**SUPPLEMENTARY INFORMATION**

*Supplementary Figures S1-S3*

*Supplementary File S1*

*Supplementary Tables S1-S4*



**Supplementary Figure S1**: Maximum likelihood phylogram (RAxML) showing relationships of 49 individual samples based on DNA sequence data from four gene regions (ND2, 20454, FIB\_BI7, TGFB2). Labels show ANWC accession number followed by species/subspecies designation. Labels for nominal subspecies *D. l. leachii* indicate position east or west of Carpentarian Barrier (CB).



**Supplementary Figure S2**: Isolation-by-distance (IBD) analyses. Pairwise scatterplot of nucleotide p-distance against geographic distance for 71 individuals based on *ND2* data (upper panel), and for 32 individuals where genetic data was a concatenated alignment of four genes (lower panel).



**Supplementary Figure S3**: Current day projections for five species distribution model (SDM) algorithms for *Dacelo leachii*. **A.** Orange points show distribution records used for SDMs (data from Atlas of Living Australia). Red points highlight distribution records outside normal range excluded from analysis. **B.** Classification Tree Analysis projection. **C.** Maxent projection. **D.** Multivariate Adaptive Regression Splines projection. **E.** Generalized Linear Model projection. **F.** Artificial Neural Network projection. Grey density plotted along top and right margins represent average probability of occurrence by longitude (x-axis) and latitude (y-axis).

**Supplementary File S1:** R script used to create Figure 3

##R script by D. J. Schmidt

##for Dorrington et al. 'Phylogeography of the blue-winged kookaburra

##Dacelo leachii across tropical northern Australia and New Guinea'

##This script investigates the effect of dividing a sample of geopositioned

##DNA sequences into two groups where the dividing line between the two

##groups is randomly selected from across a longitudinal range.

##Two files are required:

##1) DNA sequences in fasta format

##2) Latitude and longitude coordinates in CSV format.

## -Specifically the CSV file has three columns:

## -column 1 = "code", sample code corresponding to DNA sequence name in fasta file

## -column 2 = "long", longitide of sample in decimal degrees

## -column 3 = "lat", latidute of sample in decimal degrees

##

## Example:

## code long lat

## B28618 141.5847 -16.45170

## B28834 145.2300 -15.53140

## B29455 139.3900 -17.72720

##

library(pegas)

dna <- read.dna("ND2\_leac\_east\_west.fasta", format="fasta",skip=0, as.matrix=TRUE)

coords <- read.csv("leachii\_long\_lat\_ND2\_east\_west.csv", header=TRUE, sep=",", quote="", dec=".")

dist\_matrix <- dist.dna(dna, "N")

west.limit <- quantile(coords$long, 0.1)

#set western and east limits for AMOVA dividing line as 10th & 90th percentile of longitude values

east.limit <- quantile(coords$long, 0.9)

long.set <- data.frame(coords$long)

#store longitude values as dataframe as we'll be adding a column of non-numeric values (factors for AMOVA groups) during the loop

output <- matrix(ncol=3, nrow=100)

#initialise matrix to store output of loop

start.time <- proc.time()

for (i in 1:100) {

 long.div <- runif(1, west.limit, east.limit)

 #set longitudinal dividing line for AMOVA as random numeric value between east and west limits

 long.set$grp <- ifelse(long.set$coords.long >= long.div, x <- "east", x <- "west")

 # evaluate each longitude value as east or west of dividing line and add result to new column called grp which then use as factors in AMOVA

 amova.groups <- factor(long.set$grp)

 result <- pegas::amova(dist\_matrix~amova.groups, is.squared = TRUE)

 # AMOVA call to pegas

 sigma2.ap <- result$varcomp[1,1]

 # extract among group variance

 sigma2.wp <- result$varcomp[2,1]

 # extract within group variance

 phi\_st <- sigma2.ap/(sigma2.ap + sigma2.wp)

 #phi\_st formula

 output[i,1] <- phi\_st

 # write output to matrix

 output[i,2] <- result$varcomp[1,2]

 output[i,3] <- long.div

}

proc.time() - start.time

output

plot(output[,3], output[,1])

