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An ant genus-group (*Prenolepis*) illuminates the biogeography and drivers of insect diversification in the Indo-Pacific

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29 Abstract:

30 The Malay Archipelago and the tropical South Pacific (hereafter the Indo-Pacific region) are
31 considered biodiversity hotspots, yet a general understanding of the origins and diversification of
32 species-rich groups in the region remains elusive. We aimed to test hypotheses for the
33 evolutionary processes driving insect species diversity in the Indo-Pacific using a higher-level
34 and comprehensive phylogenetic hypothesis for an ant clade consisting of seven genera. We
35 estimated divergence times and reconstructed the biogeographical history of ant species in the
36 *Prenolepis* genus-group (Formicidae: Formicinae: Lasiini). We used a fossil-calibrated
37 phylogeny to infer ancestral geographical ranges utilizing a biogeographic model that includes
38 founder-event speciation. Ancestral state reconstructions of the ants' ecological preferences, and
39 diversification rates were estimated for selected Indo-Pacific clades. Overall, we report that
40 faunal interchange between Asia and Australia has occurred since at least 20–25 Ma, and early

41 dispersal to the Fijian Basin happened during the early and mid-Miocene (*ca.* 10–20 Ma).
42 Differences in diversification rates across Indo-Pacific clades may be related to ecological
43 preference breadth, which in turn may have facilitated geographical range expansions. Ancient
44 dispersal routes suggested by our results agree with the palaeogeography of the region. For this
45 particular group of ants, the rapid orogenesis in New Guinea and possibly subsequent ecological
46 shifts may have promoted their rapid diversification and widespread distribution across the Indo-
47 Pacific.

48 Keywords: biogeography; diversification rate; ecological shift; New Guinea; Pacific islands;
49 taxon cycle

50 **1. Introduction**

51 The islands of the Pacific Ocean constitute a relatively small amount of land area, but they
52 harbour an extraordinary number of endemic taxa (Keppel et al., 2009). Given the complexity of
53 their biogeographical history, multiple scenarios for the origin of the region's vast diversity have
54 been proposed (Gillespie et al., 2008; Keppel et al., 2009; Lohman et al., 2011; Stoddart, 1992),
55 but evaluations of them incorporating robust phylogenetic inferences, probabilistic biogeography
56 analyses, and ecological data have been scarce, especially as applied to species-rich groups (but
57 see, Gressitt, 1984; de Boer & Duffels, 1996; Sharma & Giribet, 2012; Clouse et al., 2015;
58 Economo et al., 2015b). In this study, we aim to understand the evolution of the ants within the
59 *Prenolepis* genus-group (Formicinae: Lasiini) (LaPolla et al., 2010a; Ward et al., 2016) as a
60 model for studying historical biogeography in the Malay Archipelago and the tropical South
61 Pacific (hereafter the TSP; Fig. 1). These ants are geographically widespread, and their lineages
62 exhibit a broad array of ecological preferences. They are a ubiquitous component of tropical

63 forests, they occupy all types of terrestrial habitats in the region, and some species have become
64 invasive.

65 Although various palaeogeographical reconstructions have been proposed for the region
66 (Baldwin et al., 2012; Hall, 2013; Lohman et al., 2011), most models agree that there was a
67 significant rise of subaerial (above water) land and orogenic activity within the past 5–10 Ma.
68 However, it is unclear whether there was ever a chain of volcanic activity and possible
69 archipelago connecting the Sunda Shelf in Southeast (SE) Asia and the Sahul Shelf, which
70 includes Australia and New Guinea (Hall, 2013; Lohman et al., 2011). If such a gateway did not
71 exist, then dispersal of many non-marine taxa between Asia and Australia across Wallace's Line
72 and the Wallacea region (the islands between Borneo and New Guinea) would have been limited
73 during most of the Miocene (i.e., 10–25 Ma); however dated molecular phylogenies of several
74 vertebrate groups strongly suggest faunal interchange across Wallacea throughout the Miocene
75 epoch (Cibois et al., 2014; Georges et al., 2014; Jönsson et al., 2011; Mitchell et al., 2014).
76 Molecular chronograms of insect taxa, nonetheless, largely agree with a later biotic exchange
77 scenario, around the late Miocene and Pliocene (i.e., <15 Ma; Balke et al., 2007; Condamine et
78 al., 2013, 2015; Müller et al., 2013; Tänzler et al., 2014; but see, Economo et al., 2015b), but
79 even among arthropods there are unexplained dispersal patterns (Clouse and Giribet, 2007). Not
80 only is the existence of such a Miocene land bridge unclear, but so is its possible extent, location,
81 and duration.

82 The island of New Guinea is a major centre of biotic endemism in the region. It is believed that
83 arthropod diversification there has occurred since the early Miocene (*ca.* 20–25 Ma; de Boer &
84 Duffels, 1996; Sharma & Giribet, 2012; Müller et al., 2013), accelerating during the past 5–10
85 Ma, concurrent with the orogeny of its Central Range (Toussaint et al., 2014). Although the

86 tectonic history of New Guinea is complex (Baldwin et al., 2012), broadly speaking there are two
87 competing hypotheses for the emergence of its land: 1) an early Miocene islands group along the
88 northern edge, so-called the proto-Papuan archipelago (Hall, 2002; Jønsson et al., 2011; Lohman
89 et al., 2011), and alternatively, 2) an Oligocene Papuan peninsular orogeny (*ca.* 30–35 Ma)
90 restricted to southeastern New Guinea (van Ufford and Cloos, 2005). These two models make
91 contrasting predictions about the first colonization events of New Guinea as either taking place
92 on the northern or southeastern sides of the island.

93 In the case of oceanic islands, it was hypothesized that most of the extant TSP archipelagos
94 emerged during the late Miocene and Pliocene (*ca.* 5–10 Ma; Gillespie et al., 2008; Gillespie &
95 Clague, 2009), but volcanic activity has been reconstructed since at least the Oligocene (*ca.* 30
96 Ma) (Neall and Trewick, 2008). Although palaeogeographic reconstructions depict ancient
97 Melanesian volcanic arcs extending from New Guinea into the Fijian Basin (Hall, 2002),
98 subaerial land may have been ephemeral (Hall, 2013). One hypothesis, the Vitiaz Arc Model,
99 suggests a relatively continuous archipelago extending throughout proto-Papua, the Solomon
100 Islands, Vanuatu and Fiji (Ewart, 1988; Rodda, 1994). Biogeographically, this scenario predicts
101 early stepping-stone dispersals to the southwest Pacific, which may have occurred until the
102 disruption of the island arc at about 10 Ma (Hall, 2002). Some of these earlier colonizers might
103 never have faced extinction because certain islands in Vanuatu and Fiji remained subaerial since
104 the early Miocene (*ca.* 25 Ma; Sarnat & Economo, 2012). In fact, time-calibrated insect
105 phylogenies strongly support the idea of a mid-Miocene colonization of Fiji from either New
106 Guinea or SE Asia (Balke et al., 2007; Economo et al., 2015a; Lucky and Sarnat, 2010; Sarnat
107 and Moreau, 2011).

108 Apart from the geological processes that might have facilitated the colonization of Melanesia,
109 including New Guinea, and the TSP, species diversification and distribution across islands may
110 have been driven locally by ecological processes, as suggested by recent advances in Island
111 Biogeography theory (Whittaker et al., 2008). The expansion/contraction phases, or the taxon
112 cycle hypothesis, is a classic, influential model that attempts to explain population differentiation
113 and geographic ranges over time in an ecological framework (Ricklefs and Cox, 1972; Wilson,
114 1961, 1959). In the expansion stage of the cycle, species colonize nearby archipelagos
115 (geographical expansion) facilitated by shifts in habitat preference towards marginal habitats
116 such as island coasts (ecological expansion). The following contraction stages involve
117 phenotypic and genetic differentiation of populations across islands, extinction of small
118 unspecialized populations, and the origin of single-island endemics. Although biogeographic
119 data and phylogenetic evidence have partially given support to the taxon cycles (Economo et al.,
120 2015b; Economo and Sarnat, 2012; Jönsson et al., 2014; Ricklefs and Bermingham, 2002), the
121 complexity of the hypothesis has hindered its comprehensive evaluation. For instance, other
122 factors have been proposed to explain species' expansion and contraction phases, such as recent
123 climatic fluctuations, character-displacement, and disparate dispersal abilities across lineages
124 (e.g., Pregill & Olson, 1981; Liebherr & Hajek, 1990; Losos, 1992).

125 Phylogenetically, the taxon cycle hypothesis predicts the repeated evolution of widespread
126 lineages exhibiting ecological shifts (Ricklefs and Cox, 1972). Lineages in the expansion phase
127 could give rise to daughter lineages adapted to marginal habitats, thus, the expansion phase may
128 also be represented by entire clades having wider ecological preferences. However, a potential
129 link between the expansion phase and phylogenetic diversification of Melanesian insects remains
130 to be tested (but see, Sarnat & Moreau, 2011; Economo & Sarnat, 2012; Economo et al., 2015b).

131 If expansion phases and phylogenetic diversification are indeed correlated, we would expect
132 increased diversification rates within certain clades due to expanded ecological opportunities.

133 In this study, we test four pairs of competing hypotheses that collectively inform our
134 understanding of diversity dynamics in the Indo-Pacific region:

135 1. ASIA-AUSTRALIA DISPERSAL IN THE MIOCENE

136 (1a) Dispersal between SE Asia and Australia was mostly post-late Miocene due to a lack of
137 subaerial land before 5–10 Ma.

138 (1b) Older colonization events of terrestrial lineages between these two areas were possible since
139 at least the early Miocene, either through overwater dispersal or via significant emergent land not
140 accounted for by the current palaeogeographic reconstructions.

141 2. COLONIZATION OF NEW GUINEA

142 (2a) The first colonization of—and diversification in—New Guinea was in a proto-Papuan
143 archipelago on the northern edge of the island.

144 (2b) The first emergence, colonization, and diversification in New Guinea occurred in the
145 present-day Papuan peninsula on the southeastern part of the island.

146 3. COLONIZATION OF EAST MELANESIA

147 (3a) Ancient colonization of east Melanesia (Vanuatu and Fiji) was facilitated by the
148 hypothesized ancient island chain associated with the Vitiaz arc, which may have lasted until
149 about 10 Ma.

150 (3b) Colonization of Vanuatu and Fiji occurred during the Pliocene (< 5 Ma) as a consequence of
151 substantial emergence of land above sea.

152 4. RANGE EXPANSION, SHIFTS IN ECOLOGICAL PREFERENCE, AND RADIATION

153 (4a) Lineages go through concordant shifts in ecological preference and geographical range
154 expansion, which may result in increased phylogenetic diversification rates.

155 (4b) Range expansions are not linked to niche shifts, and diversification remains constant over
156 time, thus, the extant species diversity in the region is time-dependent (i.e., older clades contain
157 more species diversity).

158 To test these hypotheses, we reconstruct a dated molecular phylogeny of seven ant genera in the
159 *Prenolepis* genus-group, calibrated using fossil data and secondary constraint, and infer its
160 ancestral geographical ranges, habitat preferences, and diversification rates on species-rich Indo-
161 Pacific clades.

162 **2. Material and methods**

163 **2.1. Sample and dataset acquisition**

164 The *Prenolepis* genus-group is monophyletic (Blaimer et al., 2015; LaPolla et al., 2010a) and has
165 recently been classified within the tribe Lasiini based on phylogenomic data (Ward et al., 2016).

