Supplementary Methods

Precautionary re-analyses

The method presented in Eq. 3 and Figure 4, using the post-change categories, “Becomes threatened”, Becomes non-threatened”, “Stayed threatened” and “Stayed non-threatened”, picks up important nuance on directional change and whether the change moves the species to a threatened or non-threatened category. The key result of this analysis is that a change does not systematically change species reoccurrence. To confirm this we ran a simpler model solely considering a directional change. Here we modelled the following categories, “Pre-change”, “Increase” and “Decrease”. Pre-change here denotes the same as in the main methods. Here “Increase” refers to an increase in extinction risk (i.e. LC to VU, NT to CR, etc.). Conversely, “Decrease” is any decrease in extinction risk (i.e. VU to LC, CR to EN etc.). The simplicity of these models required a number of species (changes) to be removed. All species that changed category more than once were removed, all species changing to or from Data Deficient (DD) or changing from Not evaluated (NE) were also removed as changes to or from DD or NE should not be considered an increase or decrease in extinction risk. Therefore, this re-analysis focused only on the most well-understood species that were reassessed into a different category, with full assessments pre and post-change. As before the same criteria as applied in the main text models applied here mainly all species must have at least 2-years data pre- or post-change. The number of species modelled was therefore severely reduced (36 birds, 42 mammals, 3 amphibians and 16 reptiles, totalling 97 species).

The basic structure of the models remained the same as that in the main text. Due to the reduced number of species, this model does not account for relatedness between species we do however account for species variation and class level differences by nesting species within taxonomic classes in the models group-level effects (see Equation 5). The smaller number of species meeting the prerequisites for this reanalysis prevent a more nuanced analysis fully separating classes and accounting for species non-independence.

$$
\begin{aligned}
n &\sim \text{Hurdle-NB}(\hat{P}, \mu, \phi) \\
Logit(\hat{P}) &= \alpha^1_{j,k} + \beta^1_{j,k}(\text{Year}) + \beta^1_{2j,k}(\text{Change}) + \beta^1_{3j,k}(\text{Year} \times \text{Change}) + \beta^1_4(\text{lag}) \\
\begin{pmatrix} \alpha_j \\ \beta_{1j} \\ \beta_{2j} \\ \beta_{3j} \end{pmatrix} &\sim N\left(\begin{pmatrix} \mu_{\alpha_j} \\ \mu_{\beta_{1j}} \\ \mu_{\beta_{2j}} \\ \mu_{\beta_{3j}} \end{pmatrix}, \begin{pmatrix} \sigma^2_{\alpha_j} & \rho_{\alpha_j\beta_{1j}} & \rho_{\alpha_j\beta_{2j}} & \rho_{\alpha_j\beta_{3j}} \\ \rho_{\beta_{1j}\alpha_j} & \sigma^2_{\beta_{1j}} & \rho_{\beta_{1j}\beta_{2j}} & \rho_{\beta_{1j}\beta_{3j}} \\ \rho_{\beta_{2j}\alpha_j} & \rho_{\beta_{2j}\beta_{1j}} & \sigma^2_{\beta_{2j}} & \rho_{\beta_{2j}\beta_{3j}} \\ \rho_{\beta_{3j}\alpha_j} & \rho_{\beta_{3j}\beta_{1j}} & \rho_{\beta_{3j}\beta_{2j}} & \sigma^2_{\beta_{3j}} \end{pmatrix}\right), for\ Species: Class\ j = 1, \dots, J \\
\begin{pmatrix} \alpha_k \\ \beta_{1k} \\ \beta_{2k} \\ \beta_{3k} \end{pmatrix} &\sim N\left(\begin{pmatrix} \mu_{\alpha_k} \\ \mu_{\beta_{1k}} \\ \mu_{\beta_{2k}} \\ \mu_{\beta_{3k}} \end{pmatrix}, \begin{pmatrix} \sigma^2_{\alpha_k} & \rho_{\alpha_k\beta_{1k}} & \rho_{\alpha_k\beta_{2k}} & \rho_{\alpha_k\beta_{3k}} \\ \rho_{\beta_{1k}\alpha_k} & \sigma^2_{\beta_{1k}} & \rho_{\beta_{1k}\beta_{2k}} & \rho_{\beta_{1k}\beta_{3k}} \\ \rho_{\beta_{2k}\alpha_k} & \rho_{\beta_{2k}\beta_{1k}} & \sigma^2_{\beta_{2k}} & \rho_{\beta_{2k}\beta_{3k}} \\ \rho_{\beta_{3k}\alpha_k} & \rho_{\beta_{3k}\beta_{1k}} & \rho_{\beta_{3k}\beta_{2k}} & \sigma^2_{\beta_{3k}} \end{pmatrix}\right), for\ Class\ k = 1, \dots, K \\
\text{Log}(\mu) &= \alpha^2_{l,m} + \beta^2_{l,m}(\text{Year}) + \beta^2_{2l,m}(\text{Change}) + \beta^2_{3l,m}(\text{Year} \times \text{Change}) + \beta^2_4(\text{lag}) \\
\begin{pmatrix} \alpha_l \\ \beta_{1l} \\ \beta_{2l} \\ \beta_{3l} \end{pmatrix} &\sim N\left(\begin{pmatrix} \mu_{\alpha_l} \\ \mu_{\beta_{1l}} \\ \mu_{\beta_{2l}} \\ \mu_{\beta_{3l}} \end{pmatrix}, \begin{pmatrix} \sigma^2_{\alpha_l} & \rho_{\alpha_l\beta_{1l}} & \rho_{\alpha_l\beta_{2l}} & \rho_{\alpha_l\beta_{3l}} \\ \rho_{\beta_{1l}\alpha_l} & \sigma^2_{\beta_{1l}} & \rho_{\beta_{1l}\beta_{2l}} & \rho_{\beta_{1l}\beta_{3l}} \\ \rho_{\beta_{2l}\alpha_l} & \rho_{\beta_{2l}\beta_{1l}} & \sigma^2_{\beta_{2l}} & \rho_{\beta_{2l}\beta_{3l}} \\ \rho_{\beta_{3l}\alpha_l} & \rho_{\beta_{3l}\beta_{1l}} & \rho_{\beta_{3l}\beta_{2l}} & \sigma^2_{\beta_{3l}} \end{pmatrix}\right), for\ Species: Class\ l = 1, \dots, L \\
\begin{pmatrix} \alpha_m \\ \beta_{1m} \\ \beta_{2m} \\ \beta_{3m} \end{pmatrix} &\sim N\left(\begin{pmatrix} \mu_{\alpha_m} \\ \mu_{\beta_{1m}} \\ \mu_{\beta_{2m}} \\ \mu_{\beta_{3m}} \end{pmatrix}, \begin{pmatrix} \sigma^2_{\alpha_m} & \rho_{\alpha_m\beta_{1m}} & \rho_{\alpha_m\beta_{2m}} & \rho_{\alpha_m\beta_{3m}} \\ \rho_{\beta_{1m}\alpha_m} & \sigma^2_{\beta_{1m}} & \rho_{\beta_{1m}\beta_{2m}} & \rho_{\beta_{1m}\beta_{3m}} \\ \rho_{\beta_{2m}\alpha_m} & \rho_{\beta_{2m}\beta_{1m}} & \sigma^2_{\beta_{2m}} & \rho_{\beta_{2m}\beta_{3m}} \\ \rho_{\beta_{3m}\alpha_m} & \rho_{\beta_{3m}\beta_{1m}} & \rho_{\beta_{3m}\beta_{2m}} & \sigma^2_{\beta_{3m}} \end{pmatrix}\right), for\ Class\ m = 1, \dots, M \\
\text{Log}(\phi) &= \alpha \\
\beta &\sim Normal(0,1) \\
\alpha &\sim Normal(0,1) \\
\phi &\sim \text{Gamma}(0.01,0.01) \\
\alpha_{j,k,l,m} &\sim\sim \text{Normal}(0, \sigma_{j,k,l,m}) \\
\sigma_{j,k,l,m} &\sim \text{Normal}(0,1)
\end{aligned}
$$

