Data Article

Dataset on wood density of trees in ecotone forests in Northern Brazilian Amazonia

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\section*{ARTICLE INFO}

\textbf{Article history:}
Received 26 December 2019
Revised 5 February 2020
Accepted 26 February 2020
Available online 7 March 2020

\textbf{Keywords:}
Specific gravity
Forest ecology
Tropical forest
Tree
Wood technology

\section*{ABSTRACT}

Wood density is expressed by the ratio between dry weight and fresh volume of a sample piece. The value of this measure is an important variable for assessing wood functional properties, successional stages and biomass/carbon stock estimates in different terrestrial ecosystems. Wood density data were collected for tree species from ecotone forests of the northern Brazilian Amazonia. We sampled 680 individuals with stem diameter $\geq 10$ cm. For each sampled individual measurements were taken for three stem variables: bark thickness (mm), bark density (g cm$^{-3}$) and wood density (g cm$^{-3}$). This dataset is intended to improve biomass and carbon estimates of forests in the northern ecotone region of Brazilian Amazonia, an area poorly known in terms of ecosystem dynamics.

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https://doi.org/10.1016/j.dib.2020.105378
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**Value of the Data**

- A wood density database is essential to improve biomass and carbon stock estimates at local, regional and global scales.
- The generated data are key for understanding of climate change effects on ecotonal forest dynamics in northern Brazilian Amazonia.
- These data are an important reference source for research on tree species functional traits linked to diversity and spatial distribution.

1. **Data**

This research reports on a wood density data set for northern Brazilian Amazonia ecotonal forests. **Table 1** shows the density of stem wood (sapwood + heartwood), bark density and bark thickness from 110 tree species and morphospecies (mean ± SD) present in ecotone forests of eastern Maracá Island. **Fig. 1** shows the fieldwork to collect the stem samples and the subdivisions of the samples considered in this research for calculation of wood density.

2. **Experimental design, materials and methods**

2.1. **Sampling area description**

Data were collected from the Biodiversity Research Program (PPBio) research grid, located on the east of Maracá Island (or Ilha de Maracá), which lies within the Maracá Ecological Station (3.360 N a 3.405 N / −61.442 W a −61.486 W), State of Roraima, northern Brazilian Amazonia, as
Table 1
Tree species and morphospecies wood density from ecotone forests of northern Brazilian Amazonia (mean ± SD). Samples = number of individuals sampled, Bark T = bark thickness in millimeters, Bark D = bark density, Core WD = sapwood + heartwood density, Weighted average WD = weighted average between Bark D and Core WD.