166 The group has a worldwide distribution, occurring mostly in tropical and subtropical regions. In
167 the Malay Archipelago, TSP, and Australia, the focal study area, the group consists of 35
168 described species (AntWeb, 2016). We collected ants throughout the study region over a 10 year
169 period to obtain the most geographically and taxonomically extensive sampling of species as
170 possible, including undescribed and cryptic diversity. We sampled *ca.* 470 specimens that

171 represent 73 putative species distributed across our focal study area (Fig. 1; Table A.1 in
172 Appendix A). For most of these specimens (91%; see Table A.1), we sequenced the barcoding
173 region (659 bp) of the mitochondrial COI gene. Furthermore, for the phylogenetic analyses, we
174 expanded the molecular dataset for selected specimens to include at least one specimen per
175 species. This expanded aligned dataset consists of 3389 bp from six protein-coding genes: one
176 mitochondrial (COI) and five nuclear gene markers (CAD, EF-1 α F1, EF-1 α F2, LWR, and
177 wingless). We retrieved sequences from GenBank of outgroup taxa (tribe Lasiini: *Cladomyrma*,
178 *Lasius*, *Myrmecocystus*) (Ward et al., 2016) and all available sequences for 63 taxa within the
179 *Prenolepis* genus-group distributed around the world. All voucher specimens were deposited in
180 the Melanesian Ant Collection, Biology Centre of the Czech Academy of Sciences, with selected
181 duplicates deposited in the MCZ (Museum of Comparative Zoology, Cambridge, MA, USA).

182 Species determination was primarily based on morphology, whereas molecular divergences were
183 used to evaluate putative species boundaries and to detect cryptic species with substantial genetic
184 variation. We used the program bPTP (Zhang et al., 2013) to delimit species based on branch
185 length information. The multi-species coalescent model could not be utilized because of
186 computational limitations, convergence and mixing problems when analyzing our dataset
187 consisting of multiple genera (analyses not shown) (Yang and Rannala, 2010). However, the
188 species assignments by bPTP and programs based on the multi-species coalescent, such as
189 BP&P, may be similar in some cases (Toussaint et al., 2015). As input for the program bPTP, we
190 used a maximum likelihood tree with branch lengths representing number of substitutions as
191 inferred by RAxML v8.0 (Stamatakis, 2014). We used a multi-locus dataset, with 164 ingroup
192 specimens having unique COI haplotypes and at least one nuclear marker sequenced. The
193 molecular species delimitation analysis was conducted through the bPTP web server

194 (<http://species.h-its.org/ptp/>), having the following settings: 500,000 MCMC generations;
195 thinning by a factor of 100; and 25% burnin.

196 **2.2. Phylogenetic analyses**

197 Ingroup members of our molecular dataset consisted of *Prenolepis* genus-group specimens from
198 our focal study area and other regions in the world, and included in total 176 specimens from 124
199 species, having at least 4 out of 6 gene fragments sequenced (level of matrix completeness *ca.*
200 90%). Based on Bayes factors calculated by the stepping-stone sampling approach in MrBayes
201 v3.2.2 (Ronquist et al., 2012), we used the best-fit partitioning strategy consisting of by-gene and
202 by-coding positions in all phylogenetic analyses (21 partitions; Table A.2 in Appendix A). Other
203 less-fit partitioning schemes that were analyzed include: a) all sequences concatenated (1
204 partition), b) mitochondrial and nuclear sequences (2 partitions), c) each gene marker (7
205 partitions), and d) nucleotide sites grouped in bins with comparable relative evolutionary rates as
206 estimated by the program TIGER (Cummins and McInerney, 2011) (3 partitions), after verifying
207 congruence among single-gene tree topologies (Fig. A.4 in Appendix A).

208 Maximum likelihood analysis was conducted using RAxML v8.0 as implemented in CIPRES
209 (Miller et al., 2010). We performed "rapid bootstrapping" with 1000 iterations to assess the level
210 of node support. Bayesian inferences were conducted using MrBayes v3.2.2, with two
211 independent runs, each for 50 million generations with sampling every 5000 generations. We
212 applied the mixed option for nucleotide substitution (Huelsenbeck et al., 2004) to each partition
213 and a conservative burnin of 25%. We verified that the final average standard deviation split
214 frequencies were lower than 0.05, PSRF values were approaching unity, and log-likelihoods
215 reached a stationary distribution.

216 2.3. Molecular dating of phylogenies

217 Divergence dates were obtained under the uncorrelated relaxed-clock model as implemented in
218 BEAST v2.3.1 (Bouckaert et al., 2014), using a reduced dataset comprising one specimen per
219 species. The level of completeness of this molecular dataset is nearly 85%. We calibrated the
220 phylogeny using three extinct *Prenolepis*-group species with affinities to three extant genera
221 (*Nylanderia*, *Prenolepis*, and *Pseudolasius*) found in Baltic amber (34–42 Ma) and two extinct
222 species within the extant genera *Nylanderia* and *Zatania* from Dominican amber (15–20 Ma)
223 (LaPolla et al., 2012; LaPolla and Dlussky, 2010) (see Appendix A for further details on fossil
224 taxa phylogenetic placement). Because the Baltic fossils cannot be confidently assigned to any
225 extant infrageneric group or clade, we conservatively constrained the stem ages of *Nylanderia*,
226 *Prenolepis*, and *Pseudolasius* using an exponential distribution with mean of 5.0 and offset to
227 34.0. The Dominican fossils, instead, closely resemble extant clades and are likely members of
228 crown groups (LaPolla et al., 2012; LaPolla and Dlussky, 2010). Therefore we constrained the
229 minimum crown ages of *Zatania* and the North American *Nylanderia parvula* clade following an
230 exponential distribution with mean of 3.0 and offset to 15.0. In addition, we also constrained the
231 stem of the genus *Lasius* (outgroup) based on fossil data from Baltic amber deposits, following
232 the same calibration parameters as above. A secondary calibration point was used to constrain
233 the root of the tree (i.e., the tribe Lasiini), by setting a broad normal distribution to the root
234 height with mean of 77.4 Ma (5% quantiles to 66.5 Ma and 88.3 Ma), following Blaimer et al.,
235 (2015).

236 We selected the Birth-Death Model as the tree prior (Stadler, 2009), and substitution models
237 were unlinked across partitions. The best substitution models for each gene partition were
238 calculated using jModelTest 0.1.1 (Posada, 2008) under the Bayesian Information Criterion:

239 GTR+ Γ model for CAD; HKY+ Γ model for EF-1 α F1; SYM+ Γ model for EF-1 α F2; GTR+ Γ
240 model for COI; GTR+ Γ model for LWR; and SYM+ Γ model for wingless. We ran the analyses
241 using four independent runs for 100 million generations each, sampling every 5000 generations.
242 We checked that ESS values were higher than 200 before combining and summarizing the
243 estimated trees (Figs 2 & 3). An additional analysis using the Yule tree model is presented in
244 Fig. A.5 in Appendix A.

245 **2.4. Biogeographical inferences**

246 We estimated ancestral geographic ranges to test the competing pairs of Hypotheses 1–3 on the
247 origin of New Guinean, Melanesian and TSP ant diversity (i.e., first faunal interchange between
248 SE Asia and Australia, and colonization events to New Guinea, Vanuatu, and Fiji). Although the
249 New World and the Afrotropics were considerably undersampled, it is probable based on
250 morphological similarities (Kallal and LaPolla, 2012; John S. LaPolla et al., 2011; LaPolla et al.,
251 2010a, 2010b) and global framework phylogenies (Blaimer et al., 2015; LaPolla et al., 2010a)
252 that such missing taxa would cluster along the well-defined, geographically correspondent clades
253 (Figs 2 & 3; see Appendix A for further accounts on morphology and distribution of missing
254 taxa). Geographical distributions of species were taken from the literature and public databases
255 (e.g., Clouse, 2007; Economo & Sarnat, 2012; Antweb, 2016), as well as from our field records
256 (<http://www.newguineants.org>).

257 Ancestral geographic ranges were estimated following the Dispersal-Extinction-Cladogenesis
258 model (Ree et al., 2005) and including a founder-event speciation parameter (DEC+J; Matzke,
259 2014). We conducted our biogeographical analyses by finely subdividing the focal region based
260 on biogeographical characteristics of Pacific fauna (Fig. 1; Keppel et al., 2009), resulting in a

261 total of nine global geographical areas. The palaeogeographic models of the Indo-Pacific
262 (Gillespie and Clague, 2009; Hall, 2013, 2002) were incorporated as differential rates of
263 dispersal (range expansion) across a time-stratified phylogeny at 25, 15, and 5 Ma. Relative
264 dispersal rates between two areas were arbitrarily set from 1.0 to 10^{-4} as an attempt to represent
265 the extent of geographic barriers such as sea straits and mountain ranges (see Appendix A for
266 further details). The analyses were performed on a likelihood framework using the R package
267 BioGeoBEARS (Matzke, 2013). Further analyses using other biogeographical models, including
268 the DIVA-LIKE and BAYAREA-LIKE, are described in Appendix A but in all cases the DEC+J
269 model outperformed other biogeographical models (Akaike weight = 0.998, Table 1).

270 **2.5. Reconstruction of ancestral habitat preferences and diversification rates**

271 We reconstructed ancestral ecological preferences of Indo-Pacific clades to evaluate any
272 association between niche shift and geographical range expansion (competing pair of Hypotheses
273 4a–b). We compiled habitat preferences for each species from the literature (e.g., Clouse, 2007;
274 Economo & Sarnat, 2012; Antweb, 2016) and our field records (<http://www.newguineants.org>).
275 Locality information for each collected specimen, including habitat type and GPS coordinates,
276 are presented in Appendix A, Table A.1, and each species' distributional information can be
277 found in Table A.4 and in the New Guinea Ants database (<http://www.newguineants.org>). Three
278 categories were set for the "habitat" character: 1) undisturbed primary rainforest, 2) disturbed
279 forest and savanna, 3) highly-disturbed areas including gardens, docks, coastal margins and
280 urban areas; and "elevation" was categorized as: 1) lowlands, 2) lower montane, and 3) montane.
281 The breaks between the three elevation categories were at 800 m and 1600 m on New Guinea,
282 and at 250 m and 500 m on TSP archipelagos, based on major distributional turnover (pers. obs.;
283 Sarnat & Economo, 2012). Character matrices were used to reconstruct and trace ancestral states

284 over the phylogeny, under the Fitch Parsimony (unordered) model and the Mk1 Likelihood
285 model, in Mesquite 3.10 (Maddison and Maddison, 2016).

286 To test for expanding geographic ranges and ecological opportunity driving diversification
287 (Hypothesis 4a), we estimated the diversification rates of four Indo-Pacific clades, two within
288 *Paraparatrechina* and two within *Nylanderia*. We used the branching times of these Indo-Pacific
289 lineages to evaluate the best-fitting diversification model using the R package DDD (Etienne et
290 al., 2012). We carried out the three following analyses: 1) constant pure-birth diversification
291 (Yule), 2) constant birth-death diversification (BD), and 3) diversity-dependence birth-death
292 diversification, with speciation linearly declining with diversity (DD). Akaike weights were used
293 to estimate the relative probability of each diversification model fitting our dataset.
294 Diversification rates were compared across clades to evaluate the alternative scenarios of
295 increased rates followed by diversity-dependent speciation, potentially linked to ecological shifts
296 (Hypothesis 4a) vs. constant phylogenetic diversification (Hypothesis 4b).

297 **3. Results**

298 **3.1. Species delimitation and phylogenetic relationships**

299 The estimated number of species recovered by bPTP ranged between 80–105, with a mean of 92
300 species (Fig. A.1). Most of the species boundaries were moderately to highly supported
301 (Bayesian supporting values > 0.8), and only nine species were not in agreement with our
302 morphologically-based sorting. Five of these conflicting lineages, however, represented
303 described species whose morphological identifications were based on available taxonomic keys
304 and comparisons with museum specimens. In cases where there was no sufficient molecular
305 evidence or conflicting resolutions of molecular species boundaries, we followed our

306 morphologically-based species delimitations (see Fig. A.1 for a visual inspection of molecular
307 divergences within these conflicting lineages). Nonetheless, the species diversity estimated in
308 this study should be taken as preliminary, and a thorough taxonomic investigation and the usage
309 of multi-species coalescent on smaller taxonomic groups are strongly demanded, whereas other
310 fast-evolving molecular markers (e.g., STRs) along with better population sampling may be
311 beneficial in finding any further cryptic species not detected here.

