaluate the efficacy of conservation efforts and address tensions that arise from the politics of resource management (Stoett 2002; Singh 2008; Harrison & Loring 2020; Law 2022).

Due to the paucity of human dimensions research on this topic – and on non-game wildlife management in the US more broadly – this research relied on inductive, qualitative inquiry to first identify the common narratives and themes that shape this case (Creswell 2007; Luker 2009; Drury et al. 2011; Charmaz & Belgrave 2012). I adopted a "follow the policy" and "follow the meeting" approach of distended case studies (Peck & Theodore 2012; Dickinson 2022) which involves tracking the evolution of recent and proposed regulatory changes (e.g., state harvest and possession regulations or listings under the Convention on International Trade in Endangered Species (CITES)) and the discourses and politics surrounding those changes through participant observation, interviews, and document review. I conducted semi-structured interviews (n=23) with managers, scientists, conservation advocates, law enforcement agents, and trade participants and reviewed policy documents, citizen petitions, hearing testimonies, public comments, working group reports, and governmental reports. I visited turtle farms and aquaculture facilities, shadowed turtle field research, and attended reptile expos, conferences, commission meetings, and webinars where I also had dozens of informal and enlightening conversations. I also actively participated in monthly meetings and three, multiday workshops as a member of the Collaborative to Combat Illegal Trade in Turtles (CCITT), which comprises government agency managers, biologists, legal experts, academics, criminal investigators, and inspection agents (Sevin et al. 2022). Through these activities, I gained a rich and nuanced account of how turtle trade emerged as a conservation concern and is conceptualized by different

interest groups. This work directed and informed the three empirical studies presented in this dissertation (Chapters 2-4).

1.1 Chapter Summaries

In recent years, several, large-scale cases of illegal turtle trade have made headlines and caught the attention of wildlife managers, scientists, and law enforcement (Maron 2019; Sevin et al. 2022). These cases have been highlighted as examples of how severe the problem is; however, there was little information on the overall scale and trends of illegal trade, nor how this issue was being communicated to general audiences through the news media. Media framing (Entman 1993; Weaver 2007) can reflect and reinforce the perceived legitimacy or necessity of actions taken to address illegal trade, influencing decision-making and compliance with new rules (Lakoff 2010; Turner et al. 2016; Walker et al. 2019). Thus, in Chapter 2 (Easter et al. 2023) I synthesized the spatial, temporal, taxonomic, and prosecutorial trends of 54 known cases of illegal trade in the US that occurred from 1998-2021 and qualitatively analyzed how the media framed these cases in 217 corresponding news articles. At least 24,000 turtles of 34 species were involved in these cases, 12 of which are considered threatened by the IUCN, and were listed under one of the CITES Appendices at the time of analysis. Illegal trade occurred domestically and internationally, involving at least 43 states and 6 countries. While these cases varied widely in their scale and severity, problem and solution framing in news articles focused on foreign demand, primarily in Asia for turtles as pets, as the main driver of trade and a need to increase law enforcement and regulations to prevent future occurrences. However, through a novel application of criminology's neutralization theory (Kaptein & van Helvoort 2019), I also found that media framing justified or downplayed these cases in several ways, indicating a potential lack of perceived legitimacy of top-down measures to address illegal trade. I argued

that longstanding norms in reptile keeping and trading in the US may drive perceptions of illegitimacy and in some cases lead to a lack of compliance with new regulations (Eliason 2003; Acemoglu & Jackson 2017; Moreto & Gau 2017; Wagner et al. 2019).

In Chapter 3 (in review at *Conservation Science and Practice*), I turned to the dynamics of *legal* trade (emphasis added due to the frequent conflation of legal and illegal trade) and the direct and indirect effects of international regulations. The Convention on International Trade in Endangered Species (CITES) is the primary mechanism for regulating international wildlife trade, with the aim of preventing trade from harming the viability of wild populations. However, measuring the efficacy of CITES is difficult because before and after trade data are often lacking, as there are few datasets on the trade of species not listed under CITES that can act as a control against which to compare the effects of CITES listings (Janssen & Shepherd 2018; Robinson & Sinovas 2018; Booth et al. 2020). In response to global concerns regarding the sustainability of freshwater turtle trade (Lovich et al. 2018; Rhodin et al. 2018; Stanford et al. 2020), turtles have been increasingly listed under CITES, including several species native to the US. In this chapter, I assessed the spatial and temporal dynamics of turtle exports from the US and changes to those trends following CITES listings, adding to the overall evidence base of this critical policy instrument. I used 20 years of export data from the US Fish and Wildlife Service's Law Enforcement Information System (LEMIS) to measure changes in export volumes and trade route complexity of CITES-listed turtles in three ways: average changes, immediate changes, and the changes in trends in the years pre- and post-listing. I further triangulated these findings with qualitative data from my case studies (e.g., interviews, policy documents, and participant observation) to better discern drivers of trade patterns that could not be quantified. I found that trade followed boom-and-bust patterns typical of CITES-listed turtles from other regions (CITES

2011), and these patterns are likely driven by several factors relating to supply and demand, including CITES listings for some species. However, CITES had mixed effects overall for both Appendix II and III species, including a slower rate of exports of *Graptemys* and *Clemmys* spp., but counterintuitively higher on-average export volumes of *Malaclemys* and *Macrochelys* spp. post-listing. At the same time, the diversity of spatial trade networks consistently declined for CITES and non-CITES listed genera. These results likely point to differences in demand and species' availability from captive breeders, farms, or wild harvest, which are important factors to consider in future listing decisions given the limited implementation and permitting capacity of agencies. However, as noted by other researchers (Schlaepfer et al. 2005; Hinsley & Roberts 2018; AFWA 2020; Challender et al. 2021) and made evident by my interviewees, significant issues with the LEMIS data limited my ability to evaluate the efficacy of CITES listings more fully in preventing overexploitation of wild populations.

Chapters 2 and 3 elucidate the many uncertainties of legal and illegal turtle trade, its sustainability, and how the two markets interact. While these uncertainties complicate management decisions, ultimately, opinions on the most effective and acceptable ways to prevent overexploitation also stem from individual perceptions of the issue and values-based judgments that vary based on identities and worldviews (Chandran et al. 2015; Estévez et al. 2015; Biggs et al. 2017). In Chapter 4, I drew from the conflicts and tensions observed in semi-structured interviews (n = 23), informal conversations, public comments in responding to regulatory proposals, and working group meetings to design a study that used Q-methodology to investigate how differing perceptions and attitudes toward turtle trade aligned with preferred approaches to management. Q studies use both qualitative and quantitative methods to systematically characterize diverse subjectivities surrounding a particular topic (i.e., narratives, viewpoints,

perspectives, discourses), regardless of how frequently those subjectivities occur in a population (Watts & Stenner 2005, 2012; Mukherjee et al. 2018; Zabala et al. 2018). I selected 37 representative statements from a concourse of quotes that captured different viewpoints on regulatory approaches and priorities, trade dynamics, trade sustainability, and attitudes toward turtle trade and its participants. Study participants (n = 29) included agency managers, biologists, academics, law enforcement agents, hobbyists, and commercial traders. Participants ranked each of the 37 statements on a grid according to their level of agreement or disagreement with each statement. Factor analysis, combined with respondents' comments on the statements following sorting and my knowledge of the case (Watts & Stenner 2012), characterized four viewpoints on management approaches: the legal trade skeptics, targeted interventionists, sustainable trade advocates, and the ex-situ conservationists. There was a consensus among respondents that the most important thing is to ensure the continued existence of wild turtle populations, but viewpoints differed on if and how trade could be sustainable, the acceptability of captive breeding and pet keeping, and the efficacy of regulations. Differences related to values-based judgments on the appropriate use of turtles and varied perceptions of trade drivers, trade regulations, and the risks and legitimacy of legal breeding and trade (Estévez et al. 2015; Yanco et al. 2019). These divergent perspectives help to clarify differences in policy responses across state agencies and underscore the need to address tensions in conflicting value positions and perceptions of trade (Sarewitz 2004; Harrison & Loring 2020).

Chapter 2 Media Portrayal of the Illegal Trade in Wildlife: The Case of Turtles in the US and Implications for Conservation[1]

2.1 Introduction

The implementation and success of any conservation program or policy depends largely on its perceived necessity and legitimacy by both decision makers and the general public (Kuperan & Sutinen 1998; Turner et al. 2016; Moreto & Gau 2017). Media framing (i.e., the inclusion and emphasis of certain information in mass communications that make some aspects of a perceived reality more or less salient, (Entman 1993) plays a significant role in shaping such perceptions and thus can hinder or facilitate conservation agendas (Lakoff 2010; Drews & van den Bergh 2016; Walker et al. 2019). More specifically, media framing defines problems, diagnoses causes, makes moral judgments, and suggests remedies (Entman 1993, p. 52). Media selectivity and coverage of certain events also influences an issue's perceived importance and scale (Weaver 2007). For example, the media's amplification of relatively rare instances of shark or grizzly bear (*Ursus arctos*) attacks on people frames these species as dangerous to the public, which can hinder support for their conservation and restoration (Muter et al. 2013; Hughes et al. 2020). Additionally, disproportionate media coverage of certain conservation issues (e.g., shark finning and plastic pollution) may inadvertently divert public attention and limited resources

[1] This chapter has been published in *People and Nature*. It is included here with minor formatting changes. Citation: Easter T, Trautmann J, Gore M, Carter N. 2023. Media portrayal of the illegal trade in wildlife: The case of turtles in the US and implications for conservation. People and Nature **00**:1–16.

away from more pressing concerns for endangered species such as sharks and sea turtles (Shiffman et al. 2020; Santos & Crowder 2021).

Illegal and unsustainable wildlife trade is recognized as a significant threat to the survival of species across the globe (Scheffers et al. 2019; Morton et al. 2021), drawing calls for better monitoring systems, increased regulatory oversight and enforcement of trade rules (Massé et al. 2020; Macdonald et al. 2021; Watters et al. 2022). Efforts to gain control over unsustainable and illegal trade revolve around building certainty about the drivers of trade, most effective supply and/or demand reduction strategies, and normative and ethical considerations of animal welfare and commodification (Collard & Dempsey 2013; Challender & MacMillan 2014; Bennett et al. 2021; Cooney et al. 2021a; Rizzolo 2021). Understanding how wildlife trade issues are framed in news media can bring clarity while revealing the assumptions and evidence underlying different standpoints (Walker et al. 2019; Margulies 2020; Li et al. 2022). However, few such studies exist. We conducted a media framing analysis to understand perceptions and responses to an emergent wildlife trade issue: the illegal trade in non-marine turtles.

Turtles and tortoises (Order Testudines) are among the most threatened vertebrates in the world, with over half of recognized species listed as Critically Endangered, Endangered, or Vulnerable on the International Union for the Conservation of Nature's (IUCN) Red List (Rhodin et al. 2018). The overexploitation and global trade of wild turtles for pets, meat, and medicinal markets or cultural uses is one of the main drivers of their population declines (Stanford et al. 2020). Turtles are particularly vulnerable to overexploitation due to their slow reproductive rates, but biologists and conservation managers did not realize the extent of the problem with freshwater turtle exploitation until the late 90s, which spurred a worldwide increase in turtle conservation monitoring, legal trade regulations, illegal trade prosecutions, and

incorporations of nongovernmental organizations such as the Turtle Survival Alliance (van Dijk et al. 2000; Gibbons & Lovich 2019; Stanford et al. 2020). These efforts have heightened awareness of significant illegal trading in threatened turtle species among conservation managers (Nijman & Shepherd 2007; Auliya et al. 2016; Sigouin et al. 2017), but we know less of how this problem and its potential solutions are communicated to general audiences. Such information could dramatically increase insight on existing norms toward turtle trade and the perceived necessity and legitimacy of newly implemented regulatory and enforcement actions for managing the trade (Gamson & Modigliani 1989; McLeod & Detenber 1999; Humphreys & Latour 2013).

The US is a microcosm of the global trade in turtles and shifting norms and regulations regarding the trade in reptiles, more generally. It has one of the richest assemblages of freshwater turtle species in the world (Mittermeier et al. 2015), which have long been legally hunted, collected, and commercialized for their meat and as pets domestically and abroad (Moll & Moll 2004). Snapping turtle meat was once such a common food that it was used in commercially produced Campbell's turtle soup until the late 1960s. While turtle soup is less popular than it once was in the US, snapping and softshell turtles are still commercially harvested in several states and sent to meat wholesalers or shipped abroad. Likewise, the US is one of the largest suppliers of pet turtles in the world, stemming from the establishment of commercial turtle farms in the 1950s which have sold many millions of hatchlings in domestic and international pet markets (Hughes 1999). Reptile breeding and keeping as a hobby has also grown immensely, with hundreds of reptile expos and trade shows happening every year in the US (Collis & Fenili 2011). However, with the increased recognition of the plight of turtles, stricter trade regulations and greater enforcement of them has shed light onto the illegal underside to turtle trading in the

US (UNDOC 2020). For example, diamondback terrapins (*Malaclemys terrapin*) were heavily exploited for commercial food markets in the 19th and early 20th centuries (Moll & Moll 2004), but as population declines became more apparent and terrapins grew in popularity as pets, several states banned the commercial harvest of terrapins. Subsequent enforcement efforts then exposed continued illegal collection, which likely threatens already dwindling populations (Maron 2019). Some states, such as Florida, have reacted to this potential threat with stricter rules on personal possession of terrapins, while others, such as Louisiana, allow for regulated commercial harvest of the species.

Given the growing concern over illegal trade among managers and the US's significant role in the global turtle market, we analyzed how known instances of illegal turtle trade – defined here as any instance where one or more turtles were caught, transported, sold, offered for sale, bought, attempted to be bought, or possessed in violation of the law – in the US are framed in news media (predominantly electronic versions of newspaper articles) to broaden our understanding of how the heterogeneous regulatory and enforcement landscape regarding turtle trade is perceived. We had two main objectives. First, because there are no published, open-access and verified data sources on the scale and dynamics of illegal turtle trade, we sought to synthesize existing information on the spatial, temporal, taxonomic, and prosecutorial trends of illegal turtle trade from media articles. Second, given the context of those trends and existing legal markets, we characterized how news media frames illegal turtle trade in the US. Specifically, we asked: (1) in what ways does the news media problematize illegal turtle trade, (2) what are the stated drivers of trade, (3) how do media frames suggest we mitigate illegal trade, and (4) what moral and normative evaluations of illegal trade, trade regulations, and its enforcement exist in media frames? To answer this last question, we applied criminology's

techniques of neutralization theory to analyze how media framing constructs notions of normative deviance (i.e., when an act violates a formal norm) beyond the legal/illegal dichotomy (Sykes & Matza 1957; Pritchard & Hughes 1997; Kaptein & van Helvoort 2019). With this framework, we posited that neutralizing media frames reflect and reinforce broader social norms about what is considered legitimate and deviant in wildlife trade, which can determine the success or failure of subsequent policies.

2.2 Materials and Methods

2.2.1 Sampling

We first identified known instances of illegal trade in non-marine turtles (hereafter referred to as "cases"), similar to other studies of events- and place-based media analyses (Pritchard & Hughes 1997; Daniels et al. 2007; An & Gower 2009; Jørgensen & Renöfält 2013; Solman & Henderson 2018). We used press releases and monthly bulletins from the US Department of Justice's Environment and Natural Resources Division (ENRD, available from 2006 – October 2021) to identify an initial set of cases. These sources summarize the developments of criminal cases in the US involving violations of federal laws dealing with wildlife and the environment, and their purpose is to increase information sharing between district attorneys and enforcement agencies (https://www.justice.gov/enrd/selected-publications/environmental-crimes-monthly-bulletins). To overcome the potential bias for press releases to only highlight larger busts of illegal trade and the limited timeframe of available bulletins, we supplemented this search with an inhouse ENRD database of non-confidential/completed turtle trade cases, which included the defendant's name, a short summary of the case (similar to bulletin summaries), and the sentencing. We also deployed a form of snowball sampling (Parker et al. 2019); if during analysis another case was referenced that had

not been previously identified through the above sources and it met our criteria for inclusion, we added it to our analysis.

Cases had to involve the illegal trade in turtles sourced from the US to be included in our analysis. This included cases that explicitly involved the trade of species native to North America but may have been prosecuted elsewhere (e.g., cases where North American species were trafficked from the US into Canada and the offender was prosecuted in Canada). This also included cases where the offender acquired turtles in the US and was prosecuted in the US, but the specific species involved were not stated in case summaries.

Cases often involved multiple people or a network of traders that were charged at different times. We considered cases to be separate if the people involved were charged at different times, at least one of the associated news articles focused on only that individual, and details of that person's case can be reasonably split from the rest of the group. For example, WG was involved in illegal trading with SB and others, but this person was charged separately; that case received individualized attention in the media, and the trade that occurred and species involved were listed separately from that of SB and others in that network. Thus, we treated this as two cases – one identified as WG and one identified as SB and others. Although the names of offenders are public information, we will refer to them using short identifier codes throughout this paper.

In all, this process identified 54 cases prosecuted from 1998-2021. While not exhaustive, we focused on this time frame because around the late 90s was when commercial turtle trade became known as an international threat to turtle populations and garnered more media and policy attention, as described earlier (van Dijk et al. 2000; Cheung & Dudgeon 2006; Gibbons & Lovich 2019). We used the name of the person or business charged with illegal trade and

"turtles" to search NewsBank – an online database that archives print and web-based newspapers, newswires, periodicals, broadcast transcripts, and other publications from sources all over the world (hereafter "articles") – for related news articles. This search resulted in 867 associated articles, and after removing duplicates, we analyzed 217 articles. Articles did not have to be solely about the case to be included but had to mention it. For example, articles about turtle-related books that reference certain cases were included, but articles that quoted a charged individual about turtle-related activities (e.g., turtle farming) but predated a charge were removed. Finally, news articles that mentioned more than one case were tallied for each case to assess total coverage associated with each case, but the content of such articles was only coded once.

2.2.2 Summarizing Case Characteristics

We extracted contextual information that described the scope and scale of each of the 54 cases and their prosecutions from their associated press releases and news articles. We coded every statement related to our list of categories (Table 2-1, Supplementary Table 1), no matter how vague the statement was to ensure a complete portrayal of what transpired. We then synthesized the coded statements to create case summaries and explore trends in illegal turtle trade. We summarized data in the most detailed form that it was available. For example, some articles stated the exact number of turtles and which species were traded, while others used more vague language such as "hundreds of box turtles". We mapped illegal trade flows for the cases with information on starting and ending locations of trade using the center points of source and destination states and countries in ArcGIS Pro (2.8). We plotted the number and type of turtles traded over time in R 4.0.3 (R Core Team 2020) with the package *vistime* (Raabe 2022) to explore taxonomic trends using information from only the cases with explicit information on

North American species traded to gauge potential impacts and pressures on wild populations. We also plotted the amount of coverage each case received using the package *ggbreak* (Xu et al. 2021) and recorded the laws broken, the mode of operation for each case, and summarized the sentences (fines, imprisonment, and probation) each case received. All of this information is further used to contextualize the framing analysis.

Table 2-1: Contextual information that was coded from all articles and their associated descriptions.

Category & Code	Description
Scales of Case	
Geography	Stated locations of where illegal trade occurred.
Timeline	Stated dates or timelines of illegal trade.
Value	Stated monetary value of illegally traded turtles.
Volume	Actual or estimated numbers of turtles illegally traded.
Prosecutorial	
Actual sentencing	Fine, restitution fee, property forfeiture, prison or probation sentence.
Evidentiary behavior	Descriptions of the ways offenders knowingly evaded laws or regulations.
Max. possible sentencing	Stated maximum sentencing a case could receive based on the charges.
Relevant law(s)	Descriptions of the laws or regulations that were violated (e.g., Lacey Act).
Repeat offender	Statements on prior wildlife-related charges or warnings.
Turtle Characteristics	
Conservation status	Stated conservation listing/designation. (e.g., listed "threatened" by IUCN).
Natural & life history	Stated reproductive rates, lifespans, distributions, ecologies, morphologies.
Protection status	Stated protection status (e.g., illegal to harvest from New Jersey).
Threats	Stated threats to a species (e.g., poaching, vehicle strikes, habitat loss).

2.2.3 Analyzing Media Frames

To identify different frames used to portray illegal turtle trade cases in the US, we conducted a thematic analysis of the 217 articles following Braun and Clarke (Braun & Clarke 2006). This method is iterative and involves multiple rounds of revisions and checks among coders to ensure congruence in the interpretation of themes and frames. We used Entman's (1993) broad framing categories (problem definition, causal diagnosis, moral judgment, and

remedy suggestions) as a guide for frame categories and code themes (Matthes & Kohring 2008; Giles & Shaw 2009).

To develop the codebook, first the lead author read all the articles to get a sense of tone and content. Then, the first and second author freely coded a randomly selected set of 20 articles (~10% of total). We compared these codes and drafted an initial codebook based on material coded similarly by both authors. We then used this initial codebook to recode the same set of articles to check for missing or overlapping themes and revised the codebook accordingly. The first and second authors then independently coded another randomly selected sample of articles (n=34, ~15% of total) using the revised codebook. To gauge agreement among coders, we used percent agreement and Krippendorf's Alpha (KALPHA) to check intercoder reliability with this set of 34 articles. These tests were performed in NVivo (1.5) and R 4.0.3 (R Core Team 2020) using the package *irr* (Gamer et al. 2019). Categories with a KALPHA score below 0.80 and variables with percent agreement below 90% were dropped (Hayes & Krippendorff 2007). First and second authors then proceeded to both code all 217 articles with the remaining and revised variables.

We organized a final set of themes within four framing categories: problem drivers, problem impacts, solutions, and neutralizations (Table 2-2, Supplementary Table 1). Problem drivers referred to anything that was framed as a reason for why illegal trade may occur, e.g., high market values of turtles. Content coded to the problem impacts frame encompassed why we (or the article's audience) should care about illegal turtle trade, i.e., what harm does it cause? The solutions frame included any offered remedy to the problem of illegal turtle trade, i.e., what should be done about this issue? The neutralization frame constituted ways that articles downplayed or diverted attention from the harm caused by illegal turtle trade. We equated this to

how neutralization theory is operationalized in criminology, where offenders justify their deviant behavior to avoid admitting guilt (Sykes & Matza 1957). We coded content generally as "neutralizations" following Kaptein and van Helvoort's (Kaptein & van Helvoort 2019) model, then further divvied this content into the two top tier categories of their model: denying responsibility and denying deviance. We added a third category that included instances of othering and joking about the offender or case that we label as uniquely deviant. Finally, we summarized the frequency of each theme by dividing the number of cases where a theme was found by the total number of cases and by the number of articles where a theme was found by the total number of articles.

2.3 Results

2.3.1 Media Coverage

We collected information from 54 cases involving illegal trade of turtles sourced from the US and 217 associated news articles covering 47 of those cases. The number of news articles collected from NewsBank that mentioned each case ranged from 0-177, and the number of unique articles ranged from 1-31 (Figure 1). There was a higher number of cases and news articles in later years, with a time lag between case occurrence and media coverage in part due to media attention often occurring in two stages: when a person was charged and later when they were sentenced (Figure 2). Not all cases had reached the sentencing phase at the time of this analysis. Articles on new cases would also sometimes reference back to older cases to frame the issue, adding to the time lag and total coverage some cases received over others.

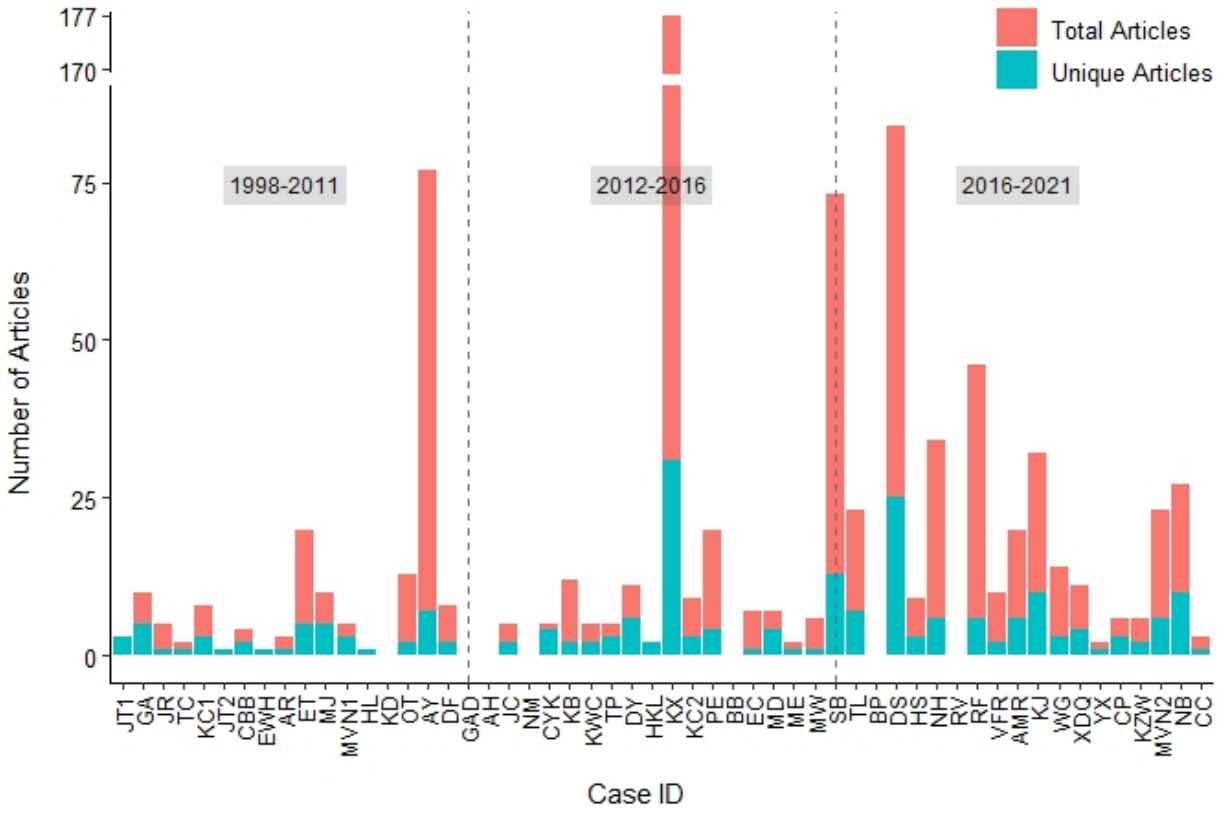


Figure 2-1: Number of news articles associated with each case, with the cases ordered on the x-axis by the year the offender(s) were charged with illegal trade from 1998 to 2021. Case charges did not occur evenly across time, so three general time periods are marked by the vertical, dashed lines. Only unique articles were coded for the content analysis.

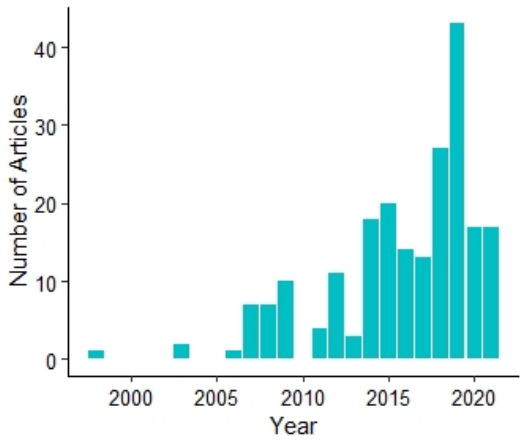


Figure 2-2: Total number of unique articles by the year they were published.

2.3.2 Offenses and Prosecutions

Most charges were brought under the Lacey Act and included violations of the Endangered Species Act, various state regulations, CITES permitting requirements, false labeling, and/or money laundering. Two cases involved the sale of undersized turtles (which is banned by the US Food and Drug Administration). The longest stated prison sentence of cases that had concluded at the time of this analysis was for 57 months out of the 18 cases (33%) that received a prison sentence. The largest fine charged, including restitution fees to different organizations, was $450,000 out of the 27 cases (50%) that were fined. Most cases with known charges (33 of 46) received some amount of a probationary sentence ranging from 1-8 years. Articles reported that nine of the charged offenders had previously been charged or cited for a wildlife-related violation. One offender occurs in our database for three separate cases (Supplementary Table 2).

2.3.3 Trade Flows

The analyzed cases were filed in 24 states as well as Washington D.C. and Ontario, Canada. Illegal trade of turtles sourced from the US was said to have occurred across at least 43 US states and six countries or territories (Canada, China, Hong Kong, Japan, Netherlands, Sweden). Although the origins and final destinations of illegally traded wildlife were often unknown or unspecified, 19 states were identified as starting points for trade, and 17 states and 6 countries or territories were reported as destination locations (Figure 3, Supplementary Table 3).

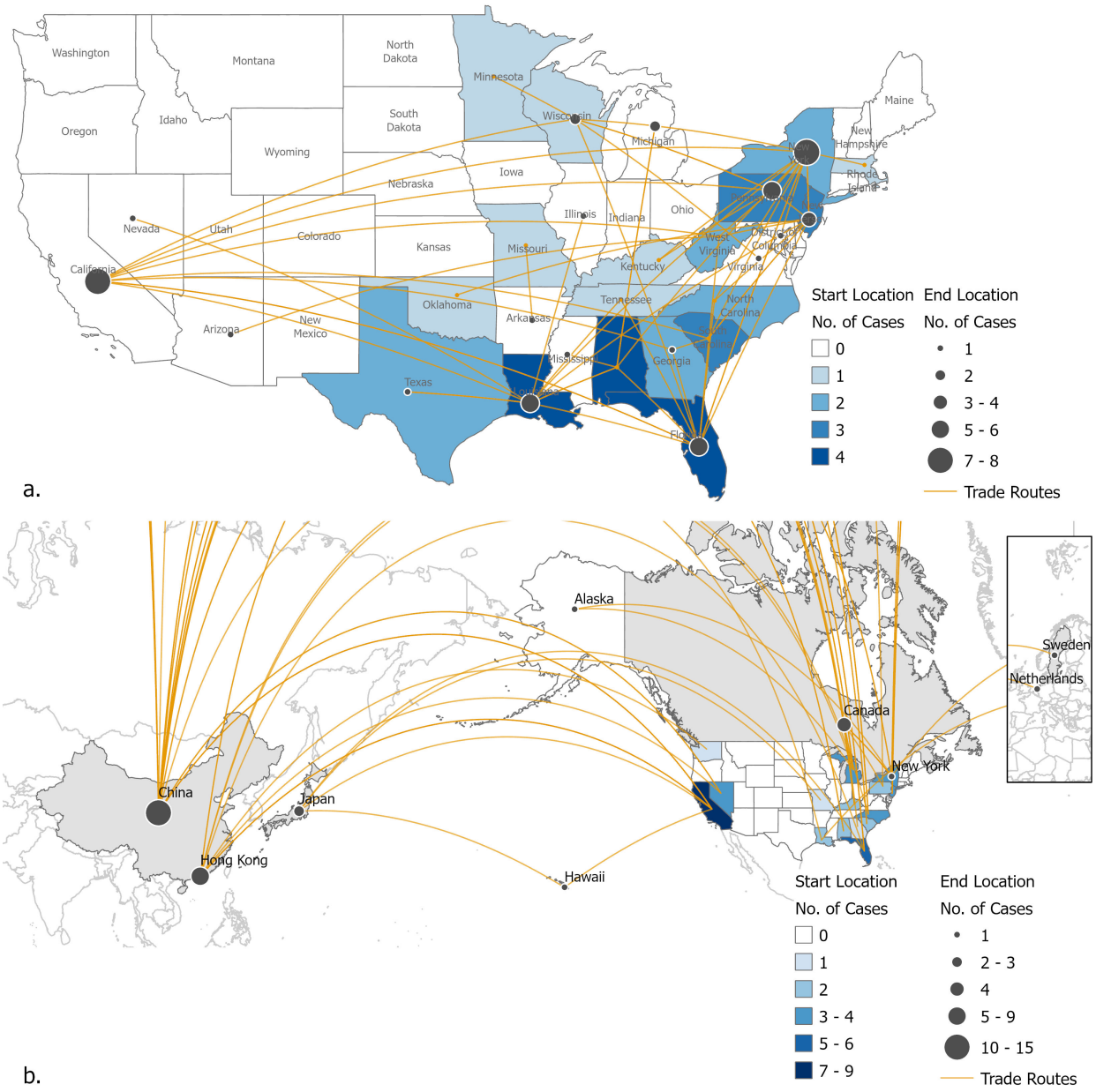


Figure 2-3: Documented illegal turtle trade routes within the continental US (a) and outside the continental US (b). Blue states are where trade routes began, with darker blues representing more cases which involved that state as a start location. Grey dots and filled in countries are where trade routes ended, with the larger dots representing more cases involving that state or country as an end location. Start and end points are oriented at the approximate centre of a given state, province or country. Orange lines represent the known trade routes. Cases without known start and end locations were not included in this figure (n = 11).

2.3.4 Volume and Species Traded

Of cases where any volumes of turtles illegally traded was reported (48 of the 54 cases), they ranged in trade of between 1-5,581 turtles. In sum, over 24,000 North American freshwater turtles were illegally caught, transported, or sold in these 48 cases. It is important to note that this is a conservative estimate based only on exact numbers reported in these cases. Often, a person is charged based on one interdiction and only the number of turtles involved in that instance are reported, but in many cases that person had been involved in illegal trading for years. On the other hand, several cases involved high volumes of reptile trade but the majority of which was in other reptile species or turtles not native to North America. For example, one case involved an estimated "18,000 turtles and reptiles", but it was unclear how many North American turtle species were involved, if any. Therefore, this number is not included in the reported totals (Supplementary Table 3).

Because of so much taxonomic and exact volume uncertainty, Figure 2-4 shows volume approximations of North American turtles illegally traded based on either quotations from law enforcement (e.g., "Evidence suggests person X was dealing in thousands of turtles over X years") or estimates based on the offender's activity. For example, one case involved the interdiction of 11 packages containing a total of 59 turtles, but law enforcement later estimated that between 60-70 packages were successfully sent prior to this interdiction. For this case, we assume that "hundreds" of turtles were smuggled for Figure 2-4. We also must emphasize that these cases and volumes of turtles involve a range of violation types, from selling undersized, potentially captive bred turtles to trafficking in thousands of wild caught turtles.

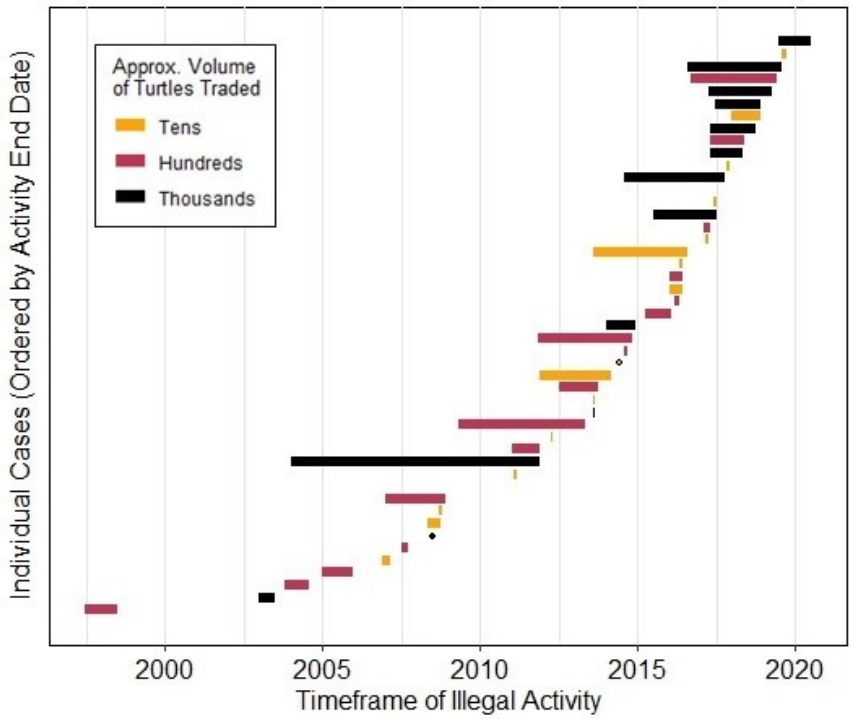


Figure 2-4: The approximate volume of turtles illegally traded in each case by the timeframe that the illegal activity occurred. Horizontal bars represent the length of time that illegal activity occurred for each case (n = 47). Orange bars indicate that the case involved fewer than 100 turtles (n = 18). Purple indicates that between 100 and 1000 turtles were estimated to have been traded (n = 16). Black indicates thousands of traded turtles (n = 13). Cases where there was not enough information to approximate the volume of North American turtles traded or the timeline of illegal activity were not included in this figure (n = 7).

Of the known timelines, illegal activity took place over the course of one day to seven years (Figures 2-4, 2-5, Supplementary Table 3). At least 34 species (including eight subspecies where specified) from 14 genera of North American turtles were illegally traded, plus other reptile species in several cases. Box turtles (*Terrapene* spp.) were the most commonly reported turtles involved in these cases (23 cases), followed by spotted turtles (*Clemmys guttata*; Figure 2-5). Of the 34 species involved, 23 are listed under one of the CITES Appendices, and 12 are classified by the IUCN's Red List as Vulnerable, Endangered, or Critically Endangered (Figure 2-6).