Equation 5

This simplified approach has merit but also severe limitations as LC to NT, NT to VU, or EN to CR are all classed equally as "Increases" extinction risk, a factually correct, but very limited interpretation as it is dubious all changes are equally likely to prompt policy or management measures. Crucially, these results mirror our main text findings. There is no systematic change in species traded volumes after pre- to post-IUCN change. This was true across species and for the average species changing to a more-threatened (Increase) or less threatened (Decrease) status, there was no substantial directional effect on traded volumes (Figure S4). There are a number of reasons why species may show no response to a change, namely that species presence is ephemeral and that species may have ceased to be traded (but remain listed) years before the IUCN reassessment and status change.

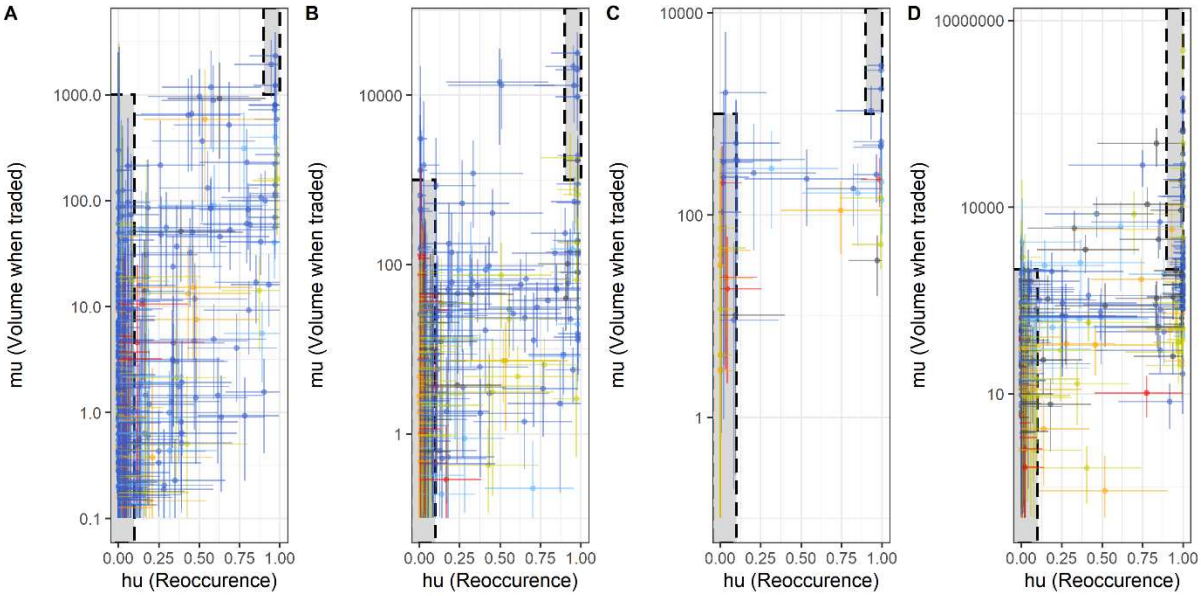

Figure S1. Species level *hu* and *mu* estimates. For each species the Year is held at 2018 and the lagged term at the species-specific values for 2017. IUCN statuses coloured as in the main text. Left-hand side grey box highlight species with a probability of reoccurrence < 0.1, highlight that the majority of species have been traded at some point, and some in high volumes (shown by large *mu* estimates), but this is not the case in recent years, and as such have a very low probability of reoccurring. The right-hand side grey box shows species that have a high probability of occurring in recent trade (*hu* > 0.9) and to be traded at "*high*" volumes (*mu* > 1000). Points are medians and lines the 90% HDCI, calculated from the entire posterior.