| Family         | Species                  | Samples | Bark T (mm) | Bark D (g cm⁻³) | Core WD (g cm⁻³) | Weighted average WD (g cm⁻³) |
|----------------|--------------------------|---------|-------------|-----------------|------------------|-----------------------------|
| Achariaceae    | Lindackeria paludosa     | 3       | 3.74 ± 1.26 | 0.606 ± 0.139   | 0.694 ± 0.101    | 0.691 ± 0.094              |
| Anacardiaceae  | Astromium lecontei       | 3       | 6.00 ± 2.65 | 0.691 ± 0.076   | 0.778 ± 0.178    | 0.774 ± 0.170              |
|                | Spondias mombin          | 1       | 14.1        | 0.250           | 0.774            | 0.735                       |
| Annonaceae     | Dugueta lepidota         | 14      | 8.14 ± 2.21 | 0.535 ± 0.102   | 0.796 ± 0.043    | 0.780 ± 0.042              |
|                | Dugueta lucida           | 3       | 10.33 ± 4.04| 0.407 ± 0.129   | 0.732 ± 0.023    | 0.710 ± 0.020              |
|                | Guatteria citriodora     | 1       | 4.1         | 0.128           | 0.604            | 0.594                       |
|                | Guatteria schomburgkiana | 8       | 8.27 ± 4.11 | 0.488 ± 0.177   | 0.646 ± 0.116    | 0.638 ± 0.113              |
|                | Xylophia amazonica       | 2       | 9.00 ± 0.00 | 0.533 ± 0.131   | 0.669 ± 0.093    | 0.662 ± 0.081              |
| Apocynaceae    | Aspidosperma nitidum     | 1       | 2.7         | 0.418           | 0.828            | 0.820                       |
|                | Aspidosperma spruceanum  | 3       | 8.94 ± 2.54 | 0.733 ± 0.099   | 0.750 ± 0.024    | 0.750 ± 0.024              |
|                | Himantanthus articulatus | 35      | 9.33 ± 4.40 | 0.459 ± 0.153   | 0.567 ± 0.039    | 0.562 ± 0.040              |
| Araliaceae     | Schefflera morototoni    | 2       | 3.50 ± 0.57 | 0.479 ± 0.086   | 0.323 ± 0.017    | 0.327 ± 0.019              |
| Bignoniaceae   | Handroanthus obscurus    | 2       | 5.00 ± 1.41 | 0.259 ± 0.058   | 0.862 ± 0.059    | 0.838 ± 0.064              |
|                | Handroanthus uleanus     | 4       | 4.45 ± 0.53 | 0.508 ± 0.104   | 0.811 ± 0.089    | 0.802 ± 0.086              |
| Bixaceae       | Cochlospermum orinicense | 3       | 12.37 ± 4.75| 0.520 ± 0.318   | 0.424 ± 0.147    | 0.425 ± 0.150              |
| Boraginaceae   | Cordia tetrandra         | 5       | 6.94 ± 2.91 | 0.441 ± 0.186   | 0.476 ± 0.200    | 0.476 ± 0.197              |
| Burseraceae    | Protium neglectum        | 2       | 3.50 ± 2.12 | 0.488 ± 0.387   | 0.554 ± 0.023    | 0.556 ± 0.014              |
|                | Protium polybotryum      | 2       | 4.94 ± 2.17 | 0.801 ± 0.212   | 0.571 ± 0.016    | 0.584 ± 0.001              |
|                | Protium rhoifolium       | 4       | 4.39 ± 3.19 | 0.701 ± 0.088   | 0.585 ± 0.045    | 0.589 ± 0.045              |
|                | Protium stevensonii      | 22      | 4.62 ± 2.11 | 0.705 ± 0.155   | 0.709 ± 0.072    | 0.709 ± 0.071              |
|                | Protium unifoliolatum    | 8       | 4.20 ± 1.68 | 0.614 ± 0.154   | 0.692 ± 0.049    | 0.688 ± 0.046              |
|                | Trattinnickia glaziowii  | 5       | 4.06 ± 1.47 | 0.624 ± 0.191   | 0.422 ± 0.024    | 0.427 ± 0.019              |
|                | Trattinnickia rhoifolia  | 3       | 5.81 ± 1.28 | 0.537 ± 0.017   | 0.521 ± 0.099    | 0.523 ± 0.094              |
| Caryocaraceae  | Caryocar villosum        | 1       | 6.8         | 0.707           | 0.569            | 0.575                       |
| Celastraceae   | Maytenus guanensis       | 5       | 3.08 ± 1.12 | 0.757 ± 0.128   | 0.722 ± 0.040    | 0.723 ± 0.040              |
| Chrysobalanaceae| Exellodendron barbatum  | 8       | 3.71 ± 1.43 | 0.826 ± 0.116   | 0.841 ± 0.061    | 0.841 ± 0.061              |
|                | Hirtela racemosa         | 1       | 2.0         | 0.859           | 0.785            | 0.786                       |
|                | Leptobalanus apetalus    | 5       | 3.30 ± 1.48 | 0.725 ± 0.123   | 0.747 ± 0.062    | 0.746 ± 0.063              |
| Chrysobalanaceae| Licania kunthiana        | 3       | 3.96 ± 2.10 | 0.733 ± 0.055   | 0.803 ± 0.101    | 0.802 ± 0.097              |
|                | Licania discolor         | 17      | 5.09 ± 2.33 | 0.748 ± 0.176   | 0.825 ± 0.124    | 0.824 ± 0.121              |
|                | Moquilea minutiflora     | 3       | 6.50 ± 2.60 | 0.601 ± 0.067   | 0.624 ± 0.023    | 0.623 ± 0.019              |
| Clusiaceae     | Garcinia macrophylla     | 1       | 4.0         | 0.962           | 0.674            | 0.685                       |
| Elaeocarpaceae | Sloanea guianaensis      | 2       | 4.00 ± 0.00 | 0.573 ± 0.348   | 0.870 ± 0.058    | 0.866 ± 0.061              |
| Erythroxylaceae| Erythroxylum mucronatum  | 1       | 8.0         | 0.582           | 0.819            | 0.806                       |
| Euphorbiaceae  | Mabea speciosa           | 2       | 2.82 ± 1.67 | 0.515 ± 0.546   | 0.567 ± 0.021    | 0.567 ± 0.030              |