**Supplementary Table S1.** Voucher specimen information for 97 kookaburra samples included in genetic analyses.

| **ANWC Voucher code** | **Species** | **Subspecies** | **Region** | **Locality** | **Latitude** | **Longitude** |
| --- | --- | --- | --- | --- | --- | --- |
| B56106 | *Dacelo gaudichaud* |  | Papua New Guinea | Bensbach Lodge | -8.85101 | 141.24799 |
| B56135 | *Dacelo gaudichaud* |  | Papua New Guinea | Bensbach Lodge | -8.85101 | 141.24799 |
| B56267 | *Dacelo gaudichaud* |  | Papua New Guinea | left bank Morehead river, Morehead | -8.71205 | 141.64272 |
| B56202 | *Dacelo tyro* |  | Papua New Guinea | Thou, Bensbach River | -8.78841 | 141.20567 |
| B56256 | *Dacelo tyro* |  | Papua New Guinea | Morehead/ Suki road | -8.58917 | 141.74752 |
| B56265 | *Dacelo tyro* |  | Papua New Guinea | left bank Morehead river, Morehead | -8.71205 | 141.64272 |
| B56266 | *Dacelo tyro* |  | Papua New Guinea | left bank Morehead river, Morehead | -8.71205 | 141.64272 |
| B56401 | *Dacelo tyro* |  | Papua New Guinea | Wando patrol post | -8.85101 | 141.24799 |
| B56407 | *Dacelo tyro* |  | Papua New Guinea | Bensbach Village | -8.8 | 141 |
| B29832 | *Dacelo novaeguineae* |  | Australia: Qld | Mission River, *ca* 10.3 km NE of Weipa, Cape York Peninsula | -12.5556 | 141.9222 |
| B32159 | *Dacelo novaeguineae* |  | Australia: Qld | Sandy Creek, 8 km NW of Laura, Cape York Peninsula | -15.5314 | 144.3847 |
| B45112 | *Dacelo novaeguineae* |  | Australia: SA | 5 km W of Bool Lagoon, SW of Naracoorte | -37.15 | 140.6333 |
| B48466 | *Dacelo novaeguineae* |  | Australia: SA | 14 km N of Wangary, SW Eyre Peninsula | -34.4439 | 135.4556 |
| B26691\_E009 | *Dacelo leachii* | *intermedia* | Papua New Guinea | Port Moresby District (Moitaka), Central Province (40m) | -9.43 | 147.21 |
| B55941 | *Dacelo leachii* | *intermedia* | Papua New Guinea | 4.5 km W of Agevairu, on Hisiu Road | -9.02211 | 146.77823 |
| B55942 | *Dacelo leachii* | *intermedia* | Papua New Guinea | 4.5 km W of Agevairu, on Hisiu Road | -9.02211 | 146.77823 |
| B55948 | *Dacelo leachii* | *intermedia* | Papua New Guinea | 4.5 km W of Agevairu, on Hisiu Road | -9.02211 | 146.77823 |
| B56024 | *Dacelo leachii* | *intermedia* | Papua New Guinea | 3.5 km NW of Agevairu, 90 km NW of Port Moresby | -8.99921 | 146.79308 |
| B56059 | *Dacelo leachii* | *intermedia* | Papua New Guinea | 3 km NNW of Agevairu, 90 km NW of Port Moresby | -8.99887 | 146.80368 |
| B56127 | *Dacelo leachii* | *intermedia* | Papua New Guinea | Bensbach Airstrip | -8.85469 | 141.25822 |
| B56231 | *Dacelo leachii* | *intermedia* | Papua New Guinea | Bensbach/Morehead Rd | -8.78196 | 141.34428 |
| B56271 | *Dacelo leachii* | *intermedia* | Papua New Guinea | South of Morehead on road to Mibini | -8.77699 | 141.63367 |
| B56352 | *Dacelo leachii* | *intermedia* | Papua New Guinea | Bensbach Lodge environs | -8.85101 | 141.24799 |
| B28618 | *Dacelo leachii* | *leachii* | Australia: Qld | Bayswater Waterhole, Inkerman Station, SW Cape York Peninsula | -16.4517 | 141.5847 |
| B28834 | *Dacelo leachii* | *leachii* | Australia: Qld | *ca* 7 km SSW of Cooktown | -15.5314 | 145.23 |