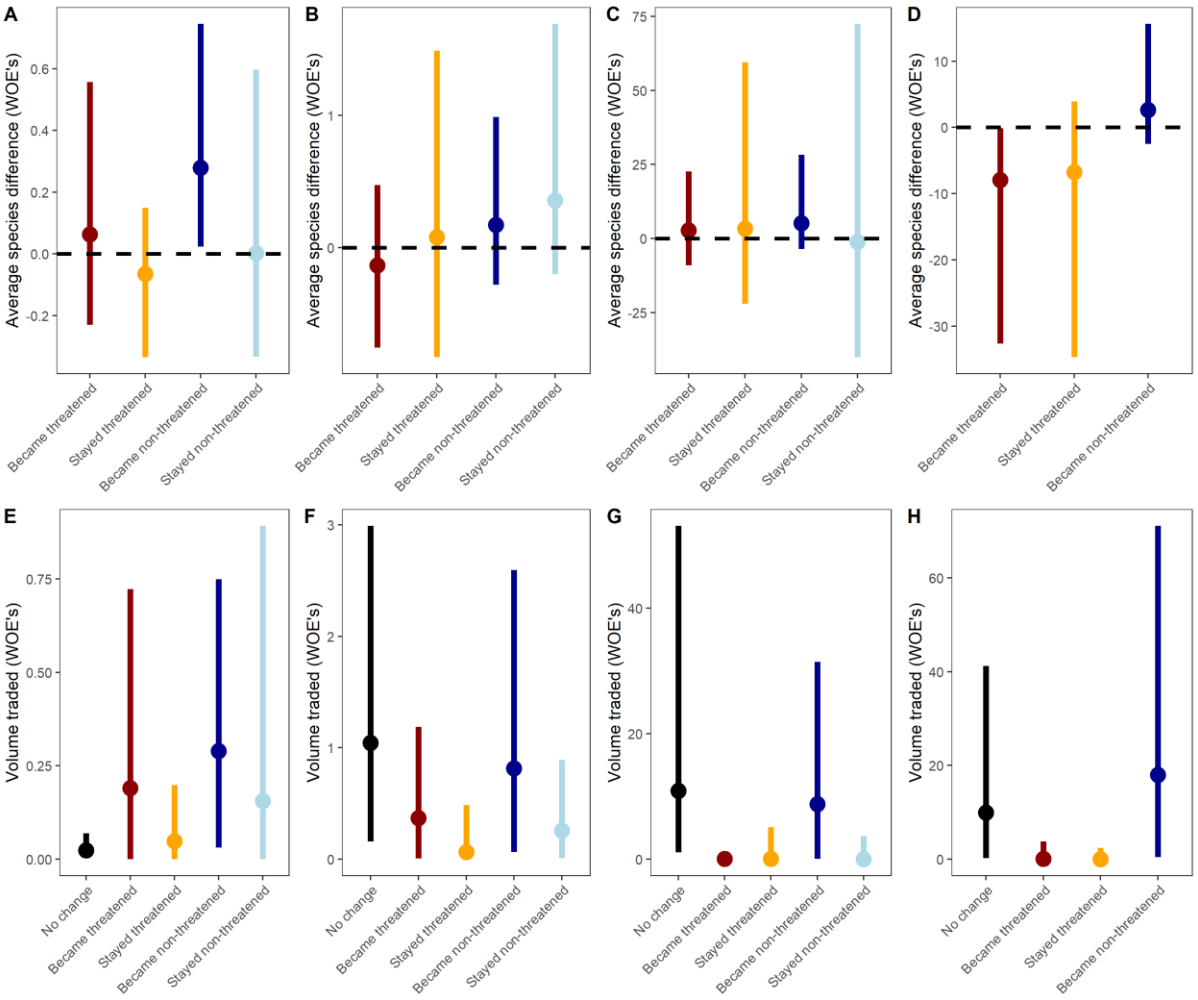

Figure S2. Average (population-level) results, columns represent Aves, Mammals, Amphibians and Reptiles respectively. A – D. Represent the volume difference 1-year pre- to 1-year post-change for each change type. Change year modelled as the most common change year per class (Aves – 2013, Mammals – 2007, Amphibians – 2003, Reptiles – 2010), lagged volume fixed at the Class median. E – H. Estimated