(continued on next page)
| Family           | Species                        | Samples | Bark T (mm) | Bark D (g cm\(^{-3}\)) | Core WD (g cm\(^{-3}\)) | Weighted average WD (g cm\(^{-3}\)) |
|------------------|--------------------------------|---------|-------------|--------------------------|--------------------------|------------------------------------|
| Lamiaceae        | Vitex schomburgkiana           | 3       | 5.47 ± 2.78 | 0.667 ± 0.074            | 0.606 ± 0.064            | 0.607 ± 0.063                      |
| Lauraceae        | Aniba sp.                      | 1       | 7.7         | 0.507                    | 0.622                    | 0.616                              |
|                  | Endlicheria dictifarínosa      | 1       | 10.0        | 0.565                    | 0.478                    | 0.483                              |
|                  | Licaria chrysophylla           | 1       | 2.0         | 0.988                    | 0.677                    | 0.682                              |
|                  | Mezilaurus crassiramea         | 3       | 4.66 ± 3.06 | 0.541 ± 0.213            | 0.697 ± 0.021            | 0.694 ± 0.024                      |
|                  | Ocotea sandwihii              | 7       | 4.31 ± 1.33 | 0.649 ± 0.245            | 0.664 ± 0.045            | 0.664 ± 0.041                      |
| Lecythidaceae    | Couratari multiflora           | 1       | 4.1         | 0.203                    | 0.468                    | 0.459                              |
|                  | Eschweileria pedicellata       | 4       | 5.90 ± 3.48 | 0.767 ± 0.115            | 0.759 ± 0.035            | 0.758 ± 0.036                      |
|                  | Eschweileria sp.\(^1\)        | 9       | 5.74 ± 3.24 | 0.603 ± 0.208            | 0.698 ± 0.141            | 0.695 ± 0.139                      |
|                  | Gustavia augusta              | 2       | 6.25 ± 0.95 | 0.340 ± 0.158            | 0.698 ± 0.037            | 0.682 ± 0.042                      |
| Leguminosae      | Lecythis corregata subsp. rosea| 66      | 6.39 ± 3.14 | 0.628 ± 0.159            | 0.733 ± 0.074            | 0.730 ± 0.073                      |
|                  | Albizia glabrifolata          | 1       | 4.5         | 0.398                    | 0.622                    | 0.617                              |
|                  | Albizia pedicellaris          | 1       | 9.0         | 0.598                    | 0.405                    | 0.411                              |
|                  | Albizia sp.                   | 1       | 8.0         | 0.258                    | 0.518                    | 0.503                              |
|                  | Andira surinamensis           | 2       | 4.00 ± 0.00 | 0.413 ± 0.275            | 0.688 ± 0.037            | 0.682 ± 0.041                      |
|                  | Caesalpinia sp.               | 2       | 5.01 ± 4.26 | 0.561 ± 0.095            | 0.665 ± 0.057            | 0.660 ± 0.050                      |
|                  | Centrolebium paraense         | 2       | 4.45 ± 0.64 | 0.843 ± 0.019            | 0.755 ± 0.004            | 0.756 ± 0.004                      |
|                  | Dialium guianense             | 1       | 0.5         | 0.746                    | 0.784                    | 0.784                              |
