

Supporting Information

From current distinctiveness to future homogenization of the world's freshwater fish faunas

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Table S1. Present patterns of extirpations of native fish species and of introductions of non-native fish species in the six biogeographic realms.

Biogeographic realm	Number of river basins studied	Number of native species extirpations	Number of non-native species introductions	Number of non-native species introduced	Proportion of non-native species introduced in only one basin (%)	Median and 1 st and 3 rd quartile of the number of introductions per non-native species	Proportion of non-native species introduced in at least 10% of river basins (%)
Afrotropical	109	29	156	44	45	2 (1;6)	7
Australian	179	1	406	52	52	1 (1;6)	13
Nearctic	207	19	1330	224	44	2 (1;5)	8
Neotropical	155	8	222	70	60	1 (1;3)	4
Oriental	59	1	149	56	66	1 (1;2)	14
Palaearctic	345	4	1407	169	38	2 (1;8)	8

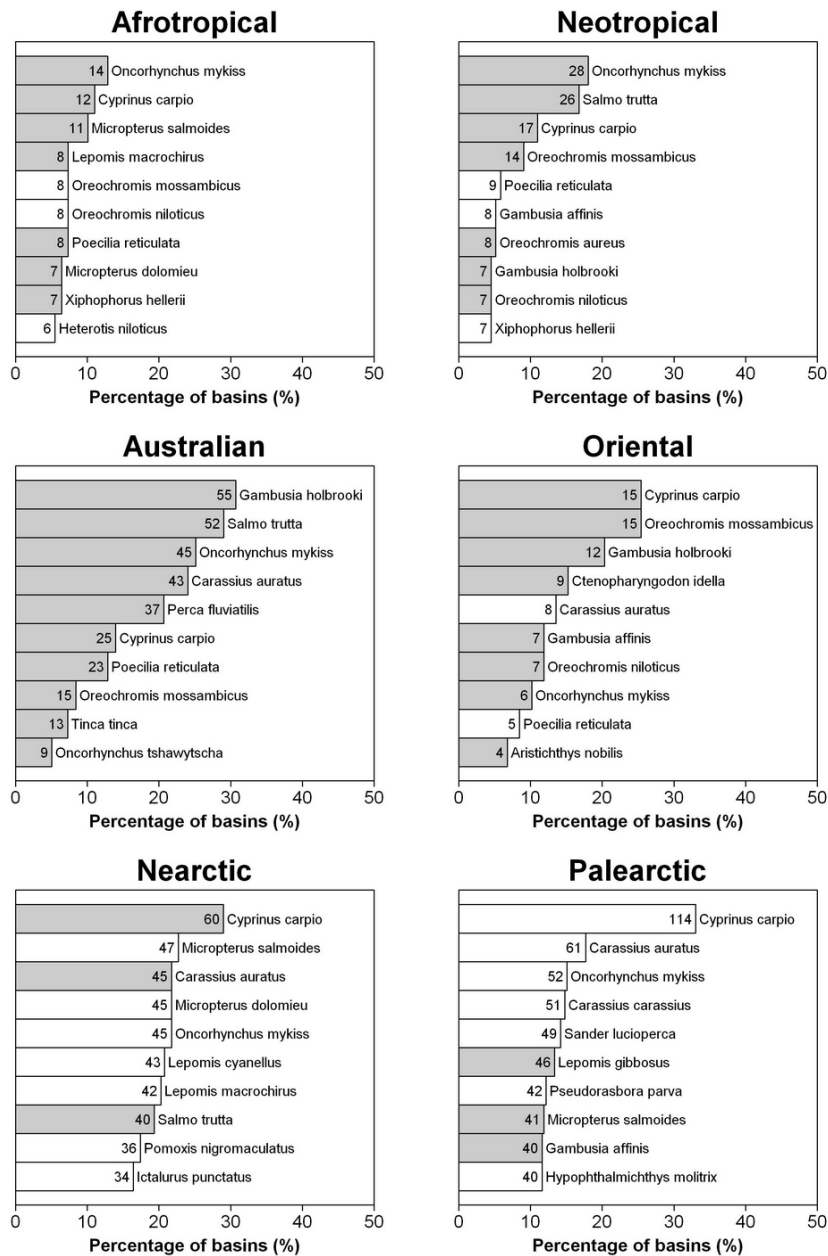


Figure S1. Occurrence frequencies of the ten most introduced fish species in the six biogeographic realms.