volumes traded in 2018 for each change type and those that did not change, lagged volume fixed at the Class median. Points are medians and lines the 90% HDCI, calculated from the entire posterior.

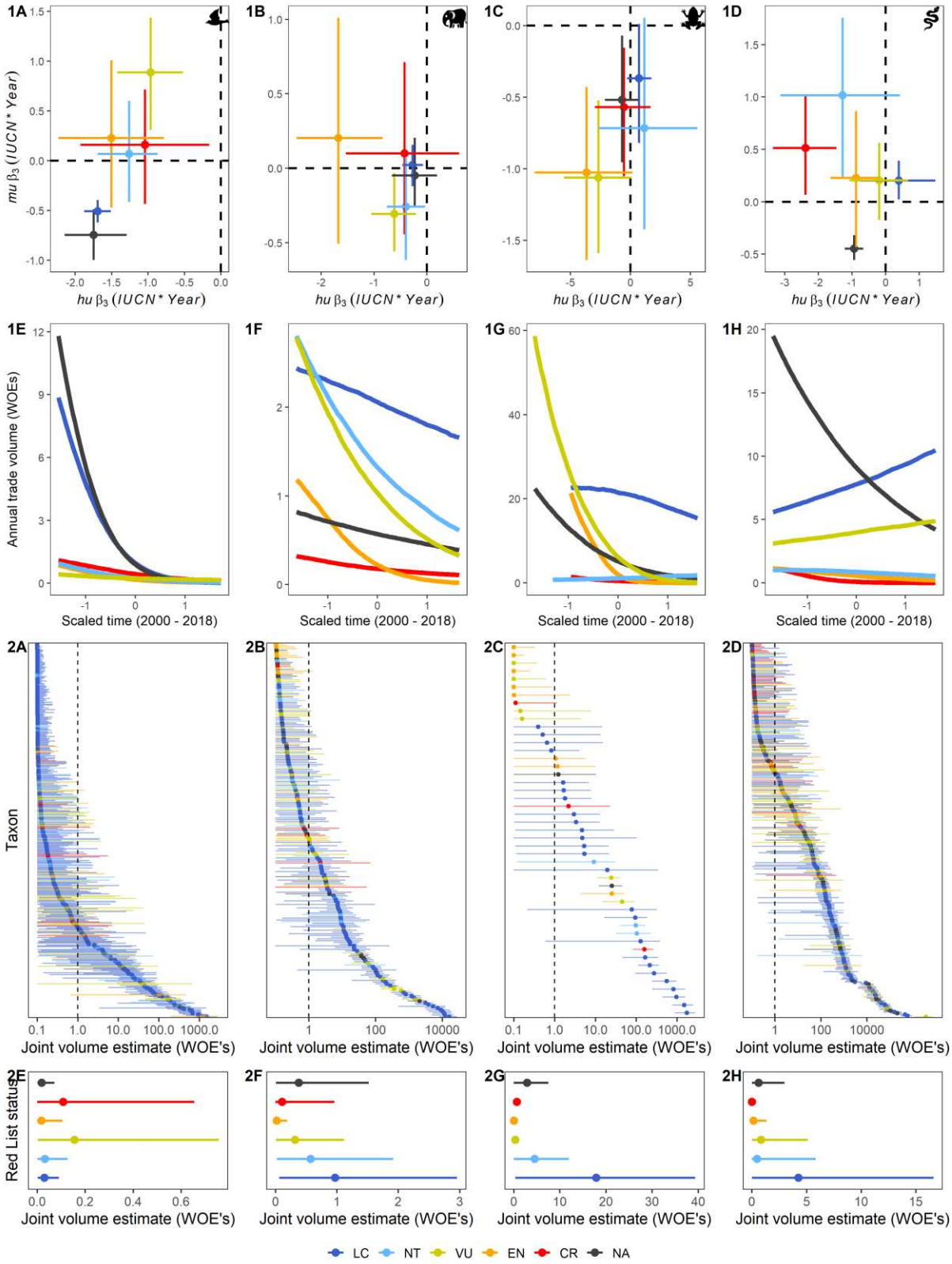

Figure S3. Replication of main text findings (Figures 1 and 2) using the Importer reported results (rather than exporter). Points are medians and lines the 90% HDCI, calculated from the entire posterior.

