Global Change Biology

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CORRECTION

Correction to "Contrasting Future Growth of Norway Spruce and Scots Pine Forests Under Warming Climate"

Martinez del Castillo, E., Torbenson, M.C.A., Reinig, F., Tejedor, E., de Luis, M., Esper, J., 2024. Contrasting future growth of Norway spruce and Scots pine forests under warming climate. Global Change Biology 30, e17580. https://doi.org/10.1111/gcb.17580.

The published article "Contrasting future growth of Norway spruce and Scots pine forests under warming climate" (https://doi.org/10.1111/gcb.17580) contained a data processing error that affected a portion of the dataset and, consequently, the results. Specifically, a subset of tree-ring records was inadvertently duplicated during the merging of site elevation data. This duplication affected 39.1% of *Picea abies* trees and 2.3% of Pinus sylvestris trees. The error originated from using two altitude sources: the original site metadata and values extracted from a digital elevation model (DEM) based on geographic coordinates. In cases where both values were present but different for the same site, records were unintentionally included more than once, and inconsistent elevation values were assigned.

Upon identifying the issue, we reconstructed the dataset, ensuring no data duplication, and retaining the altitude information from the original metadata, extracting DEM-derived values only where metadata was missing. All analyses were subsequently repeated using the corrected dataset. As a result, the parametrization of both species' growth models changed, affecting all results and figures that relied on model application.

Despite these changes, the overall spatial and temporal patterns of tree growth projections remain broadly consistent with those originally reported. The main conclusions of the study are unaffected. Some localized differences in growth estimates emerged, particularly for *Picea abies*, but these do not alter the central narrative or interpretations presented in the paper (Figures 2–5, Table S1, and Figures S1, S2, S4, S5, S6, S7, and S8). All figures maintain their original figure caption, except Figure 2.

We thank S. Klesse, A. Buras, and R. Peters for bringing these issues to our attention, and we apologize for this error.

All the changes in the document, corrected and new figures are reported below, following the article sections. All statements described as "Original text" should now read as the ones written under "Corrected text".

Abstract

Original text: "($R^2 > 0.82$)."
Corrected text: "($R^2 > \mathbf{0.80}$)."

2. Methods

2.3. Predictive Growth Model

Original text: "A total number of 2,241,365 and 805,043 individual tree-ring measurements from the period 1950–2016 were used to build the PCAB and PISY models, respectively."
Corrected text: "A total number of **813.887** and **729.605** individual tree-ring measurements from the period 1950–2016 were used to build the PCAB and PISY models, respectively."

Original text: "In the end, the PCAB model contained 12 independent variables and 20 interactions, and the PISY model, 9, and 12 respectively (Table S1)."
Corrected text: "In the end, the PCAB model contained **11** independent variables and **19** interactions, and the PISY model, **8**, and **11** respectively (Table S1)."

2.4. Model Application

Original text: "Growth values were computed individually for each grid cell, representing a theoretical tree with a fixed basal area of 2100 cm^2 (approximately 51 cm DBH) for PCAB and 690 cm^2 (approximately 30 cm DBH) for PISY—reflecting the mean size of trees within the model."
Corrected text: "Growth values were computed individually for each grid cell, representing a theoretical tree with a fixed basal area of **1980** cm^2 (approximately **50** cm DBH) for PCAB and **750** cm^2 (approximately **31** cm DBH) for PISY—reflecting the mean size of trees within the model."