|                  | Enterolobium schomburgkii     | 2       | 4.00 ± 0.00 | 0.688 ± 0.080            | 0.573 ± 0.079            | 0.576 ± 0.074                      |
|                  | Hymenaea sp.                  | 1       | 3.0         | 0.924                    | 0.884                    | 0.885                              |
|                  | Inga splendens                | 4       | 6.79 ± 1.20 | 0.570 ± 0.054            | 0.639 ± 0.070            | 0.636 ± 0.068                      |
|                  | Inga cinnamomea               | 1       | 4.5         | 0.656                    | 0.525                    | 0.530                              |
|                  | Inga sp.\(^2\)               | 2       | 3.81 ± 3.26 | 0.722 ± 0.172            | 0.727 ± 0.006            | 0.727 ± 0.010                      |
|                  | Ormosia coarctata             | 2       | 5.16 ± 1.19 | 0.612 ± 0.232            | 0.822 ± 0.236            | 0.816 ± 0.239                      |
|                  | Peltogyne gracilipes          | 36      | 3.74 ± 2.06 | 0.841 ± 0.165            | 0.903 ± 0.091            | 0.901 ± 0.088                      |
|                  | Peltogyne paniculata          | 4       | 2.02 ± 1.18 | 0.922 ± 0.202            | 0.921 ± 0.037            | 0.922 ± 0.037                      |
|                  | Swartzia grandifolia          | 2       | 10.00 ± 9.90| 0.513 ± 0.204            | 0.602 ± 0.245            | 0.599 ± 0.245                      |
|                  | Swartzia latifolia            | 1       | 5.0         | 0.451                    | 0.694                    | 0.684                              |
|                  | Swartzia sp.                  | 1       | 4.2         | 0.699                    | 0.778                    | 0.775                              |
| Malpighiaceae    | Byrsonima schomburgkiana       | 5       | 8.46 ± 3.75 | 0.616 ± 0.172            | 0.626 ± 0.150            | 0.626 ± 0.146                      |
| Malvaceae        | Apetia bitoroubou              | 6       | 10.83 ± 4.48| 0.353 ± 0.070            | 0.345 ± 0.124            | 0.348 ± 0.115                      |
|                  | Luehea speciosa               | 7       | 7.84 ± 2.53 | 0.501 ± 0.130            | 0.639 ± 0.063            | 0.631 ± 0.066                      |
|                  | Pochota fenderi               | 2       | 11.50 ± 3.54| 0.324 ± 0.055            | 0.367 ± 0.035            | 0.364 ± 0.028                      |
| Melastomataceae  | Miconia stenosstachya         | 1       | 6.3         | 0.833                    | 0.817                    | 0.818                              |
| Meliaceae        | Trichilia cipo                | 9       | 5.22 ± 2.24 | 0.723 ± 0.151            | 0.725 ± 0.054            | 0.725 ± 0.053                      |
| Moraceae         | Brosimum guianense            | 5       | 5.41 ± 2.62 | 0.697 ± 0.201            | 0.768 ± 0.096            | 0.765 ± 0.097                      |
|                  | Clarisia racemosa             | 3       | 7.94 ± 8.87 | 0.806 ± 0.191            | 0.675 ± 0.045            | 0.676 ± 0.043                      |
|                  | Pseudomedia laevigata         | 17      | 4.06 ± 1.38 | 0.642 ± 0.160            | 0.673 ± 0.057            | 0.672 ± 0.057                      |