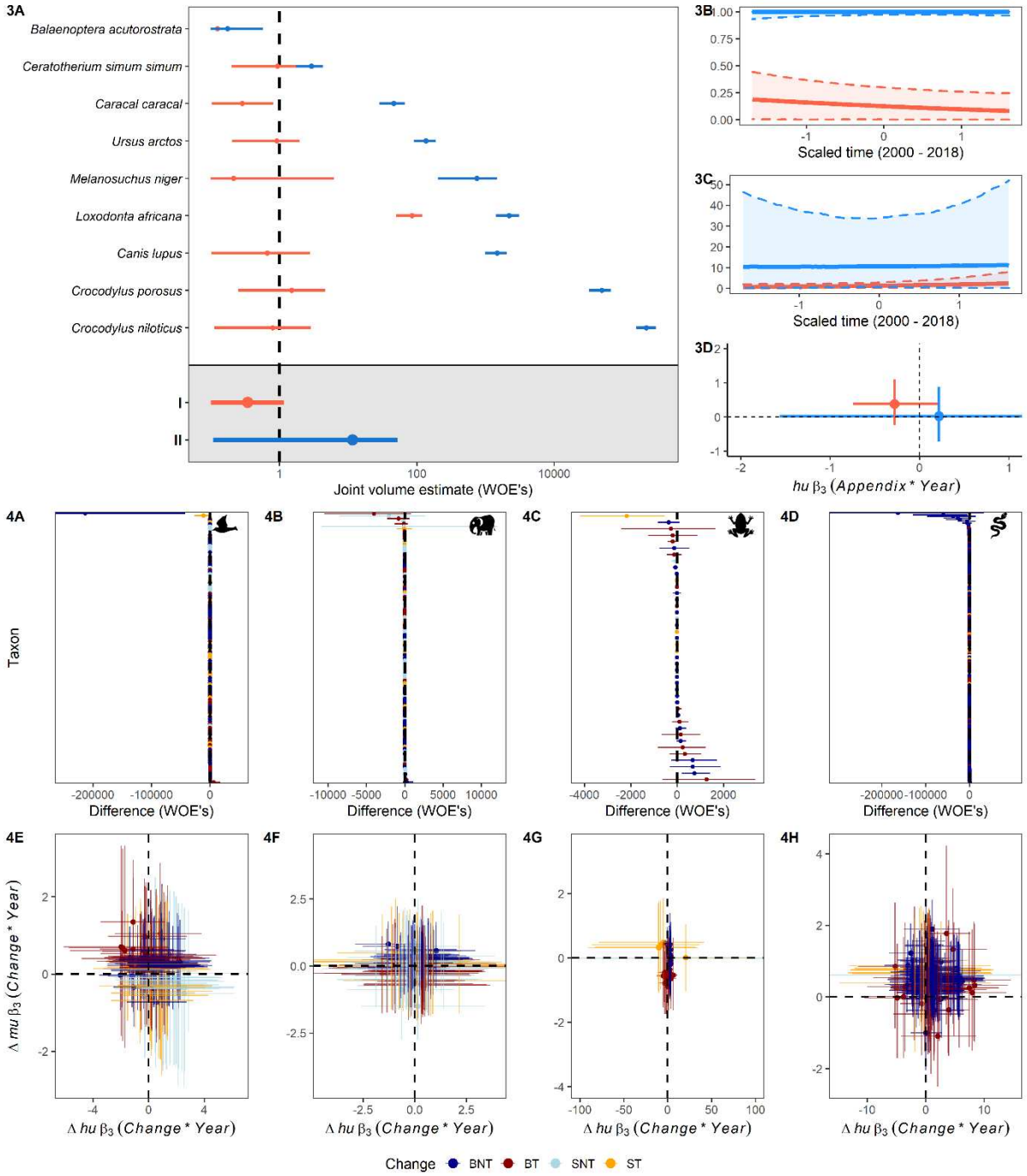

Figure S4. Replication of main text findings (Figures 3 and 4) using the Importer reported results (rather than exporter). Points are medians and lines the 90% HDCI, calculated from the entire posterior.