Bar length represent percentage of river basins of each realm where each non-native species has been introduced. The number of basins where each non-native species has been introduced is shown inside corresponding bars. Bars for exotic species (i.e. coming from a different realm) are filled in grey while bars for translocated species (i.e. introduced in additional basins within their native realm) are filled in white.

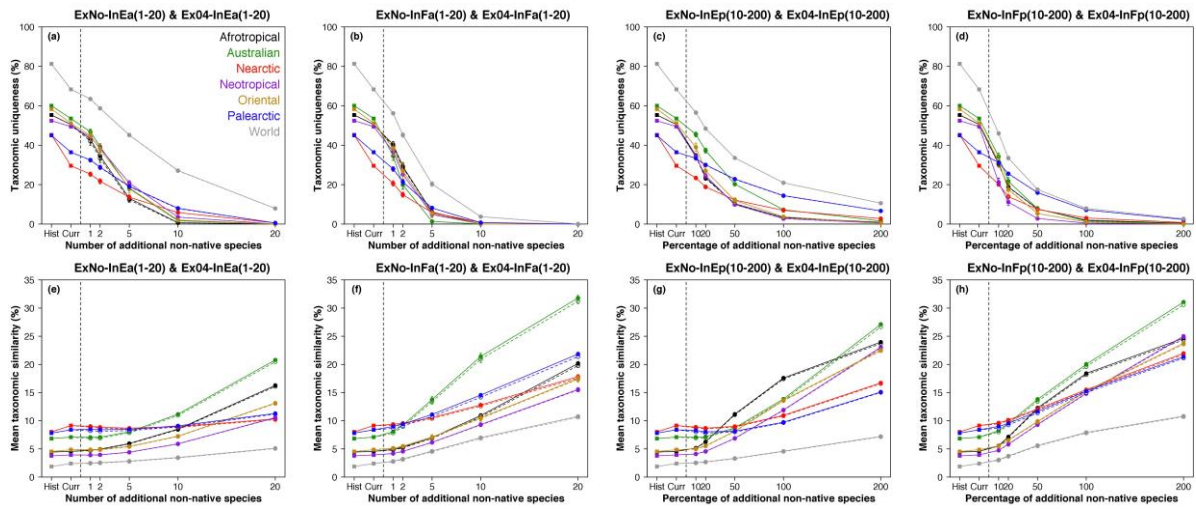


Figure S2. Historical, current and future taxonomic uniqueness (i.e. percentage of river basin pairs sharing no species) (a-d) and mean taxonomic similarity among pairs of fish faunas (e-h) at the world and realm scales for different scenarios of introduction and extirpation considered (see codes in Table 1). The left side of each plot shows the historical and current patterns, while the right side shows simulations of future trends under scenarios of increasing non-native species occurrences, i.e. increase in the number of non-native species (from 1 to 20; a-b, e-f) or increase in the proportion of non-native species richness compared to native species richness (from 10 to 200%; c-d, g-h). Additional non-native species occurrences were selected randomly in the pool of non-native species (a,c,e,g) or according to their current frequencies (b,d,f,h) in each realm. Points represent mean values and the associated 95% confidence intervals. Filled symbols (and solid lines) represent scenarios considering both introduction and extirpation of all species listed as threatened in 2004 while open symbols and dashed lines are for the scenarios considering only introduction. Open symbols, dashed lines and confidence intervals, although present are often hidden behind filled symbols and solid lines.