312 The monophyly of each genus and putative species with more than two individuals sampled was
313 strongly supported in every phylogenetic analysis (Fig. 2 and Figs A.2–A.4). All Melanesian
314 (which includes New Guinea), Australian, and TSP lineages clustered together in monophyletic
315 groups and closely related to SE Asian lineages. New World and African species were recovered
316 in separate clades, and apparently these geographical regions have not directly contributed to the
317 extant Melanesian ant fauna. We identified seven highly-supported Melanesian and TSP clades
318 (Figs 2 & 3; posterior probabilities [PP] ≥ 0.95 , bootstraps $\geq 90\%$): two clades within
319 *Parapatrechina* and *Pseudolasius*, and three clades within *Nylanderia*.

320 **3.2. Divergence times**

321 The crown age of the *Prenolepis* genus-group was estimated at 46.0 Ma (95% HPD 41.2–51.8
322 Ma). Ingroup divergence times and tree topologies were similar and consistently recovered
323 across independent analyses using distinct tree priors (Birth-Death and Yule) (Fig. A.5).
324 Moreover, our estimated timing of origin and diversification of the *Prenolepis* genus-group is in
325 line with Blaimer et al. (2015), who found that the group originated and began its diversification
326 by the late Paleocene and Eocene (i.e., about 45–60 Ma). The extant Melanesian lineages arrived
327 to the region and diversified as early as 23.5 Ma (95% HPD 19.4–27.9 Ma) (i.e., the crown age

328 of clade 2 within *Paraparatrechina*), but it is likely that the actual dispersal event may have been
329 earlier but probably not before 34.1 Ma (95% HPD 28.9–39.6 Ma), which represents the stem
330 age of clade 2 in our phylogeny.

331 **3.3. Ancestral state reconstructions and diversification rates**

332 A continental origin from Asia was reconstructed for all the Melanesian *Prenolepis* genus-group
333 lineages (Fig. 3). Geographic range expansions occurred during two main instances: at the early
334 Miocene (*ca.* 20–25 Ma) from SE Asia to New Guinea, and during the late Miocene and Plio-
335 Pleistocene (*ca.* 3–10 Ma), again from SE Asia to Melanesia, but also from the latter region
336 towards the remaining of Indo-Pacific islands (Fig. 4). The DEC+J biogeographical model fits
337 our molecular phylogeny better than others, such as BAYAREA-LIKE or DIVA-LIKE (Table 1).

338 Ancestral state reconstructions suggested that undisturbed (primary) rainforest was the most
339 likely habitat preferred by the common ancestor of three main Indo-Pacific clades (within
340 *Paraparatrechina* and *Nylanderia*). However, highly-disturbed and open-environments were
341 recovered as the most-likely ancestral state in clade 7 (within *Nylanderia*) with about 0.67
342 marginal probability, and within clade 2 (*Paraparatrechina*) with about 0.5 marginal probability.
343 On the other hand, the origin and evolution of clade 5 (within *Nylanderia*) is likely linked to
344 lower montane habitats on New Guinea (marginal probability of 0.97). At about 10 Ma, there
345 was a shift in habitat preference from lowland to montane environments in clade 2 with marginal
346 probabilities of more than 0.6. The colonization of montane areas in archipelagos of the TSP
347 occurred recently and simultaneously with the shift to disturbed environments within clades 2
348 and 7 (< 5.0 Ma).

349 The evolution of the smaller clades 1 and 5 (within *Paraparatrechina* and *Nylanderia*,
350 respectively) might be explained by two equally-probable diversification models, the constant-
351 rate or the diversity-dependence scenarios. The best-fit diversification model for the larger clades
352 2 and 7, however, was the diversity-dependence model (Akaike weights > 0.99). Estimated
353 diversification rates for the small clades varied between 0.06 and 0.17, whereas the
354 diversification rates for clade 2 was 0.26, for the *P. oceanica*–*P. minutula* subclade within clade
355 2 was 0.5, and for clade 7 was 0.61 (Table 2).

356 **4. Discussion**

357 Ants in the *Prenolepis* genus-group likely colonized New Guinea from continental SE Asia in
358 the early Miocene *ca.* 25 Ma. Dispersal to eastern Melanesia (Fiji and Vanuatu) is as old as 10–
359 20 Ma, suggesting that a subaerial island chain associated with the Vitiaz Arc may have
360 facilitated the colonization of these archipelagos during the Miocene. Substantially larger
361 diversification rates in the young and diverse clade 7 (within *Nylanderia*), and to a lesser extent
362 in clade 2 (within *Paraparatrechina*), may have been linked to expansions in both ecological
363 preference and geographical range. Therefore, it may be possible that ecological processes have
364 significantly shaped the ant diversity and distribution in Melanesia, as partially suggested by the
365 taxon cycle hypothesis.

366 **4.1. The timing of faunal interchange between SE Asia and Melanesia**

367 Our results support the hypothesis that faunal interchange via Wallacea occurred as early as the
368 Miocene (*ca.* 20–25 Ma; Hypothesis 1b), rather than after the late Miocene (Hypothesis 1a).
369 Ancestral range inferences showed that Melanesian (including New Guinea) and TSP lineages
370 very likely had a continental SE Asian origin, which agrees with the hypothesized centre of

371 origin and diversity of the *Prenolepis* genus-group in continental tropical Asia (Blaimer et al.,
372 2015; John S LaPolla et al., 2011; LaPolla et al., 2010a). Substantial subaerial land before 5–10
373 Ma may have arisen in Wallacea as scattered volcanic islands (Hall, 2012), which might have
374 facilitated overwater dispersal of terrestrial arthropods in a stepping-stone fashion. But
375 stratigraphic evidence in favour of emergent land in the region at the early Miocene is scarce
376 (Baldwin et al., 2012; Hall, 2013; Lohman et al., 2011; Stelbrink et al., 2012; van Ufford and
377 Cloos, 2005). However, biogeographical patterns and time-calibrated dispersal events suggest
378 that significant faunal interchange might have occurred already by 25 Ma (Cibois et al., 2014;
379 Georges et al., 2014; Jönsson et al., 2011; Mitchell et al., 2014), whereas it is likely that early
380 Miocene plant dispersal across Wallacea might have been enhanced by animals (Crayn et al.,
381 2015).

382 The hypothesis that this exchange was due to the presence of significant amounts of land is
383 strengthened by the independent dispersal events across unrelated ant clades at approximately the
384 same period of time (i.e., 15–25 Ma; Fig. 3), regardless of life history traits. For instance, ant
385 nesting preferences across these clades vary from rotten logs, leaf litter, to soil, and even some
386 *Pseudolasius* appear to live completely underground (LaPolla, 2004). Our results provide further
387 evidence that faunal interchange between Asia and Australia might be in fact an old
388 palaeozoographic event, aided by a significant increase of land above water, in both vertebrate
389 and invertebrate lineages, including other ants (Economo et al., 2015b).

390 **4.2. Colonization and diversification in New Guinea**

391 Biogeographical reconstructions of the older colonists of New Guinea supported Hypothesis 2a
392 that the most likely region of arrival covered the Central Range and northern New Guinea (Fig.

393 3), rather than the southern part of the island including the Papuan peninsula (Hypothesis 2b),
394 which in the case of the *Prenolepis* genus-group was colonized later, after the mid-Miocene (<
395 15 Ma). Predaceous diving beetles from New Guinea have a similar pattern, though a younger
396 timing of colonization, from a probable origin in the Central Range followed by dispersal
397 towards the Papuan peninsula during the last 5 Ma (Toussaint et al., 2014). Although other
398 studies found that southern Papuan lineages may be older than northern taxa (Oliver et al., 2013),
399 these did not estimate time-calibrated species divergences thus a young origin, in the mid-
400 Miocene or later, of these southern Papuan lineages cannot be ruled out. In this study, the model
401 describing a proto-Papuan archipelago along the northern edge of New Guinea in the early
402 Miocene is favoured over an old Papuan peninsular origin of extant New Guinean species
403 diversity.

404 Older endemics that currently occur in montane habitats, such as the New Guinean clade 5 and
405 certain lineages within clade 2, probably originated at about 15 Ma, in agreement with the major
406 orogeny of the Central Range. Further sampling of montane ants along the Central Range is
407 necessary to infer the mechanisms driving ant montane speciation in the region. For instance,
408 ecological processes causing altitudinal segregation have been proposed as drivers of montane
409 diversification in birds (Diamond, 1973) and ants (Economo and Sarnat, 2012; Sarnat and
410 Economo, 2012). On the other hand, a large proportion of cladogenetic events in New Guinea
411 occurred within northern or southern lowland areas, and not across them as expected under a
412 "lowland vicariant" scenario driven by the Central Range. Ecological constraints and/or
413 geographical barriers within the northern and southern lowland areas may exist and explain the
414 observed pattern in the *Prenolepis* genus-group, such as strong habitat associations and riverine
415 barriers (Janda et al., 2016). Additionally, we found that on average each locality harbours 2–3

416 highly divergent species per genus. This may suggest that competitive exclusion of closely
417 related species, with perhaps similar ecological niches, might be an important mechanism of ant
418 community structure in New Guinean lowlands; a pattern described for other low-elevation ant
419 communities (Machac et al., 2011).

420 **4.3. Colonization of eastern Melanesia**

421 The earliest insect colonization of eastern Melanesia (Vanuatu and Fiji) was estimated at about
422 9–17 Ma (Balke et al., 2007; Liebherr, 2005; Lucky and Sarnat, 2010; Sarnat and Moreau, 2011),
423 consistent with the hypothesis that colonization was facilitated by emergent land as part of the
424 subaerial Vitiaz Arc as island chain (Hypothesis 3a). In the *Prenolepis* genus-group, dispersal
425 has occurred earlier than the recent re-exposure of land in eastern Melanesia during the Pliocene
426 (Hypothesis 3b), whereas early Miocene land has likely remained above water and harboured
427 older colonizers to the present. Our phylogenetic reconstructions indicate that New Guinea was
428 the likely source of ant colonists in Vanuatu and Fiji, with estimated ages congruent with
429 previous ant chronograms (*ca.* 10–16 Ma; Lucky & Sarnat, 2010; Sarnat & Moreau, 2011).
430 Dispersal to these archipelagos apparently ceased until the Plio-Pleistocene, when younger
431 colonization events occurred at about 5 Ma, consistent with the recent re-exposure of subaerial
432 land in the TSP. This apparent absence of dispersal during the late Miocene and early Pliocene
433 may be expected given the disruption of the arc at about 10 Ma, when the Ontong-Java Plateau
434 collided with the Vitiaz trench (Ewart, 1988; Hall, 2002). However, further dated phylogenies of
435 eastern Melanesian insects are needed to rule out other potential explanations, such as local
436 extinction events that erased traces of ant dispersal between 5 and 10 Ma.

437 Range expansions to Micronesia and Polynesia have happened since 5 Ma, in line with the
438 significant exposure of land in these regions during the late Miocene and Pliocene. Colonization
439 of Palau, the richest in species diversity among Micronesian and Polynesian archipelagos (six
440 *Prenolepis* genus-group taxa), occurred since 5 Ma from two sources: New Guinea and the
441 Philippines. No local ant radiation has been inferred, instead, the faunal assemblage in Palau
442 might be the result of a long history of colonization events by unrelated lineages (Rundell, 2008).
443 Dispersal to the Caroline Islands and to eastern Polynesia occurred geologically recently (< 4Ma)
444 by species with wide geographic ranges. These time-calibrated dispersal events significantly
445 post-date the geological origins of Western Pacific archipelagos inferred since at least the mid-
446 Miocene *ca.* 15 Ma (Rehman et al., 2013). Submergence of land and complete eradication of
447 Miocene fauna by the Miocene/Pliocene transition might explain the apparent "delay" in
448 colonization observed in our phylogeny. On the other hand, two invasive species, the longhorn
449 crazy ant (*Paratrechina longicornis*) and the robust crazy ant (*Nylanderia bourbonica*) most
450 likely spread throughout the Pacific due to commerce. In those cases, closely related COI
451 haplotypes were recovered from distant localities, and no apparent genetic structure across
452 islands was evident (in contrast with, for instance, *Nylanderia vaga*, which is similar in age and
453 distribution; Fig. A.3).