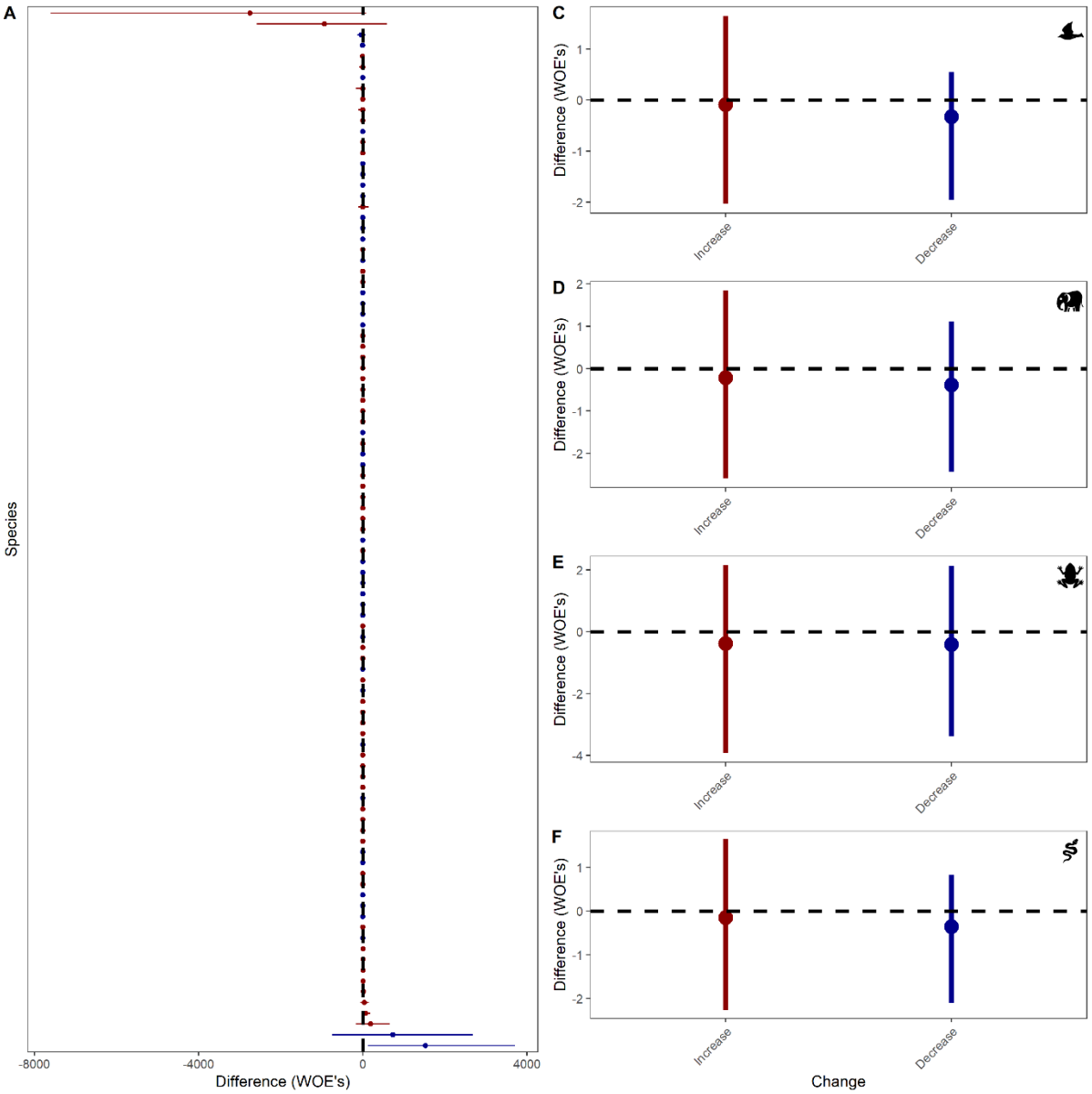

Figure S5. Simplified analysis of trade volumes pre- to post-change using only "Increase" or "Decrease". A. Species level estimates for differences in volume pre- to post-change. C – F. Differences pre-post change for the average species. Change year was specified as the most common change year per Class. Colours denote Increases (red) and Decreases (blue) in IUCN extinction risk, see supplementary methods for details. Points are medians and lines the 90% HDCI, calculated from the entire posterior.

Table S1. Summary of the CITES data curation pipeline. Initial data download accessed here https://trade.cites.org/.

Step	Description	Records	Notes
1	CITES Trade database Version 2021.1	22,616,522	
2	Remove all re-exports	12,880,243	
3	Focus on target Classes	3,770,437	
4	Convert records to woes	3,015241	80.0% of records could be converted. By Class 5.7% of Amphibian, 2.6% of bird, 19.8% of Mammal and 34.5% of Reptile records could not be converted.
5	Focus on 2000 to 2018	1,864,275	
6	Focus on Exporter data	991,417	872,858 Importer records
7	Focus on the wild sourced commercial trade	284,091	Commercial and not wild-sourced = 350,491. Non-commercial and not wild-sourced = 67,129. Non-commercial and wild-sourced = 289,706.

Table S2. Numbers of species present in the data and the number that could be included in the phylogenetic models. Species were lost from the Presence (Figure 2) analysis only if they could not be resolved to a phylogeny. Care was taken to check for incorrect naming, updated names etc. We used the CITES naming as the authority so we retained sub-species names in the phylogenetically independent group effects but the sub-species where grouped under the known species name for the phylogenetically dependent group effect. But some species still could not be included. Note – while 1024 could be modelled, when discussing species in recent trade (2018) we only consider the 926 species still listed in the Appendices at that point. Species were lost from the IUCN change (Figure 4) analysis for the same reason, but additionally where species changed status to DD or only had 1 year of trade data pre- or post-change.