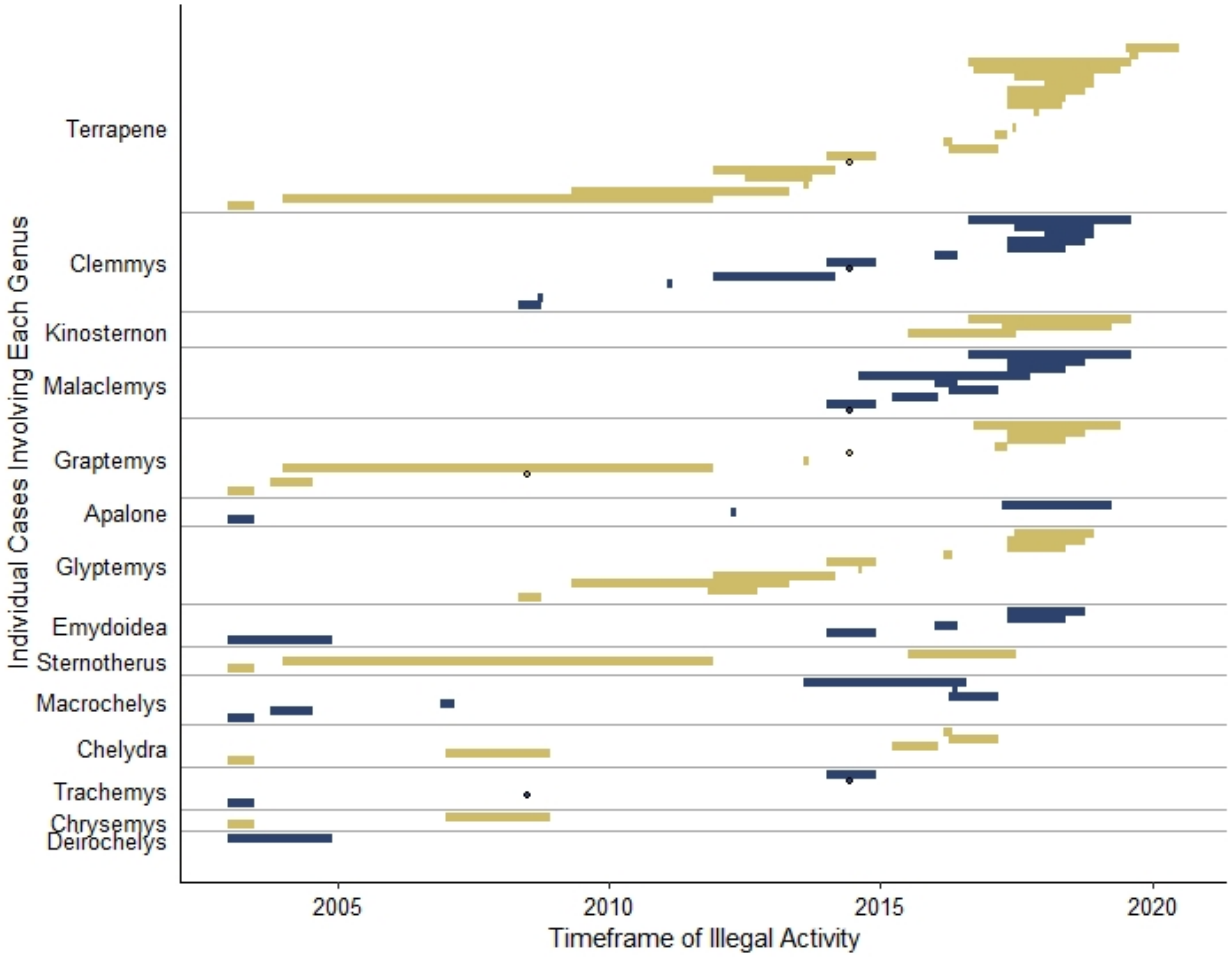


Figure 2-5: Timeframe of illegal trade organized by genus of turtle traded in each case. Horizontal bars represent the length of time that each case took place. Cases with an unknown timeline or unknown species traded (n = 10) are not included in this figure. Colors alternate to help distinguish between species bars.

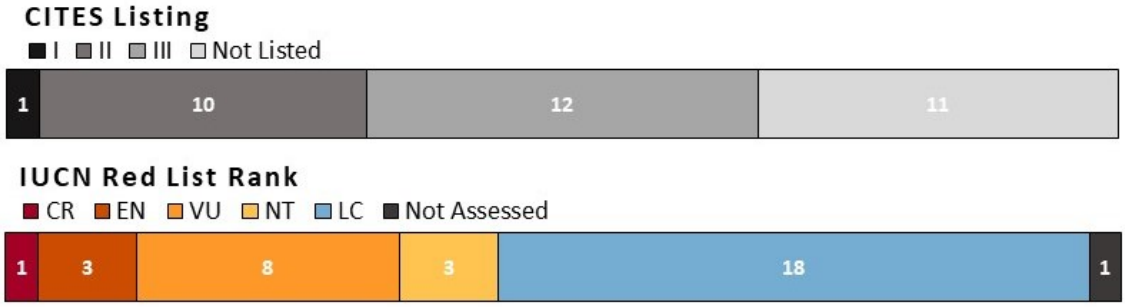


Figure 2-6: Proportion of turtle species (out of 34) illegally traded that are currently listed under the three CITES Appendices (top) and the International Union for the Conservation of Nature

(IUCN) Red List (bottom). CITES Appendix I listing is the most restrictive, shown in black, followed by Appendix II, III and species not listed in lighter grey. Species listed by the IUCN as Critically Endangered, Endangered, Vulnerable and Near Threatened are shown in descending shades of orange, and Least Concern and species not assessed are shown in blue. Some cases may have predated species listings on CITES or IUCN.

2.3.5 Main Themes in Case Articles

Thematically coded text was sorted into four identified frames: problem drivers, problem impacts, neutralizations, and solutions (Table 2-2). Article content associated with 12 of 47 cases did not fit into any of the frames. In these cases, articles were very short or only reported basic information.

Table 2-2: Framing categories and codes with example statements. Occurrence frequencies of each theme are provided by the percent of cases a theme occurred in out of 47 cases with associated news articles ("Case Freq.") and the percent of articles a theme occurred in out of 217 total articles ("Article Freq."). Frames are not mutually exclusive. See Supplementary Table 1 for additional code descriptions.

Frame	**Case Freq.**	**Article Freq.**	**Example statement**	**Article**
Problem Drivers	53% n = 25	51% n = 110		
Foreign Demand	43% n = 20	30% n = 65	"The trade in reptiles has been a particular concern for authorities in the Southeast, a region with an abundance of turtles sought as pets and food in Asia."	Fretwell, S 2021, 'Man with SC ties indicted on wildlife trafficking charges', *The State*, 3 April.
Pet Trade	40% n = 19	37% n = 80	""Turtles with intense and unique spot patterns are sought after in the domestic and foreign pet trade," he said."	Walsh, J 2019, 'Feds: smuggling ring had south jersey connection', *The Record*, 19 February.
Lucrative	38% n = 18	23% n = 49	"Wildlife traffickers get involved in the business because of the world's insatiable demand for animals and the profits dealers can make when they sell wildlife. In a single year, some dealers have reportedly made $100,000 selling turtles, snakes and other reptiles."	Fretwell, S 2018, 'Booming black market puts SC wildlife in peril', *The State*, 8 July.
Meat Trade	30% n =14	23% n = 49	"…but [he] has a keen interest in common snapping turtles in New	Smith, V 2009, 'Fear the Turtle - A federal raid in

			York--which he says are abundant now, but due to growing global demand for turtle meat, could see their numbers plummet quickly."	Maryland shows how common snapping turtles can have an uncommon bite', *City Paper*, 18 March.
Medicinal or Cultural Uses	17% n = 8	8% n = 18	"Some turtles were being kept domestically as pets, but many were being sent overseas, driven by demand as food or use in traditional medicine."	Yee, G 2020, 'With new law protecting SC's reptiles and amphibians, conservationists look to future', *The Post and Courier*, 7 December.
US Demand	17% n = 8	7% n = 16	"Driven both by demand for North American turtles in east Asia and by trade in the United States, poaching of wild turtles can devastate local populations, experts said."	Friedmann, M 2021, 'Turtle protectors work together to end poaching', *Connecticut Post*, 7 October.
Problem Impacts	62% n = 29	50% n = 108		
Threat to Species Populations	51% n = 24	26% n = 56	"Perpetuating an international trade threatening turtle stocks in the United States and Asia, pet shop owner NS and two Hong Kong-born middlemen worked for four years in the smuggling scheme."	No author, 2014, 'Everett pet shop owner turned animal smuggler: I went too far chasing my 'dream'', *Seattle Post-Intelligencer*, 16 January.
Crisis	40% n = 19	23% n = 49	"Wildlife smuggling is a major international issue that law enforcement agencies struggle to get a handle on."	Fretwell, S 2021, 'Man with SC ties indicted on wildlife trafficking charges', *The State*, 3 April.
Poor Animal Welfare	38% n = 18	22% n = 48	"This is certainly not the most serious offense," … "Quite frankly, the worst part for me is the cruelty exhibited to the turtles - the ones that died during the shipment apparently from asphyxiation."	No author, 2014,'Man jailed for illegal turtle sales', *Charleston Gazette,* 16 December.
Disease & Public Health Risk	23% n = 11	12% n = 26	"Bringing wildlife illegally into the United States or shipping it overseas can spread disease and hurt native animal populations in South Carolina."	Fretwell, S 2018, 'Scheme that hid rare turtles in candy wrappers bring s down SC wildlife Smugglers', *The State*, 5 September
Undermining Business & Law	13% n = 6	6% n = 13	"Some legitimate wildlife dealers say they could support stricter state oversight of some types of wildlife dealing to weed out the shady businesses that give their industry a bad name."	Fretwell, S 2018, 'Booming black market puts SC wildlife in peril', *The State*, 8 July.

Invasive Species Risk	6% n = 3	2% n = 4	"It's important to prevent imported animals from spreading disease to people or other animals, while preventing exotic animals from establishing themselves in the state, he said."	Fretwell, S 2018, 'Man imported 220 deadly snakes to SC, where illegal animal trade is Growing', *The Herald*, 9 July.
Neutralizations	43% n = 20	30% n = 65		
Denying Responsibility	32% n = 15	13% n = 28	"He "buys from so many states that he couldn't keep track of the laws," so "he buys turtles based on what was legal where he lived (Maryland)."""	Smith, V 2009, 'Fear the Turtle - A federal raid in Maryland shows how common snapping turtles can have an uncommon bite', *City Paper*, 18 March.
Uniquely Deviant	26% n = 12	15% n = 32	"Former Trentonian reporter DS has found himself caught up in the same type of oddball story he used to crank out for the capital city's scrappy tabloid newspaper."	Avilucea, I 2018, 'Former Trentonian reporter indicted for smuggling protected turtles out of New Jersey', *The* Trentonian, 10 July.
Denying Deviance	23% n = 11	14% n = 31	"There are rapists and murderers and drug traffickers" that deserve a high priority for prosecution… "Yet they want to come after some (expletive) animals. They have nothing better to do?"	Fretwell, S 2018, 'Booming black market puts SC wildlife in peril', *The State*, 8 July.
Solutions	43% n = 20	23% n = 50		
Law Enforcement & Prosecutions	36% n = 17	18% n = 39	"With this operation, we hope to shed light on the problem of smuggling and provide a deterrence," ... "If you come to Los Angeles to smuggle wildlife, then you're going to get caught and you're going to get prosecuted."	Brennon Dixson, B 2017, 'Wildlife Trafficking seizure nets tigers to deadly snakes', *Daily Breeze*, 21 October
Policy & Regulations	17% n = 8	8% n = 17	"The difficulty with turtles in South Carolina is we don't have stringent regulations," … "That makes turtles, other reptiles and amphibians prone to being commercially exploited."	Fretwell, S 2019, ' Black market wildlife trade leads to SC – again', *The Herald,* 21 September.
Communications & Awareness	11% n = 5	2% n = 5	"The company also has agreed to provide future purchasers of baby turtles with leaflets explaining the law"	No author 2008, 'Firm accused of improper turtle sales', *South Florida Sun-Sentinel*, 5 July.
Captive Breeding	4% n = 2	1% n = 2	"But it is possible to combat the Chinese turtle trade. When the	Cahalan, S 2018, 'The insatiable Chinese

			Burmese star … almost became extinct, its native country of Myanmar launched a captive breeding program to save them."	appetite for turtles could lead to the animal's extinction in the US', *New York Post*, 11 November.
Research & Assessments	2% n = 1	0.5% n = 1	"That's why the Minnesota Department of Natural Resources and the Nature Conservancy in Minnesota are teaming to launch a pilot program to monitor turtle populations there."	Molseed, J 2020, 'New pilot program monitors Blanding's turtle population', *Post-Bulletin*, 20 June.
Alternative Pet Choice	2% n = 1	0.5% n = 1	"Consider choosing a different type of animal to keep as a pet, as there is no way to be 100% certain a dealer is operating ethically"	Friedmann, M 2021, 'Turtle protectors work together to end poaching', *Connecticut Post*, 7 October.

2.3.6 Problem Drivers

Illegal turtle trade was framed most often as being driven by profit potential and increased demand that came in various forms. Specifically, a rising demand for pet turtles, mostly in Asia, was most often framed to be the cause for turtle trafficking in the US (Table 2-2). Mention of US demand for turtles in the absence of any mention of foreign demand in the same article only occurs once, when discussing the legal and illegal trade in pet box turtles. The only other region specifically discussed regarding demand for turtles was Europe, which was mentioned in three articles that covered two cases (1% and 4%, respectively). Similarly, although the pet trade was more often framed as the culprit of demand, the use of turtles as food or in traditional medicines was often lumped in as a catch-all, regardless of the species involved in a given case (e.g., "In China, turtles fetch top dollar when sold as pets, used for medicinal reasons and served as a dinner delicacy"[2]). Demand for turtles as food or medicine was more often associated with Asian demand in particular.

[2] Editorial Board 2016, 'Editorial: Short takes on bowl-game overload, no more flaming weather reports, and other weird stuff', *St. Louis Post-Dispatch*, 16 April.

2.3.7 Problem Impacts

The negative impacts on wild turtle populations and poor animal welfare were most often discussed as the reason to be concerned with illegal trade (Table 2-2). Illegal turtle trade, or wildlife trade generally, was framed as a nonspecific 'crisis' in 19 of the cases, where articles would discuss it as a "growing problem" for law enforcement, a "serious crime", or an international issue involving "organized criminal syndicates." The potential for illegal trade to spread harmful diseases to other wildlife or people was the next most frequent concern. Risk of invasive species establishment and the concern for illegal activity undermining legal institutions (e.g., commercial turtle farms, trade shows, banks) were also points of concern.

2.3.8 Neutralizations

Cases were often framed under more than one of the neutralization themes, but articles most frequently neutralized cases by including quotes that suggested the offender was somehow not responsible for their behavior (Table 2-2). This included being coerced into an activity, claiming ignorance about the rules, or blaming personal financial circumstances as the driver of their actions. The uniquely deviant theme occurred second most often. This is when articles joked about a case or "othered" it in a way that makes illegal turtle trade seem specific to, for example, Asian cultures or an unusual interest. Some articles were even entirely satirical. For the last neutralization category, framing that denied deviance in illegal trade cases either distorted the truth of what happened, negated that a social norm was violated, insinuated that other good deeds made up for the transgression, or considered the enforcement or punishment to be unjust in comparison to the crime (See Supplementary Table 4 for additional examples).

2.3.9 Solutions

Articles included suggested "solutions", or ways to address illegal turtle trade, for 20 of the cases, but of the four frames it occurred in articles the least often (Table 2-2). Increased law enforcement and prosecutions were the most frequently suggested solutions, often through the quotes of law enforcement officers themselves from press releases. The second most frequently cited solution was to change the laws and regulations to close loopholes in the legal trade of wildlife. These were often specific to certain states, rather than a broad suggestion. Only five articles mentioned a need to increase awareness of the issue. Captively breeding endangered turtles to reduce pressure on wild populations was mentioned twice. Conducting research to assess the effects of trade on wild populations and considering a different pet choice to avoid accidentally participating in the illegal trade of turtles were both mentioned only once.

2.4 Discussion

We conducted a news media analysis of 54 cases of illegal turtle trade in the US spanning over the last twenty years to explore the scope and scale of the trade and to examine how media framing defines turtle trade problems and solutions. Three major insights emerged. First, there is increased attention to the threat of illegal wildlife trade in the US as evidenced by increased prosecutions and media coverage that, when collated, reveal a multifaceted, extensive trade in a diversity of turtle species. Second, we found that despite great heterogeneity in these cases, relatively homogenous problem drivers and solutions emerged from article frames that mirror global discourses on illegal wildlife trade. Third, through the use of neutralization theory, we expose how existing social norms in reptile trading and a lack of perceived legitimacy and necessity for more regulations may counteract policy and enforcement-based efforts to clamp down on illegal trade.

2.4.1 Scale of Illegal Turtle Trade

The number and scale of illegal turtle trade cases in the US have increased, overall, in the last 20 years (Figures 2-3, 2-4). However, this increase may actually be indicative of greater attention to the issue through enforcement and regulations facilitated by recent government mandates, rather than an actual increase in illegal trade. Following the discovery of turtle defaunations across the globe, several state agencies and the USFWS have tightened some of their formerly loose regulations on the commercial trade of turtles and subsequently ramped up enforcement of wildlife trade rules. More broadly, combatting illegal wildlife trade was also made a national priority in the US in 2013 by the Obama administration, then again in 2017 by the Trump administration (Exec. Order No. 13648 2013; Exec. Order No. 13773 2017). The END Wildlife Trafficking Act facilitated collaborations among state and federal wildlife and non-wildlife agencies, provided resources for more intensive, intelligence-led investigations, and gave authority to agencies to bring charges under non-wildlife related statutes (e.g., money laundering charges). The END sunsetted in 2022; future work could investigate how influential these policies were on enforcement effort and success.

Our analysis also indicates that the number of species reportedly traded in these cases increased over time (Figure 2-5). For example, cases involving mud turtles (*Kinosternon* spp.) and diamondback terrapins (*Malaclemys terrapin*) increased starting around 2015. This may again just be a byproduct of more detailed investigations and restrictive regulations. However, mud turtles were not listed under CITES at the time of this analysis, nor are the species that were illegally traded considered threatened by the IUCN. Thus, our results may in fact reflect a real trend in trade in these species and indicate that species rarity and value are not the only drivers of illegal exploitation as some studies suggest (e.g., Courchamp et al. 2006; Chen 2016). A more holistic understanding of the drivers and trends in turtle pet markets – rather than focusing on

species already of conservation concern – is critical to prevent biotic homogenization and keep common species common (Romagosa et al. 2009; Sigouin et al. 2017). Mapping trade routes was also helpful in discerning geographic trends. The southeast appears to be a notable source hub for turtles in the cases, while international trade was primarily routed through California, Florida, and New York (Figure 2-3). California ports in Los Angeles and San Francisco are also primary transit centers for legal, commercial exports of turtles, perhaps due to its proximity to East Asian importing destinations (Mali et al. 2014).

Understanding and addressing illegal wildlife trade is inherently difficult due to limited data availability and data sensitivity. Summarizing trade dynamics using information from press releases and news articles as we have done here for turtle trade can help elucidate broad-scale patterns (Cheng et al. 2017; Stassen & Ceccato 2020; Bondaroff et al. 2021). Identifying emerging market trends and geographic hotspots of trade, and if and where commercial collection and trade is allowed, is critical for the development of targeted, problem-oriented interventions, especially where resources are limited as is often the case in wildlife conservation (Lemieux & Pickles 2020).

2.4.2 Problematizing Illegal Turtle Trade

Although illegal trade occurred throughout the US and internationally (Figure 2-3), news articles most often framed foreign demand, particularly demand from Asian countries, as the primary driver of illegal turtle trade in the US (Table 2-2). While there is a large foreign – and in fact global – demand for turtles, this framing ignores the US's history not only as consumers in the pet turtle and turtle meat markets, but as facilitators of it. Few articles mentioned the history of domestic turtle exploitation and demand, or the popularity of reptile expos and pet turtles currently. Articles also framed illegal trade as a new crisis for turtle populations stemming from

Asian demand. However, to use one species as an example, concern over the decline in diamondback terrapins due to overexploitation for terrapin stew in the US began over a century ago (Moll & Moll 2004; Bettelheim 2005). We do not deny that there is a large demand for turtles in Asia, but to say the problem exists and is driven solely by Asian markets and culture is to ignore the US's profound participation in and influence on global markets. Further, this frame may perpetuate harmful stereotypes without addressing the drivers of illegal trade domestically (Margulies et al. 2019; Margulies 2020). The Asian demand frame shifts the blame elsewhere, while at the same time advocating for stricter regulations and enforcement of commercial trade in the US.

Illegal turtle trade was most often framed as a problem for the survival of wild populations. However, we found a disparity between this framing and the evidence available to determine potential impacts these cases could have on wild populations. For many cases there was not enough information to determine if and where the illegally traded turtles were taken from the wild, and some cases exclusively involved captive bred or ranched individuals. This echoes ongoing calls for better monitoring in wildlife trade to better direct regulatory efforts and ensure trade sustainability (Challender et al. 2021).

In addition to trade impacts on turtle populations, article frames centered animal welfare as a top concern regarding illegal trade. Gruesome photos of poached wildlife such as elephants and rhinos are often used by news media to grab attention and evoke emotion, so the media may be following the "if it bleeds, it leads" mantra of deciding whether illegal turtle trade is newsworthy. However, this raises interesting questions for what trade regulations are designed to address. CITES, for example, is designed to ensure that "international trade in specimens of wild animals and plants does not threaten the survival of the species" (CITES n.d.). In its arguments

for listing species under CITES, the USFWS states that listing will aid the Parties in stopping illegal trade by requiring import and export checks and ensure proper treatment of traded animals by forcing adherence with International Air Transport Association's live animal shipping standards (USFWS 2014). However, if high demand and inefficiencies or seemingly burdensome requirements in the permitting system encourage traders to skirt these rules altogether, an unintended consequence may be the higher likelihood that turtles are more often subjected to the cruelty of smuggling. Further, villainizing turtle traders due to how animals are treated in trade may feed into existing pressures for complete trade bans and tougher prosecutions, which are counter to most regulatory frameworks that are designed to ensure sustainable trade. Complete bans may also drive trade further underground (Titeca 2018; Roe et al. 2020; Ferns et al. 2022), resulting in the higher use of risky and inhumane shipping methods to avoid detection while failing to address illegal trade.

2.4.3 Addressing Illegal Turtle Trade

Notably few solutions were offered in article frames in comparison to problem drivers and impacts and almost all of them centered on law enforcement and regulations (Table 2-2). Enforcement and harsher prosecutions, such as hefty fines or jail time, were framed both as a deterrent for future illegal trade and as just retribution for exploiting natural resources. The need to tighten regulations to close loopholes or limit opportunities for laundering in legal turtle trade was suggested second to greater enforcement effort. There are two probable reasons why enforcement and regulations were the dominant solution frames.

First, news articles were often made aware of turtle trade cases through the Department of Justice's or state wildlife agency and law enforcement's press releases. In those press releases, the officers and prosecutors involved are the ones who were quoted, which likely skews media

coverage of those cases toward focusing on the act of enforcement. This lends significant control over messaging to those initially communicating about these cases (Killion et al. 2021). Indeed, when several large-scale turtle trade cases converged with efforts to close loopholes in South Carolina's reptile trading regulations, they were leveraged to emphasize the necessity for greater restrictions and enforcement. In those articles, South Carolina was described as a "comfortable spot for wildlife traffickers, who can take advantage of the state's weak reptile trading laws", and one offender was called "one of the most widely known wildlife traders in South Carolina, having had run-ins with authorities for parts of the past 14 years." This offender's most recent prosecution in 2019 was the first time anyone in South Carolina was sentenced to prison for illegal wildlife trade. In this case, media framing likely bolstered support for the legislative change on reptile possession in South Carolina, which passed in 2020. This speaks to the agenda setting abilities of local media as well as the ability for advocates and lawmakers to craft the framing of relevant events.

Second, the frequently cited need for increased law enforcement, harsher prosecutions, and tighter regulations follows global trends in strategies to combat wildlife crime (Duffy 2014; Massé & Margulies 2020; Massé et al. 2020). However, unlike other species threatened by illegal trade that garner more public interest, such as elephants or tigers, the trade and keeping of turtles and other herpetofauna has had relatively little oversight until recently (Mali et al. 2014; Sigouin et al. 2017). At the same time, reptile keeping, breeding, and trade has grown as a hobby and created a community of herpetoculturalists that engenders interest and value in the pet trade (Collis & Fenili 2011; Valdez 2021). Strategies to combat illegal trade in turtles, as well as other taxa that have long been commercialized and internationally popular, may require a more multi-faceted approach to match the complex dynamics of modern, global markets (Cooney et al.

2021a). Such efforts may range from short term ways of driving prices down, such as with captive breeding and wildlife ranching, to long term strategies to reduce demand and shift social norms (Challender & MacMillan 2014; Massé et al. 2020; Ferns et al. 2022). In the meantime, focusing solely on uncompromising regulations and enforcement may inhibit the cooperation of hobbyists and industry participants whose activities have historically been unabated (Dietz et al. 2003).

2.4.4 Neutralizing Illegal Turtle Trade

Analyzing how cases of illegal turtle trade are neutralized in news media uncovered several ways that existing norms in reptile keeping and trading may counteract the deterrence effects of turtle trade rules and potential punishments for violating them. While most neutralizing frames in news articles involved denying responsibility, those that denied deviance speak to prevailing notions of regulatory legitimacy. Several articles which detailed how the offender knew they were not in compliance with the rules (e.g., continuing to collect turtles covertly after clear warnings from law enforcement or mailing packages of turtles with false labels and aliases) also included neutralizing language that denied that the behavior was deviant. This may be especially relevant for those that operate within the legal wildlife trade world, where shifting rules in response to species declines or high market demand clash with the prevailing social norm and cultural tradition of commodifying or collecting turtles. These same norms shape societal notions of harm and thus may also affect the prosecutions of turtle trade cases, such as when one article quoted a case's prosecutor justifying a lighter penalty because the crime was nonviolent and committed by someone without a criminal record, despite the legal allowance of a harsher sentence. Indeed, other forms of denying deviance in article framing involved

comparing illegal turtle trade to other, seemingly more deplorable crimes, implying that the respective punishments were not justified.

Denying that these cases constituted significantly deviant behavior or a violation of social norms highlights the disconnect between the regulatory and enforcement solutions frame and the perceived risks of illegal turtle trade. This suggests that there may be barriers to normative compliance with new, restrictive turtle trade rules, such as recent state possession bans of species popular in the pet trade. Normative compliance occurs when people not only obey the rules to avoid punishment, but when the rules align with personal and societal norms (Acemoglu & Jackson 2017; Moreto & Gau 2017). When a wildlife crime is not considered morally or socially wrong, or the rules governing wildlife use are thought to be illegitimate, the perceived seriousness of that crime is lowered and violations become more likely (Muth & Bowe 1998; Eliason 2003; Wagner et al. 2019). Thus, top-down measures to reduce illegal wildlife trade must be considered legitimate to be effective. This requires impending regulatory and enforcement reforms to be paired with other strategies, such as shifting the narrative on what is considered acceptable (e.g., through social signaling) or maintaining an efficient and adaptable monitoring system that facilitates legal, sustainable trade (Naito et al. 2022).

Importantly, the last neutralizing frame did not deny deviance at all and instead joked about and "othered" cases in a way that framed them as strange and novel, carried out by uniquely deviant actors. We suspect that this may have the effect of downplaying the severity or prevalence of illegal turtle trade and delegitimizing efforts to address it. However, this uniquely deviant frame was also related to the cases that drew the most media attention, such as for KX and DS (Figure 2-1). This may provide an opportunity for educating the public on illegal wildlife trade and other threats to wildlife populations. While almost half the KX articles we analyzed

framed the case as uniquely deviant, joking about how he duct-taped 51 turtles to his legs, about two-thirds of the KX case articles also included details on how he had actually been involved in trafficking thousands of turtles over the years as part of a network of international traders, highlighting the severity of his case overall. Neutralizing illegal trade in this way, then, may be counteracted by increasing salience of the issue. Future work could investigate how framing wildlife trade as novel and uniquely deviant influences public knowledge of and attitudes toward the issue.

2.5 Conclusion

To adequately address something as complex as illegal wildlife trade, it is crucial to understand how social norms, issue salience, and the perceived legitimacy of problem mitigation – revealed through media framing – may affect the outcomes of conservation efforts. In this study, we investigated news media framing of illegal wildlife trade using 54 cases of illegal trade in turtles in the US as a case study. For the first time, we summarized trends in illegal turtle trade to guide conservation and management efforts and to provide context to media frames. We found contradictions in how news articles problematized illegal turtle trade and the solutions it offered which parallel broader discourses and debates surrounding wildlife trade. We also advanced the use of neutralization theory to explore differences in legal categorizations of deviant versus what is considered socially legitimate in wildlife trade. We note that this particular analysis lacks a comparison measure to the neutralizations frame, such as how the news media frames the legal exploitation of turtles or how illegal turtle trade is framed for cases outside the US. However, in examining news media content within the context of specific case studies, we were able to provide detailed context valuable for identifying and comparing patterns in article framing with broader implications for conservation and management strategies.

Chapter 3 Analysis of 20 Years of Turtle Exports from the US Reveals Mixed Effects of CITES and a Need for Better Monitoring[3]

3.1 Introduction

Overexploitation of wildlife for commercial trade poses significant threats to biodiversity worldwide (Scheffers et al. 2019; Fukushima et al. 2020; Morton et al. 2021). Globalized markets and the growth of social media have made international wildlife trade easier and have generated demand for exotic species for a multitude of uses (Nekaris et al. 2013; Lavorgna 2014; Bennett et al. 2021). For example, consumption markets have driven the serial exploitation of taxa such as sea cucumbers (Anderson et al. 2011), while species' rarity has led to spikes in their demand in specialty hobbyist trades (Courchamp et al. 2006; Chen 2016).

Outside of domestic legislation, the primary way of regulating international wildlife trade is through the Convention on International Trade in Endangered Species (CITES), which aims to ensure that international trade does not threaten the survival of wild plants and animals. It does so mainly by listing species under one of its three appendices, each of which come with specific regulations on trade. Despite the many criticisms of CITES and its effectiveness (Phelps et al. 2010; Bowman 2013; Janssen & Krishnasamy 2018; Cooney et al. 2021a), it remains a formative instrument in managing wildlife commerce. Thus, it is important to understand the direct and indirect effects listings have in a variety of contexts to better understand the complex systems of global trade. For example, while several studies have shown a decrease in overall trade volumes

[3] At the time of submission, this chapter was in review at *Conservation Science and Practice*. It is included here with minor changes.

following CITES listings of different species, they also document shifts into illegal trade, homogenization of spatial trade networks, spikes in trade in anticipation of listings, shifts from wild- to captive-sourced specimens, and mixed effects on national governance and implementation (Robinson et al. 2015; Friedman et al. 2018; Kuo & Vincent 2018; Miller et al. 2019; Booth et al. 2020; Shepherd et al. 2020; Foster et al. 2022). Having insights into the multitudinous effects of CITES listings can lead to better interdiction efforts and help practitioners avoid adverse and unintended outcomes.

Measuring these varied effects of CITES listings or other trade regulations is challenging, however, because before and after trade data is often lacking, as there are few datasets on the trade of species not listed under CITES that can act as a control against which to compare the effects of CITES listings (Janssen & Shepherd 2018; Robinson & Sinovas 2018; Booth et al. 2020; Watters et al. 2022). The drivers of change in trade can also be elusive, especially if the limitations of trade data are not fully understood (Robinson & Sinovas 2018; Booth et al. 2020; Challender et al. 2021). Triangulating multiple data sources (e.g., market surveys, stakeholder interviews, trend analyses) can aid researchers in overcoming these limitations and discerning causal links in wildlife trade, as several studies have demonstrated (Challender et al. 2015; Lam et al. 2016; Cardeñosa et al. 2018; Friedman et al. 2018; Miller et al. 2019; Booth et al. 2020; Davies et al. 2022).

In this study, we utilize the US Fish and Wildlife Service's (FWS) Law Enforcement Management Information System (LEMIS) and mixed qualitative research to add to the evidence base for the effects of CITES. LEMIS tracks US imports and exports of all flora and fauna which provides an opportunity not only to measure changes in the trade of species listed under CITES but to also take a wider view in understanding shifts in trade among similar, unlisted taxa. Such

an approach has both practical and theoretical implications, as such information can aid managers in making listing decisions on a species-by-species basis. For example, if demand is elastic to price changes, managers may expect demand to shift to similar, unlisted taxa; whereas if it is inelastic, trade bans or restrictions may exacerbate illegal trade (’t Sas-Rolfes et al. 2019). Furthermore, whereas previous studies tend to focus on single species or regions, comparing case studies across taxa, geographic areas, or governing regimes can better measure the efficacy of CITES as a whole.

We use the commercial trade of freshwater turtles as a case study to investigate the dynamics of wildlife trade and effects of CITES listings. Turtle life history traits (i.e., low annual fecundity, delayed maturity, high adult survivorship and longevity) make them especially vulnerable to overexploitation, and researchers now consider this to be one of the main threats to wild turtle populations (Stanford et al. 2020). Turtles are sought after globally for a variety of experiential, social, function, financial, and spiritual reasons (Thomas-Walters et al. 2021), but many are broadly destined for pet/hobbyists trades and consumption markets (Sigouin et al. 2017; Lovich et al. 2018). They are collected from the wild, farmed, and bred in captivity at ranging scales, again depending on the species, its purpose, and location. Over half of recognized turtle species are threatened with extinction, so understanding turtle trade dynamics is vital to prevent further declines (Lovich et al. 2018; Stanford et al. 2020).

We specifically focus on the exports of US-native turtles for three reasons. First, the US has one of the richest assemblages of freshwater turtles in the world that have varying conservation statuses (Buhlmann et al. 2009; Mittermeier et al. 2015). This allows us to examine shifts in demand among many taxa which has important implications for the conservation of turtles, globally. Second, the US plays a significant role in international trade dynamics as one of

the top exporters of turtles for pet and consumption trades due to large aquaculture and hobbyist communities (Hughes 1999; Hoover 2000; Moll & Moll 2004; Collis & Fenili 2011). Third, as trade has globalized and moved from brick-and-mortar shops to online commerce, researchers have observed boom and bust patterns in the commercial trade of turtles across the globe, where a species or area is in high demand and heavily traded, then the market shifts to a new species or area (Klemens 2000; van Dijk et al. 2000; CITES 2011). Experts suggest that the "bust" in trade of several turtle species in Asia – due to regulatory restrictions and/or population declines – led to the rise of turtle exports from the US to meet continued demand (Reed & Gibbons 2003; CITES 2011; Mali et al. 2014; Colteaux & Johnson 2017). This, combined with a heightened awareness of the plight of turtles in international trade, led to an increase in US turtle listings under CITES, allowing for before-after analyses and underscoring the need to understand the outcomes of listing decisions.

Several studies have provided overviews of the trade in turtles and tortoises in different ways, finding that the trade in turtles from the US rapidly increased in the 1990s, began to decline overall in the 2000s, and that the species traded in the highest volumes shifted from sliders (*Trachemys* spp.) and cooters (*Pseudemys* spp.) to snapping turtles (*Chelydra serpentina*) from the 1990s to 2010s (Reed & Gibbons 2003; Mali et al. 2014; Luiselli et al. 2016; AFWA 2020). Our study seeks to build on these findings by taking a closer look at spatial and temporal trade dynamics between taxa and following CITES listings. Specifically, our objectives were to examine: (1) the spatiotemporal trends in trade over 20 years; (2) how the average, immediate, and trend in exports of turtles from the US changed following their listing on CITES; and (3) the shifts in international demand of US-native turtles. Revealing finer-scale patterns of trade will

deepen our understanding of global patterns of trade, which has important implications for the conservation of turtles and utility of CITES.

3.2 Methods

We acquired LEMIS trade data for all turtles and tortoises (Order Testudines) for 1999-2018 used by Stringham et al. (2021). We removed records of marine turtles and filtered the remaining data to only include numbers of live animals (Wildlife Description = "LIV" or "EGL", Unit = "NO"), shipped for commercial purposes (Purpose = "T"). We restricted our analysis to live turtles because that is how they are most frequently traded and because using the number ("NO") of individuals is a more reliable and consistent unit of measure than weights (e.g., kg) or reported numbers of body parts (e.g., shells, bones). We also removed records of seized shipments (Disp. = "S") and re-exports (Action = "R") and any that were missing information on whether the shipment was imported or exported (~600 records of ~50,000). Although these criteria may result in a slight underestimation of trade, the remaining number of rows accounted for approximately 92% of the total number of rows in the original dataset. This dataset did not have shipment IDs for all records, so we relied on the raw number of individuals reportedly traded in the Quantity column with the aforementioned filters. We also corrected outdated taxonomy or misspelled species names where appropriate (See Appendix B). All analyses were conducted at the genus level due to the lack of specificity of records for certain species.

We used export records of five US-native genera that were listed under CITES (Table 3-1) to evaluate changes in trade before and after a CITES listing. First, we examined how listings related to the number of exported turtles per year using generalized linear models. We initially used a Poisson distribution with a log-link function, but due to high overdispersion in the dependent variable, we used a negative binomial distribution to achieve a better fit (Bolker et al.

2009). We tested three aspects of temporal trends using two models, following Wauchope et al. (2021). The first model (Eq. 1) evaluates the *average change* in export volume before and after listing, where Y is the number of individuals exported per year (*i*) and genus (*j*) and is predicted by a binary Before-After (BA) variable set to 0 for each year before listing, and 1 for each year after listing (2006 or 2013 depending on the genus). The second model (Eq. 2) evaluates *immediate change* and the *change in trend* after listing by adding variables for year (Time) and an interaction term (BA*Time), where Time represents one time step for each year of trade, centered around 0, with 0 being the first year after listing. To check the robustness of this model, we removed the BA term (Eq. 3) and compared AIC scores of the two models (Wauchope et al. 2021).

Second, we calculated the Shannon diversity index (H) of exporting port-importing country pairs per year for each genus to analyze how listings affected the spatial complexity of trade (following Miller et al. 2019). We chose this index because it accounts for rare occurrences (i.e., port-country trade pairs where a smaller relative number of turtles were traded) better than other indices such as the Simpson index. An H of 0 means that all individuals of a given genus were exported from one port and imported into one country. Using this index as the response variable, we ran linear regressions with the same model structure (Eq. 1, 2, 3). We checked for normality – an assumption of linear regression – using Shapiro-Wilk tests.

Eq. 1: $Y_{ij} = \beta_0 + \beta_1 \mathrm{BA}_{ij}$

Eq. 2: $Y_{ij} = \beta_0 + \beta_2 \mathrm{BA}_{ij} + \beta_3 (\mathrm{BA}_{ij} \mathrm{Time}_{ij}) + \beta_4 \mathrm{Time}_{ij}$

Eq. 3: $Y_{ij} = \beta_0 + \beta_5 \mathrm{Time}_{ij}$

Table 3-1: CITES listings of US freshwater turtles. Nomenclature follows taxonomy as listed by CITES proposals. Only species native to the US are listed under each genus as these are what we filtered for in our analyses. Species listed under Appendix I are considered threatened with extinction, and international trade of these species for commercial purposes is generally prohibited. Commercial trade of Appendix II listed species is regulated with export permits, non-detriment findings (i.e., the transaction will not be detrimental to species' wild population, "NDF"), and legal acquisition findings (i.e., the plant or animal to be traded was legally sourced, "LAF"). Appendix III listed species assists individual countries in monitoring international trade of that species and also requires export permits and LAFs (CITES n.d.).