| B28911 | *Dacelo leachii* | *leachii* | Australia: Qld | Staaten River, Inkerman Station, Sw Cape York Peninsula | -16.45 | 141.5833 |
| B29455 | *Dacelo leachii* | *leachii* | Australia: Qld | Horseshoe Lagoon, Escott Station, W of Burketown | -17.7272 | 139.39 |
| B29584 | *Dacelo leachii* | *leachii* | Australia: Qld | Walker Creek Crossing, Karumba/Normanton Road | -17.4722 | 141.1922 |
| B29585 | *Dacelo leachii* | *leachii* | Australia: Qld | Walker Creek Crossing, Karumba/Normanton Road | -17.4722 | 141.1922 |
| B29994 | *Dacelo leachii* | *cervina* | Australia: NT | Koolpinyah Station, E of Darwin | -12.3978 | 131.1908 |
| B29995 | *Dacelo leachii* | *cervina* | Australia: NT | Koolpinyah Station, E of Darwin | -12.3997 | 131.1936 |
| B31156 | *Dacelo leachii* | *leachii* | Australia: Qld | 3 km ENE of Mt Ossa On Seaforth Road, N of Mackay | -20.9464 | 148.855 |
| B31157 | *Dacelo leachii* | *leachii* | Australia: Qld | 8 km ENE of Mt Ossa On Seaforth Road, N of Mackay | -20.9225 | 148.9167 |
| B31178 | *Dacelo leachii* | *leachii* | Australia: Qld | Maiden Creek, Bruce Highway, 42 km N of Bowen | -19.9322 | 147.8672 |
| B31235 | *Dacelo leachii* | *leachii* | Australia: Qld | Mt Alma Road, 3.9 km NE of Home Hill | -19.7272 | 147.5039 |
| B31236 | *Dacelo leachii* | *leachii* | Australia: Qld | Mt Alma Road, 3.9 km NE of Home Hill | -19.7272 | 147.5039 |
| B31283 | *Dacelo leachii* | *leachii* | Australia: Qld | Killymoon Creek, *ca* 24 km S of Townsville | -19.3928 | 146.9942 |
| B31340 | *Dacelo leachii* | *leachii* | Australia: Qld | Bruce Highway, 9 km S of Cardwell | -18.3269 | 146.045 |
| B31409 | *Dacelo leachii* | *leachii* | Australia: Qld | 1 km W of Daintree | -16.2581 | 145.315 |
| B31461 | *Dacelo leachii* | *leachii* | Australia: Qld | *ca* 7 km SSW of Cooktown | -15.5314 | 145.23 |
| B31588 | *Dacelo leachii* | *leachii* | Australia: Qld | 3 km E of Mt Garnet | -17.6906 | 145.1531 |
| B32157 | *Dacelo leachii* | *leachii* | Australia: Qld | Battle Creek, 10.2 km WNW of Mt Carbine | -16.5069 | 145.0397 |
| B32173 | *Dacelo leachii* | *leachii* | Australia: Qld | 52 km N of Musgrave, Cape York Peninsula | -14.3953 | 143.3625 |
| B33018 | *Dacelo leachii* | *occidentalis* | Australia: WA | Fortescue River, Roy Hill Station | -22.6439 | 119.9669 |
| B33032 | *Dacelo leachii* | *occidentalis* | Australia: WA | 124 km N of Mt Newman on road to Marble Bar | -22.3931 | 119.9747 |
| B33033 | *Dacelo leachii* | *occidentalis* | Australia: WA | 124 km N of Mt Newman on road to Marble Bar | -22.3931 | 119.9747 |
| B33044 | *Dacelo leachii* | *occidentalis* | Australia: WA | De Grey River, Near De Grey Station Entrance | -20.2956 | 119.2367 |
| B33187 | *Dacelo leachii* | *occidentalis* | Australia: WA | Hardey River, Rocklea Station, *ca* 48 km NW of Paraburdoo | -22.9406 | 117.3889 |
| B33377 | *Dacelo leachii* | *occidentalis* | Australia: WA | Gascoyne River, *ca* 2 km E of Gascoyne Junction | -25.0444 | 115.2306 |
| B33378 | *Dacelo leachii* | *occidentalis* | Australia: WA | Gascoyne River, *ca* 2 km E of Gascoyne Junction | -25.0444 | 115.2306 |
| B33430 | *Dacelo leachii* | *leachii* | Australia: NT | *ca* 45 km ESE of Katherine | -14.4631 | 132.6408 |