(continued on next page)
| Family          | Species                  | Samples | Bark T (mm)       | Bark D (g cm\(^{-3}\)) | Core WD (g cm\(^{-3}\)) | Weighted average WD (g cm\(^{-3}\)) |
|-----------------|--------------------------|---------|-------------------|-------------------------|--------------------------|-------------------------------------|
| Myristicaceae   | Virola calophylla.       | 2       | 8.05 ± 1.48       | 0.582 ± 0.155           | 0.591 ± 0.009            | 0.591 ± 0.013                       |
| Myrtaceae       | Calyptranthes fasciculata| 1       | 5.0               | 0.660                   | 0.797                    | 0.791                              |
|                 | Eugenia essequiboensis  | 1       | 2.5               | 0.556                   | 0.686                    | 0.683                              |
|                 | Eugenia omissa          | 5       | 3.00 ± 1.58       | 0.640 ± 0.337           | 0.758 ± 0.064            | 0.757 ± 0.057                       |
|                 | Psidium guineense       | 1       | 2.0               | 0.861                   | 0.829                    | 0.830                              |
| Nyctaginaceae   | Neea oppositifolia      | 1       | 13.7              | 0.507                   | 0.543                    | 0.541                              |
| Ochnaceae       | Quina rhytidopus        | 11      | 3.42 ± 1.55       | 0.663 ± 0.260           | 0.823 ± 0.063            | 0.819 ± 0.063                       |
| Olacaceae       | Chaunochiton kappleri   | 2       | 10.00 ± 5.66      | 0.403 ± 0.073           | 0.616 ± 0.197            | 0.603 ± 0.186                       |
| Peraceae        | Pera bicolor            | 1       | 2.8               | 0.787                   | 0.803                    | 0.803                              |
| Putranjivaceae  | Drypetes variabilis     | 1       | 4.2               | 0.941                   | 0.698                    | 0.705                              |
| Rubiaceae       | Alseis latifolia        | 33      | 3.55 ± 2.56       | 0.533 ± 0.219           | 0.645 ± 0.050            | 0.642 ± 0.048                       |
|                 | A Mannia corymbosa      | 4       | 4.41 ± 3.02       | 0.659 ± 0.293           | 0.726 ± 0.051            | 0.729 ± 0.053                       |
|                 | Chomelia tenuiflora     | 1       | 3.6               | 0.697                   | 0.684                    | 0.684                              |
|                 | Duroia eriopila         | 14      | 3.74 ± 2.32       | 0.577 ± 0.145           | 0.683 ± 0.074            | 0.681 ± 0.074                       |
|                 | Guettarda macrantha     | 3       | 4.70 ± 1.41       | 0.538 ± 0.191           | 0.541 ± 0.058            | 0.540 ± 0.059                       |
|                 | Palicourea crocea       | 1       | 6.5               | 0.557                   | 0.624                    | 0.621                              |
|                 | Posaqueria latifolia    | 1       | 1.0               | 0.736                   | 0.552                    | 0.554                              |
|                 | Rudgea crassuloba       | 5       | 2.58 ± 1.01       | 0.764 ± 0.278           | 0.647 ± 0.038            | 0.650 ± 0.035                       |
|                 | Rudgea sp.              | 2       | 3.68 ± 0.97       | 0.301 ± 0.130           | 0.575 ± 0.035            | 0.568 ± 0.029                       |
| Salicaceae      | Casearia spinencens     | 1       | 1.0               | 0.645                   | 0.588                    | 0.589                              |
|                 | Casearia sylvestris     | 8       | 3.58 ± 0.55       | 0.482 ± 0.150           | 0.708 ± 0.066            | 0.701 ± 0.064                       |
|                 | Xylolus benthamii       | 1       | 5.0               | 0.317                   | 0.697                    | 0.685                              |
| Sapindaceae     | Cupania rubiginosa       | 2       | 7.93 ± 1.51       | 0.653 ± 0.041           | 0.764 ± 0.011            | 0.758 ± 0.009                       |
| Sapotaceae      | Chrysophyllum sparsiflorum| 3      | 4.52 ± 0.50       | 0.855 ± 0.175           | 0.855 ± 0.034            | 0.856 ± 0.037                       |
|                 | Eccilnus guianensis     | 70      | 6.46 ± 3.08       | 0.642 ± 0.166           | 0.661 ± 0.043            | 0.660 ± 0.043                       |
|                 | Pouteria cuspidata      | 3       | 4.24 ± 1.65       | 0.429 ± 0.063           | 0.717 ± 0.050            | 0.707 ± 0.053                       |
|                 | Pouteria hispida       | 16      | 3.52 ± 2.28       | 0.654 ± 0.183           | 0.818 ± 0.085            | 0.816 ± 0.083                       |
|                 | Pouteria reticulata     | 6       | 3.41 ± 1.39       | 0.649 ± 0.230           | 0.735 ± 0.042            | 0.733 ± 0.039                       |
|                 | Pouteria sp.            | 1       | 4.7               | 0.744                   | 0.739                    | 0.739                              |
|                 | Pouteria surmuensis     | 26      | 4.74 ± 1.47       | 0.540 ± 0.162           | 0.909 ± 0.081            | 0.898 ± 0.079                       |
|                 | Pouteria venosa         | 11      | 4.19 ± 1.95       | 0.596 ± 0.248           | 0.782 ± 0.084            | 0.777 ± 0.085                       |
|                 | Pradosia surinamensis   | 24      | 6.67 ± 3.08       | 0.477 ± 0.146           | 0.681 ± 0.046            | 0.673 ± 0.043                       |
| Simaroubaceae   | Simarouba amara         | 10      | 7.93 ± 4.15       | 0.615 ± 0.199           | 0.422 ± 0.036            | 0.427 ± 0.034                       |
| Violaceae       | Leonia glycycarpa       | 1       | 4.8               | 0.688                   | 0.680                    | 0.681                              |
|                 | Rinorea pubiflora       | 3       | 5.36 ± 3.00       | 0.503 ± 0.255           | 0.685 ± 0.052            | 0.680 ± 0.059                       |