Year	Genus	Species	Generic Name	Appendix
1992	*Glyptemys*	*G. muhlenbergii*	Bog turtle	I
	Glyptemys	*G. insculpta*	Wood turtle	II
1995	*Terrapene*	*T. carolina, T. nelsoni, T. ornata*	Box turtles	II
2006	*Graptemys*	*G. barbouri, G. caglei, G. ernsti, G. flavimaculata, G. geographica, G. gibbonsi, G. nigrinoda, G. oculifera, G. ouachitensis, G. pearlensis, G., pseudogeographica, G. pulchra, G. versa*	Map turtles	III
	Macrochelys	*M. temminckii*	Alligator snapping turtle	III
2013	*Clemmys*	*C. guttata*	Spotted turtle	II
	Emydoidea	*E. blandingii*	Blanding's turtle	II
	Malaclemys	*M. terrapin*	Diamondback terrapin	II
2016	*Apalone*	*A. spinifera, A. mutica, A. ferox*	Softshell turtles	III
	Chelydra	*C. serpentina*	Common snapping turtle	III
2022	*Apalone*	*A. spinifera, A. mutica, A. ferox*	Softshell turtles	II
	Chelydra	*C. serpentina*	Common snapping turtle	II
	Graptemys	*G. barbouri, G. ernsti, G. gibbonsi, G. pearlensis, and G. pulchra*	Map turtles	II
	Macrochelys	*M. temminckii*	Alligator snapping turtle	II
	Kinosternon	*K. baurii, K. flavescens, K. hirtipes, K. sonoriense, K. steindachneri, K. stejnegeri, K. subrubrum*	Mud turtles	II

	Sternotherus	*S. carinatus, S. depressus, S. minor, S. odoratus*	Musk turtles	II

To visualize spatial and temporal trends across all US, CITES-listed genera, we mapped trade flows using Sankey diagrams across four time periods with R package *networkD3* (Allaire et al. 2017). The scale of exports in some genera and to some countries are orders of magnitude higher than for others (e.g., *Trachemys* spp. to China). Therefore, to simplify the visualization of trends while incorporating differences across taxa, all figures of trade flows show individual genera and the geographic subregions that corresponding importing or exporting countries belong to, following the United Nation's geoscheme (UN 2023).

Finally, we drew from qualitative data collected as a part of a larger project on the legal and illegal trade of turtles in the US to triangulate our findings. The purpose of this data collection was not solely to investigate the effects of CITES listings; however, trade dynamics revealed through these sources provided valuable nuance that would have been otherwise missed or unaccounted for in quantitative models. Sources included semi-structured interviews and informal conversations with key informants, participation in two multi-stakeholder workshops to combat the illegal trade in turtles in the US, and document review conducted from March 2021-November 2022. Twenty-three semi-structured interviews were conducted in total, including with scientific, management, and law enforcement personnel from state and federal agencies (n = 15), hobbyists and commercial turtle dealers (n = 5), and turtle scientists from non-governmental organizations (n = 3). Interviews were recorded and transcribed verbatim with permission. In some cases, interviews were not recorded due to the sensitivity of the discussion, and detailed notes were taken instead and typed out immediately following the conversation. Informal conversations were held with other USFWS staff and NGO-affiliated scientists and advocates

involved in CITES implementation for turtles. Finally, CITES listing proposals of US turtle species from 1992-2022 and working group documents related to international turtle trade were reviewed (Supplementary Table 7). Trade dynamics, drivers, and trends for all US species discussed in interview transcripts, workshop notes, and documents were collated using NVivo (QSR International Pty Ltd 2020). This work was determined by the University of Michigan's Institutional Review Board to pose minimal risk to participants and was exempt from ongoing review.

3.3 Results

3.3.1 Export Volumes

From 1999-2018, over 192 million live turtles were exported from the US for commercial purposes. Of those, over 99.8% were of species native to the US, and 88% were *Trachemys* or *Pseudemys* species. Aside from those two genera, the volume of exports varies widely by species and time frame, ranging from less than 100 per year (*Glyptemys, Terrapene,* and *Actinemys* spp.) to over a million per year (*Chelydra*). Taking all genera together, the total volume of exports appears to decrease over these 20 years, but this is largely driven by the decrease in exports of *Trachemys* and *Pseudemys* spp. (Figure 3-1). Trends of export volumes varied by genera as well, with some clearly increasing over most of the 20 years (e.g., *Chelydra, Sternotherus, Kinosternon,* and *Glyptemys* spp., Figure 3-2), while others followed nonlinear patterns.

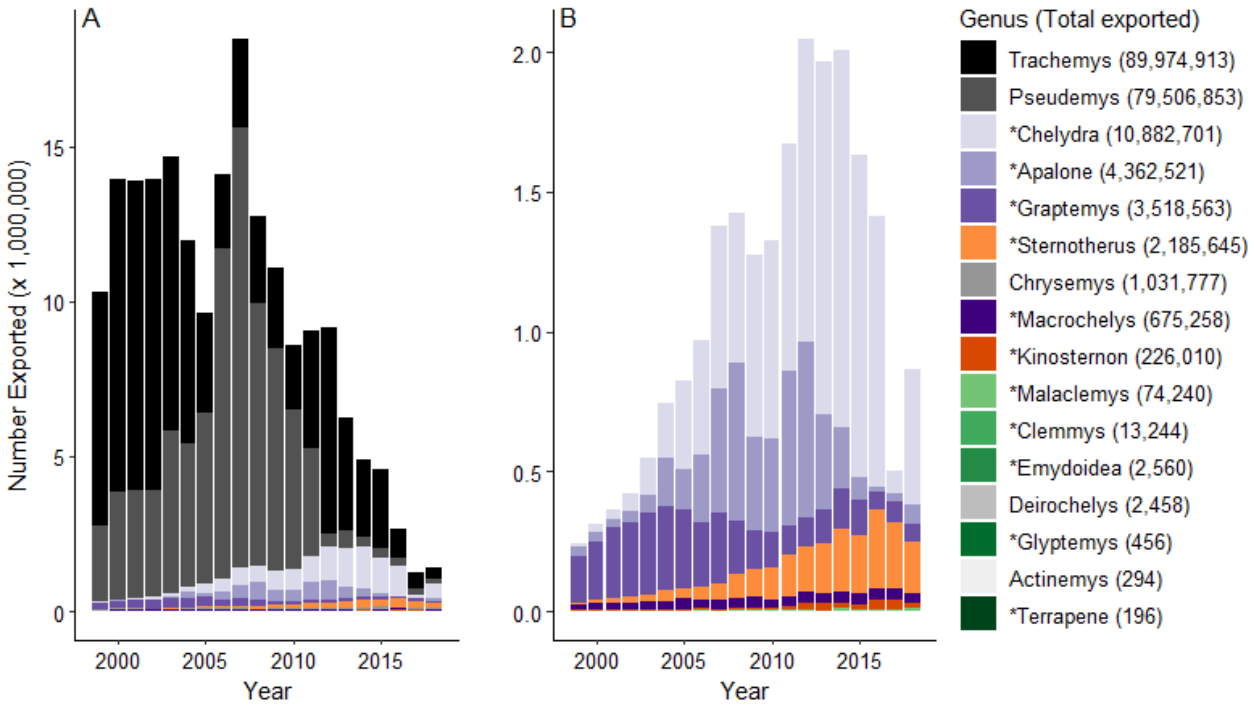


Figure 3-1: Total US export volumes of all live, US-native genera for commercial purposes from 1999-2018 (A) and only CITES-listed genera (B). Asterisks denote CITES-listed genera. Genera export volumes are stacked in descending order from the most to least individuals exported in total from 1999-2018. Genera not listed under CITES are colored in black/grey. Appendix III species (prior to 2022) are colored in purple. Appendix II species are colored in green, and genera that were newly listed in 2022 are colored in orange.

3.3.2 Importers of US Turtles

Turtles were exported from the US to 108 countries in 19 regions, but only 19 countries in 8 regions account for over 95% of all exported turtles. The top five importers, making up 72% of exports were, in order: Hong Kong, China, Mexico, Singapore, and Taiwan. However, top importers varied by genus, with *Graptemys* spp. being the most notable exception which were mostly destined for Portugal, Spain, Italy, Czechia, and Germany (Figure 3-2).

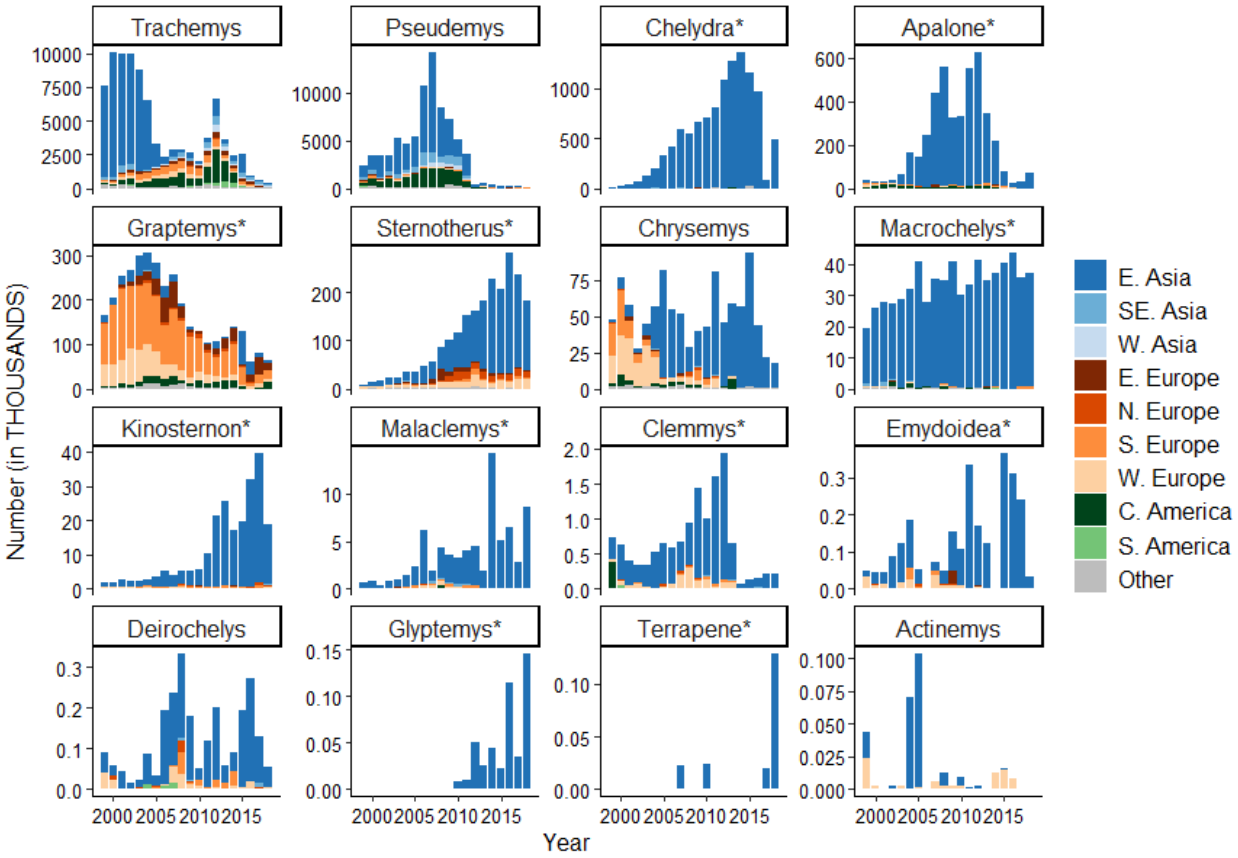
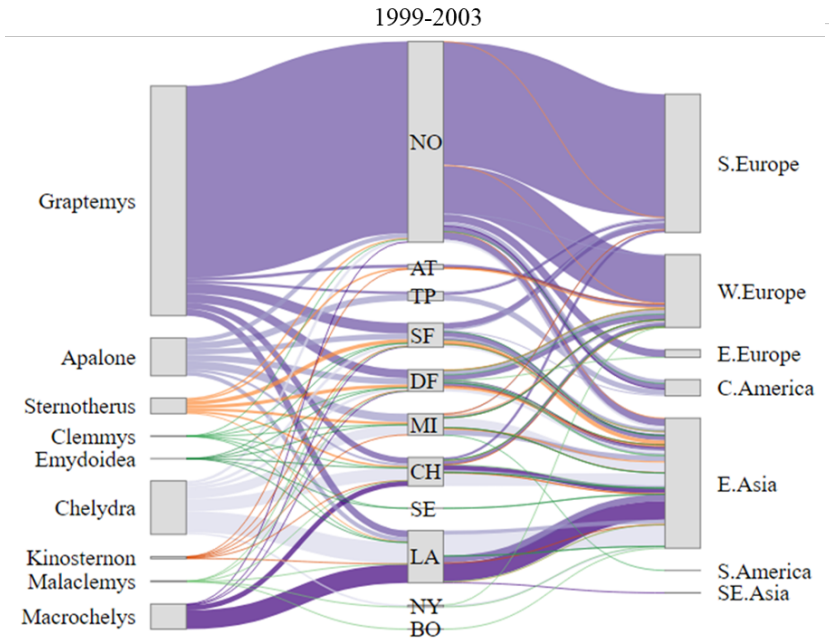


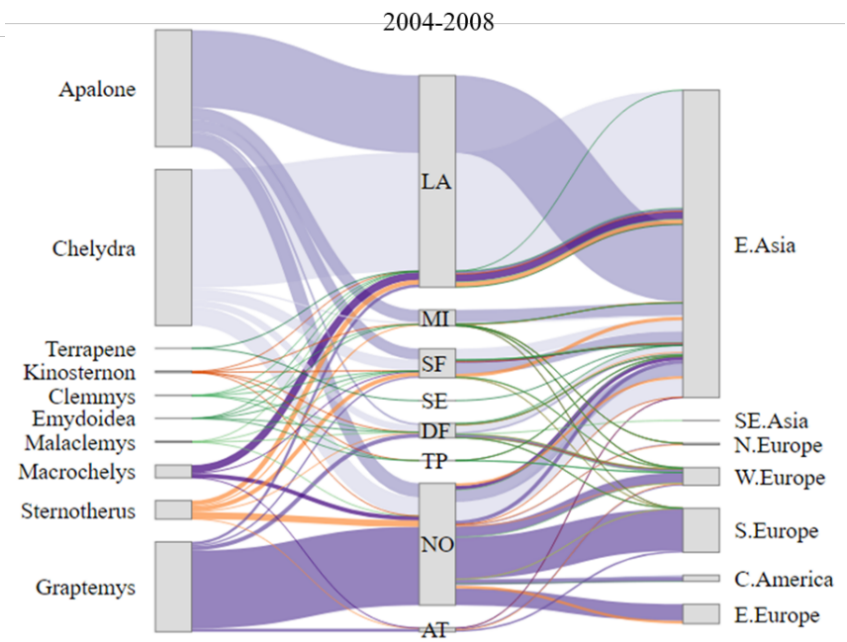
Figure 3-2: Number of live turtles exported from the US from 1999-2018. Export volumes are color-coded by the subregion of the importing countries which accounted for 95% of total exports of each genus, each year. The "Other" region sums all the countries that accounted for < 5% of exports.

3.3.3 Ports of Export for US Turtles

Turtles were exported from 22 US ports (note that domestic transport prior to export is not documented in LEMIS data). The top five exporting locations by volume were New Orleans, Los Angeles, San Francisco, Miami, and Dallas-Fort Worth (Figure 3-3, Supplementary Figure 3-1). Given the concentration of turtle farms in Louisiana and their production, it is unsurprising that New Orleans alone accounted for 60% of all exports. Los Angeles exports account for 32% of the total, likely due to its proximity to East Asian importers. Exports from California likely includes a mixture of turtles taken from the wild, farmed and/or bred from other states since most of these species do not naturally occur in California. Again, there are notable differences by

genera, with *Glyptemys*, *Clemmys, Emydoidea*, and *Terrapene* turtles exported mostly out of Miami (Figure 3-3, Supplementary Figure 1). Florida is home to many hobbyist and commercial collectors and breeders of turtles, so this may partially explain a higher number of exports in these species which are more highly valued in the pet trade and are generally protected from commercial collection in their range states. Overall, trade networks (exporting port-importing country pairs) decreased in diversity over time ($F(1, 285) = 38.74$, $p < 0.001$, Figures 3-3, 3-4). In 1999, there were 127 total port-country pairs (13 ports, 52 countries); that decreased to 56 pairs in 2018 (6 ports, 35 countries).


1999-2003
Graptemys
Apalone
Sternotherus
Clemmys
Emydoidea
Chelydra
Kinosternon
Malaclemys
Macrochelys
NO
AT
TP
SF
DF
MI
CH
SE
LA
NY
BO
S.Europe
W.Europe
E.Europe
C.America
E.Asia
S.America
SE.Asia


2004-2008
Apalone
Chelydra
Terrapene
Kinosternon
Clemmys
Emydoidea
Malaclemys
Macrochelys
Sternotherus
Graptemys
LA
MI
SF
SE
DF
TP
NO
AT
E.Asia
SE.Asia
N.Europe
W.Europe
S.Europe
C.America
E.Europe

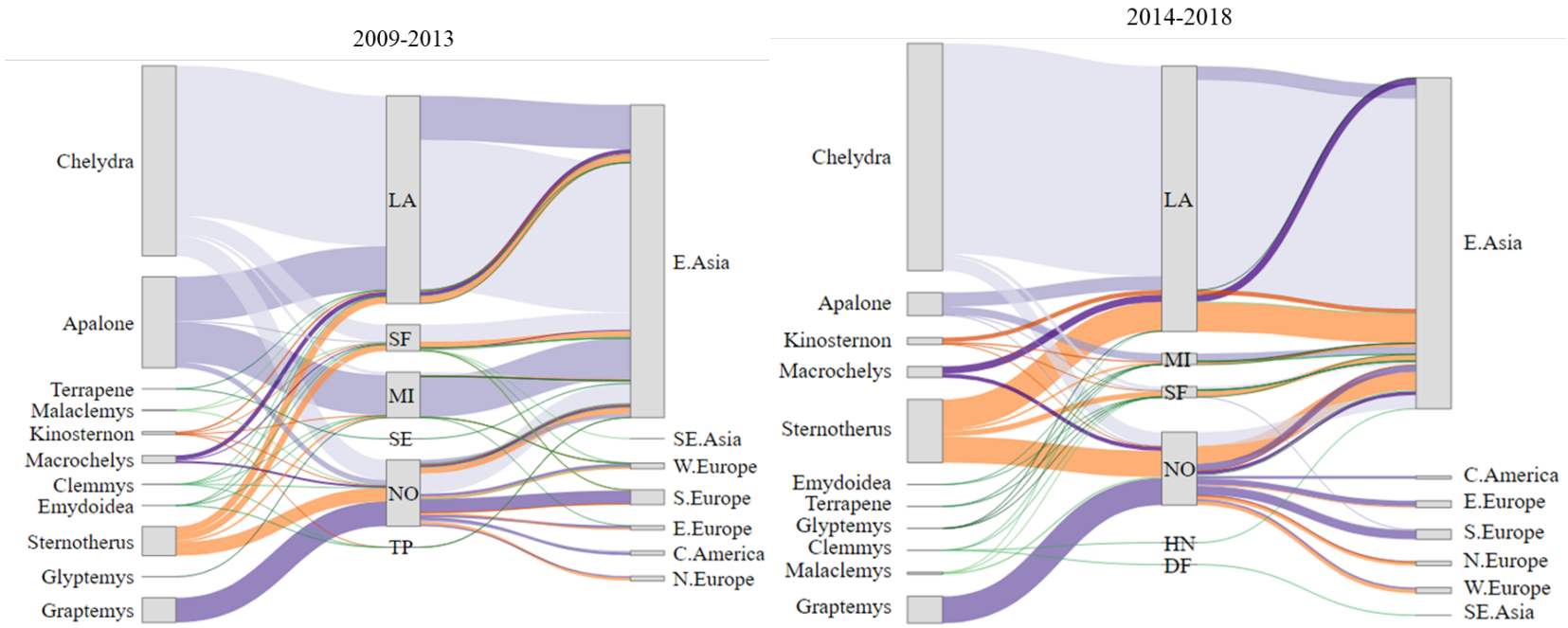


Figure 3-3: Sankey diagrams showing export flows of turtles by genus through their ports of export and to their regional destinations over four, even time periods. Flows of genera listed under Appendix III of CITES are shown in different shades of purple (from lighter to darker: *Chelydra*, *Apalone, Graptemys, Macrochelys*). Flows of genera that were listed under Appendix II at CoP19 are shown in different shades of orange (lighter: *Sternotherus*, darker: *Kinosternon*), and flows of genera listed under Appendix II are shown in different shades of green (from lighter to darker: *Malaclemys, Clemmys, Emydoidea, Terrapene, Glyptemys*). Flows of turtle exports which made up less than 1% of the total exports per genus and per year were removed for better visualization of major trends.

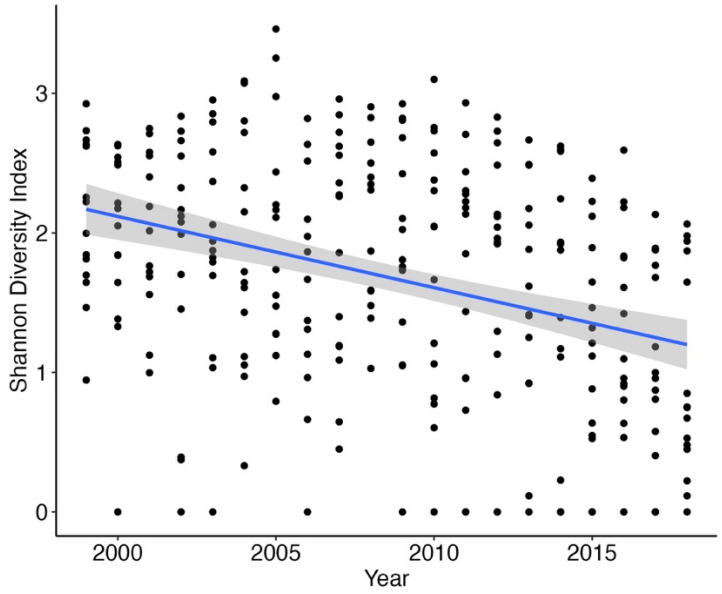


Figure 3-4: Shannon diversity index of the exporting port-importing country pairs for each genus each year (black dots) with trendline (blue) and standard error (grey).

3.3.4 Before-After Trends of CITES-listed Species

CITES-listings under both Appendix II and III for US genera had mixed effects, which we measured in three ways: average change, immediate change, and change in trend before and after a genus was listed (Table 3-2, Figure 3-5). *Clemmys* exports decreased on average and immediately following CITES listing, and the trend in export volumes switched from positive to negative after listing. There was not a statistically significant change in the average, immediate or trend of *Emydoidea* exports after listing, and the best-fitting model was Equation 3, without before-after interaction terms. *Malaclemys* exports increased on average, but immediate changes and changes in trend after listing were not statistically significant. Equation 3 was also the best fitting model for *Malaclemys* exports, further indicating that there was not a significant change in exports from before to after listing (Figure 3-5).

Results also differed for *Graptemys* and *Macrochelys* export numbers (Table 3-2, Figure 3-5). *Graptemys* exports decreased on average and immediately following listing, and the trend in export volumes switched from positive to negative after listing in 2006. *Macrochelys* exports increased on average after listing, but there was an immediate decrease following listing. Although the trend in Macrochelys remained positive, the rate of increase was slower from 2007-2018.

Table 3-2: Before-after model coefficient estimates with 95% confidence intervals for models measuring change in export volume and Shannon Diversity Index (H). Export volumes were modeled with a negative binomial distribution and log-link function; coefficient estimates are given in the log scale. Spatial complexity models used the Shannon Diversity Index as a response variable and were modeled with linear regression. Estimates in bold indicate statistical significance (95% confidence intervals that do not overlap zero).Asterisks for Equation 3 coefficients denotes a lower AIC score than that of Equation 2, indicating a better fit without the BA term. Estimates are not included ("-") Shannon Index models where residuals were non-normal (Shapiro-Wilk $p < 0.05$).

			App. II (2013)			App. III (2006)	
		Coefficient	*Clemmys* Coef. Est. (95% CI)	*Emydoidea* Coef. Est. (95% CI)	*Malaclemys* Coef. Est. (95% CI)	*Graptemys* Coef. Est. (95% CI)	*Macrochelys* Coef. Est. (95% CI)
Export Volume (Log Scale)	Eq. 1	β_1: Avg. change	**-1.27 (-1.82, -0.72)**	0.53 (-0.47, 1.52)	**0.95 (0.28, 1.62)**	**-0.63 (-0.96, -0.31)**	**0.23 (0.09, 0.38)**
	Eq. 2	β_2: Immediate change	**-1.55 (-1.63, -1.46)**	-0.30 (-2.07, 1.47)	-0.14 (-1.05, 0.76)	**-0.46 (-0.80, -0.13)**	**-0.24 (-0.43, -0.06)**
		β_3: Change in trend	**-0.34 (-0.37, -0.31)**	-0.03 (-0.51, 0.44)	-0.17 (-0.41, 0.07)	**-0.19 (-0.26, -0.12)**	**-0.08 (-0.12, -0.04)**
	Eq. 3 (null)	β_5: Trend over time	-0.02 (-0.07, 0.04)	0.07 (-0.00, 0.15)*	**0.12 (0.09, 0.17)***	**-0.07 (-0.09, -0.05)**	**0.02 (0.01, 0.04)**
Shannon (H) (Linear)	Eq. 1	β_1: Avg. change	**-1.20 (-1.73, -0.67)**	**-1.22 (-1.82, -0.61)**	**-1.49 (-1.83, -1.15)**	**-0.84 (-1.09, -0.58)**	-0.19 (-0.46, 0.08)
	Eq. 2	β_2: Immediate change	**-1.29 (-2.33, -0.25)**	-	**-1.86 (-2.44, -1.27)**	**-1.06 (-1.40, -0.75)**	0.46 (-0.07, 0.98)
		β_3: Change in trend	-0.17 (-0.46, 0.11)	-	-0.09 (-0.25, 0.06)	**-0.19 (-0.26, -0.13)**	0.09 (-0.02, 0.20)
	Eq. 3 (null)	β_5: Trend over time	**-0.06 (-0.11, -0.00)**	**-0.08 (-0.13, -0.02)**	**-0.07 (-0.13, -0.02)**	-	**-0.03 (-0.05, -0.00)**

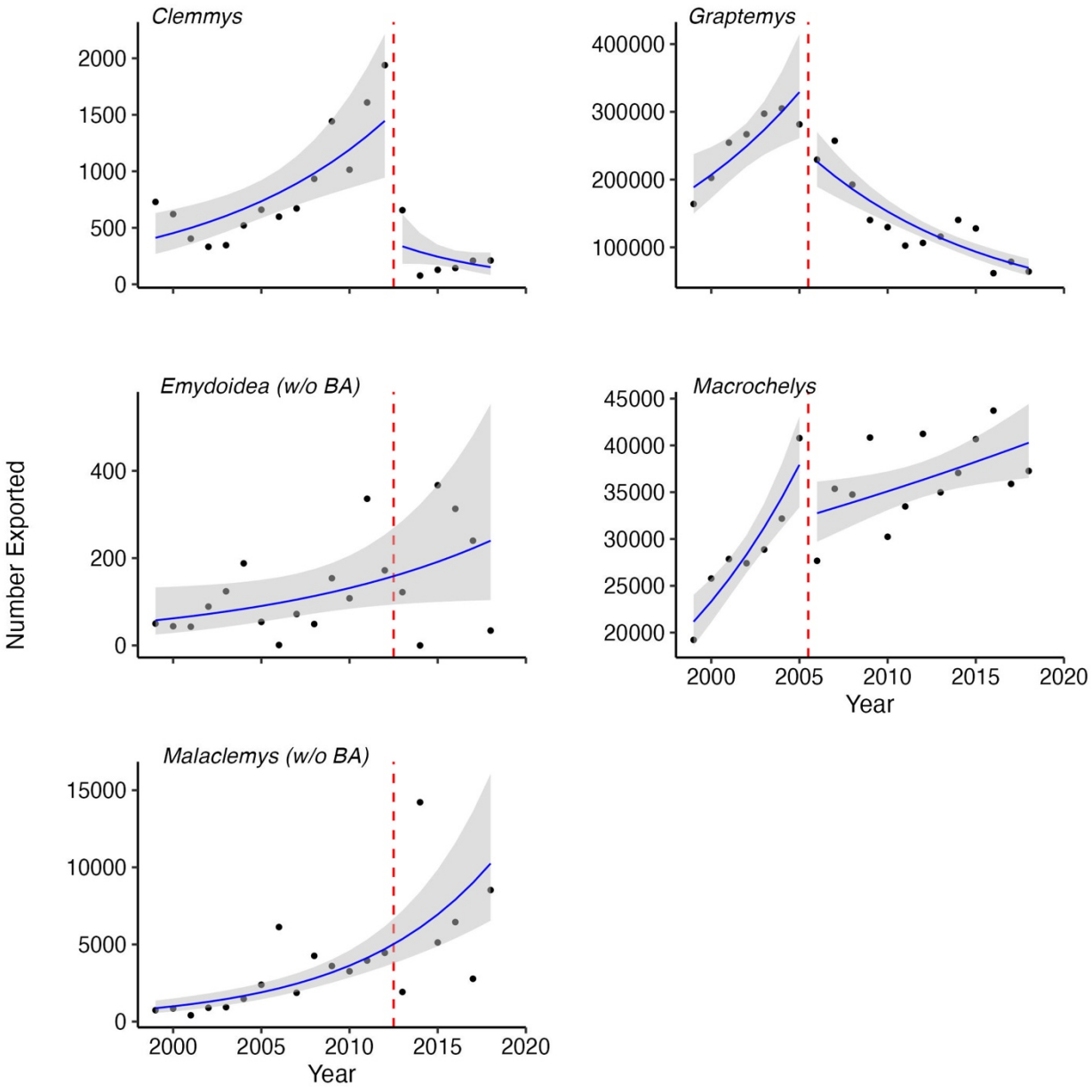


Figure 3-5: Negative binomial regressions (blue trendlines) for models with the lowest AIC score (Eq. 2 with the Before-After term or Eq. 3 without the Before-After term ("w/o BA") for each US-native genus listed under CITES with 95% confidence intervals in grey. Dots mark the number of live individuals exported each year. Red dashed vertical lines mark the year each genus is listed under CITES (left column: 2013, Appendix II; right column: 2006, Appendix III).

Trends in spatial complexity (measured using the Shannon diversity index, H) differed by genus in relation to CITES listings as well (Table 3-2, Figures 3-3, 3-6). The diversity of ports and destination countries for *Clemmys* turtles decreased on average and immediately following listing, but there was not a significant change in trend (Figure 3-6). *Emydoidea* exports decreased in spatial complexity on average after listing. Residuals from the *Emydoidea* model for Eq. 2 were non-normal (Shapiro-Wilk $p < 0.05$), so results from this model are not shown. The diversity of ports and destination countries also decreased on average and immediately following listing in 2013 for *Malaclemys* exports, and changes in trend were not significant (Figure 3-6). *Graptemys* turtle trade decreased in spatial complexity on average and immediately following listing and had a negative trend from 2006-2018. However, results were non-significant for all three tests for *Macrochelys* (Table 3-2, Figure 3-6).

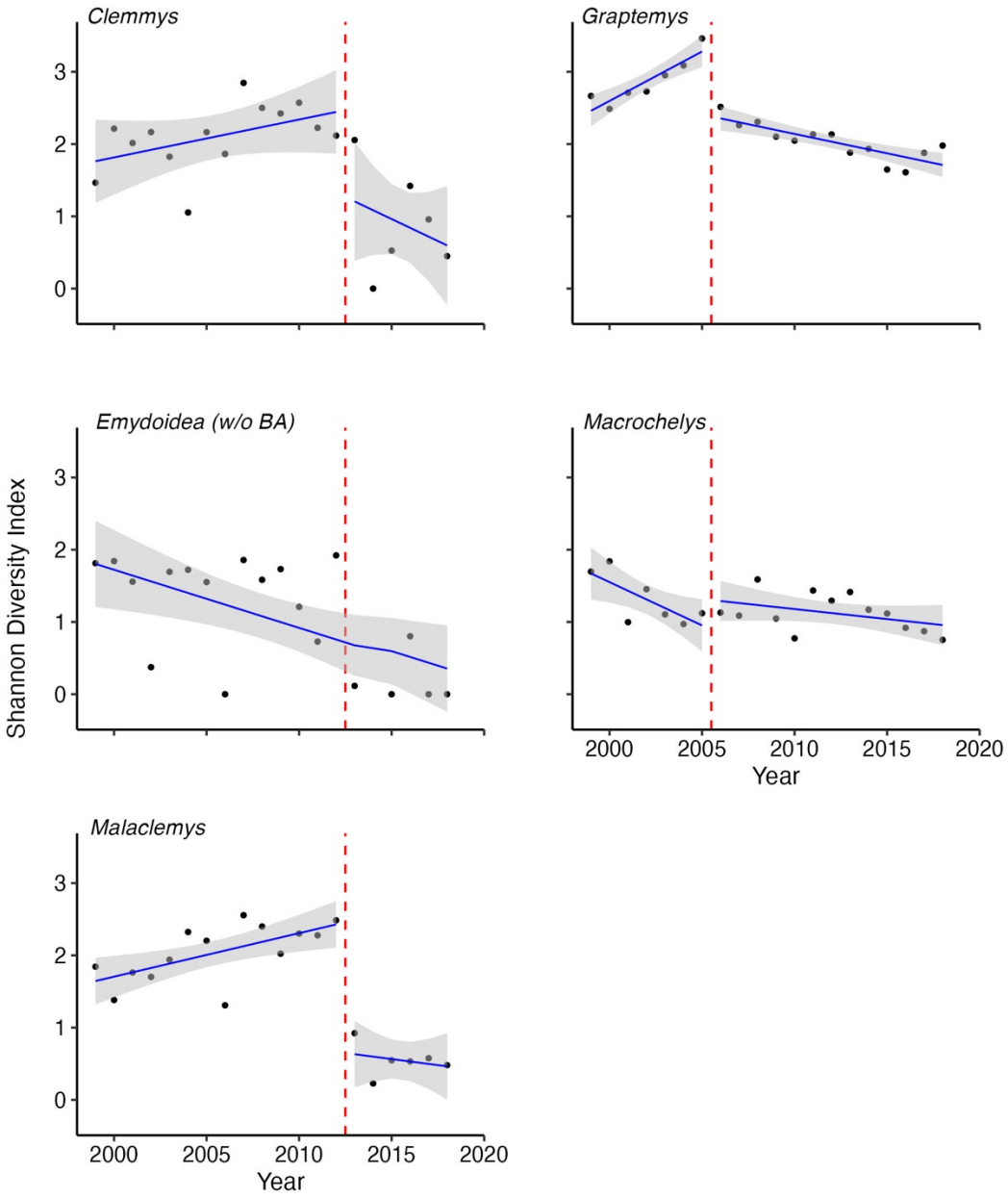


Figure 3-6: Linear regressions (blue trendlines) for models with the lowest AIC score (Eq. 2 with the Before-After term or Eq. 3 without the Before-After term ("w/o BA") for each US-native genus listed under CITES with 95% confidence intervals in grey. Dots mark the Shannon Diversity Index (H) of exporting port-importing country pairs for each year. Red dashed vertical lines mark the year each genus is listed under CITES (left column: 2013, Appendix II; right column: 2006, Appendix III).

3.4 Discussion

Commercial exports of turtles from the US varied considerably from 1999 to 2018 and in response to CITES listings with few consistent trends. Exports of some genera listed under both Appendix II and III slowed after listing (*Clemmys*, *Graptemys*, and *Macrochelys* spp.), but listing did not slow trade for two of the Appendix II species. Average export volumes for only two genera were lower in the years after listing (*Graptemys* and *Clemmys* spp.), and for three genera the trade continued on an upward trajectory or increased in overall volume. The spatial diversity of trade declined following CITES listings, where fewer exporting ports and importing countries were involved in US turtle trade. However, this was also true for all US species over the 20 years. Although the long-term effects of regulations remain to be seen for several taxa, our analyses are useful for teasing out trends that would have otherwise been missed (Wauchope et al. 2021), and exploring the effects of CITES on a per-taxa basis further enables a comparison of production systems and demand shifts in species exports that continued to increase versus those that notably plummeted. Below, we examine these patterns in more detail and consider other drivers at play.

Our findings only partially corroborate other studies that have documented declines in trade of species after being listed under CITES (Lam et al. 2016; Kuo & Vincent 2018; Shepherd et al. 2020; Foster et al. 2022) and reveal nuances worth exploring further. Declines in turtle trade may be a direct result of the CITES listing and permitting process which aims to prevent overexploitation, but it could also be due to the indirect effects of time lags and increased costs of permits, lower demand for listed species, and/or shifts into illegal trade that all vary depending on the species (Lam et al. 2016; Shepherd et al. 2020). Species are listed under Appendix II of CITES when “trade must be controlled in order to avoid utilization incompatible with their

survival" (CITES n.d.), and species tend to be listed when trade has notably increased or there is reason to believe it will soon. Thus, it makes sense that trade would slow down following the implementation of a CITES II listing. For example, shortly after box turtles (*Terrapene* spp.) were listed under Appendix II due to a surge in trade in the 90s, exports essentially ceased (Reed & Gibbons 2003). One interviewee describing this process said there was not any evidence that the trade in box turtles was sustainable, so FWS would not be issuing any permits for exports for a while. It is likely that *Clemmys* exports decreased, at least in part, as a direct result of CITES implementation and due to the fact that *Clemmys* turtles are not bred in captivity at large scales, so many exports were likely sourced from the wild. *Malaclemys* and *Emydoidea* exports remained high and were more erratic after listing in 2013, and we did not detect significant changes in trends (Table 3-2, Figure 3-5). However, CITES listings may not have immediately measurable and/or direct effects on trade volumes. Rather, it provides additional oversight of the trade, and changes to supply chains may be more gradual and indirect – if they occur at all.

Declines in trade may also be due more to logistical factors. In the US, Non-Detriment Findings (NDFs) for exports of Appendix II species are initially made on a case-by-case basis, as opposed to a quota system or other forms of regulation used in other countries. While the process is thorough, it is also time-consuming. We heard from interviewees that initial applications of newly listed species can take months to review and that there is a backlog of applications. This may serve as a deterrent to middlemen who rely on moving animals quickly, or smaller businesses and hobbyists that may avoid the extra costs and hassle, resulting in a drop in exports. The larger, established farms and breeding operations may be better equipped to handle the added cost and delays, and Annual Master Permits for consistent producers likely also facilitates continued trade (AFWA 2020).

Both *Graptemys* and *Macrochelys* exports dropped immediately following listing in 2006 (Table 3-2), and although exports of *Chelydra* and *Apalone* turtles had already started to decline, their export volumes took an additional dip after they were listed under Appendix III in 2016 as well (Figure 3-2), perhaps indicating an initial backlog following implementation, or a drop in dealers not applying for permits. Paper trails are more likely to exist for species that were more heavily regulated within the US prior to CITES listings, such as *Macrochelys* turtles, which have a smaller range and more restrictive harvest regulations relative to *Graptemys* turtles and are proposed for listing under the Endangered Species Act. This may partially explain why *Macrochelys* exports did not decrease like *Graptemys* turtle exports did after listing (Figure 3-5). The data also showed a more obvious shift from multiple ports of export for *Graptemys* turtles to solely being shipped out of New Orleans – likely from established Louisiana farms.