3. Results

3.1 Growth Models' Performance and Limitations

Original text: "($R^2 = 0.828$ for PCAB and $R^2 = 0.832$ for PISY; Figure S1)"
Corrected text: "($R^2 = \mathbf{0.807}$ for PCAB and $R^2 = \mathbf{0.838}$ for PISY; Figure S1)"

3.2 Spatial Patterns of Conifer Forest Growth

Figure 2

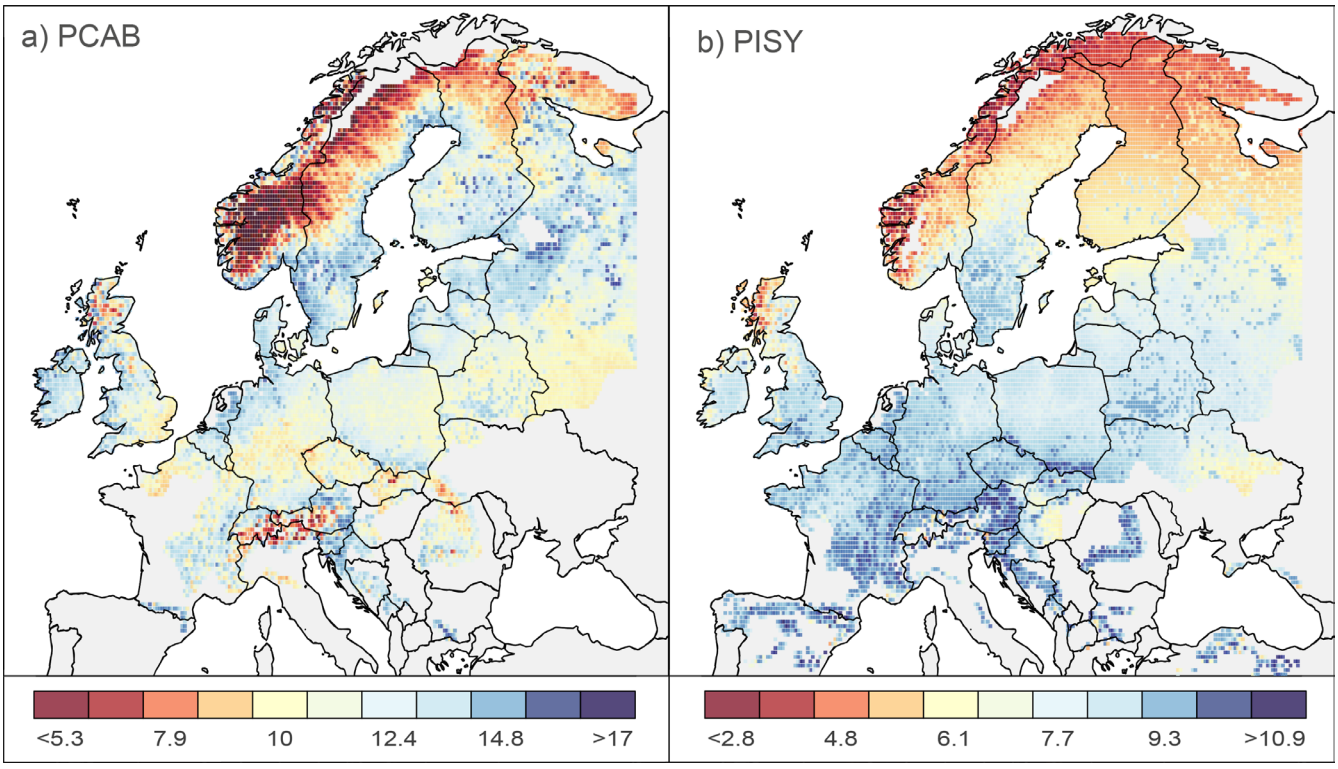

FIGURE 2 | Spatial patterns of tree growth for *Picea abies* (a) and *Pinus sylvestris* (b) over their distribution in Europe. Growth is expressed as mean Basal Area Increment (in cm^2) from 1986 to 2016, estimated for a standard tree with a fixed basal area of **1980** cm^2 for *Picea abies* and **750** cm^2 for *Pinus sylvestris*. Map lines delineate study areas and do not necessarily depict accepted national boundaries.