	Total species present in CITES data	**Total that could be resolved to include in the model**	**%**
Presence (Figure 1 and 2)			
Aves	486	486	100.0
Mammalia	207	207	100.0
Amphibia	44	44	100.0
Reptilia	316	288	91.1
Total	**1053**	**1025**	
IUCN change (Figure 4)			
Aves	482	482	100.0
Mammalia	201	201	100.0
Amphibia	40	40	100.0
Reptilia	301	277	92.0
Total	**1024**	**1000**	

Table S3. Slope coefficients for IUCN statuses through time. Coefficients were derived for each status for both volumes when traded (*mu*) and for presence in trade (*hu*). The 90% HDCI is calculated from the entire posterior draw of coefficients. The *pd* is used to show the certainty of direction, whether a slope coefficient is increasing, decreasing or uncertain. We colours slope values with *pd*'s > 97.50% indicating a very high certainty of direction. Those that decrease are coloured red, those that increase blue.

Class	IUCN	*mu*	90% HDCI	*pd*	*hu*	90% HDCI	*pd*
Aves	CR	-0.20	-0.83 to 0.39	70.21	-0.35	-1.32 to 0.69	72.16*
	EN	-0.48	-1.37 to 0.41	80.41	-1.15	-2.27 to -0.15	97.32*
	LC	-0.78	-0.90 to -0.64	100.00	-1.41	-1.57 to -1.25	100.00
	NA	-0.73	-1.00 to -0.44	100.00	-1.96	-2.43 to -1.51	100.00
	NT	-0.05	-0.46 to 0.43	57.66	-1.19	-1.68 to -0.73	100.00
	VU	0.01	-0.64 to 0.63	51.26*	-0.53	-0.97 to -0.07	97.27*
Mammalia	CR	-0.09	-0.66 to 0.53	58.92	-0.27	-0.89 to 0.44	75.46
	EN	-0.06	-0.82 to 0.69	55.17	-1.22	-2.21 to -0.26	98.21
	LC	0.02	-0.13 to 0.18	58.81	-0.34	-0.56 to -0.11	99.08
	NA	0.01	-0.38 to 0.38	50.90	-0.05	-0.39 to 0.27	59.13
	NT	-0.04	-0.47 to 0.38	55.75	-0.32	-0.64 to -0.01	95.33
	VU	-0.12	-0.41 to 0.18	74.94	-0.46	-0.78 to -0.12	99.02
Amphibia	CR	-0.59	-1.01 to -0.20	98.40	-0.15	-1.83 to 1.32	56.65
	EN	-1.18	-1.81 to -0.53	99.35	-3.77	-7.11 to -0.71	99.25
	LC	0.01	-0.30 to 0.34	51.80	0.71	-0.39 to 1.94	84.85
	NA	-0.86	-1.40 to -0.28	98.92**	-0.54	-2.11 to 0.85	74.22
	NT	-0.64	-1.28 to 0.08	93.03	1.09	-2.52 to 5.31	71.83
	VU	-1.20	-1.72 to -0.61	99.10	-2.45	-6.08 to 0.28	94.33
Reptilia	CR	-0.75	-1.22 to -0.27	99.33^{+}	-1.47	-2.27 to -0.64	99.90
	EN	-0.83	-1.26 to -0.42	99.85^{+}	-0.66	-2.10 to 0.62	80.97^{++}
	LC	0.22	0.02 to 0.41	97.50^{+}	-0.07	-1.42 to 1.22	53.57
	NA	-0.22	-0.33 to -0.10	99.83	-1.09	-1.40 to -0.81	100.00
	NT	0.27	-0.39 to 0.90	75.25^{+}	-0.62	-3.14 to 1.76	67.70
	VU	0.07	-0.27 to 0.42	63.80	-0.11	-0.89 to 0.80	57.90

*Importer based results suggests that the relative me trend through time for VU is increasing (pd > 97.5%) and the *hu* trend through time for CR, EN and VU species is also substantially negative in direction (>97.50%).

** Importer based results suggest that the relative *mu* trend through time for NA species is no longer substantially negative, however the pd remains at 97.25%.

$^{+}$ Importer based results suggests that the relative *mu* trend through time for CR, EN and LC species is no longer clearly positive or negative (pd < 97.50%). Additionally the mu trend for NT species is now substantially positive.

$^{++}$ Importer based results suggests that the relative h*u* trend through time for EN species is now substantially negative (pd > 97.50%)

Table S4. Contrasts in traded volumes across IUCN statuses. Contrasts taken with Year fixed at 2018 and the lagged volume term held at the status median.