| B33453 | *Dacelo leachii* | *leachii* | Australia: NT | Bullo River Station, *ca* 80 km W of Timber Creek | -15.6169 | 129.6697 |
| B33468 | *Dacelo leachii* | *leachii* | Australia: NT | Bullo River Station, *ca* 80 km W of Timber Creek | -15.6658 | 129.64 |
| B33475 | *Dacelo leachii* | *leachii* | Australia: NT | E Baines River, Auvergne Station, *ca* 45 km W of Timber Creek | -15.6306 | 130.0103 |
| B33923 | *Dacelo leachii* | *leachii* | Australia: NT | Big Knob Waterhole, Bullo River, Bullo River Station | -15.7019 | 129.6381 |
| B33924 | *Dacelo leachii* | *leachii* | Australia: NT | Big Knob Waterhole, Bullo River, Bullo River Station | -15.7019 | 129.6381 |
| B34193 | *Dacelo leachii* | *leachii* | Australia: Qld | *ca* 23 km SE of Edward River on road to Kowanyama | -14.9714 | 141.79 |
| B41487 | *Dacelo leachii* | *leachii* | Australia: Qld | Road into Cathu Forestry Camp, NW of Mackay | -20.8167 | 148.5917 |
| B41488 | *Dacelo leachii* | *leachii* | Australia: Qld | Road into Cathu Forestry Camp, NW of Mackay | -20.8167 | 148.5917 |
| B41676 | *Dacelo leachii* | *leachii* | Australia: Qld | SW of Normanton, 32 km along road to Normanton | -17.875 | 140.8333 |
| B41677 | *Dacelo leachii* | *leachii* | Australia: Qld | SW of Normanton, 32 km along road to Normanton | -17.875 | 140.8333 |
| B42895 | *Dacelo leachii* | *leachii* | Australia: Qld | Eastern McIlwraith Range Lowlands, Cape York Peninsula | -13.8444 | 143.4611 |
| B42907 | *Dacelo leachii* | *leachii* | Australia: Qld | Eastern McIlwraith Range Lowlands, Cape York Peninsula | -13.8917 | 143.5861 |
| B43060 | *Dacelo leachii* | *leachii* | Australia: Qld | Eastern McIlwraith Range Lowlands, Cape York Peninsula | -13.8861 | 143.5833 |
| B43549 | *Dacelo leachii* | *leachii* | Australia: Qld | Shoalwater Bay Army Training Reserve, N of Rockhampton | -22.7417 | 150.2361 |
| B43761 | *Dacelo leachii* | *leachii* | Australia: Qld | Shoalwater Bay Army Training Reserve, N of Rockhampton | -22.7583 | 150.2917 |
| B48059 | *Dacelo leachii* | *leachii* | Australia: Qld | Bayswater Waterhole, Inkerman Station, SW Cape York Peninsula | -16.3889 | 141.5328 |
| B48545 | *Dacelo leachii* | *cervina* | Australia: NT | Taracumbi Falls, 22 km S of Snake Bay, Melville Island | -11.6039 | 130.7125 |
| B48681 | *Dacelo leachii* | *cervina* | Australia: NT | 4 km W of Goose Creek (Andranangoo), Melville Island | -11.5342 | 130.8803 |
| B48462 | *Dacelo leachii* | *cervina* | Australia: NT | 17 km N of Pickertaramoor, Melville Island | -11.7692 | 130.9953 |
| B48688 | *Dacelo leachii* | *cervina* | Australia: NT | Pickertaramoor Forestry Camp, Melville Island | -11.7692 | 130.89 |
| B48761 | *Dacelo leachii* | *cervina* | Australia: NT | *ca* 18 km SE of Pickertaramoor, Melville Island | -11.8858 | 130.9203 |
| B50522 | *Dacelo leachii* | *leachii* | Australia: WA | Wellare Bridge Area, Yeeda Station, *ca* 35 km S of Derby | -17.7086 | 123.6261 |
| B50523 | *Dacelo leachii* | *leachii* | Australia: WA | Wellare Bridge Area, Yeeda Station, *ca* 35 km S of Derby | -17.7086 | 123.6261 |