Figure 3

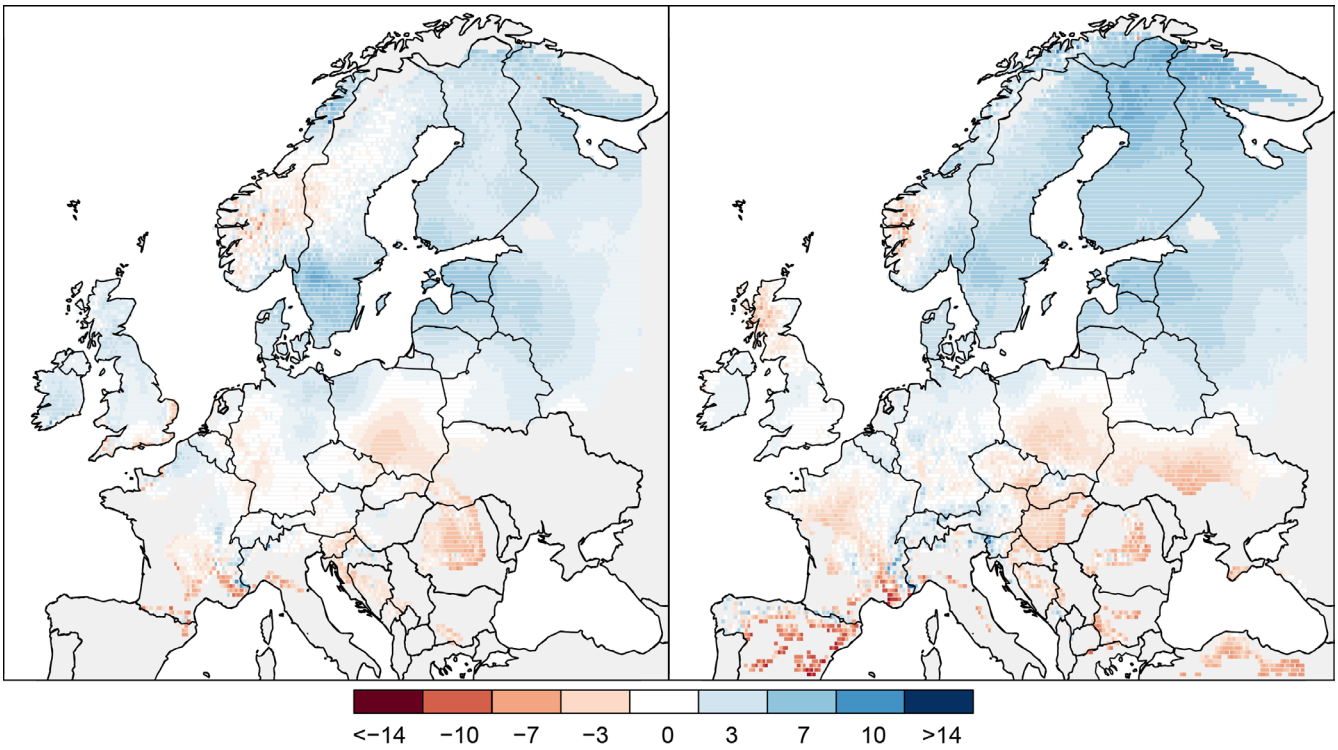

FIGURE 3 | Relative changes of Basal Area Increment (in %) of *Picea abies* (a) and *Pinus sylvestris* (b) between a 30-year period from 1955–1985 to 1986–2016. Map lines delineate study areas and do not necessarily depict accepted national boundaries.

Original text: "The mean expected growth for a *Picea abies* tree with a Basal Area Increment (BAI) of 2100 cm^2 is 11.5 ± 2.3 cm^2, while for a *Pinus sylvestris* tree with a BAI of 690 cm^2 is 5.1 ± 1.2 cm^2."
Corrected text: "The mean expected growth for a *Picea abies* tree with a Basal Area Increment (BAI) of **1980** cm^2 is **12.9 ± 2.5** cm^2, while for a *Pinus sylvestris* tree with a BAI of **750** cm^2 is **7.3 ± 1.4** cm^2."