Class	Status contrast	Absolute difference (WOE's, 90% HDCI)	*Pd (%)*
Birds	CR - LC	0.09 (-0.10 to 0.73)	80.87
	CR - NT	0.07 (-0.18 to 0.80)	74.01
	EN – LC	-0.03 (-0.12 to 0.04)	87.47
	EN – NT	-0.04 (-0.23 to 0.05)	87.53
	VU – LC	0.03 (-0.06 to 0.25)	77.54
	VU - NT	0.02 (-0.16 to 0.28)	65.08
Mammalia	CR - LC	-0.88 (-3.09 to 0.01)	**98.65***
	CR - NT	-0.62 (-2.66 to 0.16)	96.08
	EN – LC	-1.07 (-3.32 to -0.1)	**99.83**
	EN – NT	-0.80 (-2.75 to -0.06)	**99.71**
	VU – LC	-0.69 (-2.57 to 0.12)	**97.88***
	VU - NT	-0.42 (-2.15 to 0.32)	91.33
Amphibia	CR - LC	-11.72 (-41.66 to 0.01)	**99.70**
	CR - NT	-1.30 (-10.28 to 2.70)	76.00
	EN – LC	-12.59 (-43.38 to -0.19)	**100.00**
	EN – NT	-2.03 (-10.55 to 0.27)	95.08
	VU – LC	-12.48 (-43.02 to -0.07)	**99.90**
	VU - NT	-1.89 (-10.52 to 1.14)	90.80
Reptilia	CR - LC	-32.37 (-134.26 to -0.98)	**100.00**
	CR - NT	-8.30 (-64.61 to 1.40)	97.08**
	EN – LC	-31.56 (-131.23 to -0.97)	**100.00**
	EN – NT	-7.38 (-65.76 to 4.72)	90.77
	VU – LC	-20.00 (-103.87 to 8.80)	95.33
	VU - NT	-0.09 (-51.49 to 53.69)	50.40

* Importer based results suggests that the absolute difference between CR and LC, and VU and LC is no longer clearly positive or negative (*pd* < 97.5%) however the probability of direction for both remaining negative remains above 94.00%.

** Importer based results suggests there is an absolute difference between CR and NT traded volumes (pd = 98.12%).

Table S5. Summary of IUCN status change differences. Initially we contrast the volume traded for species that changed status with those that did not change. Thus assessing whether species that changed were broadly traded in any higher or lower volumes. Red shading indicates species that did change were traded in lower volumes (blue for higher volumes) than those that did change. Secondly, we contrasted the differences pre- to post-change for the average species (using the change year as the year that class most frequently changed status and the median lagged volume). Red shading indicates a decrease in volume pre- to post change and blue an increase.

		In 2018 relative to no change			***Pre- to post change for the average species***	
Class	**Contrast**	**Absolute difference (90% HDCI)**	***Pd (%)***	**Contrast**	***Absolute difference (90% HDCI)***	***Pd (%)***
Birds	NC – BT	-0.16 (-0.68 to 0.04)	96.54	BT-PC	0.06 (-0.23 to 0.56)	69.21
	NC - BNT	-0.26 (-0.69 to -0.02)	**100.00**	BNT-PC	0.28 (0.02 to 0.74)	**99.84**[+]
	NC – ST	-0.02 (-0.18 to 0.05)	72.19*	ST -PC	-0.06 (-0.34 to 0.15)	79.67
	NC – SNT	-0.13 (-0.87 to 0.06)	90.96	SNT-PC	0.00 (-0.33 to 0.60)	50.99
Mammalia	NC – BT	0.58 (-0.35 to 2.38)	91.36	BT-PC	-0.13 (-0.75 to 0.47)	73.01
	NC - BNT	0.17 (-1.22 to 1.75)	64.30	BNT-PC	0.17 (-0.28 to 0.98)	79.39
	NC – ST	0.88 (-0.01 to 2.99)	**97.50****	ST -PC	0.08 (-0.83 to 1.49)	58.11
	NC – SNT	0.70 (-0.19 to -2.49)	96.11	SNT-PC	0.36 (-0.20 to 1.69)	90.00
Amphibia	NC – BT	10.20 (-0.08 to 49.37)	**99.76**	BT-PC	2.70 (-9.09 to 22.68)	77.80
	NC - BNT	1.23 (-20.29 to 42.00)	57.24	BNT-PC	5.12 (-3.51 to 28.30)	92.73
	NC – ST	9.12 (-6.14 to 55.92)	94.08	ST -PC	3.38 (-22.00 to 59.44)	64.49
	NC – SNT	10.40 (0.49 to 51.43)	**99.44**	SNT-PC	-1.11 (-40.09 to 72.41)	60.89
Reptilia	NC – BT	9.23 (-2.52 to 44.73)	97.39	BT-PC	-7.87 (-33.73 to -0.15)	**99.70**
	NC - BNT	-7.04 (-52.60 to 13.12)	83.16	BNT-PC	2.60 (-2.96 to 14.90)	90.00
	NC – ST	9.44 (-1.93 to -45.21)	**97.60**	ST -PC	-6.45 (-34.74 to 5.80)	93.15[++]

* Importer based results suggests that the average species that did not change was traded in lower volumes than those that stayed threatened (*pd* = 97.85%).

** Importer based results suggests that the average species that did not change was no longer traded in substantially lower or greater volumes than those that stayed threatened (*pd* < 97.50%).

[+] Importer based results suggests that the average species no longer saw a substantial increase in volume pre- to post-change after becoming non-threatened (*pd* = 84.05%).

[++] Importer based results suggests that the average species now saw a substantial decrease in volume pre- to post-change after changing status but staying threatened (*pd* = 99.76%).