In some cases, CITES listings may shift trade of a species to countries outside of its native range altogether. The collection and breeding of turtles and other herpetofauna have grown as a hobby worldwide, creating sizeable stocks of nonnative animals in trade (Hoover 2000; Auliya 2003; Collis & Fenili 2011; Bush et al. 2014; Robinson et al. 2015). European countries, for example, are among the top destinations for live reptile trade (Auliya et al. 2016; also see Supplementary Figure 3-2), and CITES trade data show that while exports of *Graptemys* turtles from the US to Europe have declined, exports from East Asia to Europe increased from 2007-2019 (Supplementary Figure 3). Although we do not know what export volumes from East Asia were prior to listing, several interviewees noted that it had become cheaper for European and other countries to import US turtles from China than from the US, perhaps due to additional permitting requirements for species exported from their native ranges. Other popular pet species,

especially *Terrapene* turtles, are exported in higher volumes from Europe than from the US (Supplementary Figure 3).

It is unclear, however, the extent to which illegal trade contributes to the supply of US turtles and relates to CITES listings. Quantifying this clandestine activity is inherently challenging, and records of seized turtles in the LEMIS data alone were not enough to correlate to CITES listings or discern trends (Supplementary Figure 4), though several recent cases of illegal turtle trade in the US show how smuggling and laundering circumvent the CITES permitting process (Sevin et al. 2022; Easter et al. 2023). In interviews and workshops, we also learned that CITES export permits have become a commodity in and of themselves among illegal traders. Indeed, combinations of continued demand, scarcity-driven price increases, a lack of enforcement capacity or will, or difficulty of obtaining permits for legal trade likely means that some amount of illegal trade is to be expected with stringent trade regulations (Challender et al. 2019; Cooney et al. 2021a). Shifts into or the continuation of illegal trade of CITES listed species, especially of species with complex legal supply chains, have been demonstrated in several contexts (e.g., Wyatt 2009; Lyons & Natusch 2011; Auliya et al. 2016; Hinsley et al. 2017; Shepherd et al. 2020), including turtles (Nijman & Shepherd 2007; CITES 2016). Despite the challenges of effectively controlling illegal trade of CITES-listed species, one positive outcome of listings is that in cases where there has been little domestic oversight on trade, CITES listings and implementation stimulate greater attention to the issue by both managers and law enforcement (Friedman et al. 2018; Heinrich et al. 2022a), as has been the case for turtles in the US.

Other factors outside of CITES are likely contributing to fluctuations in turtle trade. For example, a combination of domestic regulations, market saturation, and a decline in demand

have influenced the overall boom and bust trade pattern of US turtles (Figure 3-1), which is driven by the more voluminously exported genera (e.g., *Trachemys*, *Pseudemys*, *Chelydra*, *Apalone*; van Dijk et al. 2000; CITES 2011; Mali et al. 2014). Large-scale commercial harvesting of wild turtles was banned or restricted in several states in the US during this study's time period which likely reduced exports and trade route variability (Figure 3-4), especially of the more abundant and widespread species (Mali et al. 2014; Colteaux & Johnson 2017; Bennett & Loda 2020). Many countries have also banned the import of red-eared sliders (*T. scripta elegans*) due to their invasion potential (van Dijk et al. 2000). These turtles made up the majority of the exports up until the late 2000s (Fig. 1, Reed & Gibbons 2003; AFWA 2020). Trends in turtle production and harvest in two of the least restrictive states in the US – Louisiana and Arkansas (Bennett & Loda 2020) – mirror overall declines, which also points to a reduction in demand. Louisiana turtle farms produced over 85 million turtle hatchlings from 2004-2019, but yearly production declined from 13 million in 2004 to 1.2 million in 2019. The number of producers also declined from a peak of 86 in 2008 to 14 in 2019 (LSU AgCenter 2019). In Arkansas, 53 licensed trappers reported harvest of over 150,000 turtles in 2007, but by 2017, only 6 licensed trappers reported harvest of fewer than 25,000 turtles. The number of purchased commercial turtle harvest permits also declined from 146 in 2007 to 35 in 2017 (Irwin 2018). Interviewees pointed to a drop in prices and lack of demand for the more common species that are typically harvested and farmed on large commercial scales as the main driver of these declines. Demand for common snapping turtles, for instance, peaked around 2013, and farms overseas are now reportedly producing enough on their own to no longer need to import them at the same scales from the US.

These trends, however, obscure finer scale shifts in supply and demand of species more typically destined for pet and hobbyist trades. While export volumes of *Graptemys* and *Clemmys* turtles fell, *Kinosternon* and *Sternotherus* exports rose significantly, leading to their own CITES listing in 2022 (Figure 3-2; CITES 2022a, 2022b). Following the boom-and-bust logic of other turtle species (i.e., as one species becomes less available through regulation or overexploitation, trade and demand sequentially increases for other species, CITES 2011), the decline in supply of some species following CITES listings may have influenced the rise of others. Indeed, *Graptemys*, *Clemmys*, and *Terrapene* turtles have long been attractive pet species, but interviewees suggested that *Kinosternon* and *Sternotherus* just recently gained popularity in the pet trade. The demand for different species could be driven by myriad factors. For example, popular media may influence the demand for featured species in some cases (Nekaris et al. 2013; Nijman & Nekaris 2017; Veríssimo et al. 2019). Anecdotally, *Emydoidea* turtles were featured in Reptile Magazine in 2012 as one of the most "engaging and interesting" turtles to keep (CITES 2013), and exports of them remained relatively high even after CITES listing in 2013 in comparison to years before listing. Specialist collectors may be more interested in species due to their perceived or actual rarity (Courchamp et al. 2006; Purcell et al. 2014). Some interviewees even reported rumors of cartels using turtles as investment opportunities and stockpiling certain species to control the market. Several other exogenous factors could be driving trade patterns as well such as hurricanes impacting farm stocks in Louisiana and Florida or global economic downturns.

Whatever the drivers of trade patterns are, it is impossible to know if CITES is effective in preventing overexploitation without reliable data on the supply side of traded wildlife. Source codes in both LEMIS and CITES data are meant to show the origins of the species – if they were

captive bred, farmed, ranched, or sourced from the wild (Supplementary Table 8) – and several studies have based their analyses on this information (e.g., Mali et al. 2014; Robinson et al. 2015; Harfoot et al. 2018). However, several have warned that the source codes in trade data are flawed (Reed & Gibbons 2003; Schlaepfer et al. 2005; Mali et al. 2014; Hinsley & Roberts 2018; AFWA 2020), and we purposefully did not include any analyses that use source codes because our interviews with wildlife agency managers, turtle farmers, and review of correspondence between FWS and state agencies made it especially clear that these data, at least for turtles, are unreliable. For example, *Graptemys* and *Macrochelys* turtle exports switched almost entirely to source code "W" *after* they were listed under Appendix III in 2006 (Supplementary Figure 5) when most of these turtles are likely hatchlings from turtle farms. This was the result of a negotiation with the states to streamline permits of Appendix III species despite unclear origins of the turtles, including if founder stock were legally acquired (CITES 2022c). Turtle farms often do not meet the strict requirements of CITES to be considered captive breeding facilities (AFWA 2020), nor do they always have the paperwork to prove legal origins of their breeding stock. Indeed, reporting is still not required for aquaculture facilities in some states. Appendix III listings are meant to monitor trade and could be a valuable tool in wildlife trade management and enforcement (Heinrich & Gomez 2021; Heinrich et al. 2022a, 2022b), but not knowing the source of traded wildlife defeats the purpose and may create a veneer of legality (Blundell & Rodan 2003).

For species not listed under CITES, LEMIS source codes may be misleading in other ways that complicate implementation and evaluation of CITES listings. For example, researchers speculated that due to their low clutch sizes and thus low viability for large-scale commercial breeding, most of the 597,823 reportedly captive-bred *Sternotherus* turtles exported from 2013-

2019 were more likely wild-caught (CITES 2022a). State harvest reports, where available, are also difficult to use to corroborate these data as they rely on consistent and accurate reporting of trappers and collectors. To refer to an earlier example, Arkansas harvesters estimated that only 50% of total harvest is reported. Further, information on the number of turtle farms and captive breeders that exist (or have existed over time), or the species or number that are produced or taken from the wild in different states are severely lacking. Some states track this at a broad level through their permitting systems; others split tracking between the state wildlife agency and state agricultural agency, creating further confusion. One state agency referred us to the US Department of Agriculture's 2012 and 2018 censuses when we requested yearly data, but participation in this census is voluntary, clearly underestimates farm numbers, and lacks species-level information. Finally, how facilities are defined as farms, ranches, or open or closed systems needs clarification, as each has different implications for the level of offtake from the wild, but these terms are used in different ways (CEC 2019).

These issues with trade data and monitoring are not new or unique to the US, and for many species basic biological and demographic data are often lacking as well (Phelps et al. 2010; Smith et al. 2011). In the absence of these data, estimates of sustainability can come from long-term trends of body sizes, life history traits, and offtake rates (Brown et al. 2012; Natusch et al. 2019). For turtles, including the size or age class of traded animals would help to evaluate sustainability, as it is more likely that hatchlings originated from captive breeding or ranching operations, and adults are the most vulnerable age class to take from the wild (Foster & Vincent 2005; CEC 2019). Unfortunately, for long-lived and slow-reproducing species such as turtles, by the time overexploitation of a population is confirmed, they could already be in a downward trajectory that is difficult to reverse. That is why it is critical to understand the efficacy of

regulatory tools already in place and utilize existing, albeit flawed, datasets and triangulation to discern trends.

3.5 Conclusion

Our analysis of LEMIS data, triangulated with mixed qualitative data, showed mixed effects of CITES Appendix II and III listings on turtle exports from the US from 1999-2018. We explained how several direct and indirect factors related to CITES permitting, turtle production systems, markets for different species, domestic regulations, and shifting demands influence the dynamic and fluctuating patterns of turtle trade. This study is limited by several factors that are often inherent in wildlife trade data, including the lack of species-level labeling, unknown sources of turtles, and a limited time frame of exports post-CITES listings. However, our in-depth look at individual genera and the before-and-after changes in the average, immediate, and trend of export volumes and spatial patterns elucidated dynamics that would have been otherwise missed. These details are crucial for management decisions, especially since CITES is designed to consider trade at both the individual species level and at broader taxonomic levels. Nevertheless, we echo the calls of many to improve monitoring systems to better determine trade sustainability.

Chapter 4 Regulatory Perceptions and Priorities at the Nexus of Legal and Illegal Trade of Freshwater Turtles in the US

4.1 Introduction

In today's globalized social-ecological systems, the scale and complexity of threats to natural resources often lead to uncertainty and contested conservation strategies. Moreover, diverging opinions of what is necessary, effective, and desirable in natural resource management are heavily influenced by myriad, interacting social and psychological factors (Nie 2003; Rastogi et al. 2013; Estévez et al. 2015). Conservation issues pertaining to wildlife, especially, can evoke strong responses from different interest groups about both human and animal wellbeing that drive conflicts between them (Madden & McQuinn 2014). Ongoing debates regarding the regulation and use of wildlife in commercial trade are illustrative of these challenges (Bennett et al. 2021; Fukushima et al. 2021). Deeply divided opinions on wildlife trade policy between scientists, practitioners, and the public have resulted in conflicts and gridlocks that pose substantial obstacles to sustainable and just interventions (e.g., Biggs et al. 2017; Cooney et al. 2021b, 2021a; Orenstein et al. 2021). Understanding the roots of diverse viewpoints embedded in conflicting discourses (e.g., divergent value systems, differing perceptions of problem drivers, etc.) is required to overcome these barriers to biodiversity conservation in wildlife trade management (Biggs et al. 2011; Redpath et al. 2013; Harrison & Loring 2020). Here, we investigated viewpoints regarding the management of legal and illegal trade of non-marine turtles in the US – an emergent concern of conservation practitioners and policymakers – as a case study in wildlife trade policy and conflict.

Tortoises and freshwater turtles are used in commercial and non-commercial trade all over the world for experiential, social, functional, financial, and spiritual purposes (Thomas-Walters et al. 2020). The US plays a significant role in this trade both as consumers and suppliers and is home to a wide diversity of turtle species (Moll & Moll 2004; Buhlmann et al. 2009; Mittermeier et al. 2015). There, turtles are collected from the wild, farmed in small- and large-scale aquaculture facilities, and bred in captivity for domestic and international trade, mostly for the pet and hobbyist trades and for consumption (Hughes 1999; Moll & Moll 2004; Mali et al. 2014, 2015). However, turtles are particularly vulnerable to overexploitation due to their slow life histories and ease of collection, and, like so many other taxa, they face compounding threats of habitat loss, disease, and climate change (Lovich et al. 2018). Indeed, turtle populations have declined significantly, and over half of recognized species are considered threatened with extinction (Rhodin et al. 2018; Stanford et al. 2020).

Increased awareness of the adverse effects of overexploitation, plus a notable increase in exports and demand for North American turtles, has pushed ecologists, conservation practitioners, and wildlife managers to re-examine the status and sustainability of turtle trade in the US (van Dijk et al. 2000; Reed & Gibbons 2003; Gibbons & Lovich 2019). This led to several species listings under the Convention on International Trade in Endangered Species (CITES), new state restrictions and/or bans of commercial harvest, possession, and sale of native turtles, increased monitoring of trade and enforcement of trade rules, as well as workshops and scientific studies to share knowledge of trade dynamics and evaluate sustainability (Mali et al. 2014; CEC 2019; AFWA 2020; Bennett & Loda 2020). Yet, turtle trade regulations still vary widely by state and species (Nanjappa & Conrad 2011; Bennett & Loda 2020), challenging

enforcement efforts by creating loopholes for laundering that traders have been known to exploit (Sevin et al. 2022; Easter et al. 2023).

At the same time, there is a robust and legal trade in turtles and other reptiles with hundreds of reptile expos and shows in major cities across the US every year (Hoover 2000; Collis & Fenili 2011). The reptile keeping hobby has grown substantially as husbandry and breeding techniques have advanced and social media has raised the profile of hobbyist keeping. However, scrutiny of this industry has grown over concerns of species invasions, disease spread, animal welfare, and illegal or unsustainable trade, spurring conflicts and animosity between regulators and trade participants (Warwick 2014; Robinson et al. 2015; Lockwood et al. 2019; Collard 2020; Macdonald et al. 2021). In response, organizations such as the US Association of Reptile Keepers (USARK) formed to push back against increasingly restrictive regulations that they believe infringe on the rights of responsible keepers. Attempts to reign in unsustainable and illegal turtle trade are therefore also entangled in a larger struggle of conflicting norms in the trade of herpetofauna.

This study clarifies varied perspectives on the legal and illegal trade in turtles in the US and its regulation. Specifically, we asked how differing understandings of trade dynamics, perceived efficacy of various policies, and attitudes toward the trade and its participants related to regulatory and enforcement priorities. We employed Q-methodology, informed by qualitative case studies, to elicit and characterize subjectivities of biologists, managers, law enforcement officers, hobbyists, legal affairs experts, and academics involved in or tasked with managing turtle trade. Clarifying these perceptions reveals the underlying value systems and assumptions from which decisions and judgments are made and conflicts are formed, thereby providing an

opportunity to build understanding and cooperation between interest groups and find agreeable solutions.

4.2 Methods

We collected and analyzed data in two phases. The first phase consisted of semi-structured and conversational interviews, participant observation, and document review relating to recent changes (or lack of) to turtle trade policies at state and international levels (i.e., state harvest and possession regulations, CITES listings). Twenty-three in-depth interviews were conducted with key informants from government agencies (n=15), the hobbyist and commercial turtle trade communities (n = 5), and non-governmental organizations (n = 3). Interviews ranged from 30 minutes to over 4 hours, but most lasted for about one hour. Questions varied based on the regulations and timelines specific to the informant's context but generally covered (1) their background in their respective fields and how they got into those fields, (2) how the il/legal commercial trade in turtles has changed over time, (3) their individual knowledge of and responses to those changes or the responses of their respective organizations (e.g., regulatory changes, increasing enforcement capacity, etc.), and (4) their opinions on il/legal commercial turtle trade and how it should be addressed. Interviews were open-ended to let the interviewee guide the conversation and discuss topics most important to them (Appendix C).

Participant observation and dozens of informal conversations were also carried out while in the field with herpetologists, at reptile shows, turtle farms, state agency webinars and commission meetings, turtle trade-related conferences, and multi-stakeholder workshops to combat illegal turtle trade from May 2021 – January 2023. Recognizing various sensitivities surrounding the topic of illegal trade and trade regulations, the lead author recorded interviews where appropriate with permission, and transcribed those recordings verbatim for analysis.

Detailed notes were taken in real time where possible or immediately following each event for all other conversations and participant observations. Finally, governmental and non-governmental reports and proposals were reviewed including species listing proposals for CITES, petitions to ban or reinstate the commercial harvest or breeding of turtles, working group reports, and action plans. These data were analyzed using iterative, open coding for recurring themes and bases for contention in the efforts to manage turtle trade which motivated and fed into the design of the Q study, described below, and were also used to triangulate interpretations of the Q study results (Watts & Stenner 2005; Hagan & Williams 2016; Nost et al. 2019).

4.2.1 Q Study Design and Analysis

Q methodology combines qualitative and quantitative approaches to systematically characterize subjectivity and identify areas of consensus and disagreement. Q studies can uncover a range of perspectives, regardless of how frequently those viewpoints occur, while also using qualitative data to interpret their meaning. Further, this method helps piece together how seemingly different aspects of an issue are related by requiring participants to weigh statements against each other, rather than considering them separately such as in a traditional survey (Watts & Stenner 2012; Zabala et al. 2018).

We first selected 189 statements from our interviews, documents, and participant observation notes that covered a wide range of viewpoints and attitudes toward trade and its various regulations (i.e., the concourse). We inductively categorized these statements into four non-mutually exclusive themes: regulatory approaches and priorities; trade dynamics; trade sustainability; and attitudes toward turtle trade and its participants. We then narrowed this concourse down to a smaller set of representative statements (Q set) by removing redundant statements and folding context-specific statements into more general statements that held similar

meanings (Watts & Stenner 2012). We pretested this set with three practitioners (two from USFWS, one from a non-governmental organization) with knowledge of legal and illegal turtle trade, its regulations, and the various perspectives that likely exist on the topic. With their feedback, we further narrowed the Q set to 37 statements, edited some for clarity, and reversed the meaning of some (i.e., "turtle trade is sustainable" to "turtle trade is not sustainable") to balance the set.

We used purposeful sampling, as is typical in Q methodology (Watts & Stenner 2012; Zabala et al. 2018; Sneegas et al. 2021), to identify participants knowledgeable about both legal and illegal turtle trade in the US and likely to have strong opinions on its management. We invited 169 people from the Collaborative to Combat Illegal Trade in Turtles (CCITT), the Turtle and Tortoise Preservation Group (TTPG), and IUCNs Tortoise and Freshwater Turtle Specialist Group (TFTSG) to participate in the study. Members of these groups include state and federal agency biologists, managers, and law enforcement personnel, academics, NGO representatives, hobbyists and commercial turtle dealers. We recruited participants at group meetings and over email.

We conducted the study online using Q Method Software (Lutfallah & Buchanan 2019), allowing participants to anonymously complete the study on their own time. We also hoped this would encourage reflexive responses to the statements, regardless of the respondent's professional positions or perceived researcher biases. Participants first completed a short questionnaire on demographics and their backgrounds and expertise related to turtle trade. They were then instructed to pre-sort the statements into "piles" of statements they agreed with, disagreed with, or were neutral or unsure about. They then ranked the statements on a scale of -4 (strongly disagree) to +4 (strongly agree) into a grid that forced statements into a normal

distribution (Figure 4-1). After completing the grid, they were asked to elaborate on the statements they dis/agreed with and why they dis/agreed with them. To get a rough sense of how balanced the Q set was thought to be, we also asked participants if they dis/agreed with more statements than there was room for on the grid (Appendix C).

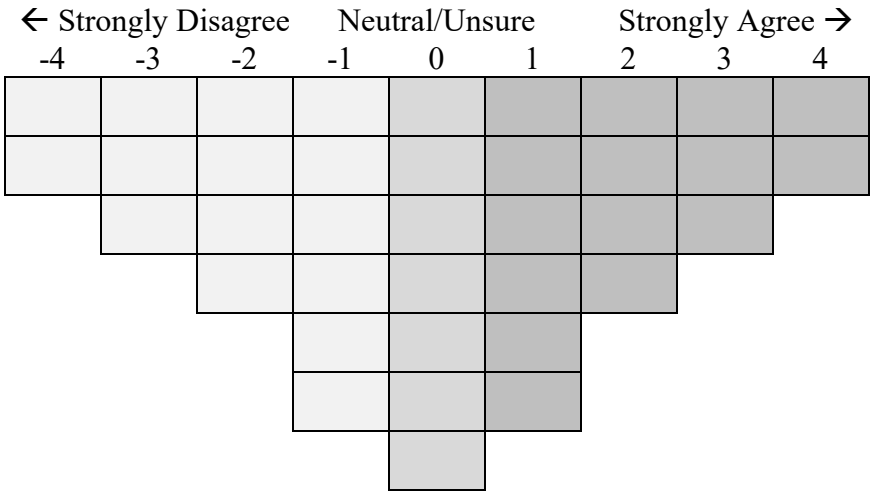


Figure 4-1: The Q-sort grid.

We used Q Method Software to analyze the resulting 29 Q sorts. A Pearson correlation matrix was generated to group Q sorts for centroid factor analysis. We explored several factor combinations based on both qualitative and quantitative metrics (Webler et al. 2009; Watts & Stenner 2012), but ultimately extracted three factors based on visual interpretation of a 7-factor scree plot, Eigenvalues (>1, Kaiser-Guttman criteria), variance explained by each factor (at least 5%) and the number of significant factor loadings following extraction (at least 2 per factor, Watts & Stenner 2012). We used varimax rotation to rotate factors.

We considered factor loadings to be significant at the 0.05 level. Typically, confounded sorts (i.e., Q sorts that significantly load onto more than one factor) are removed from analysis in

Q studies for factor clarity and distinctness (Webler et al. 2009). However, we determined that valuable information would be lost by removing the confounded sorts in our study, such as having to eliminate the only respondent involved in commercial trade. After assessing results under higher significance thresholds (0.01) and without confounders (Watts & Stenner 2005), we found that assigning confounded sorts to their highest loading factor did not significantly alter statement rankings or factor interpretation. Rather, following other studies, we viewed these respondents as having hybrid subjectivities that are important to include (Mazur & Asah 2013; Nost et al. 2019; Lundberg et al. 2022). Z-scores are used to identify statistically distinguishing statements (i.e., statements ranked differently by a factor relative to the others) and consensus statements (i.e., statements ranked similarly by all factors). Crib sheets and responses to the open-ended questions asking participants to elaborate on their ranked statements were used to interpret the factors (Watts & Stenner 2012). This work was determined by the University of Michigan's Institutional Review Board to pose minimal risk to participants and was exempt from ongoing review.

4.3 Results

We analyzed 29 Q-sorts that all loaded onto three factors that cumulatively explained 50% of the variance. However, Factor 1 had both positively (n=13) and negatively loaded sorts (n=1), meaning that it is a bipolar factor representing two essentially opposite viewpoints (Table 4-1). We thus interpreted four distinct viewpoints (Watts & Stenner 2012) that we named the Legal Trade Skeptics, the Targeted Interventionists, the Sustainable Trade Advocates, and the Ex-Situ Conservationists. The Legal Trade Skeptics and Targeted Interventionists were the most correlated factors (60%); all other correlations were less than 40% (Supplementary Table 9). Most respondents identified as men from the northeast US working as government agency

biologists and natural resource managers; however, a range of stakeholder groups are represented (Table 4-2). Below, we characterize the similarities and differences of each of the four viewpoints. To ease interpretation, statement numbers and their normalized ranks for each factor are presented in parentheses with the viewpoint descriptions; statement numbers with asterisks are ones that were distinguishing statements for that factor.

Table 4-1: Criteria used to determine the number of factors to extract. *Factor 1 is bipolar with 13 positively loaded sorts and one negatively loaded sort.

Criteria	Factor 1	Factor 2	Factor 3
Eigenvalues	9.57	3.42	1.50
Explained Variance	33%	12%	5%
Cumulative Explained Variance	33%	45%	50%
Significantly loaded Q sorts	13+/1-*	7	8

Table 4-2: Demographics, roles, and affiliations of study participants (total=29). Participants were encouraged to select all roles and affiliations that were applicable to them, thus the number of participants in each category (N) may add to more than 29. We used USFWS Regions to group the states that the respondents said they have worked in.

Professional Role	**N**
Biologist/Researcher	21
Manager	10
Law Enforcement	5
Non-Commercial Hobbyist	4
Public Affairs/Advocacy	2
Commercial Trader	1
Legal Affairs	1
Professional Affiliation	**N**
Government agency	19
NGO	5
Personal Hobby/Business	4
University	4
Regions	**N**
Northeast	13
Southeast	9
Midwest	4
Pacific West	1
Southwest	1
Gender	**N**
Man	21
Woman	7

Nonbinary	1	

Table 4-3: Statement rankings by each factor. Factors are ordered by similarity to each other. Statements highlighted in red indicate disagreement with a statement (negative values), with darker red indicating stronger the disagreement, and vice versa for blue. Ranks with asterisks (*) indicate distinguishing statements for that factor. **Bolded statements** are ones that were most disagreed on by all factors, and *italicized statements* are consensus statements (Table format adopted from Nost et al. 2019). See Supplementary Table 10 for factor z-scores.

Statement	Legal Trade Skeptics	Targeted Interventionists	Sustainable Trade Advocates	Ex-Situ Conservationists
	Factor Ranks			
1. Keeping turtles and other reptiles and amphibians as pets keeps people connected to nature and fosters an appreciation for the animals.	-3*	1	2	0
2. Captive breeding of turtles for commercial purposes should be factored into the solution rather than being seen as part of the problem.	-2*	0*	3	4
3. There will always be people who take the easy way out and exploit wild turtles because breeding takes too much time and money.	1	-1	3	0
4. State regulations are trending more toward complete possession and trade bans because bans are easiest to enforce.	-1*	-3*	1	3
5. Trade bans and restrictions fuel the black market.	-2	-2	2	0
6. It is too risky to allow the trade of threatened or rare turtle species that are captive bred because wild turtles can be laundered through that legal trade too easily.	4*	2*	-2	-3
7. The sustainable trade of American alligator skins should serve as a model for regulating turtle trade.	-2	-3	0	1
8. Turtle trade follows serial exploitation patterns: when one turtle species or region is depleted or made unavailable due to regulations, demand shifts to other species and regions.	0	3*	0	-3*
9. The penalties for illegal turtle trade should be harsher to deter potential offenders.	3	3	3	0*
10. Federal protection for all native turtles is needed to close state-to-state loopholes.	2*	-1	-1	0

11. Listing turtle species that are growing in value and popularity in the pet trade under CITES Appendix I would have a positive impact on conservation efforts.	1*	-1*	-2*	-4*
12. Regulations on the harvest, possession, and trade of turtles should be species- and place-specific.	-1	2	1	1
13. At the end of the day, the most important thing is to ensure the continued existence of wild turtle populations.	3	4	4	2
14. Listing all turtles under CITES Appendix II would better ensure trade sustainability.	0	-1	-2	1
15. Agencies should work hand in hand with legitimate breeders and dealers to minimize potential harms of allowing captive breeding.	-1	1	2	0
16. It is crucial for law enforcement and state agency biologists to work together to stop illegal turtle trade.	4	3	1	0
17. Turtles in the US are being unsustainably exploited primarily because their market values have risen so much abroad.	1	1	0	-1
18. Illegal turtle trade does not get the public outcry that it needs.	2	2	4	-2*
19. Illegal turtle trade is not a serious threat to turtle populations.	-4	-4	-4	1*
20. You do not have to be a population ecologist to know that exporting millions of turtles a year is unsustainable.	2	1	0	1
21. Trade in turtle hatchlings is less of a concern for sustainability than trade in adult turtles.	-1*	0*	1	2
22. Poaching of reptiles and amphibians happens everywhere all the time.	0	-2	1*	-1
23. Our native turtles should not be used for commercial gain.	3*	-1	-1	-3*
24. Turtles should not be kept as pets.	2*	-2	-4	-4
25. Hobbyist turtle keepers and breeders have a deep respect and love for the animals.	-1*	0	0	2*
26. People who breed, farm, or trap turtles to sell them are primarily motivated by financial gain.	1*	4*	-1	-1
27. Increasing the supply of captive bred turtles to reduce pressure on wild populations creates new concerns of disease spread, invasive species, and animal welfare.	1	2	0	-2
28. Casting a shadow of doubt over all trade participants based on the questionable or illicit actions of a few bad actors is unjust and counterproductive.	-1	-1	2	3
29. Captive bred turtles are widely preferred in the pet and hobbyist trades.	-3*	1	0	4*
30. Simply allowing commercial trade in turtles increases the demand for them and thus threatens wild populations.	0	0	-1	-1
31. We cannot regulate our way out of the problem of illegal turtle trade.	-3*	0*	-3*	3*

32. All collection and trapping of wild turtles (except for scientific purposes) should be phased out.	1	-2	-1	-1
33. The boom-and-bust cycles in demand for different turtle species are unpredictable, making management and enforcement difficult.	0	0	-2	-2
34. Given the slow reproduction of turtles and current global demands, a sustainable, commercial trade in turtles is not possible.	0	1	-3	-2
35. The pet turtle market is too dynamic; turtle breeders cannot produce the latest in-demand species fast enough to compete with illegal collectors.	0	0	-3	-1
36. The war on drugs is an example of why complete bans on turtle possession and trade will not work.	-4	-3	1	2
37. Captive breeders and turtle farmers are being driven out of business or into illegal trade by overly burdensome regulations and inefficient permitting systems.	-2*	-4*	-1*	1*

4.3.1 Legal Trade Skeptics

The Q sorts of 13 respondents positively loaded onto this factor. Respondents associated with this group included three people in law enforcement, two university researchers, six government agency biologists (five of whom are also involved in management and regulatory decisions), one NGO-affiliated researcher, and one person involved in legal affairs and regulatory analysis. Two of these respondents identified as women, and the others identified as men. These participants come from at least 12 states (one person has worked in multiple states), mostly in the Northeast and Midwest. This group was primarily distinguished by a strong prioritization of comprehensive regulations and enforcement and a skepticism toward legal commercial trade and its potential benefits (Table 4-3).

This viewpoint strongly agrees that the risk is too great to allow captive breeding and trade of rare or threatened species (#6*, 4). One respondent claimed that this "*is known to be problematic because of wild caught individuals being integrated too easily (and in some instances being the primary source despite being labeled as captive bred). Captive breeding also requires a major source stock to begin with.*" Further, this viewpoint believes turtles should not

be used for commercial gain (#23*, 3) or kept as pets (#24*, 2) and at the same time contends that turtle traders are primarily motivated by financial gain (#26*, 1); "*The nature of the problem and the financial motivations of those who are exacerbating it are clear, as is the importance of arriving at a comprehensive solution to preserve wild populations in perpetuity*", said one respondent, while another clarified that the preservation of declining or rare species should be prioritized over financial gain [paraphrased].

This viewpoint sees collaboration between law enforcement and biologists to stop illegal turtle trade as a top priority (#16, 4). One respondent explained that: "*As a state herpetologist, I'm keenly aware that cooperation with wardens/enforcement is critical to the success of any reptile case. Biologists can't write tickets, and a stern talking-to won't dissuade anyone*", and another said: "*I believe no progress will be made combatting turtle black markets without partnership between these stakeholders. Sharing information and expertise is crucial to both understanding and addressing criminal activity*." This viewpoint further agreed that federal protection was needed for all native turtles (#10*, 2). In support of this idea, a state biologist explained that: "*States typically do not have the resources or backing to update turtle regulations, and it would be extremely helpful if there were a set of Federal blanket regulations that biologists, law enforcement, and law professionals could refer and adhere to during poaching/overharvest cases*." Similarly, this group supported the notion that listing popularly traded species under CITES Appendix I would be beneficial to their conservation (#11*, 1). Confirming this group's slant toward enforcement and criminal justice, one respondent elaborated: "*Listing the species as CITES Appendix I would help us to enforce harsher penalties on violators. Current turtle smugglers do not face much of a penalty*". This viewpoint also holds that all collection of wild turtles should be phased out (#32, 1).

As with each of the other viewpoints except for this factor's opposite (the Ex-Situ Conservationists), illegal trade was viewed as a serious threat to turtle populations and a predominant concern among respondents (#19, -4). Many corroborated this sentiment: "*There is no doubt that illegal turtle trade is a threat to wild populations; the evidence is throughout the turtle order*", and "*I think the evidence and rationale claiming that illegal trade threatens wild turtles is sound and backed up by data.*" This viewpoint also strongly rejected the comparison between the war on drugs and efficacy of turtle trade bans (#26, -4), with one respondent explaining that: "*The war on drugs and illegal trade are different in terms of people's motivation and therefore what is driving demand. Demand for drugs is driven by a physical addiction that can be difficult to control and demand for wildlife is so people can own a status symbol*."

Furthering this group's cynicism toward turtle breeding and trade, this viewpoint disagreed that keeping reptiles and amphibians keeps people connected to nature or fosters and appreciation for the animals (#1*, -3) nor that hobbyists respect and love the animals (#25*, -1). Personal experiences guided this perspective in some cases: "*I do not think keeping or breeding turtles fosters any appreciation for animals or for conservation. I have seen the opposite too many times*", and "*If pet turtles do connect people with nature, and if these people like nature, then why are so many turtles abandoned, released in the wild, given away, returned, etc.?*" Some also took issue specifically with the comparisons between turtles in captivity and nature: "*Keeping a turtle in a glass tank filled with tap water and plastic vegetation does not connect keepers with nature. Nearly everything about most pet turtle enclosures is artificial ... It's all fake.*" or with needing to own it to be connected to it: "*Owning a pet turtle is not necessary to have people form connections. People have very strong connections with birds and the ownership of native, migratory birds is banned*." This viewpoint also strongly disagreed that

captive bred turtles were preferred in the pet trade (#29*, -3). Additionally, trade in turtle hatchlings was not viewed as less of a concern for sustainability (#21*, -1), as one respondent noted: "*Commercial farming is also proven to not be a sustainable means of solving this issue due to the need to constantly supplement farm stock with wild stock, the integration of wild caught individuals with captive bred.*" Relatedly, this viewpoint does not regard captive breeding as part of the solution to illegal trade (#2*, -2) and does not believe agencies should work with legitimate breeders to minimize harms, or at least does not view this as a high priority (#15, -1).

4.3.2 Targeted Interventionists

Eight participants loaded significantly onto this factor, including two people working in law enforcement, and six government agency biologists, four of whom are also involved in management and rulemaking. Respondents were from seven states in the Northeast, Southeast, and Midwest. Four identified as men, two identified as women, and one identified as nonbinary. This viewpoint is most similar to the Legal Trade Skeptics (60% correlation, Supplementary Table 9) but is distinguished by its prioritization of targeted interventions that are specific to the context, particularly for protecting threatened and rare species, and its openness toward a regulated, legal trade (Table 4-3), as one respondent summarized: "*Attempting a one-size-fits-all solution will not succeed in the face of diverse species life histories and ecology, or diverse communities of harvesters, sellers, buyers, and land management/conservation strategies.*"

The Targeted Interventionists prioritized the survival of wild turtle populations (#13, 4), viewed illegal trade as a serious threat (#19, -4), and strongly agreed that turtle traders are primarily motivated by financial gain (#26*, 4). This group also strongly disagreed that trade participants were being driven into illegal trade or out of business by regulations (#37*, -4), in part due to the perceived inadequacies of existing regulations in limiting legal (or quasi-legal)

trade and financial gain. However, they recognized that not all trade participants are the same; "*Many of the "breeders" or dealers I have dealt with take poor care of the animals, often don't know species or species specifics, and only seem to care about their bottom dollar. It is a product that they are selling. We need to remove many of the bad actors in the trade and allow for the voices of the good (or better) breeders to be heard for helping create a sustainable trade.*" Nevertheless, this group was concerned about the other potential consequences increasing the supply of captive-bred turtles, such as disease spread, species invasions, and animal welfare (#27, 2), and rather than the strong agreement or disagreement expressed by the other viewpoints, the statement on captive breeding being factored into the solution was ranked neutrally (#2, 0). Though someone involved in law enforcement noted that "*Allowing breeders to assist in breeding programs of more rare or unique species could help boost populations in the wild by stifling the need to collect them for the black market*."

This viewpoint also agreed that trade follows serial exploitation patterns (#8*, 3); "*We have seen poachers wipe out entire populations of turtles to meet demands. Once turtles were unable to be readily found they moved to different areas.*" Yet, the need for species- and place-specific regulations was rated higher by this group than the other three (#12, 2), and they disagreed that state regulations are trending toward complete bans because they are easier to enforce (#4*, -3). One respondent clarified: "*while bans are somewhat easy to enforce, protections of the most imperiled species should be strongest within their native range*." Generally, this perspective tended to resist implications of uniform threat levels (#22, -2; #3, -1), broad comparisons to others trades and issues (#7, -3; #36, -3), and blanket solutions (#32, -2; #10, -1). An agency biologist elaborated: "*Poaching [is] not confined to any single locality; however, poaching pressure [is] not uniform. Specific turtle [populations are] more vulnerable*

to poaching, [and] specific communities [are] more likely to engage [with illegal turtle trade]. Again, specific/targeted approaches >> blanket approach that assumes everyone is equally likely to be engaged with [illegal turtle trade]".

4.3.3 Sustainable Trade Advocates

This viewpoint was significantly associated with seven Q-sorts. These respondents included three personal and commercial hobbyists, two university biologists/researchers, three NGO biologists, and one agency biologist, some of whom were affiliated with multiple roles. Two respondents identified as women and five identified as men, and they were from five states, mostly in the Southeast. This viewpoint is distinguished by its recognition that illegal trade is a significant problem, but that legal trade has value and should be incorporated into rulemaking (Table 4-3). There is also an understanding that the issue is complex and that restrictive regulations have unintended consequences.