Original text: "For *Picea abies*, the highest growth values are observed along the western coastal regions of the British Isles and Scandinavia, as well as in lowlands areas of Western Europe and the northern Balkans (Figure 2a). Lower growth is recorded at the northernmost extent of the species distribution in Scandinavia and the Kola Peninsula. The overall *Picea abies* growth distribution pattern follows a distinct west-to-east gradient in three sub-regions (British Isles, Scandinavia, and continental Central Europe);"
Corrected text: "For *Picea abies*, the highest growth values are observed along the western coastal regions of **Sweden**, as well as in lowlands areas of Western Europe and the northern Balkans (Figure 2a). Lower growth is recorded at the northernmost extent of the species distribution in Scandinavia and the Kola Peninsula **and the Alps**. The overall *Picea abies* growth distribution pattern follows a distinct west-to-east gradient in **two** sub-regions (Scandinavia and continental Central Europe);"

Original text: "Across Europe, growth of both species in the most recent 30-year period (1986–2016) only exhibits slight variations compared to the mean growth observed in the preceding period (1950–1985), with values of 10.9 ± 2.1 cm^2 for a standard *Picea abies* tree and 5.0 ± 1.3 cm^2 for the standard *Pinus sylvestris* tree during the earlier period"
Corrected text: "Across Europe, growth of both species in the most recent 30-year period (1986–2016) only exhibits slight variations compared to the mean growth observed in the preceding period (1950–1985), with values of **12.7** ± 2.1 cm^2 for a standard *Picea abies* tree and **7.2 ± 1.5** cm^2 for the standard *Pinus sylvestris* tree during the earlier period"

Original text: "The mean increase over time is 5.7% ± 3%, ranging from 6.7% ± 3.1% in cold areas (mean annual temperatures below 5°C) to 4.9% ± 3.9% in warmer areas (mean annual temperatures above 5°C). The most substantial increases are recorded in southern Sweden and in the Baltic region, where tree growth is ~14% higher on average during the latter period."
Corrected text: "The mean increase over time is **1.8**% ± **2**%, ranging from **2.7**% ± **1.7**% in cold areas (mean annual temperatures below 5°C) to **0.5**% ± **1.7**% in warmer areas (mean annual temperatures above 5°C). The most substantial increases are recorded in southern Sweden and in the Baltic region, where tree growth is ~**10**% higher on average during the latter period."

Original text: "The mean growth increase in cold areas is 5.7% ± 2% change, differing from 0.1% ± 4.3% change recorded in warm areas, where the change is more variable."

Corrected text: "The mean growth increase in cold areas is **4.3**% ± **1.7**% change, differing from **0.1**% ± **2.3**% change recorded in warm areas, where the change is more variable."