454 **4.4. The connection between niche shifts and diversification**

455 One of the main predictions of the taxon cycle hypothesis is that range expansions may be
456 facilitated by shifts in habitat preference, eventually resulting in ecological release whereby
457 relaxed selective pressures caused by ecological opportunity may promote phenotypic variability
458 and speciation. Species adapted to lowland marginal habitats, such as the coasts of islands, might
459 be more prone to colonize other archipelagos by overwater dispersal (Hypothesis 4a). Although

460 an explicit relationship between expansion/contraction phases and shifts in diversification rates
461 has not been formulated, it may be possible that expanding lineages diversify due to ecological
462 innovation through the key adaptation to marginal habitats. Using ancestral character state
463 reconstruction, we found that ant habitat preferences for highly disturbed and open environments
464 may be linked to geographical expansion across archipelagos (e.g., within clade 2 and in clade
465 7). Moreover, adaptation to disturbed environments might also explain one of the origins of ant
466 invasiveness, as some of the tramp species are closely related and derived from common
467 ancestors already adapted to marginal habitats (e.g., *Nylanderia bourbonica*, *N. vaga*, and *N.*
468 *obscura*, all within clade 7). In addition, alternative reproductive strategies are known to increase
469 the invasive potential of some ant species, such as *Paratrechina longicornis* (Pearcy et al., 2011),
470 by producing queens clonally (thelytoky) and avoiding the negative effects associated with small
471 founding populations (Rabeling and Kronauer, 2013).

472 Although diversification rates and any shift in evolutionary dynamics across clades need to be
473 studied in the light of a global, well-sampled phylogeny, we propose that speciation in the Indo-
474 Pacific may have not remained constant across clades. Older colonization events to the Indo-
475 Pacific do not necessarily explain the disparate species-richness observed across clades
476 (Hypothesis 4b), but it seems that ecological processes may enhance diversification and broaden
477 geographical distribution of the ants. The main diversification of extant *Prenolepis* genus-group
478 lineages in the Indo-Pacific has occurred on New Guinea since the past 15 Ma, but younger
479 clades (clades 2 and 7) hold decoupled diversification dynamics compared to older clades (clades
480 1 and 5).

481 We showed that diversification scenarios facilitated by ecological innovations (shifts in habitat
482 preference) in the Indo-Pacific region cannot be ruled out (Hypothesis 4a). Ecological

483 opportunity in a macroevolutionary perspective might be related to an initial burst in speciation
484 rates followed by diversity-dependent deceleration of diversification rates (Etienne and
485 Haegeman, 2012; Rabosky, 2010). On the contrary, under a time-dependent diversification
486 model (Yule or Birth-Death) speciation is constant, and the extant diversity across clades is
487 primarily explained by the age of lineage's origin (Hypothesis 4b). The diversification rates of
488 the clade 7 (and partially within clade 2) have accelerated compared to other Indo-Pacific taxa
489 (Table 2). This coincides with the reconstructed shift in ecological preference towards disturbed
490 habitats (Fig. 3), which may have increased the “ecological limits” determining the clades’
491 species richness (Rabosky, 2009). Accordingly, shifts in habitat preference (ecological release)
492 may not only favour geographical range expansion, as proposed by the taxon cycle hypothesis,
493 but may also trigger species diversification of terrestrial invertebrates in Melanesia. In this line,
494 recent developments of island biogeography models also predict that speciation rates would peak
495 before islands reach maximal topographic complexity, as empty niche space will provide more
496 opportunities for radiation (Whittaker et al., 2008). However, a more rigorous approach to study
497 macroevolutionary dynamics, including the study of ant ecology (e.g., worker abundances,
498 dispersal abilities) and mathematical models that consider species abundances (Rosindell and
499 Phillimore, 2011) are needed before attempting a formal test of the taxon cycle in the light of
500 molecular phylogenies..

501 **5. Conclusions**

502 We found evidence of old insect colonization events from SE Asia to New Guinea, dating to at
503 least the early Miocene (*ca.* 25 Ma). A broad, faunistic and floristic interchange between Asia
504 and Australia may have happened earlier than previously thought geographically possible.
505 Moreover, early insect radiations on New Guinea have apparently occurred along the northern

506 edge of the island, contrasting with the hypothesis of an older, subaerial Papuan peninsula.
507 Colonization of eastern Melanesia (i.e., Vanuatu and Fiji) may be as old as 10–20 Ma, in
508 agreement with the hypothesized ancient island chain Vitiaz Arc connecting the proto-Papuan
509 archipelago to the Fiji Basin. In addition, a link between ecological shifts, geographic range
510 expansion, and phylogenetic diversification of insular arthropods cannot be ruled out, and such
511 shifts may have promoted geographical range expansion and triggered diversification of the
512 Indo-Pacific ant fauna. Further studies of other New Guinean and Melanesian insect lineages
513 would clarify if speciation in the region is primarily driven by ecological factors, and if so,
514 whether that is characterized by the fragmentation of geographic ranges or adaptation to new,
515 empty niches.

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532 **Supplementary material**

533 Supplementary data (Appendix A) associated with this article can be found in the online version.

534 **Data accessibility**

535 We deposited the data in external repositories. DNA sequences: GenBank accessions KP231876-
536 KP232901. Phylogenetic data, including alignments and dated trees: TreeBASE accession
537 numbers 17090 and 18335.

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- 774
- 775

777 **Table 1**

778 Statistical comparison across eight biogeographical models as implemented in BioGeoBEARS.
 779 LnL: log-likelihood of the model; numparams: number of parameters; *d*: rate of anagenetic range
 780 expansion; *e*: rate of anagenetic range contraction; *j*: founder-event parameter weight. The
 781 relative probability of each model was estimated using Akaike weights based on the AICc values
 782 estimated in BioGeoBEARS. The model DEC+J stratified model (in asterisks) outperformed
 783 other biogeographical models.

	LnL	numparams	d	e	j	AICc	Akaike weights
DEC+J **	-298.42	3	0.026	0.003	0.246	602.84	0.99845
DIVA-LIKE+J	-304.89	3	0.029	0.002	0.252	615.79	0.00154
BAYAREA-LIKE+J	-311.57	3	0.026	0.004	0.241	629.14	0.00000
DEC	-328.26	2	0.041	0.009	-	660.51	0.00000
DIVA-LIKE	-333.74	2	0.046	0.007	-	671.49	0.00000
BAYAREA-LIKE	-364.74	2	0.044	0.046	-	733.48	0.00000

784

786 **Table 2**

787 Phylogenetic diversification analyses on selected Indo-Pacific clades using DDD and the median
 788 divergences times in the chronogram inferred by BEAST. Estimated parameters: number of
 789 parameters in each model (nP), net diversification rate (r) = speciation minus extinction rates,
 790 clade-level carrying capacity (K) in diversity-dependence model, maximum likelihood of the
 791 model (LogLik), Akaike Information Criterion (AIC), Akaike weights (A.W.) for each
 792 diversification scheme. The most probable model fitting the dataset is shown in asterisks (**).
 793 Yule: pure-birth diversification, (BD) constant birth-death diversification, (DD) diversity-
 794 dependent diversification.

<i>Clade 1 (P. opaca clade)</i>	nP	r	K	LogLik	AIC	A.W.
Yule	1	0.072	-	-23.304	48.609	0.530
BD	2	0.072	-	-23.305	50.609	0.195
DD	2	0.128	20	-22.961	49.922	0.275
<i>Clade 2 (P. oceanica–P. pallida clade)</i>						
Yule	1	0.084	-	-83.608	169.216	0.003
BD	2	0.084	-	-83.608	171.216	0.001
DD**	2	0.259	66	-76.812	157.623	0.996
<i>Clade 2, (P.oceanica–P. minutula subclade)</i>						
Yule	1	0.108	-	-51.925	105.851	0.000
BD	2	0.108	-	-51.925	107.851	0.000
DD**	2	0.502	38	-42.681	89.363	1.000
<i>Clade 5 (N. nuggeti clade)</i>						
Yule	1	0.063	-	-24.200	50.399	0.395
BD	2	0.063	-	-24.200	52.400	0.145
DD	2	0.170	15	-23.048	50.097	0.460
<i>Clade 7 (N. obscura clade)</i>						
Yule	1	0.157	-	-59.661	121.322	0.000
BD	2	0.157	-	-59.661	123.322	0.000
DD**	2	0.613	35	-50.165	104.330	1.000

795

797 **Figure legends**

798 **Fig. 1.** Map of the Indo-Pacific region. Red stars represent this study's sampling localities.
799 Locality information including GPS coordinates, elevation, and brief habitat descriptions are
800 presented in Table A.1 in Appendix A.

801

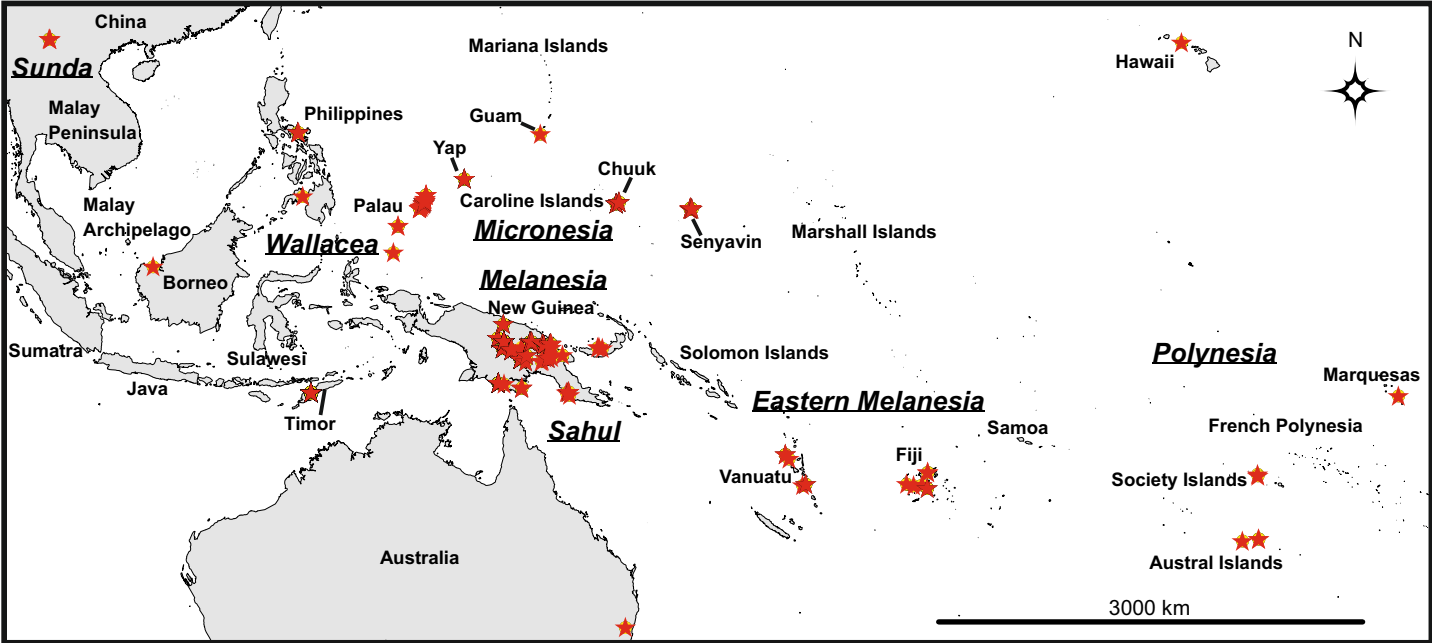
802 **Fig. 2.** Time-calibrated phylogeny of the *Prenolepis* genus-group and outgroup taxa (in grey) as
803 inferred in BEAST. Six fossil-based calibration points were used as minimum ages for crown
804 (*Zatania*, *Nylanderia parvula* group) or stem groups (*Lasius*, *Prenolepis*, *Pseudolasius*,
805 *Nylanderia*), based on morphological affinities or apomorphies sharing with close taxa (LaPolla
806 and Dlussky, 2010). A secondary calibration from (Blaimer et al., 2015) was used for the root of
807 the tree (tribe Lasiini). Posterior probabilities of each node are depicted as coloured asterisks
808 (black for > 0.95; red for 0.75–0.94; values < 0.75 are not shown). 95% credibility intervals for
809 divergence times are displayed over each node in the tree. The seven main Indo-Pacific clades
810 within the *Prenolepis* genus-group are numbered in the phylogeny. Scale bar in Ma. Inset,
811 specimen photographs in frontal and lateral views. Red scale bar in each photograph represents 1
812 mm. A: *Paraparatrechina opaca* (MJ15399, New Guinea); B: *Paraparatrechina* sp. VANU002
813 (CR120619-01-02, Vanuatu); C: *Pseudolasius* sp. PSEU002 (MJ9384, New Guinea); D:
814 *Pseudolasius* sp. PSEU005 (MJ16068, New Guinea); E: *Nylanderia nuggeti* (MJ6887, New
815 Guinea); F: *Nylanderia vaga* (MJ16124, Fiji).