The viewpoint prioritized the preservation of wild turtles (#13, 4) and raising public awareness of illegal turtle trade (#18, 4), with some believing it to be overshadowed by more charismatic megafauna and others felt that outreach and education could be an avenue for pet owners who do not care if their turtle was captive bred. This viewpoint further agreed that there will always be people who exploit wild turtles (#3, 3) and that poaching of herpetofauna is prevalent (#22*, 1), as expressed here: "*illegal trade will always be an issue because some turtles are simply so easy to collect.*" At the same time, respondents thought that keeping herpetofauna fosters appreciation for nature and the animals (#1, 2), that bans fuel the black market (#5, 2), and that agencies should work with breeders to minimize harms in legal trade (#15, 2). Regarding CITES I listings (#11*, -2), which essentially bans international commercial trade, one respondent noted that it "*increases a species' perceived value to black market*

participants, increases demand for poaching and encourages smuggling due to the inability to acquire permits for even captive bred specimens." Another said: "*Captive breeding needs to be a part of this solution, people will try to get whatever they want in any way possible, captive bred turtles can take the pressure off wild populations.*"

Respondents strongly disagreed that turtles should not be kept as pets (#24, -4), stating that "*Turtles actually make wonderful pets given their comparably inexpensive husbandry requirements and most individuals are not motivated by financial gains in the slightest. Rather, for most, it is an interest and affection for the species as a whole*," and "*When provided with suitable captive conditions turtles make excellent, long-lived, interesting, and rewarding pets. That said, not everyone should have pets, whether it's a dog, cat, or turtle.*" This group also strongly disagreed that illegal trade was not a threat to populations (#19, -4). Further, sustainable trade that meets the dynamic demands of the pet trade was believed to be possible (#34, #35, -3), but they disagreed that CITES Appendix II listings would better ensure trade sustainability (#14, -2).

4.3.4 Ex-Situ Conservationists

This viewpoint is the bipolar counterpart of the Legal Trade Skeptics and is defined by one Q-sort (Table 1). This person identified as a hobbyist, biologist, and advocate, but selected personal hobby as their professional affiliation regarding turtle trade. This viewpoint most strongly agreed that captive bred turtles are preferred in the pet and hobbyist trades (#29*, 4) and that captive breeding should be factored into the solution rather than being seen as the problem (#2, 4). They wrote: "*Captive propagation has been demonstrated time and again to be the only viable conservation solution for declining species. There are countless examples of this in both flora and fauna, worldwide*" and "*Captive-propagated animals are always preferred over wild-*

collected specimens for many reasons, including health and demeanor." This viewpoint does not think regulations will address illegal trade (#31*, 3) and further thought that breeders were being driven out of business or into illegal trade by burdensome and inefficient regulations (#37*, 1).

This viewpoint most strongly disagreed that CITES Appendix I listings would have a positive conservation benefit (#11*, -4), stating: "*CITES is a problematic, politically motivated listing process that is deeply flawed and ineffective at conserving listed taxa. CITES I, in particular, creates barriers to species management and captive propagation, greatly reducing the effectiveness of conservation actions both in the US and abroad.*" This perspective also strongly rejected the notion that turtles should not be kept as pets (#24, -4) nor used for commercial gain (#23*, -3) while agreeing that hobbyists do love and respect the animals (#25*, 2).

With this perspective, turtle trade is not thought to follow serial exploitation patterns (#8*, -3). In further contrast to the other perspectives, this respondent disagreed that illegal trade did not get the outcry it needs (#18*, -2) and agreed that illegal turtle trade was not a serious threat to turtle populations (19*, 1). However, whether they truly think this or if this statement was simply less of a priority to them given other statements that they felt were more important is not clear. They indicated that they both agreed and disagreed with more statements than there was room for at respective ends of the grid. Overall, this perspective echoed the sentiments we heard from many captive breeders and hobbyists; "*Banning the possession of turtles will not reduce the demand nor the value. It would have the reverse effect*."

Table 4-4: Participant associations with each factor and factor loadings. Bolded loadings mark the sorts used to define the factor. One asterisk indicates significance at the 0.05 level, two asterisks mark significance at the 0.01 level. Participants self-selected their roles and

professional affiliations pertaining to turtle trade. Govt = Government, NGO = Nongovernmental Organization, Uni = University, Hobby = Personal hobby or business.

Role – Affiliation	Legal Trade Skeptics	Targeted Interventionists	Sustainable Trade Advocates	Ex-Situ Conservationists
Biologist - Govt	**0.777****	0.007	0.225	-0.777
Researcher - Uni	**0.763****	0.378*	-0.084	-0.763
Researcher - Uni	**0.728****	0.249	-0.188	-0.728
Biologist/Manager - Govt	**0.700****	0.310	0.096	-0.700
Legal Affairs - NGO	**0.661****	0.352*	0.077	-0.661
Biologist - NGO	**0.638****	0.438**	-0.009	-0.638
Biologist/Manager - Govt	**0.637****	0.300	0.143	-0.637
Biologist/Manager - Govt	**0.633****	0.178	0.051	-0.633
Law Enforcement - Govt	**0.582****	0.066	0.055	-0.582
Law Enforcement - Govt	**0.576****	0.509**	-0.179	-0.576
Biologist/Manager - Govt	**0.541****	0.168	0.197	-0.541
Biologist/Manager - Govt	**0.504****	0.390*	-0.004	-0.504
Law Enforcement - Govt	**0.450****	0.295	0.181	-0.450
Biologist/Manager - Govt	0.275	**0.821****	0.008	-0.275
Biologist/Manager - Govt	0.287	**0.740****	0.134	-0.287
Biologist/Manager - Govt	0.153	**0.716****	0.222	-0.153
Biologist/Manager - Govt	0.084	**0.639****	0.131	-0.084
Law Enforcement - Govt	0.459**	**0.494****	0.105	-0.459
Biologist - Govt	0.351*	**0.416***	0.209	-0.351
Law Enforcement - Govt	0.191	**0.379***	0.128	-0.191
Biologist - Govt	0.036	**0.365***	0.313	-0.036
Biologist/Manager/Hobbyist - NGO/Hobby	-0.010	0.043	**0.722****	0.010
Biologist - Govt	0.280	0.305	**0.685****	-0.280
Biologist - NGO	0.048	0.106	**0.610****	-0.048
Commercial Trader/Hobbyist - NGO/Hobby	-0.547	0.040	**0.558****	0.547**
Researcher - Uni	0.155	0.432**	**0.548****	-0.155
Researcher - Uni/Govt	0.275	0.303	**0.529****	-0.275
Hobbyist - Hobby	-0.385	-0.075	**0.489****	0.385
Biologist/Hobbyist/Public Affairs - Hobby	-0.630	-0.007	0.394*	**0.630****

4.4 Discussion

This study identified and described four viewpoints on the legal and illegal turtle trade and its associated policies: the Legal Trade Skeptics, Targeted Interventionists, Sustainable Trade Advocates, and Ex-Situ Conservationists. At a minimum, the four perspectives agreed that ensuring the continued existence of wild turtle populations is important, but opinions on why or how to do that varied. Perspectives diverged primarily based on value judgments and attitudes toward legal trade and captive breeding and perceived tradeoffs of various regulatory approaches. Differing opinions and priorities were further complicated by issues of trust and legitimacy, but notably, there were not rigid distinctions between different stakeholder identities. Characterizing these viewpoints helps to clarify the state and source of conflicts that have emerged amid efforts to address unsustainable and/or illegal turtle trade.

4.4.1 Values-Based Judgments Underly Management Considerations

The perspectives identified here diverge in part due to differences in values-based judgments on the appropriate uses and relationships with wildlife, as has been shown in other wildlife management contexts (Estévez et al. 2015; Manfredo et al. 2018; Bruskotter et al. 2019; Yanco et al. 2019). Respondents associated with the Legal Trade Skeptics and the Targeted Interventionists noted the intrinsic, ecological, and cultural values of wild turtles in their responses, with one person clarifying that "*even if a turtle is in captivity, the goals of captive breeding programs should be focused on reintroducing the species into the wild. A turtle does little use if it's not part of our cultural and natural heritage*." This does not necessarily mean the other participants do not share these values; the given statements may just not have prompted this line of thinking. However, the Legal Trade Skeptics further expressed disapproval of the use and commodification of turtles as pets and a distrust in the motivations and intentions of people

who sell or keep turtles, while at the same time supported more uniform regulations to prioritize enforcement efforts. The view of the Legal Trade Skeptics also reflected normative constructions on the acceptability of selling and keeping native turtles in comparison to other species such as migratory birds (which is banned in the US), or of producing turtles for consumptive purposes over the pet trade, which are at odds with common, legal practices.

It is worth noting, however, that the three other perspectives characterized here saw value in the legal pet trade not only for its potential to disincentivize poaching by increasing legal supply (i.e., through captive breeding), but also for the connections people form with turtles and other herpetofauna through the pet keeping hobby. These viewpoints included the perspectives of government agency biologists, law enforcement, and managers (Table 4-4), contrary to the "us vs. them" (i.e., regulators vs. traders) sentiment sometimes described in regulatory contexts. A state agency biologist's comment underscores this commonality: "*Keepers and hobbyists undoubtedly have deep interests, respect, and love for their animals and the species they choose to keep. I think this is similar to people that work with the species professionally in regulatory, agency, and research fields as well. This is the common ground. Most people in these groups have some connection to turtles, that often started with keeping one as a pet. I believe for many this fosters an appreciation of the animal but also an appreciation for wildlife and nature generally*". Identifying this common ground between stakeholder groups and explicitly addressing value tradeoffs is an essential first step in preventing or mediating conflict (Biggs et al. 2011; Harrison & Loring 2020). That is not to say, however, that shared values translate directly to agreement on interventions.

4.4.2 Trade Drivers, Intervention Goals, and Impacts are Perceived Differently

Support of different management approaches is further driven by how problem drivers and the goals of regulation are perceived and conceptualized. The Targeted Interventionists, for example, were not necessarily against the commercial use of turtles but were highly concerned with the financial motivations of trade participants and the risks of allowing trade of rare and higher-value species due to this motivation. While respondents associated with the Sustainable Trade Advocates perspective reported effective self-policing of the trade through the higher asking prices of quality, ethically produced, captive-bred animals, differing perceptions of scale led others to consider this an insulated viewpoint, missing the cumulative impacts of the trade that regulators and researchers have seen.

The perceived efficacy of trade bans is at the crux of debates on addressing illegal and unsustainable turtle trade, and wildlife trade more broadly (Cooney & Jepson 2006; Rivalan et al. 2007; Lemieux & Clarke 2009). Here, the goals and effects of ban-and-enforcement approaches are perceived differently, as well. Take, for example, the divergent perspectives on CITES Appendix I listings, which essentially prohibits international trade except under special circumstances (#11, Table 4-3). The Targeted Interventionists, Sustainable Trade Advocates, and Ex-Situ Conservationists were generally unsupportive of these listings because they viewed them as ineffectual (due to lack of enforcement capacity or being too late to reverse population declines), or even more harmful than beneficial (by inadvertently increasing price and demand and limiting supply). However, the Legal Trade Skeptics see CITES I listings as a useful avenue for enacting more severe punishments for illegal trade, and therefore deterring future offenders. Similarly, this group's support of federal protection of turtles related to closing state-to-state loopholes to prevent illegal trade.

The comparison of wildlife trade bans to the war on drugs was another diverging point (#36, Table 4-3). The failures of the war on drugs were legitimized by some due to differences in supply and demand structures; drugs are easy to produce, and physical addictions maintain high demand, whereas turtles are limited in the wild and were perceived as unessential luxury products (either in pet or consumption trades). Others suggested that the war on drugs was an example of what not to do, not just because it failed to prevent trade and drove further criminality in the same way wildlife trade bans might (Challender & MacMillan 2014), but also because of the negative and disproportionate ramifications it has had on vulnerable communities. These responses illuminate the different ways the problem and its solutions are perceived, leading to variations of support for different management approaches (Bennett 2016).

4.4.3 Perceptions of Trust and Legitimacy Complicate Management

Perceptions of legitimacy and trust further compound management disagreements between regulators and those being regulated, particularly where legal and illegal activities already intersect (McMullan & Perrier 2002; Turner et al. 2016). Three of the four viewpoints put a heavy emphasis on the need to work with law enforcement and enact harsher penalties for offenders due to the extent and threat of illegal trade (#9, #16, #19, Table 4-3), which mirrors global shifts in wildlife trade management priorities (Challender & MacMillan 2014; Baynham-Herd et al. 2018; Massé & Margulies 2020; Massé et al. 2020). Several respondents relayed their firsthand accounts of intentional rule-breaking within legal supply chains (e.g., "*I have not yet dealt with a legal turtle breeder*") and poor treatment of turtles in trade. These experiences understandably erode trust and skew perceptions of legitimacy of legal trade participants, but increased emphasis on and attention to criminality risks conflating all trade with illegal, unsustainable, or otherwise harmful (i.e., cruel) trade, and driving further polarization between

groups (Singh 2008; Macdonald et al. 2021). We observed this in interviews and responses to this study where hobbyist groups expressed their reluctance to work with management agencies because they felt targeted and demonized.

A large body of research demonstrates the importance of stakeholder trust in governing institutions in supporting and complying with natural resource use regulations (Kuperan & Sutinen 1998; Kahler & Gore 2012; Turner et al. 2016; Young et al. 2016; Moreto & Gau 2017; Oyanedel et al. 2020), but trust in stakeholder groups by managers and its influence on decision-making and conflicts warrants further attention. On the other hand, the confidential nature and slow timelines of criminal investigations means that the full scale of illegal trade is hidden from view from the public and many relevant interest groups. This complicates the ability for agencies to develop policies in real time that address illegal trade that are deemed legitimate and necessary by the public. Resentment in both directions (i.e., regulator to regulated and vice versa) can escalate disagreements and limit the scope of potential partnerships and solutions (Turner et al. 2016; Harrison & Loring 2020).

4.4.4 Beyond Stakeholder Siloes and Other Considerations

Throughout this research, participants repeatedly cautioned against lumping heterogeneous actors into singular stakeholder groups and the need for everyone to work together – not just biologists and law enforcement (#15) or agencies and breeders (#16). One of the limitations and ironies of this study's design is that it forces groupings, but it does so based on points of agreement and disagreement that are often counter to commonly held assumptions of stakeholder interests and priorities (Mazur & Asah 2013; Lehrer & Sneegas 2018). We acknowledge that additional and more nuanced perspectives exist on this topic beyond the four

we have described here. Indeed, several hybrid views (Table 4-4) indicate overlap and flexibility in the ways of thinking about turtle trade and its management (Nost et al. 2019).

In selecting statements, we made conscience decisions to exclude certain considerations in favor of brevity and generalization (i.e., not distinguishing between consumption trades and pet trades, small-scale breeders and large-scale farmers, etc.), and we provided more space for neutrality than strong agreement or disagreement to force prioritization of key issues. Some invited participants declined to complete the study because they felt their perspective could not be accurately represented if they were forced to rank a statement counter to how they truly felt about it due to lack of space on the grid. Further, in our follow up questions for respondents, we asked them if they agreed or disagreed with more statements than the grid allowed them to, and everyone who answered that question (27 of 29) said yes. We therefore are missing or diluting, at the very least, perspectives that exist at the more extreme ends of the spectrum of viewpoints. However, other respondents noted that they were unsure about more statements than there was room for in the neutral column and were uncomfortable with relying on their intuition to make a judgment call. These are the tradeoffs inherent in Q methodology (Watts & Stenner 2012). Additionally, while Q method studies are not meant to be generalized to larger stakeholder groups and small, purposeful sample sizes are typical, we recognize that there is more diversity in the types of actors involved in turtle trade and its management than what is represented by our participants.

4.5 Conclusion

This study sheds light on underexplored bases of contention and consensus among diverse groups involved in or tasked with managing the trade of turtles. These divergent perspectives and underlying perceptions and values clarify some of the drivers of regulatory

decisions, priorities, and emergent conflicts in turtle trade management and enforcement across the US. Our findings underscore the importance of being explicit about the values and perceptions that influence decision-making to avoid or mediate conflicts between stakeholder groups (Biggs et al. 2011; Bennett 2016; Bruskotter et al. 2019; Harrison & Loring 2020). Building trust between regulators and affected interest groups is also critical for negotiating compromises and increasing legitimacy of management actions, especially in the context of addressing illegal activities (Kuperan & Sutinen 1998; Turner et al. 2016; Moreto & Gau 2017).

Chapter 5 Discussion

This dissertation characterized illegal and legal turtle trade dynamics (Chapter 2 and 3), assessed the effects of regulations on trade patterns (Chapter 3), and examined the roles of social norms, value plurality, and perceptions of trade dynamics in identifying acceptable and effective management approaches (Chapters 2 and 4). In doing so, this research was necessarily interdisciplinary, utilizing mixed qualitative and quantitative methods and contributing to the fields of conservation criminology, environmental governance, and human dimensions of wildlife management (Bennett et al. 2017; Gore 2017). Moreover, this work fills important knowledge gaps in the scholarship of wildlife trade in several ways. First, it focuses on the use and trade of native herpetofauna in a western sociopolitical context, which is relatively understudied (Esmail et al. 2020; Morton et al. 2021). Second, it examines both legal and illegal trade, incorporating their histories and intersections while not assuming illegal equates to unsustainable or that legal trade is sustainable (Macdonald et al. 2021). Third, it explores policy processes and responses at multiple scales, calling attention to potential mismatches in management approaches (’t Sas-Rolfes et al. 2019). Below I summarize the findings of each study, highlight their limitations, and suggest avenues for future research.

5.1 Characterizing Turtle Trade Dynamics

Chapter 2 synthesized spatiotemporal and taxonomic trends of illegal turtle trade in the US to guide management responses and interventions (Chapter 2, Easter et al. 2023). From 1998-2021, 54 cases of illegal turtle trade involved over 24,000 turtles, comprising 34 different species

ranging from critically endangered to least concern on IUCN's Red List. However, there was often not enough information to delineate numbers of wild-caught versus captive-bred or ranched animals. Starting and ending locations of trade were diverse, spanning at least 43 states and 6 countries. Cases also ranged in their severity, from local cases involving fewer than 10 turtles to international cases involving thousands of illegally traded turtles and other reptiles. While this synthesis illuminated the diversity and scale of illegal trade, it is not exhaustive. It only captures the 54 cases and their associated details as reported by agencies, prosecutors, and media outlets, and additional case details usually emerge over several years depending on the scale of the case. Nevertheless, these data provide a baseline to work from, as no comparable datasets currently exist, while its limitations highlight the need to clarify illegal trade's effects on wild turtle populations and its intersections with legal trade. Future work could leverage the expertise of criminal investigators and wardens through techniques such as the Delphi method to arrive at a more comprehensive assessment of illegal trade and guide prevention and interdiction efforts (for example, see Gore et al. 2020).

Chapter 3 analyzed the spatial and temporal dynamics of legal, commercial exports of turtles from the US using 20 years of LEMIS export data of 16 turtle genera, 11 of which are currently listed under one of the CITES Appendices. While several other studies have conducted similar analyses on turtle, tortoise, and reptile trade more generally (Mali et al. 2014; Robinson et al. 2015; Luiselli et al. 2016; AFWA 2020), segregating the analysis by each genus, including all "sources" of turtles (i.e., captive-bred, wild-caught, ranched, etc.), allowed for a more detailed comparison of trends across taxa to better direct management efforts. Additionally, pairing this analysis with qualitative data from interviews, documents, and participant observation elucidated direct and indirect drivers of trade patterns as well as the issues with relying on source data to

determine trade sustainability. Results showed how CITES listings affect trade in mixed, sometimes counterintuitive ways due to variations of supply and demand dynamics of each species. For example, demand (and exports) generally declined for species commonly sold for consumption and farm stocking purposes, whereas trends in popular pet species were more variable depending on their popularity and availability through established, permitted dealers, if protected, or in the wild, if not. However, it is worth noting that the long-term effects of listings remain to be seen, as these data cover a limited timeframe. Nevertheless, it is clear that as governments continue to turn to CITES for regulating international wildlife trade, those listings must be matched with the capacity to manage and enforce those listings and to anticipate shifts in exploitation to other taxa or regions or into illegal trade. Meanwhile, recent up-listings of several commonly traded species from Appendix III to II provides an opportunity for a more in-depth examination of the drivers of these potential shifts. For example, future research could use permit applications and interviews with permit holders to investigate turnover in the number and types of permit holders when a species is up listed and the drivers of that turnover.

5.2 Examining Social Dimensions of Trade Interventions

Chapters 2 and 4 demonstrated the importance of understanding the social norms, values, and perceptions that shape opinions of legitimacy and efficacy of wildlife trade regulations and enforcement. In Chapter 2, I analyzed how news articles portrayed cases of illegal turtle trade in the US. This analysis showed how media framing of these cases mirrored international discourses around wildlife trade, focusing on high Asian demand for turtles as pets, food, and for use in traditional medicines, and calling for top-down regulatory and enforcement approaches to curtail illegal trade (Challender & MacMillan 2014; Margulies et al. 2019; Massé & Margulies 2020; Massé et al. 2020). However, considering the legal and social norms and history of reptile

use and trade in the US, criminalizing trade and prosecuting traders may not immediately be seen as necessary or legitimate. Drawing from conservation criminology, I argued that the neutralizations observed in news articles demonstrated this conflict between the proposed solutions and public perceptions of the problem (Kaptein & van Helvoort 2019). Pursuing top-down only approaches without acknowledging these norms may ostracize important community groups or be undermined by a lack of compliance (Moreto & Gau 2017). Further investigation could compare media framing of illegal wildlife trade between different taxa or geographic regions to build understandings of underlying assumptions and normative dimensions related to wildlife crime and how we address it.

In Chapter 4, I clarified the bases of decisions and contention surrounding changing policies on turtle trade. I elicited and characterized subjectivities among diverse groups involved in or tasked with managing the trade in turtles using Q methodology, informed by interviews and case studies, which is a useful tool for mapping areas of consensus and disagreement in complex conservation issues (Webler et al. 2009; Mukherjee et al. 2018; Zabala et al. 2018). The analysis revealed four viewpoints on the management of turtle trade that primarily diverged on attitudes and values-based judgments of legal and illegal turtle trade, perceptions of trade drivers, intervention goals, and efficacy of regulations. However, all viewpoints agreed on the importance of conserving wild turtle populations, and there was a shared interest in and respect for the reptile-keeping hobby among several identity groups. Such differences and commonalities are important to identify and address when weighing the tradeoffs of different management approaches so that decision-makers and affected groups can avoid talking past each other (Biggs et al. 2011; Harrison & Loring 2020). Additionally, the intersections of legal and illegal trade of this case and a focus on criminality and prosecutions erode trust between

managers and trade participants, limiting possibilities for collaboratively identifying sustainable and just policies (Turner et al. 2016; Young et al. 2016).

Expanding on Chapter 4's findings, policy processes in turtle trade management would benefit from a more systematic study of demand drivers, value orientations, and associated politics of management in the context of hobbyist pet trades (Manfredo et al. 2020; Thomas-Walters et al. 2021). Scholars have discussed how broadscale western morality values and norms impede on the other cultural and individual ways of valuing wildlife (Stoett 2002; Singh 2008; 't Sas-Rolfes et al. 2019; Thomas-Walters et al. 2020), yet wildlife trade research still centers economic or monetary value as its primary concern (Feddema et al. 2021). Encouragingly, emerging research is beginning to investigate relational values, preferences, and dimensions of care in pet ownership (Hausmann et al. 2023). Additionally, industry perspectives are limited in this research (i.e., commercial breeders, trappers, middlemen) due to a focus on managerial knowledge and decisions and limiting the scope of inquiry to US-native turtles, as large-scale reptile dealers typically work with a wide variety of exotic and native taxa. A broader understanding of their motivations and perceptions of trade sustainability, market dynamics, and efficacy of policies would aid management efforts.

Overall, the findings of this dissertation underscore the importance of evaluating the efficacy of wildlife trade interventions from multiple angles, including their actual and perceived tradeoffs to reduce conflicts and identify effective solutions. More broadly, this work contributes to scant literature on the social and policy dimensions of illegal and/or unsustainable trade of herpetofauna, particularly in western contexts. In today's globalized and ever-changing world that increasingly threatens biodiversity, drawing from multiple fields of expertise and

methodologies is crucial to monitor rapid changes in wildlife exploitation and develop effective and acceptable policies.

Appendices

Appendix A: Supplementary information for Chapter 2

Supplementary Table 1: Final codebook. All coding was done in NVivo and coded statements were exported to Excel and R for analysis. Each entry was identified by the Case ID (e.g., AMR) and Article ID and date (e.g., AMR1_July2018). Categories are not mutually exclusive.

Category & Code	Description
Context Codes	
Scales of Case	Any statement that references…
Geography	locations of where illegal trade occurred.
Timeline	dates or timelines of illegal trade.
Value	monetary value of illegally traded turtles.
Volume	actual or estimated numbers of turtles illegally traded (e.g., "hundreds" or "3,500 terrapins").
Prosecutorial	Any statement that references…
Actual sentencing	a fine, restitution fee, property forfeiture, prison, or probation sentence.
Evidentiary behavior	the ways offenders knowingly evaded laws or regulations.
Max. possible sentencing	the maximum sentencing a case could receive based on the charges.
Relevant law(s)	the laws or regulations that were violated (e.g., Lacey Act).
Repeat offender	prior wildlife-related charges or warnings.
Turtle Characteristics	Any statement that references…
Conservation status	conservation listings/designations. (e.g., listed "threatened" by IUCN).
Natural & life history	reproductive rates, lifespans, distributions, ecologies, morphologies of turtle species.
Protection status	protection status of turtles (e.g., illegal to harvest from New Jersey).
Threats	threats to a species or turtles more generally (e.g., poaching, vehicle strikes, habitat loss).
Framing Codes	
Problem Drivers	Illegal trade occurs/occurred because…
Foreign Demand	demand for turtles/X species is high in other countries.
Pet Trade	turtles/X species are sought after as pets; their value is high in the pet trade.
Lucrative	turtles/X species are worth a lot of money.
Meat Trade	turtles/X species are sought after as food; their value is high in the meat trade.
Medicinal or Cultural Uses	turtles/X species are sought after as food; their value is high in the meat trade.

US Demand	demand for turtles/X species is high in the US.
Problem Impacts	Illegal trade is a problem because…
Threat to Species Populations	it threatens wild turtle populations through overexploitation.
Crisis	it is a growing crisis (general, nondescript).
Poor Animal Welfare	it is cruel to the turtles.
Disease & Public Health Risk	it threatens ecosystem or public health through disease spread (e.g., salmonella).
Undermining Business & Law	it undermines the legal practices of other institutions (e.g., permitted turtle farms, banks, etc.).
Invasive Species Risk	it increases the risk of species invasions.
Neutralizations	Illegal trade is not a concern because… (See Kaptein & van Helvoort 2019 for detailed descriptions)
Denying Responsibility	the actor cannot/should not be held responsible for their actions.
Uniquely Deviant	this is a rare or unique situation.
Denying Deviance	the actor did not violate social norms.
Solutions	We should address illegal trade by…
Law Enforcement & Prosecutions	increasing law enforcement efforts and more harshly prosecute offenders.
Policy & Regulations	changing or tightening wildlife trade regulations and laws.
Communications & Awareness	spreading awareness of the issue.
Captive Breeding	breeding turtles to meet demands and reduce pressure on wild populations.
Research & Assessments	conduct research and monitoring to better understand illegal trade and its effects on wild turtles.
Alternative Pet Choice	encourage buyers to consider a different pet so as not to accidentally purchase an illegally acquired animal.

Supplementary Table 2: Summary of the violations and prosecutions of each case. Repeat offender refers to if someone in the group of those charged has violated a wildlife-related law in the past. For cases involving multiple people, fines, probation, and prison sentences are summed. Missing or non-applicable information denoted with "n/a".

Case ID	Case State	Violation Summary	Repeat Offender?	Total Prison (months)	Total Fines & Restitution ($)	Total Probation (months)
AH	North Carolina	North Carolina prohibition of commercial take/trade of wild-caught spotted turtles	No	0	4000	12
AMR	Georgia	Georgia prohibition on possession of eastern box and spotted turtles and Gaboon vipers; Possession of firearms as a felon	Yes	n/a	n/a	n/a
AR	Pennsylvania	Pennsylvania prohibition of commercial take/trade of wild-caught spotted and wood turtles	No	0	5000	12
AY	California	CITES-listed species smuggled and traded without permit	No	21	18400	36
BB	Louisiana	Falsified paperwork	No	0	57500	60
BP	Louisiana	Louisiana prohibition on commercial take/trade of box turtles	No	0	2500	36
CBB	Nevada	Nevada prohibition of commercial possession or take of native snakes	No	0	10000	0
CC	Kentucky	Kentucky prohibition on commercial trade in box turtles.	No	n/a	n/a	n/a
CP	Florida	CITES declaration and permit requirement and Florida prohibition of wild harvest of certain species.	No	6	0	48
CYK	Washington	ESA trade ban and CITES declaration/permit requirement	No	0	10000	60
DF	Florida	Florida turtle farm breeding permit violation	No	3	20000	36
DS	Pennsylvania	New Jersey prohibition of commercial take/trade of diamondback terrapins	No	6	250000	36
DY	Canada	Smuggling across Canada/US border	No	0	3500	24

EC	Louisiana	Louisiana commercial take limits on diamondback terrapins; Trade of CITES-protected species without permit	No	0	10000	36
ET	New York	Smuggling Canadian-threatened species across the border; NY prohibition on commercialization of wildlife	No	0	0	24
EWH	Missouri	Missouri and Arkansas prohibition of commercial take/trade of certain species without permit	No	0	0	60
GA	Alabama	Alabama and Tennessee prohibition of commercial take/trade of turtles	No	0	0	36
GAD	North Carolina	National Wildlife Refuge take prohibition	n/a	0	1650	36
HKL	Louisiana	CITES-listed species smuggled and traded without permit; Pennsylvania prohibition of commercial take/trade of wood turtles	Yes	39	0	96
HL	New York	New York prohibition on commercial take/trade of snapping turtles	No	n/a	n/a	n/a
HS	Pennsylvania	CITES-listed species smuggled and traded without permit	No	12	0	0
JC	Florida	Florida turtle farm breeding permit violation	No	0	1000	12
JR	Missouri	Missouri-protected species	No	0	5000	60
JT1	Pennsylvania	Pennsylvania prohibition of commercial take/trade of wild-caught bog and wood turtles	No	0	5000	18
JT2	Pennsylvania	Pennsylvania prohibition of commercial take/trade of wild-caught bog and wood turtles	Yes	12	25000	0
KB	Louisiana	CITES falsified paperwork/permit misuse	No	0	15000	24
KC1	Illinois	Sold hatchlings in violation of FDA rule	No	n/a	n/a	n/a
KC2	Louisiana	Louisiana/Illinois prohibition on commercial trade/take of wood turtles	Yes	41	42805	36
KD	North Carolina	North Carolina prohibition of the possession/trade of certain species	No	0	10000	36
KJ	DC	CITES protected species smuggled without permit; laundered money through US banks	No	38	10000	0

KWC	California	CITES protected species smuggled under false labels	No	2	12000	24
KX	Michigan	CITES protected species smuggled without permit	No	57	17000	0
KZW	California	CITES-protected species smuggled without permit	No	3	4000	36
MD	Wisconsin	Various state laws in Wisconsin, Virginia, New York, and Pennsylvania, and interstate sale of CITES-listed species	No	1.5	2000	36
ME	Florida	West Virginia prohibition of commercial take/trade of wood turtles and other species	No	0	12000	60
MJ	Maryland	New York prohibition on commercial take/trade of snapping turtles	No	0	60000	0
MVN1	Florida	Sold hatchlings in violation of FDA rule	Yes	n/a	n/a	n/a
MVN2	Florida	Florida prohibits commercial take in turtles	Yes	n/a	n/a	n/a
MW	Texas	Texas prohibition on commercial take/trade of alligator snapping turtles	No	0	0	36
NB	Massachusetts	False statements and labels of CITES-protected species	No	0	0	24
NH	Georgia	Georgia limit of commercial trapping	Yes	n/a	n/a	n/a
NM	Florida	n/a	n/a	0	0	18
OT	New York	Various/unknown + ESA	No	18	0	36
PE	New Jersey	New Jersey prohibition of commercial take/trade of endangered/nongame species	No	0	30450	60
RF	California	CITES protected species smuggled under false labels	No	5	4500	24
RV	Minnesota	CITES protected species smuggled under false labels	No	0	2374	36
SB	South Carolina	Various/unclear state prohibitions of commercial trade in turtles	Yes	32	264225	95
TC	Alabama	Alabama commercial trade regulations	No	0	0	36
TL	Louisiana	Texas prohibition on commercial take/trade of alligator snapping turtles	No	37	22431	72

TP	West Virginia	West Virginia prohibition of commercial take/trade of box turtles	No	1	0	12
VFR	Louisiana	Louisiana prohibition on commercial take/trade of box turtles	No	0	0	12
WG	Oklahoma	Oklahoma prohibition on commercial take in box turtles	No	0	450000	24
XDQ	Oregon	CITES-protected species smuggled without permit	No	0	7858	24
YX	California	CITES-protected species smuggled without permit	No	0	2233	0

Supplementary Table 3: Summary of turtle species illegally traded, the exact and approximated number of turtles traded, year(s) that illegal activity occurred, activity timelines, and illegal trading locations (source, transit, and destination) where known for each case. Missing or non-applicable information denoted with "n/a".

Case ID	Species	Reported # Traded	Approx. # Traded	Years Traded	Source	Transit	Destination
AH	Spotted	63	10s	Unknown-2012	North Carolina	n/a	n/a
AMR	Eastern Box, Spotted	19	10s	2018-2018	Georgia	n/a	Florida
AR	Spotted, Wood	5	10s	2008-2008	Pennsylvania	n/a	Pennsylvania, others
AY	Black-knobbed Map, Florida Box, Stripeneck Musk	11	1000s	2004-2011	n/a	California (LAX), Hawaii (Honolulu)	Japan-US
BB	Unspecified	n/a	n/a	Unknown-2016	Louisiana	n/a	China
BP	Eastern Box, Unspecified	349	100s	2017-2017	Louisiana	n/a	Texas (Corpus Christi), Nevada, New Jersey
CBB	Alligator Snapping	1	10s	2006-2007	Nevada	n/a	various states
CC	Eastern Box	915	1000s	2019-2020	Kentucky	n/a	New York, Pennsylvania

CP	Diamondback Terrapin, Florida Box, Florida Mud, Spotted	5581	1000s	2016-2019	Florida	n/a	Hong Kong
CYK	Eastern Box, Ornate Box, Wood	46	100s	2009-2013	n/a	Nevada (Las Vegas), Washington (Seattle)	Hong Kong
DF	Unspecified	n/a	100s	2011-2011	Florida	n/a	California, China
DS	Diamondback Terrapin	3500	1000s	2014-2017	New Jersey	Pennsylvania	New York, Canada, Wisconsin, 43 unspecified states
DY	Diamondback Terrapin, Red-eared Slider, Ringed Map, Spotted, Three-toed Box	38	10s	2014-2014	Alabama	Michigan (Detroit), Canada	China
EC	Common Snapping, Diamondback Terrapin	220	100s	2015-2016	Louisiana	California	China
ET	Spotted	1	10s	2008-2008	Canada	n/a	New York
EWH	n/a	104	100s	2007-2007	Missouri	n/a	Arkansas
GA	Alabama Map, Alligator Snapping, Common Snapping, Common/Eastern Musk, Eastern Box, False Map, Ouachita Map, Red-eared Slider, Smooth Softshell, Southern Painted, Spiny Softshell, Yellowbelly Slider	2592	1000s	2002-2003	Alabama, Tennessee	n/a	Louisiana, Florida
GAD	Spotted	11	10s	2011-2011	North Carolina	n/a	n/a
HKL	Wood	100	100s	2011-2014	Pennsylvania	California	Hong Kong
HL	Common Snapping	n/a	100s	Unknown-2009	New York	n/a	Maryland

HS	Eastern Box	79	10s	2017-2017	Pennsylvania	n/a	China
JC	Florida Softshell	17	10s	2012-2012	Florida	n/a	California, China
JR	Blanding's, Western Chicken	n/a	n/a	2003-2004	Missouri	n/a	Japan
JT1	Bog, Spotted	500	100s	1990-1998	n/a	n/a	n/a
JT2	Wood	200	100s	NA-2006	n/a	n/a	n/a
KB	False Map	1500	1000s	2013-2013	Louisiana	n/a	Netherlands
KC1	n/a	300	100s	2005-2005	n/a	n/a	Illinois
KC2	Wood	390	100s	2014-2014	Louisiana	n/a	Illinois
KD	Eastern Mud, Red-eared Slider, Spotted	4	10s	2010-2010	North Carolina	n/a	n/a
KJ	Eastern Box, Florida Box, Gulf Coast Box, Spotted, Wood	1500	1000s	2017-2018	North Carolina, 4 other states	n/a	Hong Kong, China
KWC	Eastern Box	26	10s	2013-2013	n/a	California	Hong Kong
KX	Blanding's, Diamondback Terrapin, Eastern Box, Red-eared Slider, Spotted, Wood	1221	1000s	2014-2014	Alabama, others	Michigan (Detroit), New York (Buffalo)	Canada (Ontario), China, Hong Kong, Alaska
KZW	Eastern Box, Ornate Box, Three-toed Box, Unspecified	59	100s	2016-2019	n/a	California	Hong Kong, China
MD	Blanding's	4	10s	2016-2016	Minnesota	Wisconsin	Virginia, New York, Pennsylvania, Florida, California
ME	Common Snapping, Eastern Box, Wood	118	100s	2016-2016	West Virginia	n/a	Florida

MJ	Common Snapping, Northern Painted	80	100s	2007-2008	New York	Maryland	n/a
MV N1	Mississippi Map, Yellowbelly Slider	1000	1000s	2008-2008	Florida	n/a	n/a
MV N2	Eastern Mud, Florida Softshell, Striped Mud	393	1000s	2017-2019	Florida	n/a	Louisiana, California, China, Japan
MW	Alligator Snapping	2	10s	2013-2016	Texas	n/a	Louisiana
NB	Eastern Box	3	10s	2019-2019	Massachusetts (Worcester)	New York (JFK)	Hong Kong, Sweden
NH	Common/ Eastern Musk, Eastern Mud, Loggerhead Musk, Stripeneck Musk	200	1000s	2015-2017	Georgia, South Carolina	Georgia (ATL), California (LAX)	China
NM	n/a	n/a	n/a	2012-2012	North Carolina	n/a	Florida
OT	n/a	n/a	n/a	2009-2010	Louisiana, Florida, California	New York (Hogansburg)	Canada
PE	Eastern Box, Florida Box, Gulf Coast Box, Spotted, Three-toed Box, Wood	40	10s	2011-2014	New Jersey	n/a	New York
RF	Alligator Snapping, Common Snapping, Desert Box, Diamondback Terrapin, Ornate Box, Three-toed Box	11	10s	2017-2017	Unknown US source, other shipments from Hong Kong	n/a	Hong Kong, US
RV	Eastern Box	38	10s	2017-2017	n/a	n/a	Hong Kong
SB	Spotted, Unspecified, Diamondback Terrapin	200	100s	2016-2016	New York, South Carolina, North Carolina, New Jersey	New York, New Jersey	Florida, China

TC	Alabama Map, Alligator Snapping, Black-knobbed Map	119	100s	2003-2004	Alabama	n/a	Louisiana, Mississippi
TL	Alligator Snapping	90	10s	2016-2016	Texas	n/a	Louisiana
TP	Eastern Box	300	100s	2012-2013	West Virginia	n/a	New Jersey, California, Arizona, Pennsylvania
VFR	Three-toed Box	29	10s	2017-2017	Louisiana	n/a	n/a
WG	Ornate Box, Three-toed Box, Unspecified	1000	1000s	2017-2018	Oklahoma, South Carolina	n/a	New Jersey, China
XDQ	Blanding's, Diamondback Terrapin, Eastern Box, Florida Box, Spotted, Wood, Yellow-blotched Map	315	100s	2017-2018	Alabama, California, Florida, Kentucky, Michigan, New Jersey, Nevada, North Carolina, and South Carolina	n/a	China
YX	Blanding's, Diamondback Terrapin, Eastern Box, Florida Box, Spotted, Three-toed Box, Wood, Yellow-blotched Map	769	1000s	2017-2018	Alabama, California, Florida, Kentucky, Michigan, New Jersey, Nevada, North Carolina, and South Carolina	n/a	China

Supplementary Table 4: Additional examples of content coded to the "Neutralizations" frame.