3.3. Projected Growth Assessment of Future Forests

Figure 4

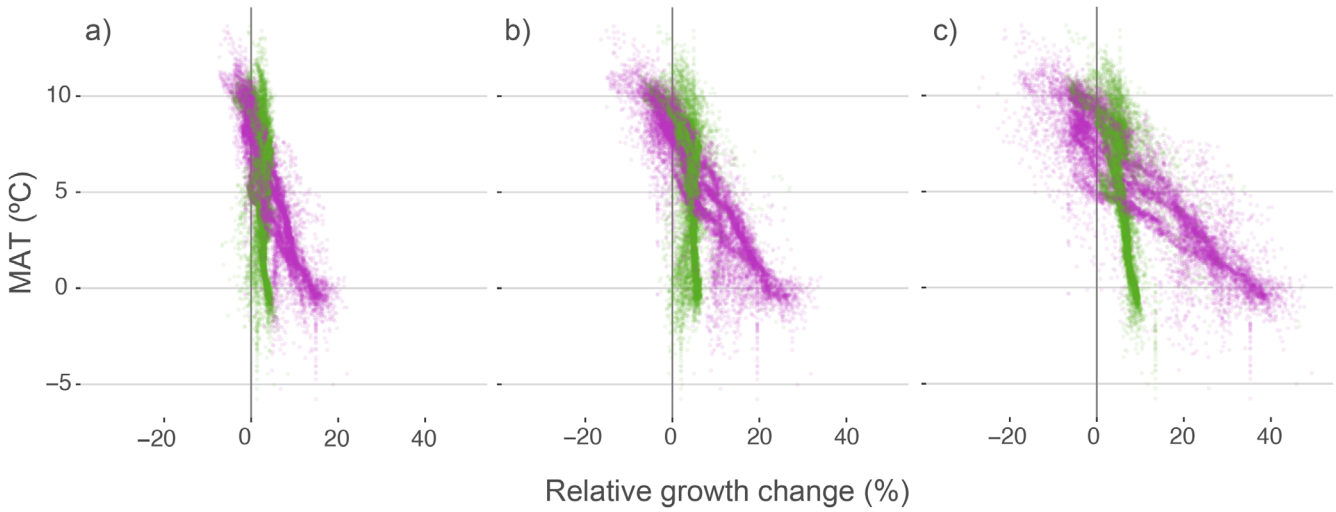

FIGURE 4 | Projected growth changes of *Picea abies* (green) and *Pinus sylvestris* (purple) growth along Mean Annual Temperature (MAT) gradients under SSP3-7.0 climate change scenario. Changes are expressed as relative differences of Basal Area Increment (in %) for the periods 2011–2040 (a), 2041–2070 (b), and 2071–2100 (c) relative to the 1986–2016 mean.