1 Mean of values for *Eschweilera* sp. 1 and *Eschweilera* sp. 2 morphospecies.
2 Mean of values for *Inga* sp.2, *Inga* sp.3 morphospecies.
Fieldwork: (a) collection of stem samples using an increment borer; (b) detail of the sample taken from the stem and (c) subdivisions of the samples that were considered in this research for calculation of wood density.

showed in the Fig. 2. Maracá Island has an area of \( \sim 101,000 \) ha, being 60 km long and some 15–25 km wide [1,2]. This region occupies the climatic transition between Köppen classification subtypes (Aw) and (Am), with annual average temperature of 26 °C and annual average precipitation of 2086 ± 428 mm. The wettest months (>300 mm month\(^{-1}\)) are from May to August, and the driest from December to March (<100 mm month\(^{-1}\)) [1–4].

The vegetation of Maracá Island includes a variety of forest and non-forest types as the main feature of the savanna-forest transition zone of north central Roraima [2,5,6]. The different dominant forest types of the contact region are characterized by a mosaic of ombrophilous and seasonal forests (semideciduous and deciduous) whose composition and location are determined by distinct hydro-edaphic constraints, with the presence/absence of individuals of Peltogyne gracilipes Ducke (Leguminosae) operating as a robust environmental indicator [4,7,8]. Other technical details and environmental information on PPBio grid installed in Maracá Island can be accessed in the official PPBio website (https://ppbio.inpa.gov.br/sitios/maraca).

2.2. Sample processing and analysis

Field collection and construction of the current Dataset were derived from an existing forest inventory [8] carried out in the 25 km\(^2\) grid of PPBio (Biodiversity Research Program) installed on the eastern part of Maracá Island as described above. All samples to estimate the wood density of the different tree species occurring in the ecotone forests on eastern of Maracá Island
were obtained from a systematic sampling of 129 plots (50 m x 10 m/6.45 ha in total) dispersed throughout the PPBio grid. These plots were intentionally established with small dimensions and with short between-plot distances to obtain high spatial resolution, and so better capture the microvariations in structural and species composition present across the island’s altitudinal gradient; which defines the distinct hydro-edaphic conditions under which the different forest types of Maracá Island occur. The minimum distance between the plots was 150 m, based on the distance-markers located every 50 m along the PPBio grid trails; all sampling plots are geo-referenced in UTM and with topographically defined altitudes. All data and metadata related to trail topography is available on the official PPBio website [9,10]. Plots in aquatic environments (swamps) and open areas enclaves (savannas) were discarded because they do not contain forest environments. The fieldwork was carried out in two stages: January / 2018 (269 samples) and January / 2019 (411 samples). Both fieldworks were carried out purposely at the peak of the regional dry period in order to avoid the variation of wood moisture due to climatic seasonality, and a possible bias in the biomass/carbon stock estimates.

Acknowledgments

Financial support for the research was provided by CNPq (Grant no. 403591/2016-3; project “Tree growth and mortality in Roraima ecotone forests: effects of environmental conditions and climate variability”) and the Instituto Nacional de Ciência e Tecnologia dos Serviços Am-
bientais da Amazônia (INCT-ServAmb). The Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) provided PhD funding for H.L.S. Farias and W.R. Silva (PELD Roraima; CNPq/CAPES/FAPs/BC-Fundo Newton; Proc. n. 441575/2016-1). The Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), provided a fellowship for R.I. Barbosa (CNPq 304204/2015-3). The Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio) provided authorization for the work (SISBIO n. 52017).

**Conflict of Interest**

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

**Supplementary materials**

Supplementary material associated with this article can be found, in the online version, at http://dx.doi.org/10.17632/n4kzj3d2g7.5 (Mendeley Data).

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