Neutralization Type	Example Statement	Article
Uniquely Deviant	"Cultural norms and superstitions, like good luck and fortune, are the main reasons the black market is rampantly growing in Eastern Asian countries and the United States."	Brennon Dixson, B 2017, 'Wildlife Trafficking seizure nets tigers to deadly snakes', *Daily Breeze*, 21 October
Uniquely Deviant	"You may remember the zombie "Turtle Boy" whose deadpan delivery of "I like turtles" during a news interview made him a viral sensation (if not, watch the video for a refresher). Apparently a Canadian man named KX likes turtles even more than that famous child, as he was caught at the U.S./Canadian border with 51 turtles taped to his body back in 2014."	Nefer, B 2015, 'Smuggler who was busted with 51 turtles taped under his pants pleads guilty', *Family & Home Examiner*, 2 December.
Uniquely Deviant	"Of these, 700,000 turtles were shipped illegally—probably in the irregularly shaped bulging pants of DY and KX. This is an outrage. The Chinese are eating all of our turtles. Why hasn't President Obama dispatched John Kerry to Ottawa and Beijing to resolve this crisis? Why isn't Trump trumpeting something about this? Action needs to be taken. Sabers need to be rattled. Somebody needs to check Hillary's email server. The Teenage Mutant Ninja Turtles need to be deployed."	No author 2016, 'Making a living smuggling turtles', *Sierra Vista Herald,* 6 March.
Denying Deviance	"A Canadian man convicted of taping 51 turtles to his legs and trying to smuggle them from the U.S. to China this week was sentenced to 60 months in federal prison. This is 30 months longer than the sentence being served by Kareem Serageldin, the only U.S. banker who went to prison for financial crimes related to the 2008 economic collapse."	Editorial Board 2016, 'Editorial: Short takes on bowl-game overload, no more flaming weather reports, and other weird stuff', *St. Louis Post-Dispatch*, 16 April.
Denying Deviance	"So far, this doesn't sound as gruesome as the whale meat scandal from last year, where a Santa Monica restaurant and its sushi chef were charged with serving up an endangered mammal."	Vogel, C 2011, 'Feds find 55 turtles illegally smuggled into LAX stuffed in snack food boxes', *LA Weekly*, 10 January.
Denying Deviance	"Growing up, their older son worked as a volunteer at a New Jersey wildlife refuge and with the Delaware Riverkeeper organization. He also worked at a youth camp, where he once risked "life and limb to remove dangerous snapping turtles" that had endangered campers who swam in a pond, his parents' letter said, noting that he always had an interest in nature and reptiles. Neighbors wrote letters saying he was kind to their children, including two autistic youngsters in New Jersey. As a teenager, he was featured in a 2006 Philadelphia Inquirer article for his community service accomplishments. He told the newspaper he loved animals."	Fretwell, S 2019, 'SC wildlife trader going to prison', *The State*, 3 May.

Supplementary Table 5: News article citations. All articles were accessed and downloaded from NewsBank, available through University of Michigan's library: https://www.newsbank.com/libraries/military/solutions/access-world-news. This is also available on Data Dryad: https://doi.org/10.5061/dryad.3xsj3txm4.

Year	Citation
1998	Hubley, J. (1998, July 5). Cold-blooded justice - part of a 12-state sting called operation herpscam, PFBC nabs an outlaw reptile dealer and brings a handful of endangered bog turtles back home to Lancaster county. Sunday News (Lancaster, PA), pp. C-9.
2003	Prine, C. (2003, September 1). Shady reptile dealers slither through Pa. Pittsburgh tribunereview (PA).
2003	Prine, C. (2003, August 31). Illegal animal trade draws from Pa. Pittsburgh Tribune-Review (PA).
2006	Weisberg, D. (2006, June 11). Stiff sentence for wildlife trafficking. Pittsburgh Post-Gazette (PA), pp. C-17
2007	News at 6 - 17:59:00. (2007, September 28). ABC - 13 KTNV (Las Vegas, NV).
2007	Kihara, D. (2007, October 1). Man charged in effort to sell deadly reptiles. Las Vegas Review-Journal (NV), p. 2B.
2007	Florida man gets probation in Alabama turtle smuggling case, AL. (2007, December 17). Associated Press News Service, The.
2007	Kirby, B. (2007, December 17). Carjacker gets more than 12 years. Press-Register (Mobile, AL), p. 01.
2007	Kirby, B. (2007, October 23). Floridians plead guilty to smuggling turtles. Press-Register (Mobile, AL), p. 01.
2007	Kirby, B. (2007, July 19). Three plead not guilty to smuggling FEDERAL COURT 3 people plead not guilty to smuggling rare turtles. Press-Register (Mobile, AL), p. 01
2007	Kravetz, A. (2007, September 26). Tiny turtles get Peoria man in trouble - Man faces charges for allegedly selling undersized terrapins. Peoria Journal Star, The (IL), p. B5
2008	Patrick, R. (2008, April 24). Guilty plea in turtle selling scheme. St. Louis Post-Dispatch (MO), p. B2.
2008	Kirby, B. (2008, February 18). 'Dangerous' felon given maximum prison time. Press-Register (Mobile, AL), p. 01.
2008	Kravetz, A. (2008, August 8). Two guilty in turtle trafficking case - Both await sentencing for selling baby turtles at EP reptile show 3 years ago. Peoria Journal Star, The (IL), p. B2.
2008	Star, J. (2008, August 6). Trial begins for pair accused of selling undersized turtles. Peoria Journal Star, The (IL).
2008	Kirby, B. (2008, January 7). Louisiana turtle smugglers get probation. Press-Register (Mobile, AL), p. 01.
2008	Blum, V. (2008, July 5). Firm accused of improper turtle sales. South Florida Sun-Sentinel (Fort Lauderdale, FL), p. 3B.
2008	Klingener, N. (2008, August 3). Nonfictionthe lizard king: reaping reptiles - sorting through the sordid secrets of the illegal animal trade and its purveyors. Miami Herald, The (FL), p. M6.
2009	Oliveira, M. (2009, May 12). Snake smuggler gets jail term. Toronto Sun, The (Ontario, Canada), p. 12.
2009	Cornish, D. (2010, February 17). Snake smuggler sentenced. Burlington Post, The (Ontario, Canada), p. 01.
2009	Snake smuggler sentenced. (2009, May 12). Canadian Press, The (Toronto, Ontario, Canada), p. 6

2009	Cornish, D. (2009, September 24). More convictions for smuggler. Burlington Post, The (Ontario, Canada), p. 01.
2009	Herbeck, D. (2009, March 21). 2 held in illegal poaching of turtles. Buffalo News, The (NY), p. D5.
2009	Strafford man fined for selling protected turtles, MO. (2009, December 2). Associated Press News Service, The.
2009	Man sentenced for W.Va. Turtle trafficking, WV. (2009, December 10). Associated Press News Service, The.
2009	Smith, V. (2009, March 25). Turtle Take-Down. City Paper (Baltimore, MD).
2009	Smith, V. (2009, March 18). Fear the Turtle - A federal raid in Maryland shows how common snapping turtles can have an uncommon bite. City Paper (Baltimore, MD).
2009	Fletcher, J. (2009, March 18). On the trail of animal smugglers / A childhood passion for reptiles sets author on trail of 'Lizard King'. Press of Atlantic City, The (NJ), p. B1.
2011	Chiappardi, M. (2011, March 3). Reptile dealer admits to slimy deal. Burlington County Times: Web Edition Articles (NJ).
2011	Tasci, C. (2011, January 20). Cal Poly Pomona a temporary home for confiscated exotic turtles, tortoises, frogs. Inland Valley Daily Bulletin (Ontario, CA).
2011	Operation Flying Turtle' Leads to Arrest of Japanese Nationals on Federal Charges - NEWS RELEASE. (2011, January 12). Government Press Releases (USA).
2011	Vogel, C. (2011, January 10). Feds find 55 turtles illegally smuggled into LAX stuffed in snack January 10, 2011 | LA Weekly (CA) Author: Chris Vogel Section: News 267 Words openurl Link food boxes. LA Weekly (CA).
2012	Shuster, F. (2012, May 1). 'Operation Flying Turtle' Smuggler Sentenced to 21 Months. Daily Breeze (Torrance, CA).
2012	Japanese National Sentenced to 21 Months in Federal Prison for Smuggling Turtles and Tortoises into the United States. (2012, May 5). Targeted News Service (USA).
2012	Man sentenced in LA in turtle smuggling case. (2012, May 1). Associated Press: Financial News.
2012	Romero, D. (2012, April 30). Turtle Smuggler Busted at LAX Sentenced: Atsushi Yamagami Gets 21 Months. LA Weekly (CA).
2012	Florida businessman sentenced to jail for exporting turtles to China. (2012, September 28). US Fed News (USA).
2012	Edgerton, A. (2012, September 25). Okeechobee turtle trafficker sentenced to prison - David Feltenberger pleaded guilty to federal charges of shipping wild turtles to China, and was sentenced to 90 days in prison and fined $20,000.. Miami Herald, The (FL).
2012	Roustan, W. (2012, November 1). Digest. Sun Sentinel (Fort Lauderdale, FL), p. 3B.
2012	Three Turtle Farmers Charged and Two Arrested for Illegal Turtle Trafficking. (2012, May 4). Targeted News Service (USA).
2012	Smith, V. (2012, February 1). Former Turtle Broker From Maryland Faces Possible Prison Time - The legal turtle harvest in the state goes on. City Paper (Baltimore, MD).
2012	Kilar, S. (2012, January 26). BRIEF: Chestertown man pleads guilty to trafficking turtles for meat. Sun, The: Web Edition Articles [TCA] (Baltimore, MD).
2012	Maryland Man Pleads Guilty to Violating the Lacey Act. (2012, January 24). Targeted News Service (USA).
2013	Feds: Seattle-area pet shop owner smuggled endangered turtles. (2013, May 8). Seattle Post-Intelligencer (WA).
2013	Paolone, M. (2013, April 4). North Country woman pleads guilty to smuggling more than 200 turtles, reptiles into Canada. Post-Standard, The (Syracuse, NY), p. A4.

2013	Gavin, R. (2013, April 4). Guilty plea in reptile case. Times Union, The (Albany, NY), p. A3.
2014	Everett pet shop owner turned animal smuggler: I went too far chasing my ëdreamí. (2014, January 16). Seattle Post-Intelligencer (WA).
2014	Campion, T. (2014, January 18). Everett, Wash. Turtle trafficker sentenced to one year in prison. Seattle Examiner (WA).
2014	Wash. Turtle trafficker gets year in prison. (2014, January 18). Associated Press State Wire: Washington (WA)
2014	Mustian, J. (2014, September 8). Turtle smuggling ring untangled. New Orleans Advocate, The (LA), p. 01A.
2014	Man puts turtles in his pants in cross-border smuggling attempt. (2014, September 26). Daily Miner & News (Kenora, Ontario, Canada), p. 14.
2014	Snell, R. (2014, September 27). Feds: Man ran turtle smuggling operation - Global ring used couriers, raked in cash, judge told. Detroit News, The (MI), p. A1.
2014	Snell, R. (2014, October 4). Detroit Zoo caring for 1,000 seized turtles. Detroit News, The (MI), p. A3.
2014	Senior, A. (2014, September 26). Man 'straps 51 live TURTLES to his legs and groin as he smuggles reptiles over border'. Daily Mirror, The: Web Edition Articles (London, England).
2014	Millward, D. (2014, September 26). Man caught with 51 turtles hidden in track suit bottoms and taped to his body - Canadian man faces up to 10 years imprisonment for reptile smuggling. Daily Telegraph, The/The Sunday Telegraph: Web Edition Articles (London, England).
2014	Snell, R. (2014, September 26). Man nabbed with 51 turtles in his pants. Detroit News, The (MI), p. A8.
2014	51 turtles hidden in a sweat pant: Smuggling at the US - Canadian border. (2014, September 26). Eturbo News (USA).
2014	Windsor man charged with smuggling 51 turtles in his sweatpants. (2014, September 26). Hamilton Spectator, The: Web Edition Articles (Ontario, Canada).
2014	Snell, R. (2014, November 18). Man charged in turtle smuggling denied bond. Detroit News, The (MI), p. A9.
2014	Man sent to federal prison for turtle smuggling. (2014, December 5). Associated Press State Wire: California (CA).
2014	Day, B. (2014, December 5). SAN GABRIEL Man convicted in turtle smuggling scheme. San Gabriel Valley Tribune (West Covina, CA), p. 9.
2014	Lannom, A. (2014, December 16). Man who sold turtles gets month in prison. Charleston Daily Mail (WV), p. P2A.
2014	White, K. (2014, December 16). Man jailed for illegal turtle sales. Charleston Gazette (WV), p. P14A.
2014	Steelhammer, R. (2014, May 1). Jackson man indicted over wild-turtle sales. Charleston Gazette (WV), p. P1A
2015	Warren, B. (2015, April 22). Covington turtle smuggler slapped with 15-month prison sentence. Times-Picayune, The: Web Edition Articles (New Orleans, LA).
2015	Resolved: To do better in 2015. (2015, January 1). Toronto Star, The (Ontario, Canada), p. A14.
2015	Turtle smuggler pleads guilty. (2015, December 2). Barrie Examiner, The (Ontario, Canada), p. C1 / Front
2015	Canadian student pleads guilty to turtle smuggling operations. (2015, December 2). Detroit News, The (MI), p. A9.
2015	Zurko, R. (2015, December 2). Smuggling turtles put odd bulges in pants: Man stripped of 51 turtles at border. Hartford Examiner (CT).

2015	Snell, R. (2015, September 19). 'Turtle Man' headed for captivity - Alleged smuggler likely to plead guilty, faces prison time. Detroit News, The (MI), p. A4.
2015	Nefer, B. (2015, December 2). Smuggler who was busted with 51 turtles taped tunder his pants pleads guilty. Family & Home Examiner (USA).
2015	Turtles smuggled ... In his PANTS!. (2015, December 2). Edmonton Sun, The (Alberta, Canada), p. A2.
2015	Chapman, R. (2015, December 6). Outdoors360.com is live with 2,000 visits per day. Lake City Reporter (FL), p. B6.
2015	Man caught with turtles in pants. (2015, December 6). San Diego Union-Tribune, The (CA), p. 10.
2015	No title. (2015, December 5). Nottingham Post (England), pp. 24-25.
2015	Editorial: Casual Fridays. (2015, December 3). Pitt News, The: University of Pittsburgh - Pittsburgh Campus (PA).
2015	Odd stories\ man who smuggled turtles in his pants pleads guilty in us. (2015, December 2). Augusta Chronicle, The (GA), p. A02.
2015	Squirming trousers - The Idler. (2015, December 9). Mercury (Durban, South Africa), p. 8.
2015	Louisiana briefs. (2015, August 6). Daily Review, The (Morgan City, LA), p. 11.
2015	Grimm, A. (2015, August 5). Illinois man sentenced to 3 1/2 years in turtle-smuggling sting. Timespicayune, The: Web Edition Articles (New Orleans, LA).
2015	Illinois man sentenced in Louisiana for turtle smuggling. (2015, August 6). Associated Press State Wire: Illinois (IL).
2015	JERSEY CITY BRIEFS. (2015, October 25). Hudson Reporter Publications (NJ).
2015	Sherman, T. (2015, October 21). Man sentenced as feds fight trafficking. Star-Ledger, The (Newark, NJ), p. 5.
2015	M. O'Neill, J. (2015, July 1). Guilty plea in illegal turtle trade scheme - jersey city man lacked permits, shipped animals out of state. Herald News (West Paterson, NJ), p. C03.
2016	Man fined for turtle smuggling. (2016, February 28). San Diego Union-Tribune, The (CA), p. 8.
2016	Turtle smuggler banned from owning reptiles. (2016, March 2). Cape Times, The (Cape Town, South Africa), p. 1.
2016	Langley, A. (2016, March 3). Turtle smuggler fined $3,500. Fort Erie Times (Ontario, Canada), p. A27
2016	Making a living smuggling turtles. (2016, March 6). Sierra Vista Herald (AZ).
2016	Loriggio, P. (2016, October 6). Smuggling exotics nets huge fines; Smugglers find creative ways of hiding exotic animals to bring them into Canada. Expositor, The (Brantford, Ontario, Canada), p. D4.
2016	California, Louisiana men accused of smuggling turtles. (2016, January 31). Associated Press State Wire: Louisiana (LA)
2016	Editorial: Short takes on bowl-game overload, no more flaming weather reports, and other weird stuff. (2016, April 16). St. Louis Post-Dispatch (MO), p. A10.
2016	Turtle smuggler gets 5. (2016, April 13). Calgary Sun, The (Alberta, Canada), p. A2.
2016	Canadian turtle smuggler receives nearly 5 years in prison. (2016, April 13). Daily Herald, The (Everett, WA).
2016	Briefs. (2016, April 13). Herald, The (Rock Hill, SC), p. 2A.
2016	Edwhite. (2016, April 13). Turtle smuggler jailed five years; Ontario man. London Free Press, The (Ontario, Canada), p. N3.
2016	United States/Canada: US Gives Canadian Turtle Smuggler 5 Years in Prison. (2016, April 18). Thai News Service (Bangkok, Thailand)

2016	Loriggio, P. (2016, October 6). Smuggling exotics nets huge fines; Smugglers find creative ways of hiding exotic animals to bring them into Canada. Expositor, The (Brantford, Ontario, Canada), p. D4.
2016	Weekly scorecard. (2016, March 15). Journal Gazette, The: Web Edition Articles (Fort Wayne, IN).
2017	Hubbuch, C. (2017, December 8). La crosse man indicted for trafficking turtles, salamanders. La Crosse Tribune (WI), p. B4.
2017	Grand jury returns indictments. (2017, December 6). US Fed News (USA)
2017	United States: Two Brothers Sentenced to 21 Months and 16 Months in Prison for Illegally Trafficking Threatened Alligator Snapping Turtles. (2017, December 19). Thai News Service (Bangkok, Thailand).
2017	Brennon Dixson, B. (2017, October 21). Wildlife Trafficking seizure nets tigers to deadly snakes. Daily Breeze (Torrance, CA), p. 3.
2017	Operation Jungle Book Targets Wildlife Trafficking, Leading to Federal Criminal Cases, Recovery of Numerous Animal Species. (2017, October 20). Targeted News Service (USA).
2017	Monterey Park man pleads guilty to smuggling poisonous cobras in potato chip cans. (2017, September 8). Pasadena Star-News: Web Edition Articles (CA)
2017	ODD & ENTERTAINING. (2017, July 27). Repository, The (Canton, OH), p. A2.
2017	United States: Two Brothers Sentenced to 21 Months and 16 Months in Prison for Illegally Trafficking Threatened Alligator Snapping Turtles. (2017, December 19). Thai News Service (Bangkok, Thailand).
2017	Briefly ACROSS THE STATE. (2017, December 16). Denton Record-Chronicle (TX), p. NEWS_A03.
2017	Gstalter, M. (2017, December 15). Video: 'Modern day dinosaurs' rescued by feds. Beaumont Enterprise, The: Web Edition Articles (TX).
2017	United States: Three Men Plead Guilty to Conspiracy to Violate the Lacey Act by Illegally Trafficking Threatened Alligator Snapping Turtles. (2017, August 25). Thai News Service (Bangkok, Thailand).
2017	Four Men Charged With the Illegal Trafficking of Threatened Alligator Snapping Turtles. (2017, May 4). Legal Monitor Worldwide (Jordan).
2017	Glenn, M. (2017, April 28). Four men charged in trafficking protected snapping turtles. Houston Chronicle: Web Edition Articles (TX).
2018	Fretwell, S. (2018, July 9). Man imported 220 deadly snakes to SC, where illegal animal trade is growing. Herald, The (Rock Hill, SC), p. 3A.
2018	Fretwell, S. (2018, July 8). Booming black market puts SC wildlife in peril. State, The (Columbia, SC), p. 1.
2018	Sol Warren, M. (2018, July 26). Why smugglers want N.J. turtles. Expresstimes, The (Easton, PA), p. 003.
2018	Avilucea, I. (2018, July 16). Lawyer for indicted former Trentonian reporter says he had 'legitimate' turtle business. Trentonian, The (Trenton, NJ).
2018	Sol Warren, M. (2018, July 25). Why smugglers want N.J. turtles Turtles Recent arrest underscores threat of $19B wildlife trafficking industry. Star-Ledger, The (Newark, NJ), p. 015.
2018	Business of Poaching. (2018, September 4). Cape Times, The (Cape Town, South Africa), p. 12
2018	UPDATED: Levittown Man Trafficked More Than 3,500 Protected Turtles, Feds Say. (2018, July 10). Levittownnow.com (Bristol, PA).
2018	United States: Pennsylvania Man Indicted for Trafficking Turtles. (2018, July 12). Thai News Service (Bangkok, Thailand).

2018	Pennsylvania Man Indicted for Trafficking Turtles. (2018, July 10). Targeted News Service (USA).
2018	No title. (2018, July 11). The Jaffe Briefing - July 11, 2018. Tapinto.net (NJ).
2018	Sabur, R. & Smith, N. (2018, September 15). New Jersey becomes unlikely hotbed of turtle poaching to supply appetites for delicacy in China. Daily Telegraph, The/The Sunday Telegraph: Web Edition Articles (London, England).
2018	Avilucea, I. (2018, July 10). Former Trentonian reporter indicted for smuggling protected turtles out of New Jersey. Trentonian, The (Trenton, NJ).
2018	Sabur, R. & Smith, N. (2018, September 16). Case of September 16, 2018, The/The Sunday Telegraph (London, England) Page: 15.
2018	SOJC Professor Peter Laufer discusses his latest book, ëdreaming in Turtleí. (2018, December 1). Daily Emerald: University of Oregon (Eugene, OR).
2018	Cahalan, S. (2018, November 11). POSTSCRIPT; Books Shelling out The insatiable Chinese appetite for turtles could lead to the animal's extinction in the US. New York Post (NY), p. 044.
2018	Ponchatoula turtle farmer pleads guilty to lacey act violation. (2018, August 22). US Fed News (USA).
2018	Rhoden, R. (2018, August 26). Turtle farmer pleads guilty to illegal exporting. Times-Picayune, The (New Orleans, LA), p. H02.
2018	28-year-old man convicted for shipping turtles unlawfully. (2018, June 4). Legal Monitor Worldwide (Jordan).
2018	Man sentenced for smuggling king cobras. (2018, January 28). San Diego Union-Tribune, The (CA), p. 10.
2018	Shuster, F. (2018, January 22). Man who smuggled 3 king cobra snakes in potato chip cans gets 5 months in prison. Orange County Register, The: Web Edition Articles (CA).
2018	Fretwell, S. (2018, September 5). Scheme that hid rare turtles in candy wrappers brings down SC wildlife smugglers. State, The: Web Edition Articles (Columbia, SC).
2018	Jackson, A. (2018, September 7). SC men admit to running international turtle-smuggling operation. Post and Courier, The (Charleston, SC), p. 004.
2018	Yee, G. (2018, June 21). Holly Hill man caught smuggling up to $400,000 in turtles from Hong Kong. Post and Courier, The (Charleston, SC), p. 004.
2018	Rose Brown, M. (2018, June 20). Holly Hill man admits turtle smuggling scheme. Times and Democrat, The (Orangeburg, SC).
2018	Feds: Smuggler pleads guilty to shipping protected turtles. (2018, June 21). Associated Press State Wire: South Carolina (SC).
2018	Fretwell, S. (2018, June 20). Holly Hill man pleads guilty in international reptile-trading scheme. State, The (Columbia, SC), p. 3.
2018	Smugglers target endangered species. (2018, February 21). Stayner Sun, The (Ontario, Canada).
2019	Former Trentonian reporter sentenced for turtle smuggling. (2019, August 29). Trentonian, The (Trenton, NJ).
2019	Auciello, J. (2019, August 31). Pa. Man gets jail time for trafficking protected turtles from N.J. marshes. WHYY.org (Philadelphia, PA).
2019	No title. (2019, September 1). Patriot-News, The (Harrisburg, PA), p. 010
2019	Walsh, J. (2019, February 19). Feds: smuggling ring had south jersey connection. Record, the (Hackensack, NJ), p. A4.
2019	Turtle-smuggling ex-journalist admits poaching thousands. (2019, February 6). Hunterdon County Democrat (Flemington, NJ), p. 008.

2019	Gartland, M. (2019, August 31). Turtle-poach reporter gets 6 mos. In jail. New York Daily News (NY), p. 17CS.
2019	Auciello, J. (2019, February 6). Pa. Man pleads guilty to trafficking prized turtles. WHYY.org (Philadelphia, PA).
2019	Kummer, F. (2019, February 5). Man pleads guilty in $530k N.J. turtle trafficking case Man pleads guilty in $530k illegal NJ turtle trafficking case. Press of Atlantic City, The (NJ), p. 1C.
2019	Former Reporter Pleads Guilty To Turtle Trafficking. (2019, February 4). Levittownnow.com (Bristol, PA).
2019	Stricter enforcement, public help needed to stop turtle poaching. (2019, February 22). Press of Atlantic City, The (NJ), p. 6A.
2019	Sofield, T. (2019, August 29). Former Reporter Sentenced To Prison In Turtle Trafficking Case. Levittownnow.com (Bristol, PA).
2019	Roebuck, J. (2019, August 30). Illegal turtle seller sentenced - He gets 6 months and must pay $250K in restitution. Philadelphia Inquirer, The. (Philadelphia, PA), p. B1.
2019	Pennsylvania Man Sentenced for Trafficking Protected Turtles. (2019, August 30). Https://foreignaffairs.co.nz/ (New Zealand).
2019	Bucks County man sentenced to prison for trafficking protected diamondback turtles. (2019, August 30). Daily American, The (Somerset, PA).
2019	Man sentenced for poaching protected turtles. (2019, August 30). Bucks County Courier Times (Levittown, PA), p. A7.
2019	Chinese national sentenced to prison for smuggling protected U.S. wildlife. (2019, October 29). Shippensburg News-Chronicle, The (PA).
2019	Miller, M. (2019, October 10). Judge shells out federal prison term for ex-Penn State student in international turtle smuggling case. Patriot-News, The: Web Edition Articles (Harrisburg, PA).
2019	Man sentenced for smuggling endangered turtles into China. (2019, October 11). Associated Press State Wire: Pennsylvania (PA).
2019	Walsh, J. (2019, February 19). Feds: smuggling ring had south jersey connection. Record, the (Hackensack, NJ), p. A4.
2019	MIL-OSI USA: Sacramento County Resident Indicted For Illegally Exporting Turtles To Hong Kong. (2019, October 24). Foreignaffairs (New Zealand).
2019	Moleski, V. (2019, October 26). Woman charged with smuggling turtles. Sacramento Bee, The (CA), p. 4A.
2019	Rohrlich, J. (2019, August 12). Undercover sting takes down international endangered turtles smuggler. Quartz.
2019	Gartrell, N. (2019, August 11). Man accused of turtle smuggling makes first court appearance in Bay Area. Daily News, The (Palo Alto, CA)
2019	Salamanders and turtles found smuggling into U.S., Worcester man charged. (2019, November 25). Legal Monitor Worldwide (Jordan).
2019	MIL-OSI Security: Worcester Man Indicted for Wildlife Smuggling. (2019, November 22). Foreignaffairs (New Zealand).
2019	Telegram & Gazette Staff. (2019, October 25). Worcester man charged with smuggling turtles from China. Worcester Telegram & Gazette (MA), p. B3.
2019	Bonner, M. (2019, October 24). Worcester man arrested after smuggling protected turtles in socks, toy trucks to and from Hong Kong. Republican, The: Web Edition Articles (Springfield, MA).
2019	Fretwell, S. (2019, October 3). International reptile trader found in storage shed. Herald, The (Rock Hill, SC), p. 3A.

2019	Fretwell, S. (2019, September 21). Black market wildlife trade leads to SC - again. Herald, The (Rock Hill, SC), p. 3A
2019	For unlawfully shipping reptiles to China Nathan Horton got inculpated.. (2019, August 22). Legal Monitor Worldwide (Jordan)
2019	Officers stake out 2 airports, nab accused turtle trafficker. (2019, August 21). Camden News (AR), p. 18.
2019	Man accused of turtle trafficking - newspanorama Around the world in 10 stories: UNITED STATES. (2019, August 17). The Paper For Today (London, England), p. 32.
2019	Turtle trafficker to serve time. (2019, March 13). Sun Times, The (Owen Sound, Ontario, Canada), p. B8.
2019	Fretwell, S. (2019, May 3). SC wildlife trader going to prison. State, The (Columbia, SC), p. 1.
2019	Man gets prison for smuggling turtles in candy wrappers. (2019, May 2). Associated Press State Wire: Florida (FL)
2019	Holly Hill man going to prison for international turtle smuggling. (2019, March 12). Times and Democrat, The (Orangeburg, SC)
2019	Monk and Sammy Fretwell, J. (2019, March 11). He traded rare turtles on the black market. Now, SC man is going to prison. Herald-Sun, The (Durham, NC).
2019	(2019, June 19). Star-Ledger, The (Newark, NJ), p. 008
2019	Fretwell, S. (2019, June 17). He illegally traded rare turtles to make money. Now, he's suffering the consequences. Herald-Sun, The (Durham, NC).
2019	MIL-OSI Security: Chinese National Pleads Guilty to Smuggling More Than 300 Endangered and Vulnerable Turtles from the U.S. to China. (2019, November 27). Foreignaffairs (New Zealand).
2019	Chinese national pleads guilty to smuggling turtles from U.S. to China - The man, a resident of China, smuggled an estimated $250,000 worth of turtles into China. (2019, November 27). NBC - 8 KGW (Portland, OR).
2019	Bernstein, M. (2019, November 27). Chinese national, with help from Eugene accomplice, smuggled more than 300 endangered live turtles from U.S. to China. Oregonian, The: Web Edition Articles (Portland, OR).
2019	Deffenbacher, C. (2019, November 27). Man accused of smuggling 315 endangered turtles to China, with a Eugene co-conspirator. Register-Guard, The (Eugene, OR)
2020	Chinese Man Extradited for Financing Turtle-Trafficking Ring. (2020, December 19). Legal Monitor Worldwide (Jordan).
2020	A 24 year old criminal got deported for financial forgery. (2020, December 18). Legal Monitor Worldwide (Jordan).
2020	Fieseler, C. (2020, December 11). Chinese national held in global $2.2 million turtle smuggling scheme. Washington Post, The.
2020	Chinese national extradited to US from Malaysia on money laundering charges; smuggling turtles. (2020, December 12). Governance, Risk & Compliance Monitor Worldwide (Amman, Jordan).
2020	Chinese national held in $2.2M turtle scheme. (2020, December 12). Pittsburgh Post-Gazette (PA), pp. WA-8.
2020	Demarco, J. (2020, December 10). Feds: Chinese Citizen Who Financed $2.25M Exotic turtlesmuggling Operation Extradited To NJ. Bergen County Daily Voice (NJ).
2020	Molseed, J. (2020, June 20). New pilot program monitors Blanding's turtle population. Post-Bulletin (Rochester, MN).
2020	Ariza, M. (2020, January 16). Smugglers nabbed nearly 6,000 protected turtles Planned for the animals to be sold as pets in China. Sun Sentinel (Fort Lauderdale, FL), p. 1.

2020	Salamander and turtle smuggler avoids prison time. (2020, October 6). Associated Press State Wire: Massachusetts (MA).
2020	MIL-OSI Security: Worcester Man Sentenced for Wildlife Smuggling. (2020, October 6).foreignaffairs (New Zealand).
2020	Stening, T. (2020, October 5). Nathan Boss, Worcester man who smuggled protected turtles, salamander into US, sentenced in federal court to probation. Republican, The: Web Edition Articles (Springfield, MA).
2020	Biswas, J. (2020, June 9). Worcester Man Pleads Guilty to Illegally Importing And Exporting Wildlife. International Business Times: Singapore Edition (Singapore).
2020	Croteau, S. (2020, June 9). Worcester man who smuggled protected turtles, salamander into US pleads guilty to federal charges. Republican, The: Web Edition Articles (Springfield, MA).
2020	H. Foskett Jr., S. (2020, October 7). Man gets time served for smuggling turtles and salamanders. Metrowest Daily News, The (Framingham, MA), p. A3.
2020	MIL-OSI Security: Prolific turtle trapper indicted for illegally trapping thousands of freshwater turtles. (2020, December 16). Foreignaffairs (New Zealand).
2020	Yee, G. (2020, December 7). With new law protecting SC's reptiles and amphibians, conservationists look to future. Post and Courier, The (Charleston, SC), p. 001.
2020	Box-turtle trade rap. (2020, January 30). New York Post (NY), p. 008.
2021	Fretwell, S. (2021, April 3). Man with SC ties indicted on wildlife trafficking charges. State, The (Columbia, SC), p. 3A.
2021	Reptile Dealer Arrested on Lacey Act and Firearms Charges. (2021, April 19). Legal Monitor Worldwide (Jordan).
2021	Fretwell, S. (2021, May 23). State helpless to confiscate deadly snakes from premises. State, The (Columbia, SC), p. 1A.
2021	Reptile dealer charged with trafficking turtles, vipers. (2021, April 3). Albany Herald, The (GA).
2021	Estep, B. (2021, September 17). Ky. Man charged with illegally selling turtles for pet market. Lexington heraldleader (KY), p. 3A
2021	Chinese national gets prison for $2.25M turtle smuggling ring. (2021, October 8). Star Democrat, The (Easton, MD), p. A2.
2021	Foreign National Sentenced for Money Laundering Funds to Promote Turtle Trafficking. (2021, October 15). Legal Monitor Worldwide (Jordan)
2021	Friedmann, M. (2021, October 7). Turtle protectors work together to end poaching. Connecticut Post (Bridgeport, CT), p. A014.
2021	Fleshler, D. (2021, October 7). 'Lizard King' charged with wildlife smuggling. Sun Sentinel (Fort Lauderdale, FL), p. 6.
2021	Ëlizard King' wildlife smuggler charged with trafficking turtles. (2021, October 8). Bismarck Tribune, The (ND), p. 5.
2021	Alleged ringleaders of Florida turtle smuggling ring indicted. (2021, October 6). CE Noticias Financieras: English
2021	Fleshler, D. (2021, October 5). Florida's ëlizard Kingí charged with smuggling turtles to Asia. Sun Sentinel: Web Edition Articles [TCA] (Fort Lauderdale, FL)
2021	South Florida wildlife dealer and company charged in scheme to harvest and sell protected turtles. (2021, October 5). US Fed News (USA)
2021	J. Neal, D. (2021, October 7). Did 'The Lizard King' use his Hollywood business to smuggle Florida turtles overseas?. Miami Herald, The (FL), p. 6A.
2021	Finn, J. (2021, October 26). A sting caught them illegally selling box turtles, the feds say; they got a year's probation. Advocate, The (Baton Rouge, LA)

2021	Baurick, T. (2021, January 8). Couple charged with illegally selling Louisiana box turtles. New Orleans Advocate, The (LA).
2021	Ore. U.S. Attorney: California Man Pleads Guilty for Role in Scheme to Smuggle Endangered and Vulnerable Turtles From the U.S. to China. (2021, May 8). Targeted News Service (USA).

Supplementary Table 6: Month and year of Department of Justice Monthly Bulletins with identified cases. Bulletins are available from 2006-2014 here: https://www.justice.gov/enrd/environmental-crimes-monthly-bulletins-archive and from 2015-2022 here: https://www.justice.gov/enrd/selected-publications/environmental-crimes-monthly-bulletins.

Month-Year	
Jun-08	May-16
Jan-10	Jul-17
Feb-11	Dec-17
Jul-11	Jan-18
Jun-12	Feb-18
Sep-12	May-18
Feb-13	Oct-18
Sep-13	Dec-18
Feb-14	Jun-19
Jan-15	Sep-19
Feb-15	Jan-20
May-15	Feb-20
Jun-15	Mar-20
Sep-15	Nov-20
Nov-15	Dec-20
Nov-15	May-21
Jan-16	

Appendix B: Supplementary information for Chapter 3

Detailed Account of LEMIS data cleaning and filters

For many records, species are only identified at the Genus level. We conducted our analysis at this same level but corrected or filtered out any records that were at the species level where needed (i.e., if a species' taxonomy changed or if it was a nonnative species).

1. **Sea turtles:** Not relevant to our questions of emergent trends in the commercial pet and meat trades, therefore not included.
2. **Tortoises**: Five species of tortoises occur in the US, and a 6th only occurs in Mexico (*Gopherus* spp.). LEMIS only contains 11 records of live *Gopherus* species traded for commercial purposes, totaling 155 animals. Nine of the 11 records were of animals originating in Mexico. Only one export record was found of 300 animals going to Germany, but they also originated in Mexico, according to the records. Given these small numbers, we did not include tortoises in our analyses of US exports.
3. **Freshwater turtle genera:** We filtered for genera and species native to the US and verified species names according to the Integrated Taxonomic Information System (ITIS) and Ernst and Lovich 2009: Turtles of the United States and Canada (2nd Edition). This included:

    Actinemys

    Apalone

    Chelydra

    Chrysemys

Clemmys

Deirochelys

Emydoidea

Glyptemys

Graptemys

Kinosternon

Macrochelys

Malaclemys

Pseudemys

Sternotherus

Terrapene

Trachemys

+ Genera That Have Since Changed:

Trionyx

Macroclemys

4. **Taxonomic corrections:** at the Genera and Species level, verified with ITIS. We assume that if a record has uses outdated taxonomy and identifies the animal to the species level, then that the species name, rather than the genus name, is the intended identification. Species names were also added to monotypic genera.