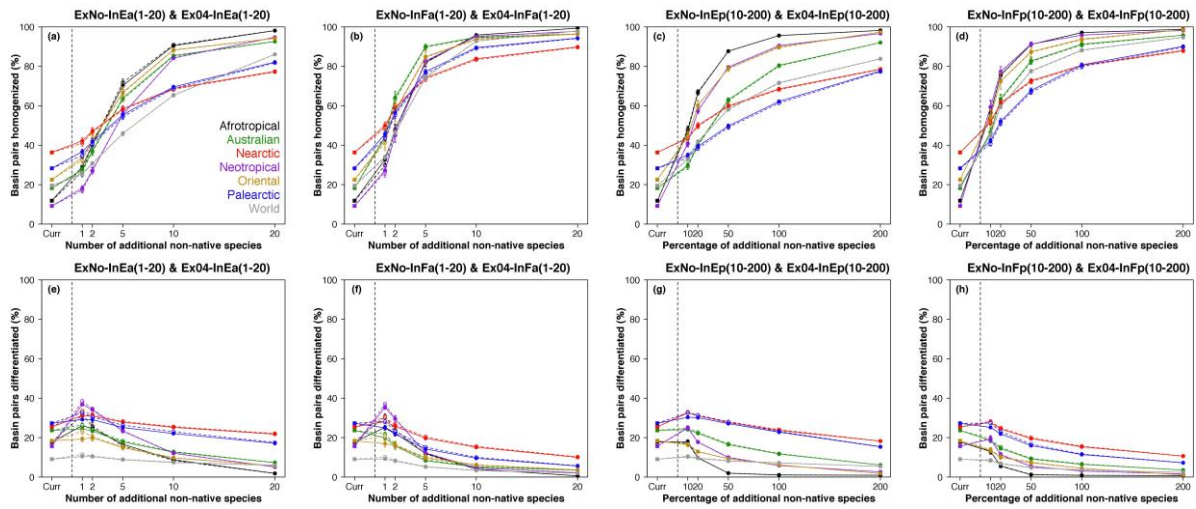


Figure S3. Historical, current and future homogenization (a-d) and differentiation (e-h) frequencies among pairs of fish faunas at the world and realm scales for different scenarios of introduction and extirpation (see codes in Table 1). The left side of each plot shows the current pattern, while the right side shows simulations of future trends under scenarios of increasing number of non-native species occurrences, i.e. increase in the number of non-native species (from 1 to 20; a-b, e-f) or increase in the proportion of non-native species richness compared to native species richness (from 10 to 200%; c-d, g-h). Additional non-native species occurrences were selected randomly in the pool of non-native species (a,c,e,g) or according to their current frequencies (b,d,f,h) in each realm. Points represent mean values and the associated 95% confidence intervals. Filled symbols (and solid lines) represent scenarios considering both introduction and extirpation of all species listed as threatened in 2004 while open symbols and dashed lines are for the scenarios considering only introduction. Open symbols, dashed lines and confidence intervals, although present are often hidden behind filled symbols and solid lines.