| B50635 | *Dacelo leachii* | *leachii* | Australia: WA | 14.5 km E of Yeeda Station Homestead, *ca* 15 km S of Derby | -17.6686 | 123.5653 |
| B50727 | *Dacelo leachii* | *leachii* | Australia: WA | Collins Lagoon area, *ca* 73 km E of Broome | -17.7742 | 122.8544 |
| B50728 | *Dacelo leachii* | *leachii* | Australia: WA | Collins Lagoon area, *ca*73 km E of Broome | -17.7742 | 122.8544 |
| B51032 | *Dacelo leachii* | *leachii* | Australia: WA | Ord River, *ca* 25 km N of Kununurra | -15.5333 | 128.6333 |
| B51466 | *Dacelo leachii* | *leachii* | Australia: Qld | Kalpowar Station, Princess Charlotte Bay, Cape York Peninsula | -14.6244 | 144.245 |
| B51614 | *Dacelo leachii* | *leachii* | Australia: Qld | Kowanyama Region, South Mitchell River, Cape York Peninsula | -15.4367 | 141.7181 |
| B51644 | *Dacelo leachii* | *leachii* | Australia: Qld | Kowanyama Region, South Mitchell River, Cape York Peninsula | -15.5558 | 141.7994 |
| B51645 | *Dacelo leachii* | *leachii* | Australia: Qld | Kowanyama Region, South Mitchell River, Cape York Peninsula | -15.5558 | 141.7994 |
| B51661 | *Dacelo leachii* | *leachii* | Australia: Qld | Kowanyama Region, South Mitchell River, Cape York Peninsula | -15.5558 | 141.7994 |
| B54504 | *Dacelo leachii* | *leachii* | Australia: NT | 8 Mile Waterhole, McArthur River, 57 km SW of Borroloola | -16.503 | 136.447 |
| B54646 | *Dacelo leachii* | *leachii* | Australia: NT | 21 km SSE of Mt McMinn Station Homestead, W of Roper Bar | -14.8260 | 134.4180 |
| B54822 | *Dacelo leachii* | *leachii* | Australia: NT | 20km ENE of Maryfield Station Homestead | -15.787 | 133.578 |
| B54960 | *Dacelo leachii* | *leachii* | Australia: WA | Ivanhoe Station, Mantinea Flat, 1 km S of Ord River, 5 km SSW of House Roof Hill | -15.6014 | 128.4906 |
| B54961 | *Dacelo leachii* | *leachii* | Australia: WA | Ivanhoe Station, Mantinea Flat, 1 km S of Ord River, 5 km SSW of House Roof Hill | -15.6014 | 128.4906 |
| B55094 | *Dacelo leachii* | *leachii* | Australia: WA | 7 km SE of Home Valley Station Homestead, Gibb River Road, Pentecost River | -15.7749 | 127.8641 |
| B55121 | *Dacelo leachii* | *leachii* | Australia: WA | Speewah Yards, 53km SW of Doon Doon Roadhouse, Great Northern Hwy | -16.4484 | 127.9609 |
| B56697 | *Dacelo leachii* | *leachii* | Australia: WA | "Frank Wise Institute", WA Ag Dept Research Stn, 17.7 km N Kununurra | -15.6556 | 128.71523 |
| B56698 | *Dacelo leachii* | *leachii* | Australia: WA | "Frank Wise Institute", WA Ag Dept Research Stn, 17.7 km N Kununurra | -15.6556 | 128.71523 |
| B57145 | *Dacelo leachii* | *leachii* | Australia: Qld | Bamaga airport 8 km SE Bamaga | -10.9407 | 142.44616 |
| B57258 | *Dacelo leachii* | *leachii* | Australia: Qld | Upper reaches Dulhunty River ca 66 km NE Weipa | -11.8996 | 142.1871 |
| B57343 | *Dacelo leachii* | *leachii* | Australia: Qld | Merluna Station (Boyds Lagoon) 68 km SE Weipa | -13.1188 | 142.35109 |
| B57457 | *Dacelo leachii* | *leachii* | Australia: Qld | Holroyd/Pretender R (Holroyd R Stn) 104 km SW Coen | -14.3639 | 142.44409 |
| B57543 | *Dacelo leachii* | *leachii* | Australia: Qld | Mitchell R (Highbury Stn) 179 km NW Chillagoe | -16.3468 | 143.05797 |