Chrysemys concinna → *Pseudemys concinna*

Chrysemys nelson → *Pseudemys nelson*

Clemmys insculpta → *Glyptemys insculpta*

Clemmys marmorata → *Actinemys marmorata*

Emydoidea blandingi → *Emydoidea blandingii*

Graptemys nigranoda → *Graptemys nigrinoda*

Graptemys pseudogeog.kohnii → *Graptemys pseudogeographica*

Sternotherus carinatum → *Sternotherus carinatus*

Kinosternon cruentatum → *Kinosternon scorpioides*

Kinosternon minor → *Sternotherus minor*

Kinosternon odoratum → *Sternotherus odoratus*

Malaclemys species → *Malaclemys terrapin*

Pseudemys floridana → *Pseudemys concinna*

Macroclemys temmincki → *Macrochelys temminckii*

Trionyx spiniferus → *Apalone spiniferus*

Trionyx Ferox → *Apalone ferox*

5. **Nonnative species of native genera:** We removed these species which are not native to the US. While it is highly possible that breeders in the US produce and export these species, we wanted to get as accurate of a representation as possible of the numbers of turtles that *could *potentially* be taken from the wild in the US*. Native genera that did not identify to the species level were kept (e.g., "Kinosternon species").

Kinosternon acutum

Kinosternon angustipons

Kinosternon creaseri

Kinosternon scorpioides

Kinosternon herrerai

Kinosternon integrum

Kinosternon leucostomum

Kinosternon oaxacae

Trachemys decorata

Trachemys decussata

Trachemys dorbigni

Trachemys stejnegeri

Supplementary Table 7: Reviewed CITES policy documents, working group reports, and other grey literature relevant to Chapter 3.

Type	Title and/or Description (if applicable)	Year	Ref. # or Citation	Result (if applicable)
CITES Proposal	Inclusion of *Clemmys insculpta* in App. II. (*Now *Glyptemys insculpta*)	1992	CoP8 Prop. 51	Adopted
CITES Proposal	Transfer of *Clemmvs muhlenbergii* from App. Il to App. I. (*Now *Glyptemys muhlenbergii*)	1992	CoP8 Prop. 52	Adopted
CITES Proposal	Inclusion of all species in the genus *Terrapene* in App. II, retaining *T. coahuila* in App. I • Increasing international demand for box turtles after 1984 EU ban on Mediterranean land tortoises • Lots of wild collection for pet trade	1994	CoP9 Prop. 43	Adopted
USFWS Proposed Rules	Export of Box Turtles from the US in 1996	1996	61 FR 3894	Abandoned quota system, essentially halted exports
USFWS Notice	Species being considered for amendments to CITES Appendices • Seeks information on *Apalone*, *Graptemys*, *Macrochelys*	1996	61 FR 44324	Proposed listing *Graptemys*, *Macrochelys* – 62 FR 18559
USFWS Proposal	Species changes proposed by the US for CITES • Proposing to list *Graptemys*, *Macrochelys* • Not proposing *Apalone*	1997	62 FR 18559	See Prop. 10.59 & Prop. 10.57 &
CITES Proposal	Inclusion of the entire turtle genus *Graptemys* in Appendix II	1997	Prop. 10.59	Rejected • Received majority vote, but not 2/3 vote required for adoption
CITES Proposal	Inclusion of *Macroclemys temminckii* in Appendix II (*Now *Macrochelys temminckii*)	1997	Prop. 10.57	Withdrawn • "…some countries expressed the view that international trade is minimal and conservation problems should be addressed through domestic measures. There was also opposition from Louisiana." – 64 FR 36893

Type	Title and/or Description (if applicable)	Year	Ref. # or Citation	Result (if applicable)
NYT article	Turtles Vanish in Black Hole: Soup Pots and Pans of China • Reports on how vet/hobbyist/turtle enthusiast found North American turtles in markets in Asia	1999	Yoon, 5/4/1999	Increased momentum for evaluating turtle trade – See van Dijk et al. 2000
USFWS Notice	CITES 11th meeting agenda items; species being considered for amendments to CITES Appendices • Possible illegal trade in App. I southeast Asian freshwater turtles for the East Asian food market • Considering proposing *Clemmys guttata* • Not considering *Chelydra, Macrochelys, Graptemys, Apalone*	1999	64 FR 36893	
Workshop report	Asian turtle trade: Proceedings of a workshop on Conservation and Trade of Freshwater Turtles and Tortoises in Asia	2000	van Dijk et al. 2000	"Asian turtle crisis" prompts CITES listings and international attention to turtle trade
USFWS Proposed Rule	Proposed rule to include several species to CITES App III • Proposed listing of *Macrochelys* o Population declines due to habitat loss + personal consumption and marketing for meat o Considered for ESA listing o Commercial use prohibited except in Louisiana and Mississippi, personal use allowed in most states. o "Almost no management of the species by state agencies" o Meat trade much larger than pet trade • Proposed listing of all 12 *Graptemys* spp. o "The degree of wild harvest is unknown but could be very substantial" o Pet trade much larger than meat trade	2000	65 FR 4217	Listed in 2006 – See 70 FR 74700
CITES Proposal	Inclusion of *Clemmys guttata* in Appendix II • Collected from the wild for commercial, domestic pet trade • Number collected for pet trade has not been quantified	2000	Prop. 11.37	Rejected – See 66 FR 27603
USFWS Rules and Regulations	Changes in list of species in appendices of CITES • Spotted turtle proposal rejected due to "significant opposition from EU countries led to defeat…based on opposition to submission of a proposal for an endemic	2001	66 FR 27603	n/a

Type	Title and/or Description (if applicable)	Year	Ref. # or Citation	Result (if applicable)
	species. Parties argued it should be up to the US to adopt domestic laws regulating trade as they are native species"			
USFWS Notice	CITES agenda items and proposal considerations • Considerable international focus on the status and trade of Asian turtles since publication of Asian Turtle Trade report in 2000 • Requesting additional information on *Apalone* spp. • Not considering proposals for *Macrochelys, Graptemys,* or *Clemmys*	2002	67 FR 19207	No proposals
USFWS Report	Conservation status of live US nonmarine turtles in domestic and international trade (main points cited in text)	2003	Reed and Gibbons 2003	n/a
CITES Report	Development of mid- and long-term conservation measures for tortoises and freshwater turtles • Documents the shifts in (primarily) Asian turtle aquaculture and exploitation, growth of turtle farming particularly in China • High value of some species means farmers (in China) are secretive about production • "Noteworthy in particular is that rearing and farming efforts have encompassed a range of North American species"	2003	AC19 Doc. 15.2 (Rev 1)	n/a

USFWS Rules and Regulations	Inclusion of alligator snapping turtles (*Macrochelys temminckii*) and all species of map turtles (*Graptemys* spp.) in App. III of CITES
	• *Macrochelys*
	  o Inconsistent regulations across states
	  o Louisiana confirms most animals captive-bred in the state
	  o Turtle farming industry has increased, but dependence on wild-caught animals has not decreased due to increased demand (meat and pet trade)
	• *Graptemys*
		2005	70 FR 74700	n/a

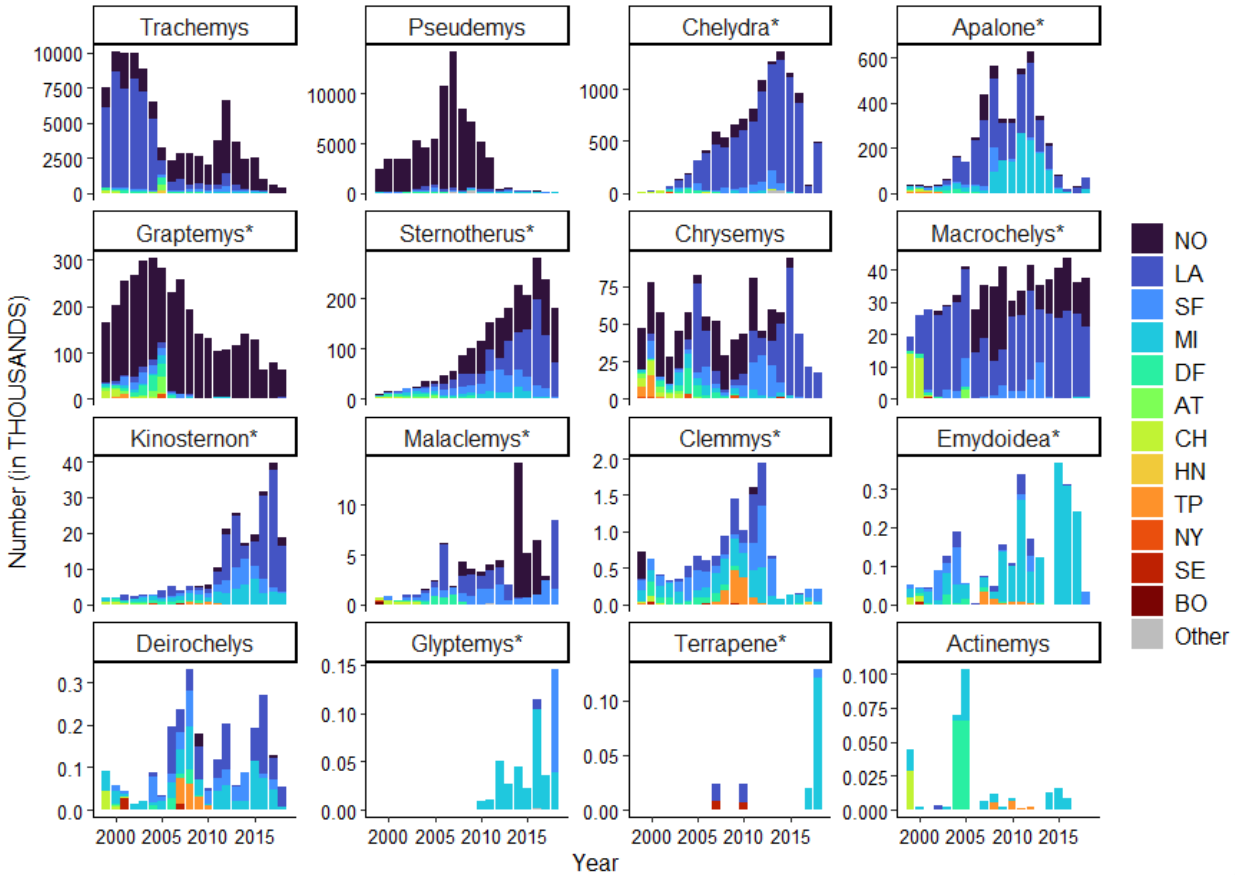
Type	Title and/or Description (if applicable)	Year	Ref. # or Citation	Result (if applicable)
	○ Rise in demand due to increased popularity in pet trade ○ Closure of many countries to imports of red-eared sliders may have led to surge in demand for map turtles			
USFWS Notice	Considerations for 15th CITES • Undecided on *Chelydra serpentina, Clemmys guttata, Malaclemys terrapin, Apalone* spp. • Not likely to submit proposals for *Macrochelys* and *Graptemys* for App. II	2009	74 FR 33460	No proposals
Workshop presentations	Conservation and Trade Management of Freshwater and Terrestrial Turtles in the United States (14 presentations, hosted by USFWS)	2010	n/a	Recommended North American turtles be listed under Appendix II
CITES Report	A study of progress on conservation of and trade in CITES-listed tortoises and freshwater turtles in Asia • Boom-and-bust patterns; decline in trade volumes due to regulations/enforcement or population depletion • Farms raising North American species (softshells, snapping turtles, sliders) maturing towards partial closed-cycle farming • Available data not detailed enough to separate pet/food/medicinal uses nor to discern trends in illegal trade • "Sequential exploitation"	2011	AC25 Doc. 19	n/a
USFWS Notice	Considerations for 16th CITES • Undecided on map, Blanding's, spotted, alligator snapping, diamondback terrapins • Unlikely to propose flattened musk and softshell turtles • "NOTE: We are aware of the fact that turtles as a group are among the world's most endangered vertebrates…"	2012	77 FR 21798 (abbreviated version)	Proposed App. II listing of spotted, Blanding's and diamondback terrapins – See CoP16 Prop. 29, 30, & 31
CITES Proposal	Inclusion of *Clemmys guttata* in App. II • Although harvest regulated throughout much of its range it is collected from the wild for national and international commercial trade, primarily destined for Asia	2013	CoP16 Prop. 29	Adopted

Type	Title and/or Description (if applicable)	Year	Ref. # or Citation	Result (if applicable)
CITES Proposal	Inclusion of *Emydoidea blandingii* in App. II • IUCN TFTSG identified the elimination of commercial collecting as an immediate conservation need • Oct. 2012 Reptiles magazine featured Blanding's turtles as one of the most "engaging and interesting turtles" to keep • "because the species is not CITES listed, it is not possible to determine whether the animals are [captive-bred]… and [amount of take from the wild]" • Reportedly high level of captive breeding abrupt shift from earlier analyses • Most trade as live pets • High market value due to rarity and ornate markings	2013	CoP16 Prop. 30	Adopted
CITES Proposal	Inclusion of Malaclemys terrapin in App. II • Collected for use primarily as pets, exported primarily to Asia, some food trade • 2006 was last year commercial harvest was allowed in Maryland, 10,500 reportedly caught • "Asian countries began importing Malaclemys terrapin due to depletion of most of their turtle species, with some vendors selling as many as 2-3k in a year"	2013	CoP16 Prop. 31	Adopted
USFWS Proposed Rule	To include *Chelydra serpentina* and *Apalone* spp. to App. III • Level of wild harvest needed to maintain farm production unknown • Potential for sustained high demand, especially in China	2014	79 FR 64553	Listed in 2016 – See 81 FR 32664
USFWS Notice	CITES 17th meeting considerations • Unlikely to submit App. II proposals for softshell, map, or alligator snapping turtles	2015	80 FR 51830	No proposals
USFWS Rules and Regulations	Inclusion of *Chelydra serpentina* and *Apalone* spp. to App. III • Public comments opposed summary points: over-regulation of legitimate businesses, unnecessary because species are common, regulations should be up to the states, no evidence to warrant listing, captive breeding reduces pressure of wild harvest, economically powerful and	2016	81 FR 32664	n/a

Type	Title and/or Description (if applicable)	Year	Ref. # or Citation	Result (if applicable)
	litigious environmental groups seek to criminalize pet ownership, differences in ecology north to south • Public comments in support main points: good but App II would be better, need better monitoring of origins of turtles in trade, increase in harvest concerning for long-term sustainability • Public comments other: protection would be more successful if we banned trade through App. I listing, need studies on effects of offtake, patchwork of regulations, Asian turtle crisis, preference for wild turtles • Louisiana opposed, Florida stressed need for expedient permitting.			
CITES Report	Illegal trade in tortoises and freshwater turtles • Original goal to examine trade for different purposes (pets/food/medicinal) but this was not feasible in practice • Illegal intertwined with legal • World's largest exporter of turtles was US from 2011-2014 • Number of seizure events higher in North America/Europe, but total volume per seizure is higher in Asia. • 2008 recession may have influence decline in trade, uptick in 2012 also corresponds to greater enforcement awareness/effort • No strong patterns of illegal trade emerged; seizures happen in most countries, animals originate form across the globe and are destined for countries on all continents.	2016	CoP17 Doc. 73	n/a
Agency report	Action plan for North America: Sustainable trade in turtles and tortoises	2017	CEC 2017	n/a
USFWS Notices	CITES 18th meeting considerations • Undecided on uplisting *Graptemys, Macrochelys* from III to II	2018	83 FR 49421	No proposals
State Agency Report	Commercial Aquatic Turtle Harvest 2004-2017 – Report to Arkansas Game and Fish Commission • Overall volume and number of reporting trappers declined	2018	Irwin 2018	n/a

Type	Title and/or Description (if applicable)	Year	Ref. # or Citation	Result (if applicable)
State Agency Report	Louisiana Summary: Agriculture and Natural Resources (2004-2019) • 2004: "Pet turtle hatchling production continued to increase, with industry estimates of more than 13 million hatchlings produced. Problems with export markets in Asia, specifically China, resulted in low prices and many unsold hatchlings"	2004-2019	AgCenter 2019	n/a
NGO Report	Case Study: US Freshwater Turtles and Tortoises in the context of CITES • Most traded species switches from sliders to snapping turtles • Shipments labeled "wild caught" likely from farms; strict requirements to be labeled captive-bred	2020	AFWA 2020	n/a
Public Comments	Comments on CITES 19th meeting proposals from: Arkansas Game and Fish Commission, US Association of Reptile Keepers, Animal Welfare Institute, Florida Department of Agriculture and Consumer Services, Natural Resource Defense Council, Species Survival Network, Turtle Source, and World Animal Protection	2022	Federal Docket FWS-HQ-IA-2021-0008	n/a
CITES Proposal	Transfer of *Chelydra serpentina* and *Macrochelys temminckii* from App. III to App. II • Legal acquisition of founder stock remains unknown • App. II will provide ability to assess sustainable use of this stock • Predominantly for meat consumption • Alligator snappers historically harvested in large numbers for domestic consumptions (60s/70s), international trade rose in 90s.	2022	CoP19 Prop. 23	Adopted
CITES Proposal	Transfer 5 big-headed *Graptemys* turtles from App. III to App. II	2022	CoP19 Prop. 24	Adopted
CITES Proposal	Inclusion of *Kinosternon* spp. in App. II • "To a different extent and with different sources, all the species are traded legally and illegally for use as pets and	2022	CoP19 Prop. 29	Adopted

Type	Title and/or Description (if applicable)	Year	Ref. # or Citation	Result (if applicable)
	as raw material to make decorative objects, musical instruments and homeopathic medicines"			
CITES Proposal	Inclusion of *Sternotherus* spp. in App. II • Asian imports of mud and musk turtles increased significantly creating a sudden demand for wild-caught turtles for export and to stock captive farms to meet growing market demand • Majority of demand thought to be for pet trade • Collection of wild musk turtles in US for domestic pet trade is likely but definitive information on this is lacking.	2022	CoP19 Prop. 31	Adopted
CITES Proposal	Transfer *Apalone* spp. from App. III to App. II • Freshwater turtles species from North America typically easier to breed than most species from Asia • For most traded species, population size inferred from volume in trade/prevalence in markets. Neither of those readily available for *Apalone* • Boom-bust/sequential exploitation: decline of alligator snappers forced market to exploit smaller, more common freshwater turtles • Unknown age classes of traded animals • Total number of turtle produced in US steadily decreased as self-sustaining softshell farms established in Asia • Asia->Africa->North America -> App. III listing was due to anticipation of increase in trade • "Even the network of extensive turtle aquaculture farms in the southeastern United States cannot fully relieve harvest pressure on wild populations, resulting in illegal trade to meet demand"	2022	CoP19 Prop. 32	Adopted

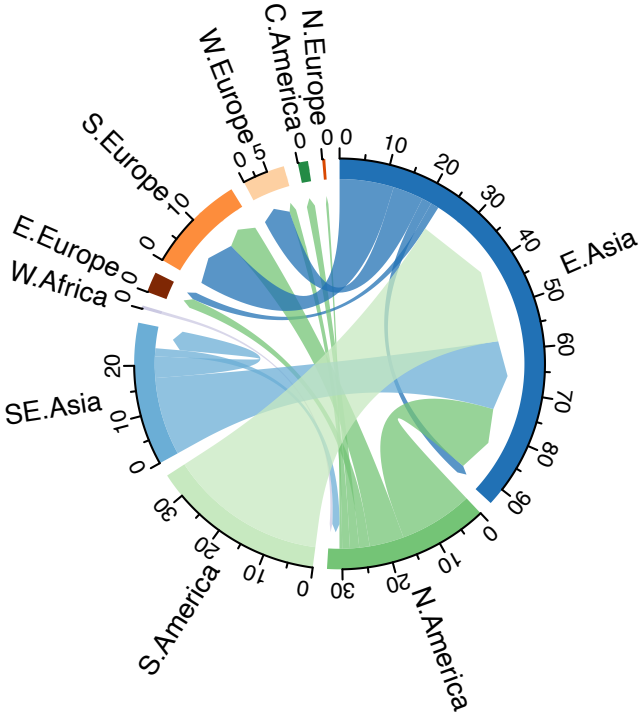


Supplementary Figure 1: Number of live turtles exported from the US from 1999-2018. Export volumes are color-coded by the US ports of export which accounted for 95% of total exports of each genus, each year. The "Other" port sums all the ports of export that each accounted for < 5% of exports.

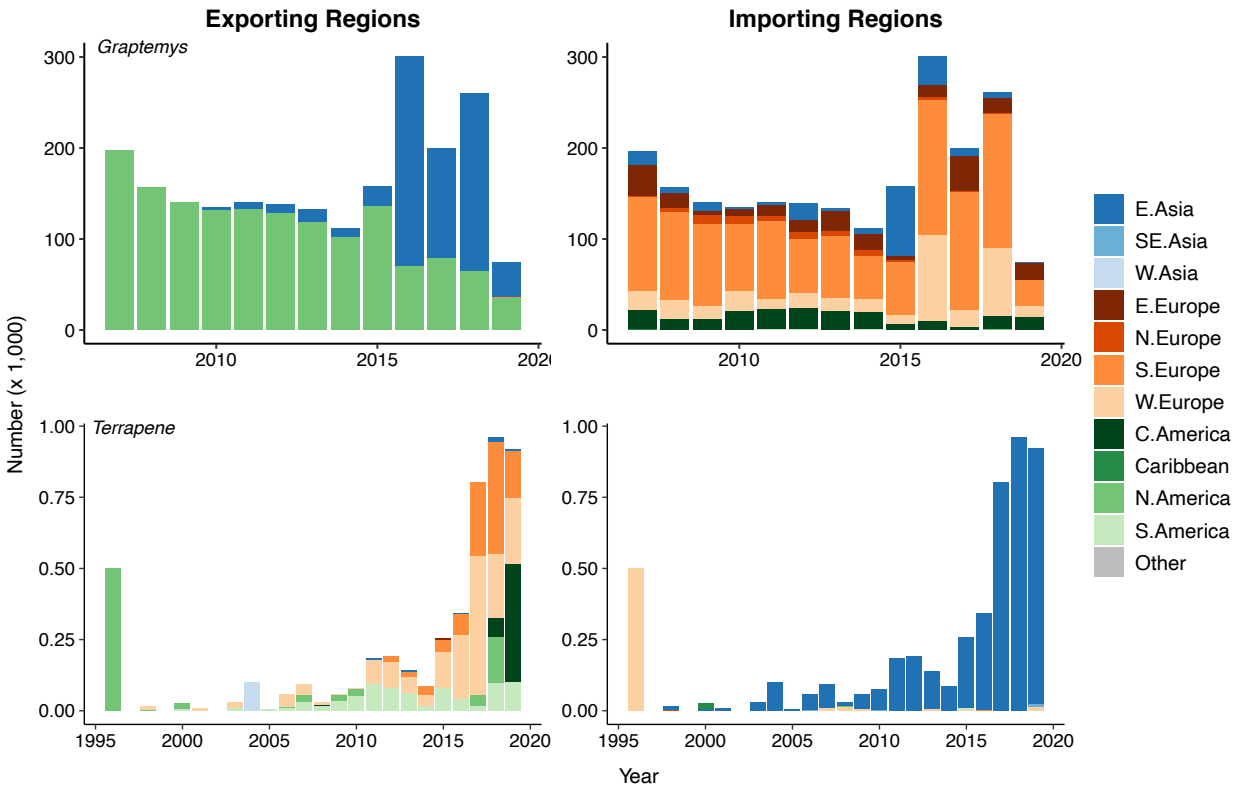
CITES Trade Data Comparisons

We queried the CITES Trade Database for live Testudines shipped for commercial purposes from 1975-2019 and downloaded the comparative tabulation report for supplemental analyses and comparisons to the LEMIS data. We removed ambiguous records with "kg" or "number of shipments" in the unit column. We also removed records for species not listed under one of the Appendices (i.e., species with special protections or prohibitions in the EU that are tracked in the

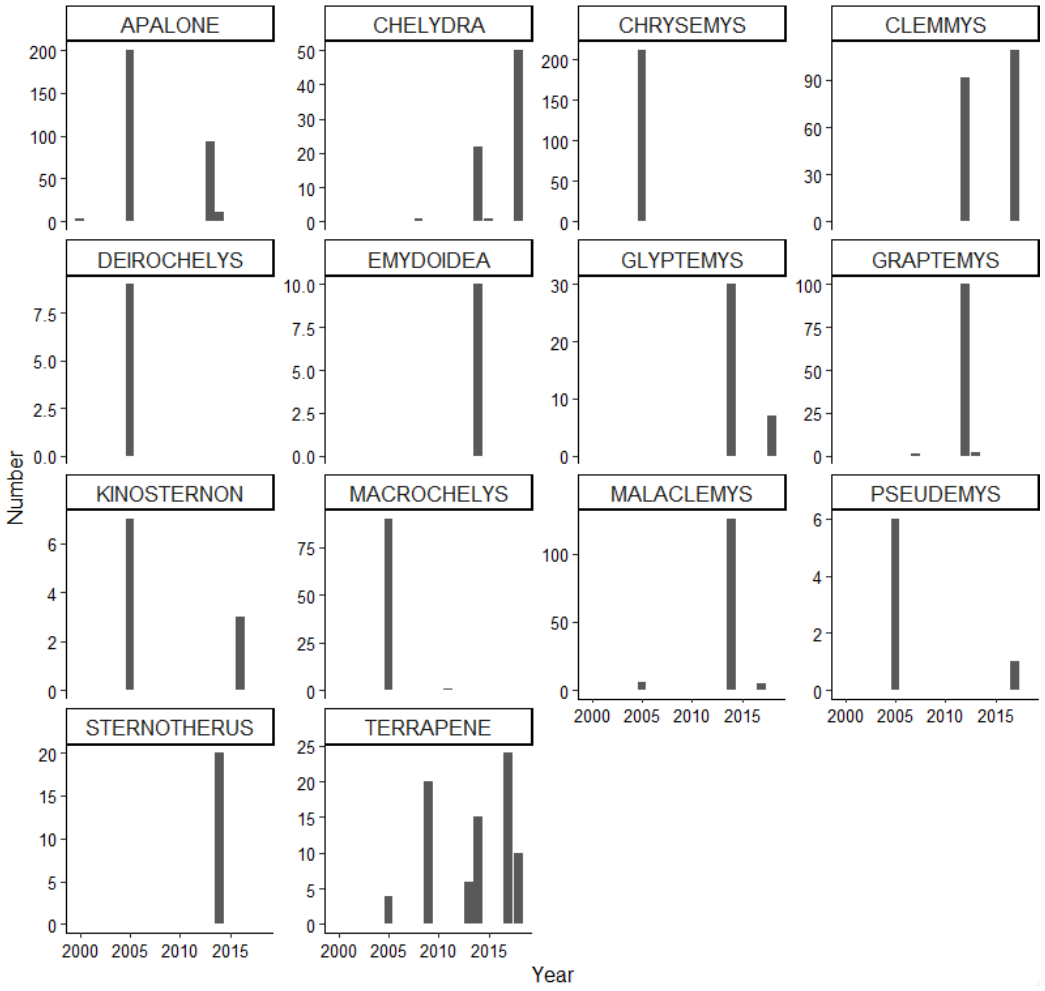
database). According to the CITES Trade Database User Guide, if a country is listed under the "Origin" column, that record is a re-export, so we filtered these rows out to avoid double-counting (CITES Secretariat and UNEP-WCMC 2022). Following other studies, we used importer-reported quantities where they were reported but included exporter-reported quantities where imported-reported quantities were blank. This may overestimate true trade volumes, as some countries report the number of specimens that were permitted to be traded in a year, rather than what was actually traded. However, some countries do not report imports of Appendix II listed species at all. Our approach aims to balance those two discrepancies.



Supplementary Figure 2: Chord diagram of trade flows in all live, CITES-listed Testudines from 1975-2019 for commercial purposes. Flow thickness is proportional to the total volume of trade between all importing and exporting regions. Trade flows comprising less than 5% of total trade were removed to simplify visualization, and shipments with unknown/unlisted importers or exporters were removed.



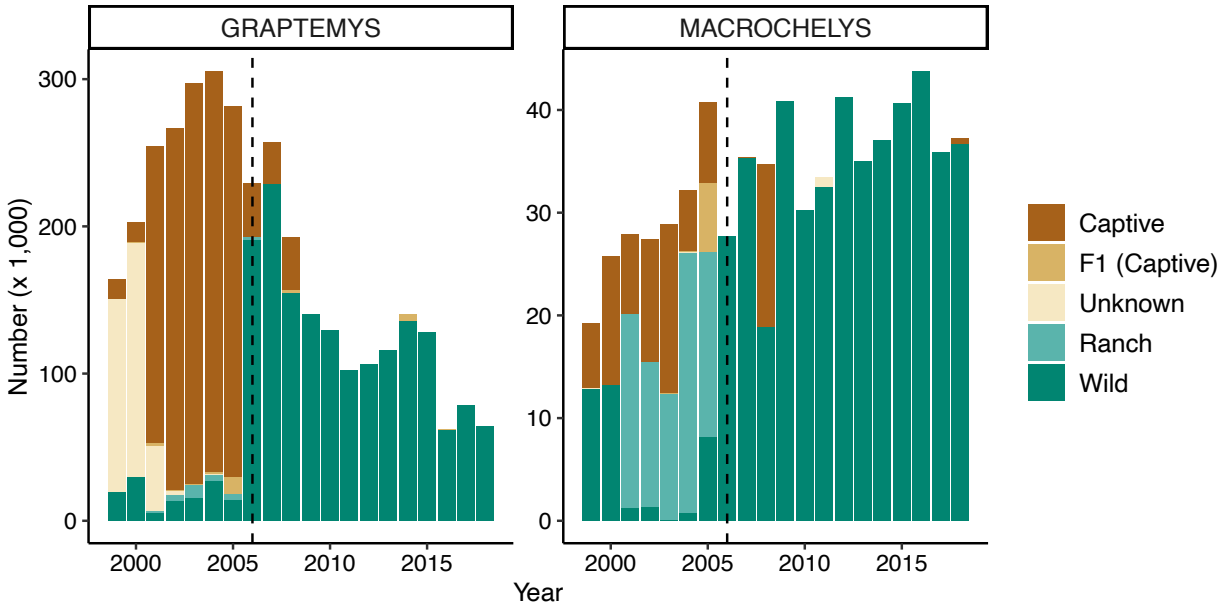
Supplementary Figure 3: Number of *Graptemys* (2007-2019) and *Terrapene* (1996-2019) turtles traded from the CITES Trade Database, color-coded by their exporting and importing regions.



Supplementary Figure 4: Number of exported turtles marked as "seized" in LEMIS data from 1999-2018 by genus.

Supplementary Table 8: LEMIS codes and definitions found in turtle export data and how we re-labeled them.

LEMIS Code	LEMIS Definition	Renamed
C	Animals bred in captivity (from parents that mated in captivity)	Captive
D	CITES Appendix I animals or plants commercially bred or propagated in CITES registered facilities	Captive
F	Animals born in captivity (from parents that mated in the wild) or animals that do not qualify as captive-bred under CITES	F1 (Captive)
R	Specimens originating from ranching operations	Ranch
U	Source unknown (lack of information must be justified)	Unknown
W	Specimens taken from the wild	Wild
*	[not listed in key]	Unknown



Supplementary Figure 5: Number of *Graptemys* and *Macrochelys* turtles exported by their source codes. Dashed line indicates their listing under Appendix III in 2006.

Appendix C: Supplementary information for Chapter 4

Supplementary Table 9: Correlations between factors.

	Legal Trade Skeptics (1a)	Ex-Situ Conservationists (1b)	Sustainable Trade Advocates (2)	Targeted Interventionists (3)
Legal Trade Skeptics (1a)	1	-0.54	0.13	0.60
Ex-Situ Conservationists (1b)		1	0.34	-0.17
Sustainable Trade Advocates (2)			1	0.37
Targeted Interventionists (3)				1

Supplementary Table 10: Factors z-scores for each statement.

Statement	Legal Trade Skeptics (1a)	Targeted Interventionists (3)	Sustainable Trade Advocates (2)	Ex-Situ Conservationists (1b)
1. Keeping turtles and other reptiles and amphibians as pets keeps people connected to nature and fosters an appreciation for the animals.	-1.31	0.60	0.88	0.00
2. Captive breeding of turtles for commercial purposes should be factored into the solution rather than being seen as part of the problem.	-0.91	0.01	1.23	1.89

3. There will always be people who take the easy way out and exploit wild turtles because breeding takes too much time and money.	0.68	-0.56	1.01	0.00
4. State regulations are trending more toward complete possession and trade bans because bans are easiest to enforce.	-0.32	-1.31	0.73	1.41
5. Trade bans and restrictions fuel the black market.	-0.89	-1.15	0.84	0.00
6. It is too risky to allow the trade of threatened or rare turtle species that are captive bred because wild turtles can be laundered through that legal trade too easily.	1.51	0.73	-0.71	-1.41
7. The sustainable trade of American alligator skins should serve as a model for regulating turtle trade.	-0.98	-1.27	0.30	0.47
8. Turtle trade follows serial exploitation patterns: when one turtle species or region is depleted or made unavailable due to regulations, demand shifts to other species and regions.	-0.03	1.26	0.23	-1.41
9. The penalties for illegal turtle trade should be harsher to deter potential offenders.	1.48	1.49	1.13	0.00
10. Federal protection for all native turtles is needed to close state-to-state loopholes.	0.99	-0.27	-0.60	0.00
11. Listing turtle species that are growing in value and popularity in the pet trade under CITES Appendix I would have a positive impact on conservation efforts.	0.28	-0.30	-0.88	-1.89
12. Regulations on the harvest, possession, and trade of turtles should be species- and place-specific.	-0.31	0.65	0.73	0.47
13. At the end of the day, the most important thing is to ensure the continued existence of wild turtle populations.	1.36	2.11	1.94	0.94
14. Listing all turtles under CITES Appendix II would better ensure trade sustainability.	-0.04	-0.58	-1.01	0.47
15. Agencies should work hand in hand with legitimate breeders and dealers to minimize potential harms of allowing captive breeding.	-0.66	0.58	0.89	0.00
16. It is crucial for law enforcement and state agency biologists to work together to stop illegal turtle trade.	1.57	1.57	0.82	0.00
17. Turtles in the US are being unsustainably exploited primarily because their market values have risen so much abroad.	0.47	0.42	0.35	-0.47
18. Illegal turtle trade does not get the public outcry that it needs.	1.32	1.22	1.40	-0.94
19. Illegal turtle trade is not a serious threat to turtle populations.	-2.50	-2.45	-2.17	0.47
20. You do not have to be a population ecologist to know that exporting millions of turtles a year is unsustainable.	1.00	0.52	-0.10	0.47
21. Trade in turtle hatchlings is less of a concern for sustainability than trade in adult turtles.	-0.88	-0.04	0.74	0.94
22. Poaching of reptiles and amphibians happens everywhere all the time.	-0.04	-0.76	0.68	-0.47
23. Our native turtles should not be used for commercial gain.	1.50	-0.17	-0.26	-1.41
24. Turtles should not be kept as pets.	0.80	-1.11	-1.88	-1.89
25. Hobbyist turtle keepers and breeders have a deep respect and love for the animals.	-0.63	-0.12	-0.09	0.94
26. People who breed, farm, or trap turtles to sell them are primarily motivated by financial gain.	0.69	1.64	-0.64	-0.47

27. Increasing the supply of captive bred turtles to reduce pressure on wild populations creates new concerns of disease spread, invasive species, and animal welfare.	0.74	0.65	-0.23	-0.94
28. Casting a shadow of doubt over all trade participants based on the questionable or illicit actions of a few bad actors is unjust and counterproductive.	-0.88	-0.55	0.88	1.41
29. Captive bred turtles are widely preferred in the pet and hobbyist trades.	-1.01	0.27	0.10	1.89
30. Simply allowing commercial trade in turtles increases the demand for them and thus threatens wild populations.	0.27	0.03	-0.68	-0.47
31. We cannot regulate our way out of the problem of illegal turtle trade.	-1.19	-0.16	-1.77	1.41
32. All collection and trapping of wild turtles (except for scientific purposes) should be phased out.	0.39	-0.74	-0.39	-0.47
33. The boom-and-bust cycles in demand for different turtle species are unpredictable, making management and enforcement difficult.	-0.05	-0.15	-0.90	-0.94
34. Given the slow reproduction of turtles and current global demands, a sustainable, commercial trade in turtles is not possible.	0.11	0.52	-1.63	-0.94
35. The pet turtle market is too dynamic; turtle breeders cannot produce the latest in-demand species fast enough to compete with illegal collectors.	-0.14	0.21	-1.03	-0.47
36. The war on drugs is an example of why complete bans on turtle possession and trade will not work.	-1.40	-1.26	0.64	0.94
37. Captive breeders and turtle farmers are being driven out of business or into illegal trade by overly burdensome regulations and inefficient permitting systems.	-0.99	-1.52	-0.52	0.47

Q Method Protocol

Preliminary Questionnaire

* Required question

How does your work relate to turtles/turtle trade? (Select ALL that apply)*

- I am a biologist or other type of scientist/researcher
- I trap, farm, or breed turtles to sell
- I keep and/or breed turtles as a hobby
- I work in law enforcement (including inspections, investigations, and prosecutions)
- I am involved in wildlife management and rulemaking
- I work in public affairs and/or advocacy
- Other

If "Other" is selected above, please describe:

Which group are you primarily affiliated with related to your work or interest in turtles?*

- Academia/university
- Government agency
- Non-governmental organization (NGO)
- Personal business or hobby
- Other

If "Other" is selected above, please describe:

What state(s) do you work in?

What year were you born?

What is your gender?

Please describe in your own words your background or expertise related to turtle trade:

Preliminary Sort

Read each of the 37 statement cards below and click the icon that aligns most with your view. Thumbs up indicates that you agree with the statement. Thumbs down indicates that you disagree with that statement, and the question mark indicates that you are neutral or unsure about a statement.

This is NOT the final sort; you will be able to change your mind as necessary when you rank the statements in the final sort.

There are no right or wrong responses. Select whether you agree, disagree, or are neutral/unsure based on your own interpretation and understanding of the trade.

Final Sort

Drag and drop each statement card from the 3 piles at the top of the screen onto the distribution grid. Statements placed **farther to the left indicate *stronger disagreement***; statements placed **farther to the right indicate *stronger agreement***.

**** It is possible that you will agree or disagree with more statements than there are corresponding slots for, and that is okay. Please prioritize the statements that most align with your views and priorities. Statements can be rearranged as necessary, but you must use every available slot. There are no right or wrong answers.****

Follow-Up Questions

Please elaborate on the statement(s) that you strongly AGREED with and why you agree with them.

Please elaborate on the statement(s) you strongly DISAGREED with and why you disagree with them.

Did you feel that you AGREED with more statements than there was room for in the grid?
- Yes
- No

Did you feel that you DISAGREED with more statements than there was room for in the grid?
- Yes
- No

Is there anything else that you would like the researchers to know?

Generalized Interview Guide Examples

State Agency Biologist/Manager

--- Introduction: General background & Role

To get started, would you please describe your role at the agency?

- How long have you worked in this position?
- What were you doing before this job?
- [*Dept. structure if relevant*] What other programs or people do you work the most with? Who do you report to? / What is the structure of your department?

How did you get into this field?

--- Knowledge/Background Leading to Rule Change

When did you first learn about commercial turtle harvest/farming/trade in X state?

- What did you know about it at the time?