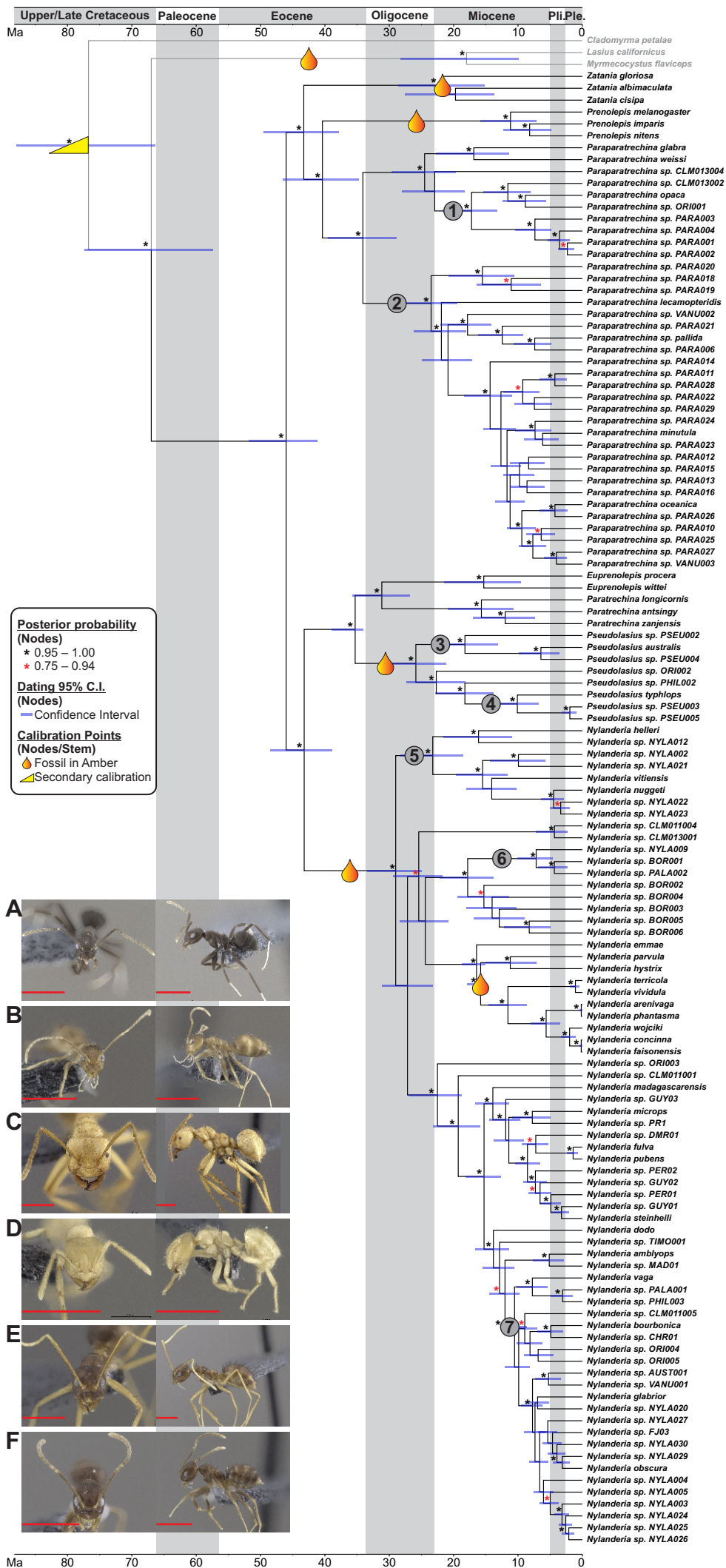
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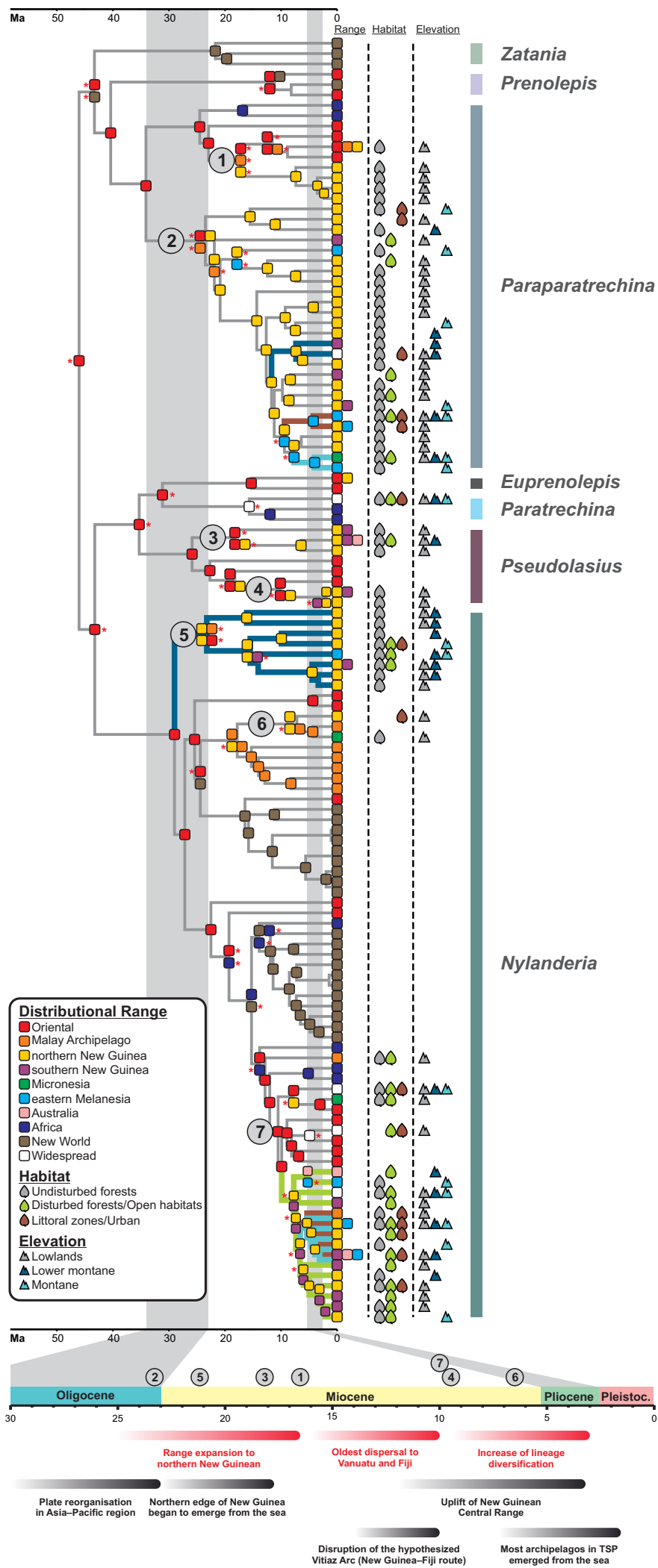
817 **Fig. 3.** Time-calibrated phylogeny of the Indo-Pacific *Prenolepis* shown in Fig. 2. Squares over
818 nodes and terminals in the phylogeny represent inferred and extant geographical ranges,
819 respectively. Coloured symbols depicts the recorded habitat preference (leave shape) and
820 elevation of each Indo-Pacific species (mountain shape). One or two most probable ancestral
821 geographical ranges estimated in BioGeoBEARS under the DEC+J model are depicted over each
822 node; red asterisks represent ranges with probabilities between 0.1 and 0.5, whereas ranges with
823 probabilities < 0.1 are not considered. Ancestral state reconstruction of habitat and elevation
824 preferences using Mesquite on each Indo-Pacific clade, are displayed as coloured branches. The
825 median ages of clades 1–7 (gray circles), main biogeographical events (red bars), and main
826 geological events (black bars), are each depicted below the phylogeny. Scale bar in Ma.