**Supplementary Table S2.** Genbank Accession numbers for the four gene regions.

| **ANWC Voucher code** | **Species** | **Subspecies** | ***ND2*** | ***20454*** | ***FIB\_BI7*** | ***TGFB2*** |
| --- | --- | --- | --- | --- | --- | --- |
| B56106 | *Dacelo gaudichaud* |  | MK116641 | MK116756 | MK116769 | MK116820 |
| B56135 | *Dacelo gaudichaud* |  | MK116643 | MK116757 | MK116768 | MK116821 |
| B56267 | *Dacelo gaudichaud* |  | MK116649 | MK116758 | MK116767 | MK116819 |
| B56202 | *Dacelo tyro* |  | MK116644 |  | MK116770 | MK116826 |
| B56256 | *Dacelo tyro* |  | MK116646 | MK116759 | MK116771 | MK116822 |
| B56265 | *Dacelo tyro* |  | MK116647 |  | MK116772 |  |
| B56266 | *Dacelo tyro* |  | MK116648 | MK116760 | MK116773 | MK116823 |
| B56401 | *Dacelo tyro* |  | MK116652 | MK116761 | MK116774 | MK116824 |
| B56407 | *Dacelo tyro* |  | MK116653 | MK116762 | MK116775 | MK116825 |
| B29832 | *Dacelo novaeguineae* |  | MK116622 | MK116763 | MK116777 | MK116827 |
| B32159 | *Dacelo novaeguineae* |  | MK116626 | MK116764 | MK116776 | MK116828 |
| B45112 | *Dacelo novaeguineae* |  | MK116667 | MK116765 | MK116778 | MK116829 |
| B48466 | *Dacelo novaeguineae* |  | MK116631 | MK116766 | MK116779 | MK116830 |
| B26691\_E009 | *Dacelo leachii* | *intermedia* | MK116666 | MK116715 | MK116818 | MK116868 |
| B55941 | *Dacelo leachii* | *intermedia* | MK116636 | MK116748 | MK116809 |  |
| B55942 | *Dacelo leachii* | *intermedia* | MK116637 | MK116749 | MK116810 | MK116860 |
| B55948 | *Dacelo leachii* | *intermedia* | MK116638 | MK116755 | MK116811 | MK116861 |
| B56024 | *Dacelo leachii* | *intermedia* | MK116639 | MK116750 | MK116812 | MK116862 |
| B56059 | *Dacelo leachii* | *intermedia* | MK116640 | MK116751 | MK116813 | MK116863 |
| B56127 | *Dacelo leachii* | *intermedia* | MK116642 | MK116752 | MK116814 | MK116864 |
| B56231 | *Dacelo leachii* | *intermedia* | MK116645 | MK116753 | MK116815 | MK116865 |
| B56271 | *Dacelo leachii* | *intermedia* | MK116650 | MK116754 | MK116816 | MK116866 |
| B56352 | *Dacelo leachii* | *intermedia* | MK116651 |  | MK116817 | MK116867 |
| B28618 | *Dacelo leachii* | *leachii* | MK116673 |  |  |  |
| B28834 | *Dacelo leachii* | *leachii* | MK116621 | MK116716 | MK116799 | MK116851 |
| B28911 | *Dacelo leachii* | *leachii* |  | MK116717 | MK116800 | MK116852 |
| B29455 | *Dacelo leachii* | *leachii* | MK116674 |  |  |  |
| B29584 | *Dacelo leachii* | *leachii* | MK116675 |  |  |  |
| B29585 | *Dacelo leachii* | *leachii* | MK116676 |  |  |  |
| B29994 | *Dacelo leachii* | *cervina* | MK116623 | MK116718 | MK116780 | MK116831 |
| B29995 | *Dacelo leachii* | *cervina* | MK116671 | MK116719 | MK116781 | MK116832 |
| B31156 | *Dacelo leachii* | *leachii* | MK116624 | MK116720 | MK116801 | MK116853 |
| B31157 | *Dacelo leachii* | *leachii* | MK116677 |  |  |  |
| B31178 | *Dacelo leachii* | *leachii* | MK116625 | MK116721 | MK116802 | MK116854 |
| B31235 | *Dacelo leachii* | *leachii* | MK116678 |  |  |  |
| B31236 | *Dacelo leachii* | *leachii* | MK116679 |  |  |  |
| B31283 | *Dacelo leachii* | *leachii* | MK116680 |  |  |  |
| B31340 | *Dacelo leachii* | *leachii* | MK116681 |  |  |  |
| B31409 | *Dacelo leachii* | *leachii* | MK116682 |  |  |  |
| B31461 | *Dacelo leachii* | *leachii* | MK116683 |  |  |  |
| B31588 | *Dacelo leachii* | *leachii* |  | MK116722 | MK116803 |  |
| B32157 | *Dacelo leachii* | *leachii* | MK116684 |  |  |  |
| B32173 | *Dacelo leachii* | *leachii* | MK116685 |  |  |  |
| B33018 | *Dacelo leachii* | *occidentalis* | MK116672 | MK116723 | MK116783 | MK116835 |
| B33032 | *Dacelo leachii* | *occidentalis* | MK116668 | MK116724 | MK116784 | MK116836 |
| B33033 | *Dacelo leachii* | *occidentalis* |  | MK116725 | MK116785 |  |