How would you describe that state of commercial turtle harvest/farming/trade in X state now – are there a lot of hobbyists, commercial dealers, aquaculturalists, etc.?

- How has it changed over time?
    - Legal/illegal
- Which species are utilized, for which purposes?

Was there reason to believe harvest/farming/trade could affecting wild populations?

- Differences in species?

Is illegal trapping and trade a concern in your state?

--- Change in Rule [where relevant]

Before X year, what was allowed?

- At that time ^ How would you describe the state of [*X species trade/harvest/farming*]?

If petitioned: What was your response to the petition to restrict commercial harvest?

What prompted X [*rule change/study initiation/etc.*]?

- Do you this was needed/warranted?

In what ways, if at all, is the risk of illegal trapping and trade factored into regulation discussions?

- Neighboring states' regulations?

Why not [*ban it entirely OR regulate rather than ban*]?

- Do you anticipate future changes/limits?

What changes in trade/the industry have you observed since?

- [*if reporting required*] What have you learned from reporting requirements?

What did you think of these changes?

- Is there anything you'd do differently if you could?
- Do you think all states need to move towards these types of regulations?

--- Interactions

Could you describe any coordination/interaction you had/have with law enforcement?

- With legal dealers? Hobbyists?
- The commission?
- Agricultural agency?
- External scientists?
- Other agencies?

What was the reaction from the hobbyists/farmers/trappers to this new rule?

- The public more broadly?
- Environmental groups?

--- Wrapping Up

In an ideal world, how would YOU regulate the harvest, farming, or sale of native turtles in your state/the US?

Is there anything we didn't cover that you want me to know?

Is there anyone else you'd recommend I speak to?

<u>Turtle Breeder/Farmer</u>

--- Introduction: General background & Role

To start, would you tell me a little bit about yourself and how you got involved in turtle keeping and breeding?

How long have you been doing it? Always in X state?

Do you breed them to sell them, mostly, or for other purposes?

- If to sell: how would you describe your customers? Where are they located?
- Is this your main source of income?

Could you walk me through how your farm/breeding operations?

Do you focus on any particular species or morphs? Why?

How has the demand or interest in different species changed over the years? Do you follow these trends?

How do you know when demand is high or rising for any given species? How do you respond?

- *In other words*: Do you breed species you like and are interested in, or do you breed species that are hot on the market?

--- Regulations
How have X changes affected you and your operations?

Can you describe any other regulatory changes that significantly changed or affected the industry/hobby?

How do you think they've affected commercial turtle trade overall?

How have CITES listings affected you?

What do you think the effects are of individual possession bans?

In what ways, if any, have the closures of wild turtle harvest in other states affected your business?

How do you feel about current regulations for commercial turtle trade?
- What would you change if you could?

--- Interactions
How would you describe the relationship between X agency and reptile breeders/farmers?

--- Illegal trade
Is illegal poaching and trade a concern in X state?

Does it concern you or affect your operations?

How do you think that should be addressed?

--- Wrapping Up
Anything else you want me to know?

Who else would you recommend I speak to?

Bibliography

Acemoglu D, Jackson MO. 2017. Social norms and the enforcement of laws. Journal of the European Economic Association **15**:245–295.

AFWA. 2020. Case Study: U.S. Freshwater Turtles and Tortoises of Wild Fauna and Flora.

Allaire JJ, Gandrud C, Russell K, Yetman C. 2017. networkD3: D3 JavaScript Network Graphs from R.

An SK, Gower KK. 2009. How do the news media frame crises? A content analysis of crisis news coverage. Public Relations Review **35**:107–112.

Anderson SC, Flemming JM, Watson R, Lotze HK. 2011. Serial exploitation of global sea cucumber fisheries. Fish and Fisheries **12**:317–339.

Auliya M. 2003. Hot trade in cool creatures: a review of the live reptile trade in the European Union in the 1990s with a focus on Germany.

Auliya M et al. 2016. Trade in live reptiles, its impact on wild populations, and the role of the European market. Biological Conservation **204**:103–119.

Ayling J. 2013. What Sustains Wildlife Crime? Rhino Horn Trading and the Resilience of Criminal Networks. Journal of International Wildlife Law & Policy **16**:57–80.

Baynham-Herd Z, Redpath S, Bunnefeld N, Molony T, Keane A. 2018. Conservation conflicts: Behavioural threats, frames, and intervention recommendations. Biological Conservation **222**:180–188.

Bennett E, Loda J. 2020. Robbing the Wild: How 10 states' refusal to ban trapping is hurting America's wild turtles. Available from https://www.biologicaldiversity.org/species/reptiles/pdfs/4_Robbing_the_Wild.pdf.

Bennett EL, Underwood FM, Milner-Gulland EJ. 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**:1–16.

Bennett NJ. 2016. Using perceptions as evidence to improve conservation and environmental management. Conservation Biology **30**:582–592.

Bennett NJ et al. 2017. Conservation social science: Understanding and integrating human dimensions to improve conservation. Biological Conservation **205**:93–108.

Bettelheim M. 2005. Marmorata: The Famed Mud Turtle of the San Fransisco Market. California History **82**:26–42.

Biggs D, Abel N, Knight AT, Leitch A, Langston A, Ban NC. 2011. The implementation crisis in conservation planning: Could "mental models" help? Conservation Letters **4**:169–183.

Biggs D, Holden M, Braczkowski A. 2017. Breaking the deadlock on ivory. Science **358**:1378–1381.

Blair ME, Le MD, Sethi G, Thach HM, Nguyen VTH, Amato G, Birchette M, Sterling EJ. 2017. The Importance of an Interdisciplinary Research Approach to Inform Wildlife Trade Management in Southeast Asia. BioScience **67**:995–1003.

Blundell AG, Rodan BD. 2003. Mahogany and CITES: moving beyond the veneer of legality. Oryx **37**:85–90.

Bolker BM, Brooks ME, Clark CJ, Geange SW, Poulsen JR, Stevens MHH, White JSS. 2009. Generalized linear mixed models: a practical guide for ecology and evolution. Trends in Ecology and Evolution **24**:127–135.

Booth H, Pooley S, Clements T, Iqbal M, Putra H, Lestari WP, Lewis S, Warwick L, Milner-gulland EJ. 2020. Assessing the impact of regulations on the use and trade of wildlife: An operational framework with a case study on manta rays. Global Ecology and Conservation **22**:e00953.

Bowman M. 2013. A Tale of Two CITES: Divergent Perspectives upon the Effectiveness of the Wildlife Trade Convention. Review of European, Comparative & International Environmental Law **22**:228–238.

Braun V, Clarke V. 2006. Using thematic analysis in psychology. Qualitative Research in Psychology **3**:77–101.

Brown DJ, Schultz AD, Dixon JR, Dickerson BE, Forstner MRJ. 2012. Decline of Red-Eared Sliders (Trachemys scripta elegans) and Texas Spiny Softshells (Apalone spinifera emoryi) in the Lower Rio Grande Valley of Texas. Chelonian Conservation and Biology **11**:138–143.

Bruskotter JT, Vucetich JA, Dietsch A, Slagle KM, Brooks JS, Nelson MP. 2019. Conservationists' moral obligations toward wildlife: Values and identity promote conservation conflict. Biological Conservation **240**:108296.

Buhlmann KA, Akre TSB, Iverson JB, Karapatakis D, Mittermeier RA, Georges A, Rhodin AGJ, van Dijk PP, Gibbons JW. 2009. A Global Analysis of Tortoise and Freshwater Turtle Distributions with Identification of Priority Conservation Areas. Chelonian Conservation and Biology **8**:116–149.

Bush ER, Baker SE, Macdonald DW. 2014. Global Trade in Exotic Pets 2006–2012. Conservation Biology **28**:663–676.

Cardeñosa D, Fields AT, Babcock EA, Zhang H, Feldheim K, Shea SKH, Fischer GA, Chapman DD. 2018. CITES-listed sharks remain among the top species in the contemporary fin trade. Conservation Letters **11**:e12457.

Cardoso P et al. 2021. Scientists' warning to humanity on illegal or unsustainable wildlife trade. Biological Conservation **263**:109341.

CEC. 2019. Trinational Trade and Enforcement Training Workshop to Support the Legal and Sustainable Trade in Turtles and Tortoises. Montreal, Canada.

Challender DWS et al. 2019. Evaluating the feasibility of pangolin farming and its potential conservation impact. Global Ecology and Conservation **20**:e00714.

Challender DWS et al. 2021. Mischaracterizing wildlife trade and its impacts may mislead policy processes. Conservation Letters:1–10.

Challender DWS, Harrop SR, Macmillan DC. 2015. Understanding markets to conserve trade-threatened species in CITES. Biological Conservation **187**:249–259.

Challender DWS, MacMillan DC. 2014. Poaching is more than an Enforcement Problem. Conservation Letters **7**:484–494.

Chandran R, Hoppe R, De Vries WT, Georgiadou Y. 2015. Conflicting policy beliefs and informational complexities in designing a transboundary enforcement monitoring system. Journal of Cleaner Production **105**:447–460.

Charmaz K, Belgrave LL. 2012. Qualitative interviewing and grounded theory analysis. The SAGE Handbook of Interview Research: The Complexity of the Craft:347–366.

Chen F. 2016. Poachers and Snobs: Demand for Rarity and the Effects of Antipoaching Policies. Conservation Letters **9**:65–69.

Cheung SM, Dudgeon D. 2006. Quantifying the Asian turtle crisis: market surveys in southern China, 2000–2003. Aquatic Conservation: Marine and Freshwater Ecosystems **16**:751–770.

CITES. (n.d.). How CITES works. Available from https://cites.org/eng/disc/how.php (accessed February 9, 2023a).

CITES. 2011. Tortoises and Freshwater Turtles (Twenty-Fifth Meeting Of The Animals Committee). Geneva, Switzerland.

CITES. 2013. Consideration of Proposals for Amendment of Appendices I and II: Prop. 30.

CITES. 2016. Species specific matters: Tortoises and freshwater turtles (Testudines spp.).

CITES. 2022a. Consideration of Proposals for Amendment of Appendices I and II: Prop. 31. Available from https://cites.org/eng/cop/19/amendment-proposals.

CITES. 2022b. Consideration of Proposals for Amendment of Appendices I and II: Prop. 29. Available from https://cites.org/eng/cop/19/amendment-proposals.

CITES. 2022c. Consideration of Proposals for Amendment of Appendices I and II: Prop. 23.

CITES. (n.d.). What is CITES? Available from https://cites.org/eng/disc/what.php (accessed June 27, 2022b).

Collard R-C, Dempsey J. 2013. Life for Sale? The Politics of Lively Commodities. Environment and Planning A **45**:2682–2699.

Collis AH, Fenili RN. 2011. The Modern U.S. Reptile History. Washington, DC. Available from https://usark.org/wp-content/uploads/2013/02/The_Modern_US_Reptile_Industry_05_12_2011Final.pdf.

Colteaux BC, Johnson DM. 2017. Commercial harvest and export of snapping turtles (Chelydra serpentina) in the United States: trends and the efficacy of size limits at reducing harvest. Journal for Nature Conservation **35**:13–19.

Cooney R, Challender DWS, Broad S, Roe D, Natusch DJD. 2021a. Think Before You Act: Improving the Conservation Outcomes of CITES Listing Decisions. Frontiers in Ecology and Evolution **9**.

Cooney R, Challender DWS, Broad S, Roe D, Natusch DJD. 2021b. Response: Commentary: Think Before You Act: Improving the Conservation Outcomes of CITES Listing Decisions. Frontiers in Ecology and Evolution **9**:1–3.

Cooney R, Jepson P. 2006. The international wild bird trade: What's wrong with blanket bans? Oryx **40**:18–23.

Courchamp F, Angulo E, Rivalan P, Hall RJ, Signoret L, Bull L, Meinard Y. 2006. Rarity value and species extinction: The anthropogenic allee effect. PLoS Biology **4**:2405–2410.

Creswell JW. 2007. Qualitative inquiry & research design: choosing among five approaches. Sage Publications.

Daniels JA, Buck I, Croxall S, Gruber J, Kime P, Govert H. 2007. A content analysis of news reports of averted school rampages. Journal of School Violence **6**:83–99.

Davies A, Hinsley A, Nuno A, Martin RO. 2022. Identifying opportunities for expert-mediated triangulation in monitoring wildlife trade on social media. Conservation Biology **36**:1–7.

Dickinson H. 2022. Caviar matter(s): The material politics of the European caviar grey market. Political Geography **99**:102737.

Dietz T, Ostrom E, Stern PC. 2003. The Struggle to Govern the Commons. Science **302**:1907–1912.

Drews S, van den Bergh JCJM. 2016. What explains public support for climate policies? A review of empirical and experimental studies. Climate Policy **16**:855–876.

Drury R, Homewood K, Randall S. 2011. Less is more: The potential of qualitative approaches in conservation research. Animal Conservation **14**:18–24.

Duffy R. 2014. Waging a war to save biodiversity: The rise of militarized conservation. International Affairs **90**:819–834.

Easter T, Trautmann J, Gore M, Carter N. 2023. Media portrayal of the illegal trade in wildlife: The case of turtles in the US and implications for conservation. People and Nature **00**:1–16.

Eliason SL. 2003. Illegal Hunting and Angling: The Neutralization of Wildlife Law Violations. Society and Animals **11**:225–243.

Entman RM. 1993. Framing: Toward Clarification of a Fractured Paradigm. Journal of Communication **43**:51–58.

Esmail N et al. 2020. Emerging illegal wildlife trade issues: a global horizon scan. Conservation Letters:1–10.

Estévez RA, Anderson CB, Pizarro JC, Burgman MA. 2015. Clarifying values, risk perceptions, and attitudes to resolve or avoid social conflicts in invasive species management. Conservation Biology **29**:19–30.

Feddema K, Nekaris KAI, Nijman V, Harrigan P. 2021. Re-evaluating the notion of value in wildlife trade research from a service marketing perspective. Biological Conservation **256**.

Ferns B, Campbell B, Veríssimo D. 2022. Emerging contradictions in the enforcement of bird hunting regulations in Malta. Conservation Science and Practice:e12655.

Foster SJ, Justason T, Magera AM, Vincent ACJ. 2022. CITES makes a measurable difference to the trade in live marine fishes: The pioneering case of seahorses. Biological Conservation **272**:109653.

Foster SJ, Vincent ACJ. 2005. Enhancing Sustainability of the International Trade in Seahorses with a Single Minimum Size Limit. Conservation Biology **19**:1044–1050.

Friedman K et al. 2018. Examining the impact of CITES listing of sharks and rays in Southeast Asian fisheries. Fish and Fisheries **19**:662–676.

Fukushima CS et al. 2021. Challenges and perspectives on tackling illegal or unsustainable wildlife trade. Biological Conservation **17**.

Fukushima CS, Mammola S, Cardoso P. 2020. Global wildlife trade permeates the Tree of Life. Biological Conservation **247**:108503.

Gamer M, Lemon J, Singh IFP. 2019. irr: Various Coefficients of Interrater Reliability.

Gamson WA, Modigliani A. 1989. Media Discourse and Public Opinion on Nuclear Power: A Constructionist Approach. American Journal of Sociology **95**:1–37.

Gibbons JW, Lovich JE. 2019. Where Has Turtle Ecology Been, and Where Is It Going? Herpetologica **75**:4–20.

Giles D, Shaw RL. 2009. The Psychology of News Influence and the Development of Media Framing Analysis. Social and Personality Psychology Compass **3**:375–393.

Gore ML, editor. 2017. Conservation Criminology. John Wiley & Sons, Ltd.

Gore ML et al. 2020. A conservation criminology-based desk assessment of vulture poisoning in the Great Limpopo Transfrontier Conservation Area. Global Ecology and Conservation **23**:e01076.

Hagan K, Williams S. 2016. Oceans of discourses: Utilizing Q methodology for analyzing perceptions on marine biodiversity conservation in the Kogelberg biosphere reserve, South Africa. Frontiers in Marine Science **3**.

Harfoot M, Glaser SAM, Tittensor DP, Britten GL, McLardy C, Malsch K, Burgess ND. 2018. Unveiling the patterns and trends in 40 years of global trade in CITES-listed wildlife. Biological Conservation **223**:47–57.

Harrison HL, Loring PA. 2020. Seeing beneath disputes: A transdisciplinary framework for diagnosing complex conservation conflicts. Biological Conservation **248**:108670.

Hausmann A, Cortés-Capano G, Fraser I, Di Minin E. 2023. Assessing preferences and motivations for owning exotic pets: Care matters. Biological Conservation **281**.

Hayes AF, Krippendorff K. 2007. Answering the Call for a Standard Reliability Measure for Coding Data. Communication Methods and Measures **1**:77–89.

Heinrich S, Gomez L. 2021. India's use of CITES Appendix III. Nature Conservation **44**:163–176.

Heinrich S, Shepherd CR, Sy EY. 2022a. Using CITES Appendix III to Protect Native Species Found in International Trade: the Case of the Philippines. Philippine Journal of Science **151**:127–137.

Heinrich S, Toomes A, Shepherd CR, Stringham OC, Swan M, Cassey P. 2022b. Strengthening protection of endemic wildlife threatened by the international pet trade: The case of the Australian shingleback lizard. Animal Conservation **25**:91–100.

Hinsley A, Nuno A, Ridout M, John FAVS, Roberts DL. 2017. Estimating the Extent of CITES Noncompliance among Traders and End-Consumers; Lessons from the Global Orchid Trade. Conservation Letters **10**.

Hinsley A, Roberts DL. 2018. The wild origin dilemma. Biological Conservation **217**:203–206.

Hoover C. 2000. The United States role in the international live reptile trade. Amphibian and Reptile Conservation **2**:30–31.

Hughes C, Foote L, Yarmey NT, Hwang C, Thorlakson J, Nielsen S. 2020. From human invaders to problem bears: A media content analysis of grizzly bear conservation. Conservation Science and Practice **2**:e176.

Hughes DW. 1999. The contribution of the pet turtle industry to the Louisiana economy. Aquaculture Economics and Management **3**:205–214.

Hughes LJ, Morton O, Scheffers BR, Edwards DP. 2022. The ecological drivers and consequences of wildlife trade. Biological ReviewsDOI: 10.1111/BRV.12929.

Humphreys A, Latour KA. 2013. Framing the game: Assessing the impact of cultural representations on consumer perceptions of legitimacy. Journal of Consumer Research **40**:773–795.

Irwin K. 2018. Commercial Aquatic Turtle Harvest 2004-2017. Little Rock, AR.

Janssen J, Krishnasamy K. 2018. Left hung out to dry: How inadequate international protection can fuel trade in endemic species – The case of the earless monitor. Global Ecology and Conservation **16**:e00464.

Janssen J, Shepherd CR. 2018. Challenges in documenting trade in non-CITES listed species: A case study on crocodile skinks (Tribolonotus spp.). Journal of Asia-Pacific Biodiversity **11**:476–481.

Jensen TJ, Auliya M, Burgess ND, Aust PW, Pertoldi C, Strand J. 2018. Exploring the international trade in African snakes not listed on CITES: highlighting the role of the internet and social media. Biodiversity and Conservation:1–19.

Jørgensen D, Renöfält BMR. 2013. Damned if you do, dammed if you don't: Debates on dam removal in the Swedish media. Ecology and Society **18**:18.

Kahler JS, Gore ML. 2012. Beyond the cooking pot and pocket book: Factors influencing noncompliance with wildlife poaching rules. International Journal of Comparative and Applied Criminal Justice **36**:103–120.

Kaptein M, van Helvoort M. 2019. Deviant Behavior A Model of Neutralization Techniques. Deviant Behavior **40**:1260–1285.

Killion A, Neuzil M, Freedman E. 2021. The wolves of fate: Media coverage of the Isle Royale "genetic rescue." Pages 50–66 Communicating Endangered Species, 1st edition. Routledge.

Klemens MW. 2000. Turtle Conservation. Page (Klemens MW, editor). Smithsonian Institution Press, Washington and London.

Kuo TC, Vincent A. 2018. Assessing the changes in international trade of marine fishes under CITES regulations – A case study of seahorses. Marine Policy **88**:48–57.

Kuperan K, Sutinen JG. 1998. Blue Water Crime: Deterrence, Legitimacy, and Compliance in Fisheries. Law & Society Review **32**:309–338.

Lakoff G. 2010. Why it Matters How We Frame the Environment. Environmental Communication **4**:70–81.

Lam JTL, Koldewey HJ, Yasué M, Vincent ACJ. 2016. Comparing interview and trade data in assessing changes in the seahorse Hippocampus spp. trade following CITES listing. Oryx **50**:36–46.

Larrosa C, Carrasco LR, Milner-Gulland EJ. 2016. Unintended Feedbacks: Challenges and Opportunities for Improving Conservation Effectiveness. Conservation Letters **9**:316–326.

Lavorgna A. 2014. Wildlife trafficking in the Internet age. Crime Science **3**.

Law J. 2022. The knotty politics of ginseng conservation and management in Appalachia. Journal of Political Ecology **29**.

Lehrer N, Sneegas G. 2018. Beyond polarization: using Q methodology to explore stakeholders' views on pesticide use, and related risks for agricultural workers, in Washington State's tree fruit industry. Agriculture and Human Values **35**:131–147.

Lemieux AM, Clarke R V. 2009. The international ban on ivory sales and its effects on elephant poaching in Africa. British Journal of Criminology **49**:451–471.

Li Y, Arias M, Hinsley A, Milner-Gulland EJ. 2022. International media coverage of the Bolivian jaguar trade. People and Nature **4**:115–126.

Lovich JE, Ennen JR, Agha M, Gibbons JW. 2018. Where Have All the Turtles Gone, and Why Does It Matter? BioScience **68**:771–781.

LSU AgCenter. 2019. Louisiana Summary: Agriculture and Natural Resources. Available from https://www.lsuagcenter.com/portals/communications/publications/publications_catalog/money and business/louisiana_summary_agriculture_and_natural_resources (accessed December 19, 2022).

Luiselli L, Starita A, Carpaneto GM, Segniagbeto GH, Amori G. 2016. A Short Review of the International Trade of Wild Tortoises and Freshwater Turtles Across the World and Throughout Two Decades. Chelonian Conservation and Biology **15**:167–172.

Luker K. 2009. Salsa dancing into the social sciences. Harvard University Press.

Lundberg E, Gottschalk Druschke C, Booth EG, Druschke CG. 2022. A Q-method survey of stream restoration practitioners in the Driftless Area, USA. River Research and Applications:1–11.

Lutfallah S, Buchanan L. 2019. Quantifying subjective data using online Q-methodology software. The Mental Lexicon **14**:415–423. Available from https://qmethodsoftware.com/.

Lyons JA, Natusch DJD. 2011. Wildlife laundering through breeding farms: Illegal harvest, population declines and a means of regulating the trade of green pythons (Morelia viridis) from Indonesia. Biological Conservation **144**:3073–3081.

Macdonald DW, Harrington LA, Moorhouse TP, D'cruze N. 2021. Trading Animal Lives: Ten Tricky Issues on the Road to Protecting Commodified Wild Animals. BioScience **71**:846–860.

Madden F, McQuinn B. 2014. Conservation's blind spot: The case for conflict transformation in wildlife conservation. Biological Conservation **178**:97–106.

Mali I, Vandewege MW, Davis SK, Forstner MRJ. 2014. Magnitude of the Freshwater Turtle Exports from the US: Long Term Trends and Early Effects of Newly Implemented Harvest Management Regimes. PLoS ONE **9**.

Manfredo MJ, Sullivan L, Don Carlos AW, Dietsch AM, Teel TL, Bright AD, Bruskotter JT. 2018. America's Wildlife Values: The Social Context of Wildlife Management in the US. Page Colorado State University. Fort Collins, CO.

Manfredo MJ, Teel TL, Carlos AWD, Sullivan L, Bright AD, Dietsch AM, Bruskotter J, Fulton D. 2020. The changing sociocultural context of wildlife conservation. Conservation Biology **34**:1549–1559.

Margulies JD. 2020. Korean 'Housewives' and 'Hipsters' Are Not Driving a New Illicit Plant Trade: Complicating Consumer Motivations Behind an Emergent Wildlife Trade in Dudleya farinosa. Frontiers in Ecology and Evolution **8**:1–10.

Margulies JD, Wong RWY, Duffy R. 2019. The imaginary 'Asian Super Consumer': A critique of demand reduction campaigns for the illegal wildlife trade. Geoforum **107**:216–219.

Maron DF. 2019. Turtles are being snatched from U.S. waters and illegally shipped to Asia. Available from https://www.nationalgeographic.com/animals/2019/10/american-turtles-poached-to-become-asian-pets/#close.

Massé F, Dickinson H, Margulies J, Joanny L, Lappe-Osthege T, Duffy R. 2020. Conservation and crime convergence? Situating the 2018 London Illegal Wildlife Trade Conference. Journal of Political Ecology **27**:23–42.

Massé F, Margulies JD. 2020. The geopolitical ecology of conservation: The emergence of illegal wildlife trade as national security interest and the re-shaping of US foreign conservation assistance. World Development **132**:104958.

Matthes J, Kohring M. 2008. The Content Analysis of Media Frames: Toward Improving Reliability and Validity. Journal of Communication **58**:258–279.

Mazur KE, Asah ST. 2013. Clarifying standpoints in the gray wolf recovery conflict: Procuring management and policy forethought. Biological Conservation **167**:79–89.

McLeod DM, Detenber BH. 1999. Framing effects of television news coverage of social protest. Journal of Communication **49**:3–23.

McMullan JL, Perrier DC. 2002. Lobster Poaching and the Ironies of Law Enforcement. Law & Society Review **36**:679–718.

Miller EA, McClenachan L, Uni Y, Phocas G, Hagemann ME, Van Houtan KS. 2019. The historical development of complex global trafficking networks for marine wildlife. Science Advances **5**:eaav5948.

Milner-Gulland EJ, Cugnière L, Hinsley A, Phelps J, ‘t Sas-Rolfes M, Verissimo D. 2018. Evidence to Action: Research to address the illegal wildlife trade. Page Evidence to Action: Research to address the illegal wildlife trade. Briefing note to policy-makers and practitioners. Available from http://www.illegalwildlifetrade.net/wp-content/uploads/sites/5/2018/09/Evidence-to-Action_IWT18_Briefing-Note.pdf (accessed January 14, 2019).

Mittermeier RA, van Dijk PP, Rhodin AGJ, Nash SD. 2015. Turtle Hotspots: An Analysis of the Occurrence of Tortoises and Freshwater Turtles in Biodiversity Hotspots, High-Biodiversity Wilderness Areas, and Turtle Priority Areas. Chelonian Conservation and Biology **14**:2–10.

Moll D, Moll EO. 2004. The Ecology, Exploitation and Conservation of River Turtles. Oxford University Press on Demand.

Moreto WD, Gau JM. 2017. Deterrence, Legitimacy, and Wildlife Crime in Protected Areas. Pages 45–58 in Gore ML, editor. Conservation Criminology. John Wiley & Sons, Ltd.

Morton O, Scheffers BR, Haugaasen T, Edwards DP. 2021. Impacts of wildlife trade on terrestrial biodiversity. Nature Ecology & Evolution **5**:540–548.

Mukherjee N, Zabala A, Huge J, Nyumba TO, Adem Esmail B, Sutherland WJ. 2018. Comparison of techniques for eliciting views and judgements in decision-making. Methods in Ecology and Evolution **9**:54–63.

Muter BA, Gore ML, Gledhill KS, Lamont C, Huveneers C. 2013. Australian and U.S. News Media Portrayal of Sharks and Their Conservation. Conservation Biology **27**:187–196.

Muth RM, Bowe JF. 1998. Illegal harvest of renewable natural resources in North America: Toward a typology of the motivations for poaching. Society and Natural Resources **11**:9–24.

Naito R, Zhao J, Chan KMA. 2022. An integrative framework for transformative social change: a case in global wildlife trade. Sustainability Science **17**:171–189.

Natusch DJD, Lyons JA, Riyanto A, Mumpuni, Khadiejah S, Shine R. 2019. Detailed biological data are informative, but robust trends are needed for informing sustainability of wildlife harvesting: A case study of reptile offtake in Southeast Asia. Biological Conservation **233**:83–92.

Nekaris BKA-I, Campbell N, Coggins TG, Rode EJ, Nijman V. 2013. Tickled to Death: Analysing Public Perceptions of 'Cute' Videos of Threatened Species (Slow Lorises – Nycticebus spp.) on Web 2.0 Sites. PLoS ONE **8**:e69215.

Nie M. 2003. Drivers of natural resource-based political conflict. Policy Sciences **36**:307–341.

Nijman V, Nekaris KAI. 2017. The Harry Potter effect: The rise in trade of owls as pets in Java and Bali, Indonesia. Global Ecology and Conservation **11**.

Nijman V, Shepherd CR. 2007. Trade in non-native, CITES-listed, wildlife in Asia, as exemplified by the trade in freshwater turtles and tortoises (Chelonidae) in Thailand. Contributions to Zoology **76**:207–211.

Nost E, Robertson M, Lave R. 2019. Q-method and the performance of subjectivity: Reflections from a survey of US stream restoration practitioners. Geoforum **105**:23–31.

Orenstein RI, Freyer D, Lieberman S, Lyman E, Reeve R, Sanerib T, Schubert DJ. 2021. Commentary: Think Before You Act: Improving the Conservation Outcomes of CITES Listing Decisions. Frontiers in Ecology and Evolution **9**:1–3.

Oyanedel R, Gelcich S, Milner-Gulland EJ. 2020. Motivations for (non-) compliance with conservation rules by small-scale resource users. Conservation Letters **In press**:1–9.

Parker C, Scott S, Geddes A. 2019. Snowball sampling. Page in Atkinson P, Delamont S, Cernat A, Sakshaug JW, Williams RA, editors. SAGE Research Methods Foundations.

Peck J, Theodore N. 2012. Follow the Policy: A Distended Case Approach. Environment and Planning A: Economy and Space **44**:21–30.

Phelps J, Webb EL, Bickford D, Nijman V, Sodhi NS. 2010. Boosting CITES. Science **330**:1752–1753.

Pritchard D, Hughes KD. 1997. Patterns of deviance in crime news. Journal of Communication **47**:49–67.

Purcell SW, Polidoro BA, Hamel JF, Gamboa RU, Mercier A. 2014. The cost of being valuable: Predictors of extinction risk in marine invertebrates exploited as luxury seafood. Proceedings of the Royal Society B: Biological Sciences **281**.

QSR International Pty Ltd. 2020. NVivo. Available from https://www.qsrinternational.com/nvivo-qualitative-data-analysis-software/home.

R Core Team. 2020. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria.

Raabe S. 2022. vistime: Pretty Timelines in R.

Rastogi A, Hickey GM, Badola R, Hussain SA. 2013. Diverging viewpoints on tiger conservation: A Q-method study and survey of conservation professionals in India. Biological Conservation **161**:182–192.

Redpath SM et al. 2013. Understanding and managing conservation conflicts. Trends in Ecology and Evolution **28**:100–109.

Reed RN, Gibbons JW. 2003. Conservation status of live U.S. nonmarine turtles in domestic and international trade. Aiken, SC.

Rhodin AGJ et al. 2018. Global Conservation Status of Turtles and Tortoises (Order Testudines). Chelonian Conservation and Biology **17**:135–161.

Rivalan P, Delmas V, Angulo E, Bull LS, Hall RJ, Courchamp F, Rosser AM, Leader-Williams N. 2007. Can bans stimulate wildlife trade? Nature **447**:529–530.

Rizzolo JB. 2021. Effects of legalization and wildlife farming on conservation. Global Ecology and Conservation **25**:e01390.

Robinson JE, Griffiths RA, St John FA, Roberts DL. 2015. Dynamics of the global trade in live reptiles: Shifting trends in production and consequences for sustainability. Biological Conservation **184**:42–50.

Robinson JE, Sinovas P. 2018. Challenges of analyzing the global trade in CITES-listed wildlife. Conservation Biology **32**:1203–1206.

Roe D, Dickman A, Kock R, Milner-Gulland EJ, Rihoy E, 't Sas-Rolfes M. 2020. Beyond banning wildlife trade: COVID-19, conservation and development. World Development **136**:105121.

Santos BS, Crowder LB. 2021. Online News Media Coverage of Sea Turtles and Their Conservation. BioScience **71**:305–313.

Sarewitz D. 2004. How science makes environmental controversies worse. Environmental Science and Policy **7**:385–403.

Scheffers BR, Oliveira BF, Lamb I, Edwards DP. 2019. Global wildlife trade across the tree of life. Science **366**:71–76.

Schlaepfer MA, Hoover C, Dodd CKJr. 2005. Challenges in Evaluating the Impact of the Trade in Amphibians and Reptiles on Wild Populations. BioScience **55**:256–264.

Sevin J, Wixted K, Kisonak L, MacDonald B, Thompson-Slacum J, Buchanan S, Karraker N. 2022. Turtles in Trouble. The Wildlife Professional:26–31.

Shepherd CR, Leupen BTC, Siriwat P, Nijman V. 2020. International wildlife trade, avian influenza, organised crime and the effectiveness of CITES: The Chinese hwamei as a case study. Global Ecology and Conservation **23**:e01185.

Shiffman DS et al. 2020. Inaccurate and Biased Global Media Coverage Underlies Public Misunderstanding of Shark Conservation Threats and Solutions. iScience **23**:101205.

Sigouin A, Pinedo-Vasquez M, Nasi R, Poole C, Horne B, Lee TM. 2017. Priorities for the trade of less charismatic freshwater turtle and tortoise species. Journal of Applied Ecology **54**:345–350.

Singh S. 2008. Contesting moralities: the politics of wildlife trade in Laos. Journal of Political Ecology **15**:1.

Siriwat P, Nijman V. 2020. Wildlife trade shifts from brick-and-mortar markets to virtual marketplaces: A case study of birds of prey trade in Thailand. Journal of Asia-Pacific Biodiversity **13**:454–461.

Smith MJ, Williams RJ, Purves DW. 2011. Boosting CITES Through Research. Science **331**:857.

Sneegas G, Beckner S, Brannstrom C, Jepson W, Lee K, Seghezzo L. 2021. Using Q-methodology in environmental sustainability research: A bibliometric analysis and systematic review. Ecological Economics **180**:106864.

Solman P, Henderson L. 2018. Flood disasters in the United Kingdom and India: A critical discourse analysis of media reporting. Journalism **20**:1648–1664.

Stanford CB et al. 2020. Turtles and Tortoises Are in Trouble. Current Biology **30**:R721–R735.

Stoett P. 2002. The International Regulation of Trade in Wildlife: Institutional and Normative Considerations. International Environmental Agreements: Politics, Law and Economics **2**:193–208.

Stringham OC, García-Díaz P, Toomes A, Mitchell L, Ross J V., Cassey P. 2021. Live reptile smuggling is predicted by trends in the legal exotic pet trade. Conservation Letters:e12833.

Sykes GM, Matza D. 1957. Techniques of Neutralization: A Theory of Delinquency. American Sociology Review **22**:664–670.

't Sas-Rolfes M, Challender DW, Hinsley A, Veríssimo D, Milner-Gulland E. 2019. Illegal Wildlife Trade: Scale, Processes, and Governance. Annual Review of Environment and Resources **44**:201–228.

Thomas-Walters L et al. 2021. Motivations for the use and consumption of wildlife products. Conservation Biology **35**:483–491.

Thomas-Walters L, Cheung H, Lee TM, Wan AKY, Wang Y. 2020. Targeted values: The relevance of classical Chinese philosophy for illegal wildlife demand reduction campaigns. People and Nature **2**:964–971.

Titeca K. 2018. Understanding the illegal ivory trade and traders: evidence from Uganda. International Affairs **94**:1077–1099.

Turner RA, Addison J, Arias A, Bergseth BJ, Marshall NA, Morrison TH, Tobin RC. 2016. Trust, confidence, and equity affect the legitimacy of natural resource governance. Ecology and Society **21**:18.

UN. 2023. UNSD — Methodology. Available from https://unstats.un.org/unsd/methodology/m49/ (accessed February 26, 2023).

UNDOC. 2020. World Wildlife Crime Report 2020.

USFWS. 2014. Notice of Intent To Include Four Native U.S. Freshwater Turtle Species in Appendix III of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). US Fish and Wildlife Service.

Valdez JW. 2021. Using google trends to determine current, past, and future trends in the reptile pet trade. Animals **11**:1–18.

van Dijk PP, Stuart BL, Rhodin AGJ. 2000. Asian Turtle Trade: Proceedings of a workshop on Conservation and Trade of Freshwater Turtles and Tortoises in Asia. Chelonian Research MonographsDOI: 10.1046/j.1365-3008.2001.0193b.x.

Veríssimo D, Anderson S, Tlusty M. 2019. Did the movie Finding Dory increase demand for blue tang fish? AmbioDOI: 10.1007/s13280-019-01233-7.

Wagner K, Owen S, Burke TW. 2019. Not Wild about Wildlife Protection? The Perceived Harmfulness, Wrongfulness, and Seriousness of Wildlife Crimes. Society & Animals **27**:383–402.

Walker JMM, Godley BJ, Nuno A. 2019. Media framing of the Cayman Turtle Farm: Implications for conservation conflicts. Journal for Nature Conservation **48**:61–70.

Watters F, Stringham O, Shepherd CR, Cassey P. 2022. The U.S. market for imported wildlife not listed in the CITES multilateral treaty. Conservation Biology:e13978.

Watts S, Stenner P. 2005. Doing Q methodology: Theory, method and interpretation. Qualitative Research in Psychology **2**:67–91.

Watts S, Stenner P. 2012. Doing Q methodological research: theory, method & interpretation. Sage, London.

Wauchope HS, Amano T, Geldmann J, Johnston A, Simmons BI, Sutherland WJ, Jones JPG. 2021. Evaluating Impact Using Time-Series Data. Trends in Ecology & Evolution **36**:196–205.

Weaver DH. 2007. Thoughts on Agenda Setting, Framing, and Priming. Journal of Communication **57**:142–147.

Webler T, Danielson S, Tuler S. 2009. Using Q Method to Reveal Social Perspectives in Environmental Research. Greenfield, MA. Available from www.seri-us.org/pubs/Qprimer.pdf.

Wyatt T. 2009. Exploring the organization of Russia Far East's illegal wildlife trade: two case studies of the illegal fur and illegal falcon trades. Global Crime **10**:144–154.

Xu S, Chen M, Feng T, Zhan L, L Z, Yu G. 2021. Use ggbreak to effectively utilize plotting space to deal with large datasets and outliers. Frontiers in Genetics **12**:774846.

Yanco E, Nelson MP, Ramp D. 2019. Cautioning against overemphasis of normative constructs in conservation decision making. Conservation Biology **0**:1–12.

Young JC, Searle K, Butler A, Simmons P, Watt AD, Jordan A. 2016. The role of trust in the resolution of conservation conflicts. Biological Conservation **195**:196–202.

Zabala A, Sandbrook C, Mukherjee N. 2018. When and how to use Q methodology to understand perspectives in conservation research. Conservation Biology **32**:1185–1194.