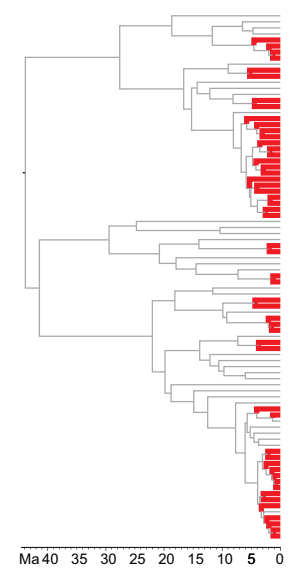
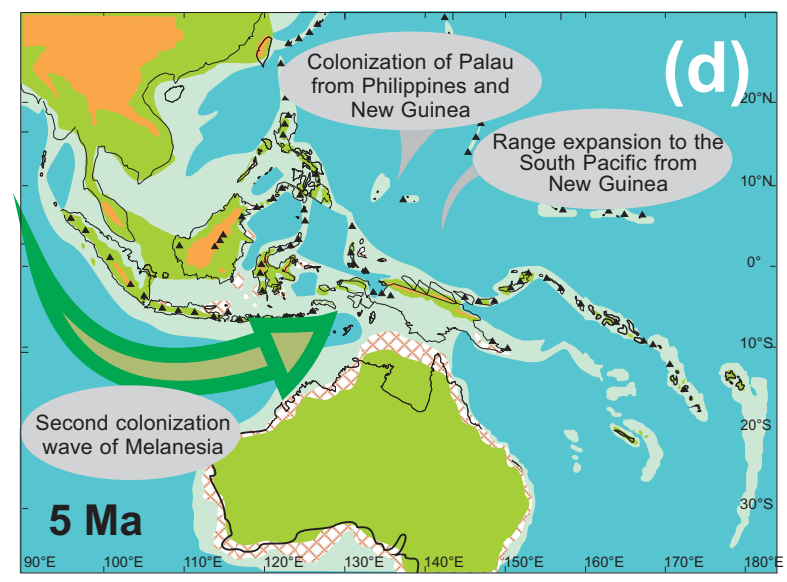
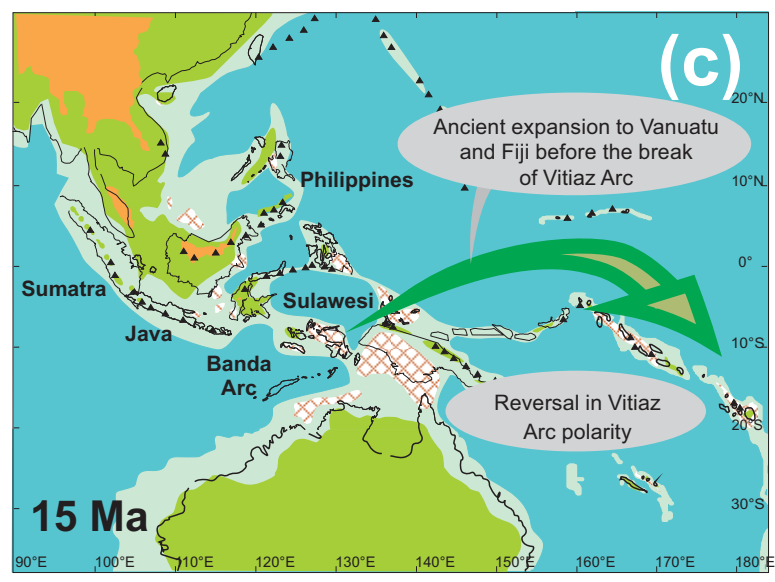
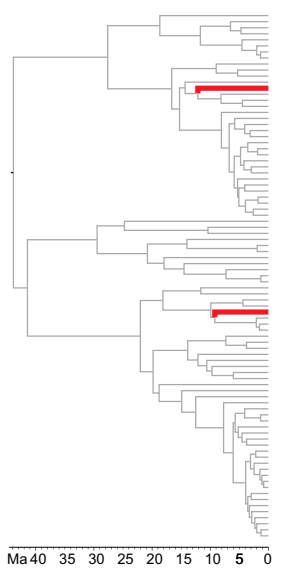
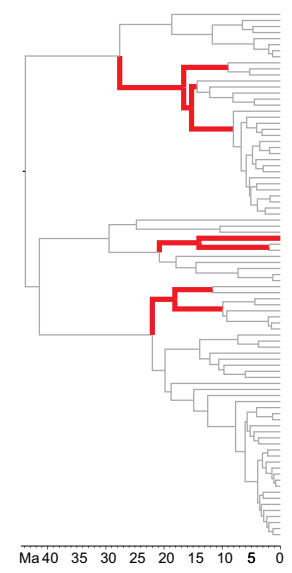
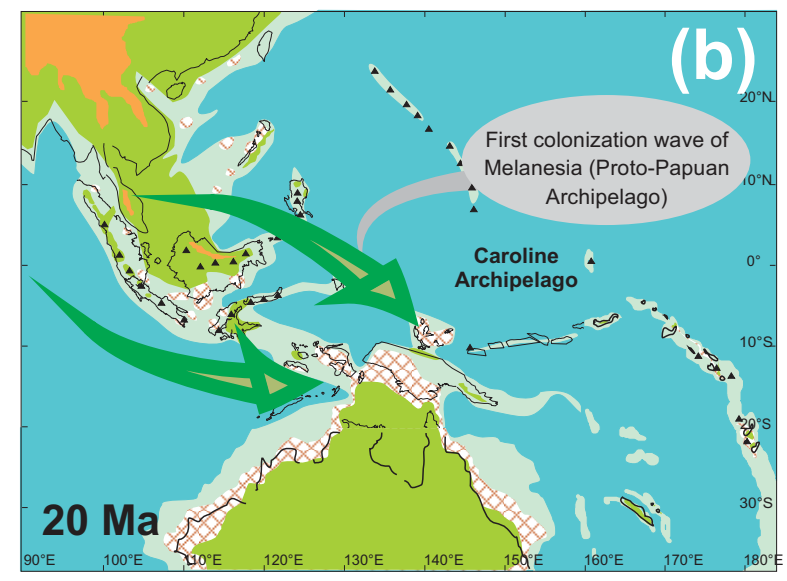
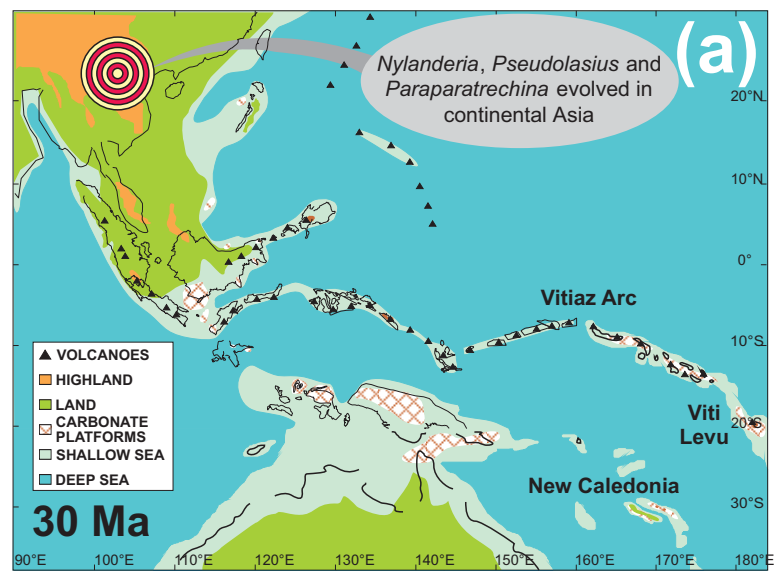
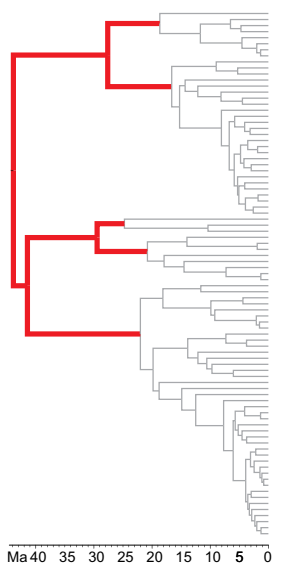
827

828 **Fig. 4.** Palaeogeographic maps and evolutionary history of the *Prenolepis* genus-group in the
829 Indo-Pacific. Panels a–d depict the four time slices used in biogeographical analyses. The legend
830 in panel a describes the distribution of land and sea for all maps, whereas major dispersal events
831 are shown as green arrows. Maps were adapted from Hall (2013).









Supplementary data

An ant genus-group (*Prenolepis*) illuminates the biogeography and drivers of insect diversification in the Indo-Pacific

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Appendix A: Detailed methods procedures and further analyses carried out in support of our analyses in the main text.

1. Further information on taxon sampling

Field work was conducted during 2002–2012, and specimens were collected following standard methods for sampling of ants in rainforest and other habitats. At majority of New Guinea sites, samples were collected by hand, baiting, and by leaf litter extraction (e.g., Agosti *et al.*, 2000) in a system of 20 m × 20 m plots, with 1 to 12 plots surveyed at each site. The sampling effort for each plot included nine samples of 1 m² leaf litter, extracted for 48–72 hours; 20 tuna bait traps on forest floor and 20 baits on understory vegetation exposed for at least one hour; and at least four person-hours of direct (hand) collecting. The total area at each site across which the surveyed plots were distributed ranged from 20–25 km². At some sites (Baitabag, Ohu, Madang Lagoon, Weam, Port Moresby), we increased population sampling by targeted collecting of *Prenolepis* genus-group species outside the surveys plots. In sites where the plot-based sampling was not possible, the ants were collected by direct hand-collecting and/or baiting. The habitats where specimens were collected encompass lowland and montane localities, primary rainforests, savanna, coastal environments, and urban areas (see Appendix S1 for locality information of each specimen and Table A.4 for an overview of habitat preference by species). Ants were stored in 70–100% ethanol and their morphology was investigated under an Olympus SZ50 microscope. Species identifications based on morphology were conducted by ant taxonomists with expertise in the *Prenolepis* genus-group.

2. Laboratory protocols and DNA sequences manipulation

Genomic DNA was extracted from whole ant specimens using the Geneaid Genomic Tissue DNA kit (Taiwan). DNA amplifications were carried out using 2 µl of isolated DNA, 1x of PPP Master Mix (Top-Bio, Prague), 0.4 µM of each forward and reverse primers, and completed with distilled water to 25 µl. PCR protocols consisted on 95°C for 5 min, 35 cycles of: 94°C for 30 sec, 50/55°C for 50 sec and 72°C for 90 sec, finalizing the program with 72°C for 5 min. Annealing temperature of primers varied from 50°C in the case of the mitochondrial COI and the nuclear genes wingless and LWR, to 55°C for the nuclear genes CAD, EF-1αF1 and EF-1αF2. Primer sequences are listed:

Gene region and primer sequences	Described in
Cytochrome c oxidase subunit I (COI) LCO: 5' <u>TAATACGACTCACTATAGGGGGTCAACAAATCATAAAGATATTGG</u> 3' HCO: 5' <u>ATTAACCCTCACTAAAGTAAACTTCAGGGTGACCAAAAAATCA</u> 3'	Folmer <i>et al.</i> (1994)
Carbonyl-phosphate synthase II (CAD). Done in two pieces Region 1, CD892: 5' <u>TAATACGACTCACTATAGGGGGYACCGRGCCTTGYTAYATGAC</u> 3' Region 1, CD1491: 5' <u>ATTAACCCTCACTAAAGGCCGCARTTNAGRRCRGTYTGYCC</u> 3' Region 2, CD1423: 5' <u>TAATACGACTCACTATAGGGAGGTRATACRATCGGARAGRCCDGA</u> 3' Region 2, CD1910: 5' <u>ATTAACCCTCACTAAAGCCGAGRGGRTCRACRRTTYTCCATRTTRCAYAC</u> 3'	Ward <i>et al.</i> (2010)
Elongation factor 1-alpha F1 paralog (EF-1αF1) F1-1424: 5' <u>TAATACGACTCACTATAGGGGCGCCKGCGGCTCTACCACCGAGG</u> 3' F1-1829: 5' <u>ATTAACCCTCACTAAAGGGAAGGCCTCGACGCACATMGG</u> 3'	Schultz & Brady (2008)
Elongation factor 1-alpha F2 paralog (EF-1αF2) F2-557: 5' <u>TAATACGACTCACTATAGGGGAACGTGAACGTGGTATYACSAT</u> 3' F2-1118: 5' <u>ATTAACCCTCACTAAAGTTACCTGAAGGGGAAGACGRAG</u> 3'	Schultz & Brady (2008) Brady <i>et al.</i> (2006)
Long wavelength rhodopsin (LWR) LW143: 5' <u>TAATACGACTCACTATAGGGGACAAAGTKCCACCRGARATGCT</u> 3' LW639: 5' <u>ATTAACCCTCACTAAAGYTTACCGRTTCCATCCRAACA</u> 3'	Ward & Downie (2005)
wingless WG578: 5' <u>TAATACGACTCACTATAGGGTGCACNGTGAARACYTGCTGGATGCG</u> 3' WG1032: 5' <u>ATTAACCCTCACTAAAGACYTCGCAGCACCARTGGAA</u> 3'	Ward & Downie (2005) Brady <i>et al.</i> (2006)

Successful PCRs were sent to Macrogen (South Korea) for standard sequencing in both directions using the universal primers T7promoter and T3 (underlined sequences listed above). We removed from the DNA alignment three intronic regions, two in CAD and one in LWR, and kept only the exonic regions for phylogenetic analyses. The dataset alignment was carried out using the Clustal W algorithm (Thompson *et al.*, 1994) (ClustalW cost matrix; Gap open cost: 16; Gap extend cost: 8) as implemented in the program Geneious R7. All DNA sequences are publicly available in GenBank and mitochondrial COI gene sequences in BOLD (ASPNA project). The aligned datasets and final trees were deposited in TreeBASE (submission IDs 17090 and 18335).

3. Phylogenetic analyses and divergence times estimation

3.1. Fossil taxa

The described fossil record for the *Prenolepis* genus-group includes five extinct species, most of them resembling extant members on the group (LaPolla *et al.*, 2012; LaPolla and Dlussky, 2010).

1: *Nylanderia vetula* † workers resemble species within the North American clade in *Nylanderia* (LaPolla *et al.*, 2010a), as regard of their lack of erect setae on scapes and legs, mandibular features, and the rounded dorsal face of the propodeum. This fossil was found in Dominican amber and it was dated to the early Miocene (15–20 Ma; LaPolla *et al.*, 2013). We enforced a minimum age of the

Nylanderia parvula clade in our phylogeny by assigning an exponential distribution with Median 17.1 Ma, and 5% and 95% Quantiles to 15.2 Ma and 24.0 Ma, respectively.

2: *Zatania electra* † was found in Dominican amber. A number of morphological characters including head, propodeum and mesosoma features in workers and male, confidently places this extinct species within crown *Zatania* (LaPolla et al., 2012). We therefore constrained the minimum age of the genus using an identical exponential distribution as for the *Nylanderia parvula* clade.

The remaining four extinct species were found in Baltic amber with an estimated age of 34–42 Ma (Dlussky and Rasnitsyn, 2010; LaPolla et al., 2013a).