Figure 5

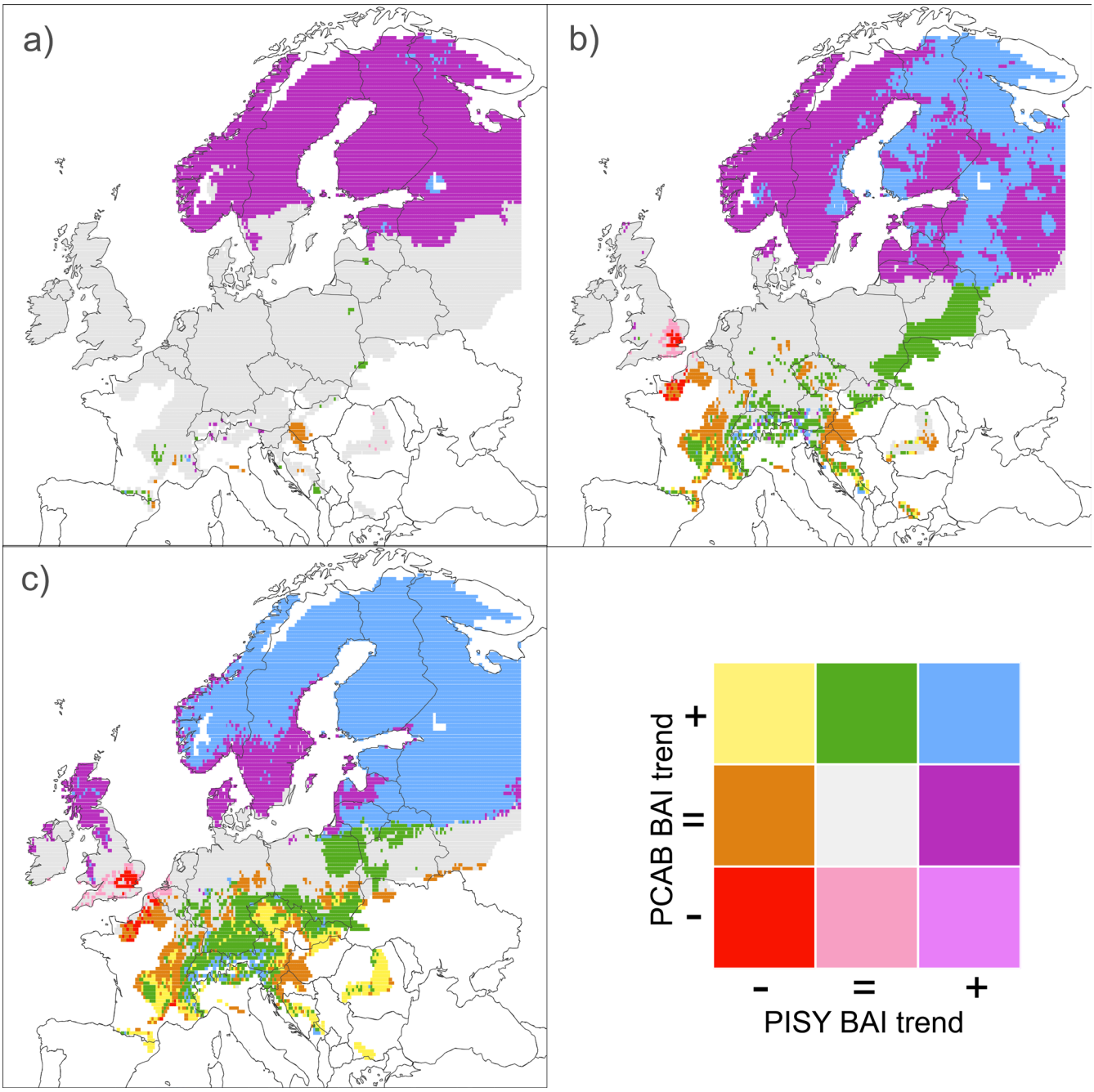

FIGURE 5 | Combined growth trends projections at shared *Picea abies* and *Pinus sylvestris* distribution across Europe. Colors represent combinations of Basal Area Increment (BAI) trends (positive +, neutral =, negative −; see Methods) over the periods 2011–2040 (a), 2041–2070 (b), and 2071–2100 (c) relative to the 1986–2016 mean. Map lines delineate study areas and do not necessarily depict accepted national boundaries.

Original text: "While the magnitude of this positive change is relatively low, it is homogenous across the species' range, with exceptions observed in a limited number of locations in the southern distribution"
Corrected text: "While the magnitude of this positive change is relatively low, it is homogenous across the species' range, with exceptions observed in a limited number of locations in the **eastern** distribution"

Original text: "For instance, at locations with a mean annual temperature of 5°C, the estimated BAI changes range from 6.4% to 10.4% for *Picea abies*, but from 2.8% to 16.3% for *Pinus sylvestris* (1st quartile–3rd quartile), under the SSP370 scenario for the period 2071–2100 (Figure 4c)."

Corrected text: “For instance, at locations with a mean annual temperature of 5°C, the estimated BAI changes range from **3.4**% to **6.1**% for *Picea abies*, but from **4.5**% to **16.1**% for *Pinus sylvestris* (1st quartile–3rd quartile), under the SSP370 scenario for the period 2071–2100 (Figure 4c).”

Original text: “Accordingly, only small areas over Europe located at the southern edge are projected to be worse for both conifer species in terms of tree growth”
Corrected text: “Accordingly, only small areas over Europe located at the **central-eastern** edge are projected to be worse for both conifer species in terms of tree growth”

4. Discussion

Original text: “This pattern becomes evident in the British Isles and the Scandinavian coast, where the predicted growth follows a similar regional distribution as the total amount of precipitation.”
Corrected text: ***#Sentence deleted#***

Original text: “Only small areas in the south are projected to experience notable declines in both species, while widespread increases are expected at colder locations.”
Corrected text: “Only small areas in the **east** are projected to experience notable declines in both species, while widespread increases are expected at colder locations.”

Open Research

Data Availability Statement

Original text: “The required data that support the findings of this study are openly available in Zenodo at https://doi.org/10.5281/zenodo.13935098. The additional data is available on request from the corresponding author.”
Corrected text: “The required data that support the findings of this study are openly available in Zenodo at https://doi.org/10.5281/zenodo.15855416. The additional data is available on request from the corresponding author.”

Supporting Information

Additional supporting information can be found online in the Supporting Information section. **Data S1:** gcb70402-sup-0001-TableS1-FigureS1-S8.docx.