| B33044 | *Dacelo leachii* | *occidentalis* | MK116661 | MK116726 | MK116786 | MK116837 |
| B33187 | *Dacelo leachii* | *occidentalis* | MK116686 | MK116727 | MK116787 | MK116838 |
| B33377 | *Dacelo leachii* | *occidentalis* | MK116687 | MK116728 | MK116788 | MK116839 |
| B33378 | *Dacelo leachii* | *occidentalis* | MK116627 | MK116729 | MK116789 | MK116840 |
| B33430 | *Dacelo leachii* | *leachii* | MK116669 | MK116730 | MK116790 | MK116841 |
| B33453 | *Dacelo leachii* | *leachii* | MK116688 | MK116731 | MK116791 |  |
| B33468 | *Dacelo leachii* | *leachii* | MK116689 |  |  |  |
| B33475 | *Dacelo leachii* | *leachii* | MK116663 | MK116732 | MK116792 | MK116843 |
| B33923 | *Dacelo leachii* | *leachii* | MK116690 |  |  |  |
| B33924 | *Dacelo leachii* | *leachii* | MK116691 | MK116733 | MK116793 | MK116842 |
| B34193 | *Dacelo leachii* | *leachii* | MK116692 |  |  |  |
| B41487 | *Dacelo leachii* | *leachii* | MK116628 | MK116734 | MK116804 | MK116855 |
| B41488 | *Dacelo leachii* | *leachii* | MK116693 |  |  |  |
| B41676 | *Dacelo leachii* | *leachii* | MK116694 |  |  |  |
| B41677 | *Dacelo leachii* | *leachii* | MK116695 | MK116735 | MK116805 | MK116856 |
| B42895 | *Dacelo leachii* | *leachii* | MK116696 |  |  |  |
| B42907 | *Dacelo leachii* | *leachii* | MK116629 | MK116736 | MK116806 | MK116857 |
| B43060 | *Dacelo leachii* | *leachii* | MK116697 |  |  |  |
| B43549 | *Dacelo leachii* | *leachii* | MK116630 | MK116737 | MK116807 | MK116858 |
| B43761 | *Dacelo leachii* | *leachii* | MK116698 |  |  |  |
| B48059 | *Dacelo leachii* | *leachii* | MK116699 |  |  |  |
| B48545 | *Dacelo leachii* | *cervina* | MK116701 |  |  |  |
| B48681 | *Dacelo leachii* | *cervina* | MK116702 | MK116738 |  | MK116833 |
| B48462 | *Dacelo leachii* | *cervina* | MK116700 |  |  |  |
| B48688 | *Dacelo leachii* | *cervina* | MK116670 | MK116739 | MK116782 | MK116834 |
| B48761 | *Dacelo leachii* | *cervina* | MK116703 |  |  |  |
| B50522 | *Dacelo leachii* | *leachii* | MK116662 | MK116740 | MK116795 | MK116844 |
| B50523 | *Dacelo leachii* | *leachii* | MK116704 |  |  |  |
| B50635 | *Dacelo leachii* | *leachii* | MK116705 |  |  |  |
| B50727 | *Dacelo leachii* | *leachii* | MK116706 | MK116741 |  | MK116845 |
| B50728 | *Dacelo leachii* | *leachii* | MK116632 | MK116742 | MK116794 | MK116846 |
| B51032 | *Dacelo leachii* | *leachii* | MK116707 |  |  |  |
| B51466 | *Dacelo leachii* | *leachii* | MK116708 |  |  |  |
| B51614 | *Dacelo leachii* | *leachii* | MK116709 |  |  |  |
| B51644 | *Dacelo leachii* | *leachii* | MK116665 | MK116743 | MK116808 | MK116859 |
| B51645 | *Dacelo leachii* | *leachii* | MK116710 |  |  |  |
| B51661 | *Dacelo leachii* | *leachii* | MK116711 |  |  |  |
| B54504 | *Dacelo leachii* | *leachii* | MK116633 | MK116744 | MK116796 | MK116847 |
| B54646 | *Dacelo leachii* | *leachii* | MK116712 |  |  |  |
| B54822 | *Dacelo leachii* | *leachii* | MK116634 | MK116745 |  | MK116848 |
| B54960 | *Dacelo leachii* | *leachii* | MK116713 |  |  |  |
| B54961 | *Dacelo leachii* | *leachii* | MK116635 | MK116746 | MK116797 | MK116849 |
| B55094 | *Dacelo leachii* | *leachii* | MK116714 |  |  |  |
| B55121 | *Dacelo leachii* | *leachii* | MK116664 | MK116747 | MK116798 | MK116850 |
| B56697 | *Dacelo leachii* | *leachii* | MK116654 |  |  |  |
| B56698 | *Dacelo leachii* | *leachii* | MK116655 |  |  |  |
| B57145 | *Dacelo leachii* | *leachii* | MK116656 |  |  |  |
| B57258 | *Dacelo leachii* | *leachii* | MK116657 |  |  |  |
| B57343 | *Dacelo leachii* | *leachii* | MK116658 |  |  |  |
| B57457 | *Dacelo leachii* | *leachii* | MK116659 |  |  |  |
| B57543 | *Dacelo leachii* | *leachii* | MK116660 |  |  |  |