3: *Nylanderia pygmaea* † is confidently described as the oldest definitive species of the genus *Nylanderia*, based on several apomorphic features observed in workers, males, and gynes (LaPolla et al., 2010a). This extinct species is the only representative of the genus known from Europe, and it cannot be confidently placed within any extant *Nylanderia* subclade. We therefore constrained the minimum stem age of the genus using an exponential distribution with Median 38.9 Ma, and 5% and 95% Quantiles to 34.4 Ma and 55.0 Ma, respectively.

4: *Prenolepis henschei* † is known from workers and reproductives, and may be related to extant species such as *Prenolepis imparis* (Nearctic) and *Prenolepis nitens* (Palearctic). However, a key feature among extant species, the thin and setose parameres, is remarkably different from the extinct taxon (LaPolla et al., 2010a). We constrained the stem age of *Prenolepis* using an exponential distribution with Median 37.5 Ma, and 5% and 95% Quantiles to 34.3 Ma and 49.0 Ma, respectively.

5: *Pseudolasius boreus* † is known only from workers, and its relation to extant *Pseudolasius* is not clear as in other *Prenolepis* genus-group extinct species. However, it likely belongs to the genus *Pseudolasius* and not to the closely related and morphologically similar genus *Euprenolepis*, given the high tooth count in workers of *Pseudolasius* ants (LaPolla et al., 2010a). We assigned a minimum stem age of *Pseudolasius* using an identical exponential distribution as for the genus *Prenolepis*.

Another extinct species that may belong to the *Prenolepis* genus-group is *Protrechina carpenteri* † from Arkansas amber. However, it is known only from a single specimen, which is deteriorated and the amber has become clouded leaving the specimen difficult to study (LaPolla et al., 2010a). Thus we did not include this fossil in our time-calibration analyses.

4. Biogeographical analyses

4.1. Taxonomic and geographical considerations of missing taxa

New World and Afrotropical *Prenolepis* genus-group taxa may form each monophyletic groups that have probably originated from Asian/Indo-Pacific lineages and that have further diversified locally (LaPolla et al., 2010a). Further taxonomic and distributional evidence is shortly described:

- The genus *Parapatrechina* has not been encountered in the New World, thus it is entirely confined to the Paleotropics. Its centre of species diversity is SE Asia and the Indo-Pacific (LaPolla et al., 2010b). Only thirteen species are known from the Afrotropics and Malagasy regions and in the light of male genitalia these taxa appear to be allied. In our phylogeny, *P. glabra* (widespread across Madagascar) and *P. weissii* (widespread throughout Central Africa) are in fact closely related and sister to a large clade of SE Asian and Indo-Pacific taxa.

- The genus *Nylanderia* is widespread across tropical and subtropical regions around the world. The known species richness of the group is about 110 extant species, most of them distributed in Asia and the Indo-Pacific (AntWeb, 2016). Two monographic revisions within the Nearctic (Kallal and LaPolla, 2012) and the Afrotropics (LaPolla et al., 2011) have found only fourteen endemic species on each region, which may be largely the result of local radiation rather than several immigration events based on morphological features. We recovered two clades containing New World *Nylanderia* taxa: a Nearctic clade and a Neotropical clade. Little is known about the taxonomy of Neotropical *Nylanderia*, but all species from such region, including described and undescribed species, so far cluster within a monophyletic group sister to a Malagasy *Nylanderia*. However, an Asian origin of these taxa cannot be discarded, as a large number of continental Asian species remain to be added in the phylogeny.

- The genus *Zatania* (only five species) is restricted to the Caribbean and Central American regions, but may have originated by dispersal from Asia.

- The genus *Prenolepis* (about 20 species) is mainly distributed in SE Asia, whereas one species is found in the Nearctic region (likely a single dispersal event from Asia) and another species is endemic to southern Europe.

- The region of origin of the genus *Paratrechina* has been hypothesised to be SE Asia (LaPolla et al., 2013b), with further dispersal to and radiation in Africa (LaPolla and Fisher, 2014).

- The genera *Euprenolepis* and *Pseudolasius* are restricted to SE Asia and the Indo-Pacific.

4.2. Historical biogeography inferences

The focal study area was finely subdivided into seven areas, whereas two larger areas were considered as New World and Afrotropics and Malagasy:

- Oriental and Palearctic area with ant faunal assemblages of mostly Asian origin. It includes continental SE Asia and the Malay Peninsula in the study area.
- Malay Archipelago area defined as the intermediate zone between SE Asia and Sahul (Australia and New Guinea). It includes Wallacea (Sulawesi, the lesser Sundas, and the Moluccas), Borneo, and the Philippines.
- Northern New Guinea area covers the northern part of the island, including the Central Range.
- Southern New Guinea area delimits the region south of the Central Range, including the Papuan peninsula.
- Australia area covers tropical and subtropical regions of the mainland continent.
- Micronesia area defined as the cluster of oceanic islands in Palau, Caroline Islands, and Marianas Islands. Although Micronesia is a vast area and some archipelagos, such as Palau, are geographically closer to the Malay Archipelago, recent molecular phylogenies suggested that ant dispersal across such areas is relatively rare (Janda *et al.*, 2014b; Clouse *et al.*, 2015).
- Eastern Melanesia area encompasses the islands of the Vanuatu archipelago and the Fijian archipelago.

Polynesia, including Marquesas Islands, Austral Islands and Society Islands, harbours only a tiny proportion of *Prenolepis* genus-group species diversity, in all cases, as a result of recent dispersal by widespread taxa or introduction by man. Species that have reached Polynesia includes *Nylanderia bourbonica* (including Hawaii), *Nylanderia vaga*, and *Paratrechina longicornis* (Ramage, 2014; Wilson and Taylor, 1967).

Three biogeographic models as implemented in BioGeoBEARS (Matzke, 2013a, 2013b) were assessed. First, we used the Dispersal-Extinction-Cladogenesis model (DEC; Ree *et al.*, 2005; Ree & Smith, 2008) allowing range expansion (dispersal) and contraction (extinction) as anagenetic processes (i.e., along branches). DEC also implements cladogenetic processes (i.e., at nodes) such as vicariance and the so-called *sympatric speciation* event *sensu* Matzke (2013c). Second, we used the BAYAREA-LIKE model (Landis *et al.*, 2013) which differs from the DEC model by disallowing vicariance and the so-called *subset sympatric speciation* event. The rationale of using these two models is to evaluate (1) the impact of vicariance (allowed in DEC but not in BAYAREA-LIKE) in

biogeographic reconstruction, like the emergence of New Guinean Central Range, and (2) the importance of anagenetic processes such as dispersal, since BAYAREA-LIKE is a simpler model accounting for fewer cladogenetic processes than DEC (Matzke, 2013a, 2013b). Third, the DIVA-LIKE model adds an extra vicariance parameter, a process that may inform on the effect of large biogeographic barriers such as the Central Range in New Guinea. Statistical comparison of these models using Akaike weights are presented in Table 1 (Main Text). The stratified DEC+J (Fig. A.6) was favoured over the remaining models.

In the stratified analyses, we sliced the chronogram into four temporal spans at 25, 15 and 5 Ma, each with different geological configurations. We arbitrarily assigned distinct dispersal rates between two areas at each time slice (Table A.3). Dispersal rates were constrained as an attempt to recreate palaeogeographical models:

- Rates were set to 1.0 when two areas are temporarily joint (e.g., northern and southern New Guinea);
- When two areas are separated by sea strait or geographic barrier, dispersal was set to either 0.5 or 0.1 depending on the extent of the separation;
- Long-distance dispersal involving three areas was set to 0.01 (e.g., SE Asia and Australia);
- Other dispersal types across areas were drastically reduced to a rate of 10^{-4} .
- Range expansion to areas that were under water during specific time slices (e.g., oceanic islands) were disallowed.

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Additional tables and figures

Table A.1. Voucher information, including sampling locality, habitat preference, and Genbank accession numbers for each gene marker and BOLD accession numbers (ASPNA project) for the COI gene marker. Outgroup taxa and described species that were not sampled in our phylogeny are presented in the first and last rows of the table, respectively.