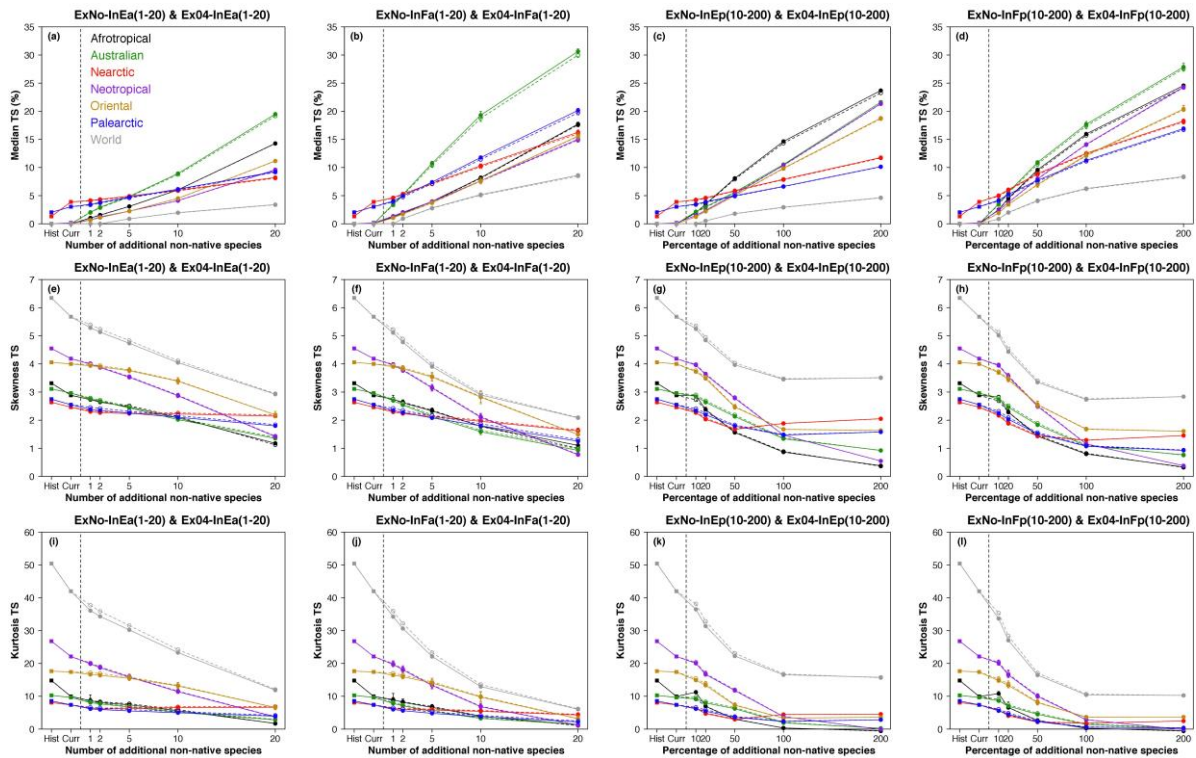


Figure S4. Historical, current and future trends of the median (a-d), skewness (e-h) and kurtosis (i-l) of the taxonomic similarity (TS) among pairs of fish faunas at the world and realm scales for different scenarios of introduction and extirpation (see codes in Table 1). The left side of each plot shows the historical and current patterns, while the right side shows simulations of future trends under scenarios of increasing number of non-native species occurrences, i.e. increase in the number of non-native species (from 1 to 20; a-b, e-f, i-j) or increase in the proportion of non-native species richness compared to native species richness (from 10 to 200%; c-d, g-h, k-l). Additional non-native species occurrences were selected randomly in the pool of non-native species (a,c,e,g,i,k) or according to their current frequencies (b,d,f,h,j,l) in each realm. Points represent mean values and the associated 95% confidence intervals. Filled symbols (and solid lines) represent scenarios considering both introduction and extirpation of all species listed as threatened in 2004 while open symbols and dashed lines are for the scenarios considering only introduction. Open symbols, dashed lines and confidence intervals, although present are often hidden behind filled symbols and solid lines.