**Supplementary Table S3**. Worldclim bioclimatic variables used in the species distribution modelling of *Dacelo leachii*.

|  |
| --- |
| bio1 = Mean annual temperature |
| bio4 = Temperature seasonality (standard deviation \*100) |
| bio5 = Max temperature of warmest month |
| bio8 = Mean temperature of the wettest quarter |
| bio9 = Mean temperature of driest quarter |
| bio10 = Mean temperature of warmest quarter |
| bio12 = Total (annual) precipitation |
| bio15 = Precipitation seasonality (coefficient of variation) |
| bio16 = Precipitation of wettest quarter |
| bio17 = Precipitation of driest quarter |
| bio18 = Precipitation of warmest quarter |
| bio19 = Precipitation of Coldest Quarter |

**Supplementary Table S4.** Configuration settings used in the BCCVL to run a species distribution model for *Dacelo leachii*. In terms of absence data settings, no true absence data was available to use as input into the SDMs. Therefore pseudo-absence points were generated for the experiments. The pseudo-absence strategy (configuration option) used was ‘random’, and the absence-presence ratio was 1. The number of background points chosen to configure Maxent with was 10,000. Since only once source of non-species (i.e. climate and environmental) data was chosen as predictor variables, there was no need to scale the input data to a common resolution. Geographic constraints for the experiments, within which the model extracts data for the purposes of training, were derived from a polygon drawn on a map which included the area delimiting the extent of the occurrence records. Default settings were used for all configuration options for each algorithm utilised for this study within the BCCVL. Table A1 lists all configuration settings used for all the algorithms used in this study. For the climate change experiment (the species distribution model run with WorldClim climate data from the Last Glacial Maximum, 22,000 years ago), the threshold used for each SDM was derived from the ‘maximize TPR+TNR’ strategy (i.e. True Positive Rate + True Negative Rate, which is the default setting in the BCCVL). This was different for each algorithm: 0.251 for ANN, 0.597 for CTA, 0.130 for Maxent, 0.485 for GLM and 0.340 for MARS). By default, the projection that results from a climate change experiment in the BCCVL is constrained to the same area as the source (input) current climate SDM. The BCCVL results also include an unconstrained projected distribution, to allow for the expansion of the modelled distribution under different past or future climate scenarios. The algorithms used to construct species distribution models for *Dacelo leachii*, the list of configurable options in the BCCVL for these algorithms, and the default settings for those configuration options, as implemented in the BCCVL.

|  |  |  |
| --- | --- | --- |
| **Algorithm** | **Configurable options\*** | **Default** |
| Maximum Entropy model (MaxEnt) | 1) Weighted response weights | 0.5 |
| 2) Maximum number of iterations | 1 |
| 3) Linear/quadratic/product/ threshold/hinge feature thresholds | Yes |
| 4) Product Feature thresholds | 80 |
| 5) Quadratic feature threshold | 10 |
| 6) Hinge feature threshold | 15 |
| 7-11) Regularisation options: - threshold feature regularization - categorical feature regularization - linear/quadratic/product feature regularization’ - hinge feature regularization - Regularization multiplier  | 1 |
| 12) Prevalence | 0.5 |
| Classification Tree Analysis (CTA) | 1) Weighted response weights | 0.5  |
| 2) Cross-validation folds | 10  |
| 3) Minimum bucket | 1  |
| 4) Minimum split | 20 |
| 5) Complexity parameter | 0.01 |
| 6) Maximum depth | 30 |
| Generalised Linear Model (GLM) | 1) Weighted response weights | 0.5  |
| 2) Type | quadratic |
| 3) Interaction level | 1 |
| 4) Test | AIC  |
| Artificial Neural Network (ANN) | 1) Weighted response weights | Null |
| 2) NbCV | 5 |
| Multivariate Adaptive Regression Splines (MARS) | 1) Degree | 1 |
| 2) NK (max. no. of terms) | Null |
| 3) Penalty | 2 |
| 4) Thresh | 0.001 |
| 5) Prune | True |
| 6) Weighted response weights | 0.5 |
| 7) Resampling | 0 |