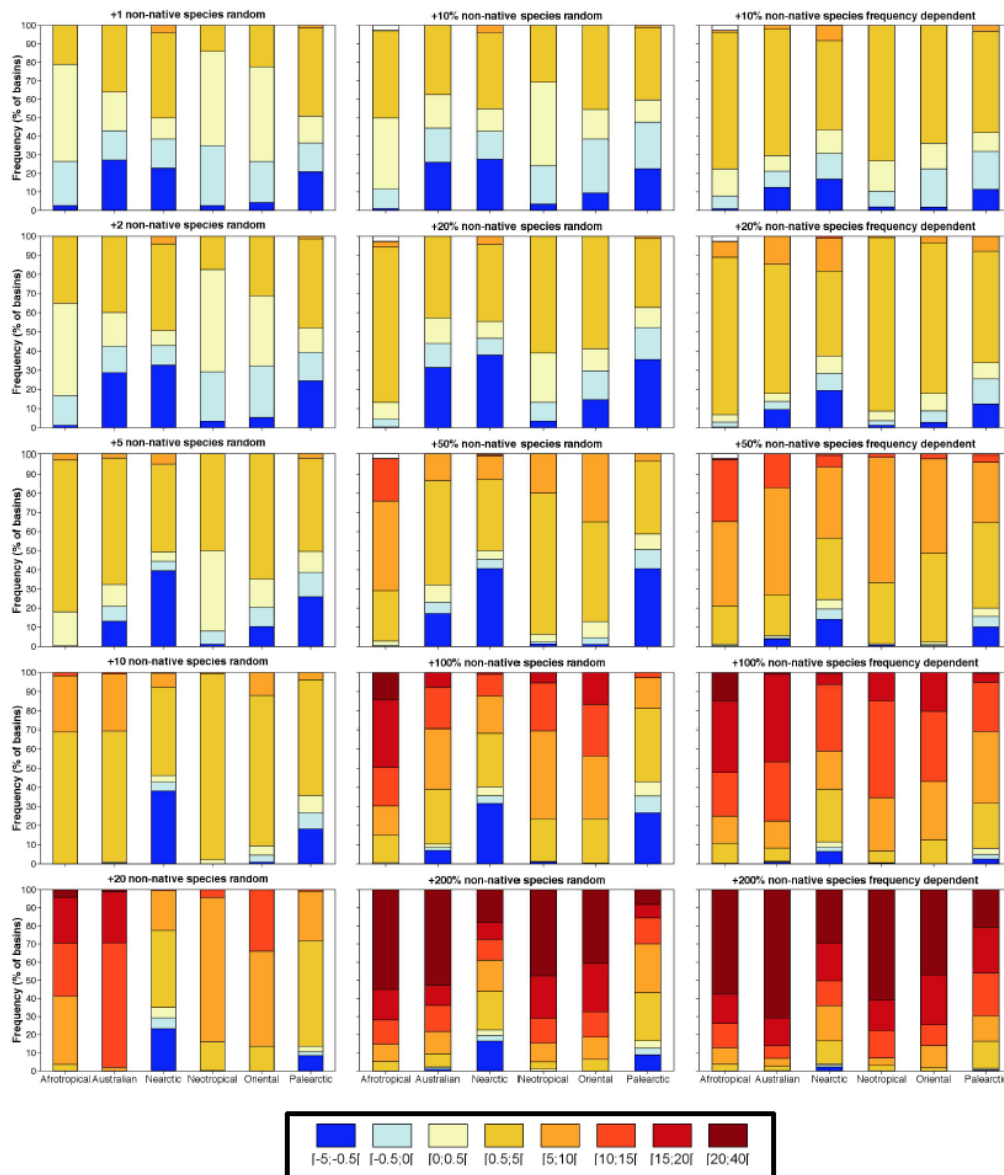


Figure S5. Distribution of future change in mean taxonomic similarity per river basin. The scenarios consider future extirpation of all species listed as threatened in 2004 and different levels of future non-native species introductions. Left column shows forecasts obtained under a scenario simulating an increase in non-native species introductions from 1 to 20 species per river basin with species selected randomly in the pool of non-native species in each realm (scenarios “Ex04-InEa” in Table 1). Centre and right columns show forecasts obtained under a scenario simulating an increase in the proportion of non-native species richness per river basin (from 10 to 200%) with additional non-native species occurrences selected randomly in the pool of non-native species (centre, scenarios “Ex04-InEp”) or according to their current frequencies (right, scenarios “Ex04-InFp”) in each realm.

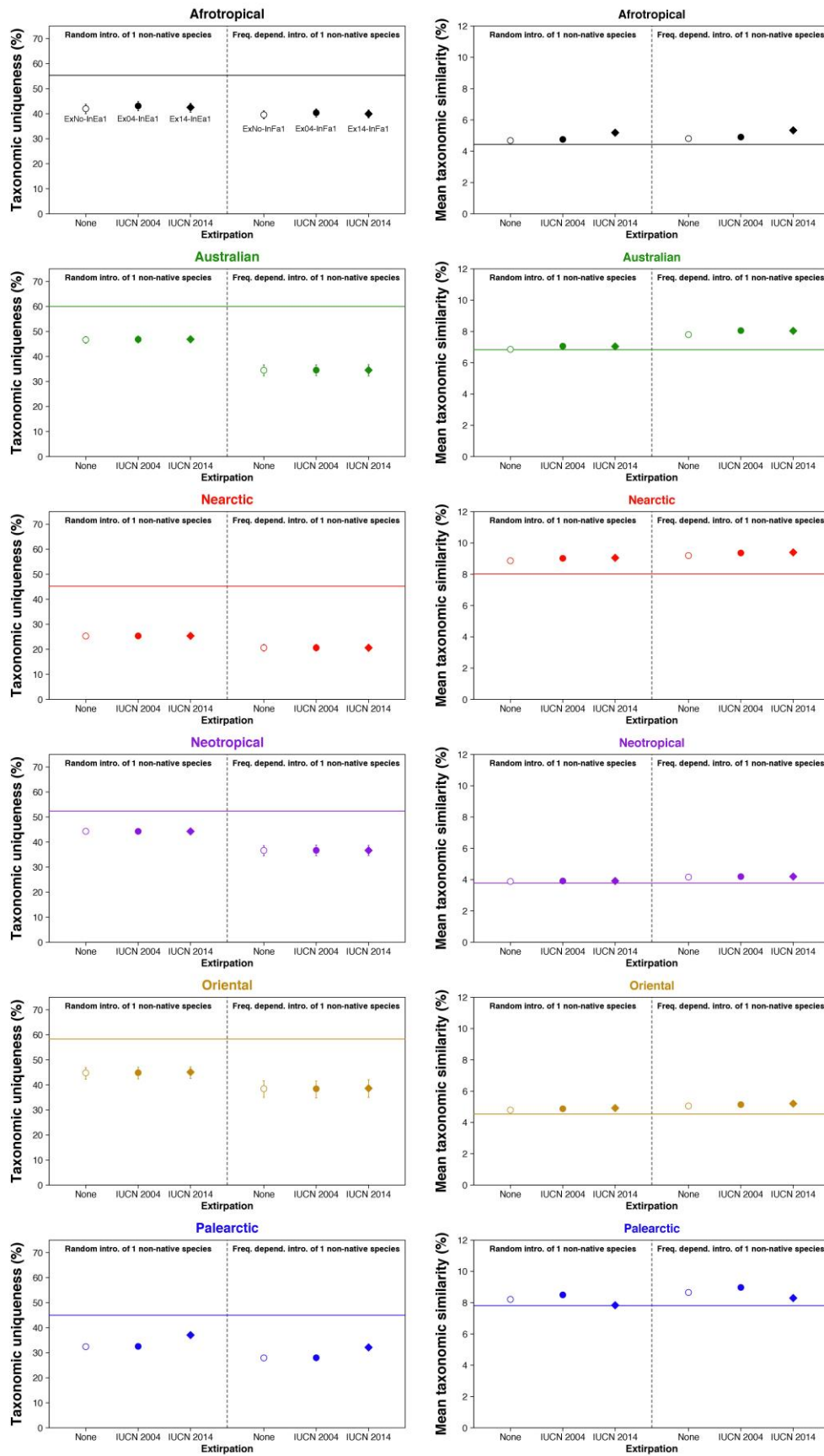


Figure S6. Future taxonomic uniqueness and future mean taxonomic similarity under three levels of future extirpation.

Each plot shows the results of simulations considering the future introduction of one additional non-native species, selected randomly in the pool of non-native species (left side) or according to their current frequencies (right side), together with no future native species extirpation (open circle), the future extirpation of all native species listed as threatened in the 2004 IUCN Red List (filled point), or the extirpation of all native species listed as threatened in the 2014 IUCN Red List (filled diamond). The scenarios codes on top left panel are as in Table 1. Points represent mean values among the 999 replicates simulated for each situation with associated 95% confidence intervals as vertical bars. Historical level of taxonomic uniqueness (or taxonomic similarity) is shown by the horizontal coloured line.