Code	Tribes	Genus	Species	Habitat	Forest/Vegetation	Country	Locality	Latitude	Longitude	Altitude	Coll.date	Collector	COI	EF1	EF2	CAD	wings	LWR		
Outgroup - Formicidae																				
CASENT023522	Lasini	<i>Cladomyrma</i>	<i>petulae</i>																	
CASENT0106045	Lasini	<i>Lasius</i>	<i>californicus</i>										EP982437	EF013268	EF013430	EP982605	EP013706	EP013578		
CASENT0106055	Lasini	<i>Myrmecosystus</i>	<i>flaviceps</i>										EP982438	EF013294	EF013456	EP982608	EP013724	EP013596		
Ingroup taxa																				
BBO86-11	Lasini	<i>Nylanderia</i>	<i>bourbonica</i>	Botanical garden rubber plantation	Plantation	CHINA	Yunnan Prov., Xishuangbanna, XTBG	21.9244	101.2677	571	2013-06-05	B. Guénard, B. Blanchard, C. Liu	KP232102	KP232293	KP232459	KP231876	KP232732	KP232646		
JCM-0014A	Lasini	<i>Nylanderia</i>	<i>bourbonica</i>	Strand (Coastal) vegetation	Disturbed	PALAU	Helen Is., Hatohobei State	2.9667	131.8000	1	2006-11-02	J. Czekanski-Moir	KP232337	KP232499	KP232775	KP232775				
JCM-0105B	Lasini	<i>Nylanderia</i>	<i>bourbonica</i>	Seashore dock area	Disturbed	PALAU	Angau Is., Angau State	6.9058	134.1297	2	2008-02-20	J. Czekanski-Moir	KP232342	KP232505	KP231918	KP232779	KP232678			
JCM-0128C	Lasini	<i>Nylanderia</i>	<i>bourbonica</i>	Strand (Coastal) vegetation	Secondary/Disturbed	PALAU	Kayangel Is., Kayangel State	8.0707	134.7165	2	2008-03-28	J. Czekanski-Moir	KP232506	KP231919	KP232780					
JCM-0153B	Lasini	<i>Nylanderia</i>	<i>bourbonica</i>	Roadside / causeway near mangrove forest	Disturbed	PALAU	Babeldaob Is., Melekeok Ngwal States border	7.5242	134.6177	1	2008-05-21	J. Czekanski-Moir								
JCM-0222D	Lasini	<i>Nylanderia</i>	<i>bourbonica</i>	Urban area	Urban	PALAU	Peleliu Is., Peleliu State	7.0416	134.2580	9	2008-09-06	J. Czekanski-Moir	ASPNA2680-12		KP232509		KP232782			
JCM-0224G	Lasini	<i>Nylanderia</i>	<i>bourbonica</i>	Urban area	Urban	PALAU	Peleliu Is., Peleliu State	7.0340	134.2507	2	2008-08-06	J. Czekanski-Moir			KP232510					
JCM-0232C	Lasini	<i>Nylanderia</i>	<i>bourbonica</i>	Urban area	Urban	PALAU	Sonsorol Is., Sonsorol State	5.3250	132.2201	3	2008-08-22	J. Czekanski-Moir	KP232344	KP232511						
JCM-0244C	Lasini	<i>Nylanderia</i>	<i>bourbonica</i>	Mature strand forest	Primary/Secondary	PALAU	Fanna Is., Sonsorol State	5.3535	132.2277	3	2008-08-26	J. Czekanski-Moir	KP232345	KP232512						
JCM-0269B	Lasini	<i>Nylanderia</i>	<i>bourbonica</i>	Strand (Coastal) vegetation on very small sandbar island	Disturbed	PALAU	Helen Is., Hatohobei State	2.9734	131.8122	2	2008-09-16	J. Czekanski-Moir	KP232346	KP232513	KP231921	KP232785				
PKSP3345	Lasini	<i>Nylanderia</i>	<i>bourbonica</i>	Side of dirt road, southern plateau	Disturbed	FRENCH POLYNESIA	Austral Islands, Rurutu Is.	-22.4667	-151.3422	199	2006-12-23	P. Krushelivsky	KP232345	KP232639	KP232023	KP232896				
PKSP3350	Lasini	<i>Nylanderia</i>	<i>bourbonica</i>			FRENCH POLYNESIA	Austral Islands, Raiatea Is.	-22.6411	-152.7917	3	2006-12-19	P. Krushelivsky			KP232640	KP232897				
PKSP3354	Lasini	<i>Nylanderia</i>	<i>bourbonica</i>	Introduced forest	Semidisturbed	FRENCH POLYNESIA	Society Islands, Raiatea Is., Introduced forest off roadside on Mt. Tapiqi, outside Uruua	-16.7340	-151.4500	83	2006-12-26	P. Krushelivsky	ASPNA1446-10	KP232454	KP232641	KP232024	KP232898			
PKSP3355	Lasini	<i>Nylanderia</i>	<i>bourbonica</i>	Dry streambed	Disturbed	UNITED STATES OF AMERICA	Hawaii, Oahu, Gulch 3	21.5400	-158.1880	525	2009-06-24	P. Krushelivsky	ASPNA1445-10	KP232455	KP232642					
JCM-0079A	Lasini	<i>Nylanderia</i>	<i>bourbonica</i>	Seashore to Primary forest transect	Primary	PALAU	Mecherchar Is., Koror State, Ngerlebang	7.1421	134.3809	10-30	2008-02-05	J. Czekanski-Moir								
JCM-0192D	Lasini	<i>Nylanderia</i>	<i>bourbonica</i>	Seashore dock area	Disturbed	PALAU	Angau Is., Angau State	6.9061	134.1298	3	2008-07-08	J. Czekanski-Moir								
JCM-0216E	Lasini	<i>Nylanderia</i>	<i>bourbonica</i>	Seashore dock area	Disturbed	PALAU	Peleliu Is., Peleliu State	7.0487	134.2667	2	2008-08-05	J. Czekanski-Moir								
JCM-0274D	Lasini	<i>Nylanderia</i>	<i>bourbonica</i>	Old secondary forest / Strand vegetation	Secondary	PALAU	Kayangel Is., Kayangel State	8.0912	134.7148	2	2008-10-12	J. Czekanski-Moir								
MJ10240	Lasini	<i>Nylanderia</i>	<i>glabrior</i>	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, Kaijagabip, Fly river	-5.4666	141.5041	180-280			ASPNA525-09							
MJ13086	Lasini	<i>Nylanderia</i>	<i>glabrior</i>	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, Kaijagabip, Fly river	-5.4666	141.5041	180-280			KP232160	KP232357	KP232524	KP231932				
MJ13240	Lasini	<i>Nylanderia</i>	<i>glabrior</i>	Savanna	Semidisturbed	PAPUA NEW GUINEA	New Guinea Is., Western Province, Weam	-8.6470	141.1343		2010-10-16	Janda & Plus	KP232185	KP232377	KP232554	KP231949	KP232811	KP232697		
MJ13241	Lasini	<i>Nylanderia</i>	<i>glabrior</i>	Savanna	Semidisturbed	PAPUA NEW GUINEA	New Guinea Is., Western Province, Weam	-8.6470	141.1343		2010-10-16	Janda & Plus	KP232186	KP232378	KP232555	KP231950	KP232812			
MJ13640	Lasini	<i>Nylanderia</i>	<i>glabrior</i>	Savanna	Semidisturbed	PAPUA NEW GUINEA	New Guinea Is., Western Province, Daru, Dorogori vill., Fly river	-9.0170	143.2420	14	2010-10-08	M. Janda	ASPNA1879-11							
MJ15261	Lasini	<i>Nylanderia</i>	<i>glabrior</i>	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, Kaijagabip													
MJ15275	Lasini	<i>Nylanderia</i>	<i>glabrior</i>	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, Kaijagabip													
MJ18293	Lasini	<i>Nylanderia</i>	<i>glabrior</i>	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, Kaijagabip													
MJ18665	Lasini	<i>Nylanderia</i>	<i>glabrior</i>	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, Kaijagabip, Fly river													
MJ18666	Lasini	<i>Nylanderia</i>	<i>glabrior</i>	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, Kaijagabip, Fly river													
MJ18668	Lasini	<i>Nylanderia</i>	<i>glabrior</i>	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, Kaijagabip, Fly river													
MJ18669	Lasini	<i>Nylanderia</i>	<i>glabrior</i>	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, Kaijagabip, Fly river													
MJ19138	Lasini	<i>Nylanderia</i>	<i>glabrior</i>	Savanna	Semidisturbed	PAPUA NEW GUINEA	New Guinea Is., Western Province, Weam, TransFly	-8.6470	141.1340	25	2010-10-16	M. Janda	ASPNA2015-11							
MJ19652	Lasini	<i>Nylanderia</i>	<i>glabrior</i>	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, Kaijagabip, Fly river	-5.4666	141.5040	230	2008-03-18	Janda & Itigeli	KP232280							
HP0648	Lasini	<i>Nylanderia</i>	<i>nuggeti</i>	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Madang Province, Middle Ramu, Wanang vill.	-5.2330	145.1830	150	2008-04-14	P. Klimes	KP232152							
MJ13686	Lasini	<i>Nylanderia</i>	<i>nuggeti</i>	Forest edge	Primary	PAPUA NEW GUINEA	New Guinea Is., Central Province, Port Moresby, Varitara National Park	-9.4360	147.3480	800	2010-11-10	M. Janda	ASPNA1919-11	KP232383	KP232560	KP231955				
MJ18664	Lasini	<i>Nylanderia</i>	<i>nuggeti</i>	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, Kaijagabip, Fly river													
MJ18887	Lasini	<i>Nylanderia</i>	<i>nuggeti</i>	Lowland rainforest	Primary/Secondary	PAPUA NEW GUINEA	New Guinea Is., Southern Highlands, Kutubu area, Fogomiu vill.	-6.5080	143.0780	300			M. Janda	KP232245	KP232416	KP232597	KP231986	KP232849	KP232716	
MJ18636	Lasini	<i>Nylanderia</i>	<i>nuggeti</i>	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Madang, Baitabg	-5.1433	145.7222	20-90	2004-01-01	M. Janda	KP232159							
MJ13180	Lasini	<i>Nylanderia</i>	NYL.A022	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, S. Muller Range, 45km SW Kopjago	-5.7291	142.2633	495	2009-09-09	A. Lucky	KP232053							
MJ13181	Lasini	<i>Nylanderia</i>	NYL.A022	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, S. Muller Range, 45km SW Kopjago	-5.7303	142.2631	470	2009-09-06	A. Lucky	KP232051							
MJ13182	Lasini	<i>Nylanderia</i>	NYL.A022	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, S. Muller Range, 45km SW Kopjago	-5.7287	142.2634	500	2009-09-05	A. Lucky et al.	KP232056							
MJ13183	Lasini	<i>Nylanderia</i>	NYL.A022	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, S. Muller Range, 45km SW Kopjago	-5.7204	142.2628	465	2009-09-07	A. Lucky & L. E. Alonso	KP232058							
MJ14981	Lasini	<i>Nylanderia</i>	NYL.A022	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Southern Highlands, Fogomiu	-6.5080	143.0780	300			KP232087							
MJ15055	Lasini	<i>Nylanderia</i>	NYL.A022	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Southern Highlands, Kutubu area, Fogomiu vill.	-6.5080	143.0780	300			KP232193							
MJ15061	Lasini	<i>Nylanderia</i>	NYL.A022	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Southern Highlands, Kutubu area, Fogomiu vill.	-6.5080	143.0780	300			KP232194							
MJ15140	Lasini	<i>Nylanderia</i>	NYL.A022	Mid elevation forest	Primary	PAPUA NEW GUINEA	New Guinea Is., Chimbu Province, Crater Mountains, Suhu	-6.6880	145.0580	1100	2011-01-02	K. Tsvetkova	ASPNA2651-12							
MJ15239	Lasini	<i>Nylanderia</i>	NYL.A022	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, Kaijagabip													
MJ15295	Lasini	<i>Nylanderia</i>	NYL.A022	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, Kaijagabip													
MJ15351	Lasini	<i>Nylanderia</i>	NYL.A022	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, Kaijagabip													
MJ16065	Lasini	<i>Nylanderia</i>	NYL.A022	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, Kaijagabip, Fly river	-5.4666	141.5041	180-280			KP232177	KP232402	KP232582	KP231972	KP232831	KP232709		
MJ16070	Lasini	<i>Nylanderia</i>	NYL.A022	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, Kaijagabip, Fly river	-5.4666	141.5040	230	2008-03-17	M. Janda	KP232076							
MJ1822	Lasini	<i>Nylanderia</i>	NYL.A022	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., West Sepik, Sandaun, Yapsiei vill.	-4.6170	141.0830	300	2004-03-08	Janda & NGBRC	ASPNA126-08							
MJ18287	Lasini	<i>Nylanderia</i>	NYL.A022	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Southern Highlands, Kutubu area, Fogomiu vill.	-6.5080	143.0780	300			KP232218							
MJ18670	Lasini	<i>Nylanderia</i>	NYL.A022	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, Kaijagabip, Fly river						KP232244							
MJ18694	Lasini	<i>Nylanderia</i>	NYL.A022	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Southern Highlands, Kantobo, Mabi river	-6.7260	143.5070	451	2008-01-01	M. Janda & Ibalim	KP232086							
MJ17695	Lasini	<i>Nylanderia</i>	NYL.A022	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Southern Highlands, Kutubu area, Fogomiu vill.	-6.5076	143.0780	300	2008-01-29	Janda & Ibalim	ASPNA214-09	KP232421	KP232604	KP231991	KP232854			
B-LEW09-11	Lasini	<i>Nylanderia</i>	NYL.A023	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Enga Province, Kompam, Lembena	-4.9608	143.9650	225	2009-01-09		ASPNA1140-10							
B-LEW09-64	Lasini	<i>Nylanderia</i>	NYL.A023	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Enga Province, Kompam, Lembena	-4.9610	143.9650	225	2009-01-09		ASPNA1345-10							
MJ13218	Lasini	<i>Nylanderia</i>	NYL.A023	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Madang Province, Ohu Conservation Area	-5.2248	145.6850	105			KP232166	KP232368	KP232539					

JCM-0179A	Lasini	Nylanderia	PALA001	Old secondary forest	Primary/Secondary	PALAU	Babeldaob Is., Ngaremlengui	7.5381	134.5785	29	2008-06-28	J. Czekanski-Moir	KP232038									
JCM-0185C	Lasini	Nylanderia	PALA001	Old secondary forest	Primary/Secondary	PALAU	Babeldaob Is., Ngaremlengui	7.5413	134.5782	38	2008-07-01	M. Taduo	KP232039									
JCM-0212B	Lasini	Nylanderia	PALA001	Lowland rainforest	Secondary	PALAU	Babeldaob Is., Ailral State	7.3881	134.5449	68	2008-07-23	J. Czekanski-Moir	KP232041									
JCM-0282A	Lasini	Nylanderia	PALA001	Old secondary forest	Primary/Secondary	PALAU	Babeldaob Is., Ngaremlengui State	7.5411	134.5771	35	2008-10-21	J. Czekanski-Moir	KP232042									
JCM-0283A	Lasini	Nylanderia	PALA001	Old secondary forest	Primary/Secondary	PALAU	Babeldaob Is., Ngaremlengui State	7.5414	134.5784	46	2008-10-21	J. Czekanski-Moir	KP232043	KP232347	KP232514	KP231922	KP232786	KP232680				
JCM-0306	Lasini	Nylanderia	PALA001	Secondary forest between Savanna and wetland	Secondary	PALAU	Babeldaob Is., Melekeok State, Ngardok lake	7.5141	134.6033	35	2007-10-17	J. Czekanski-Moir	KP232044									
PHUSQ0015	Lasini	Nylanderia	PHIL003			PHILIPPINES	Luzon Is., Camarines Sur, Panguason	13.6600	123.3100		2004-02-08		KP232092	KP232448	KP232635					KP232892		
B-MIWE09-93	Lasini	Nylanderia	NYL0002	Mid elevation forest	Primary	PAPUA NEW GUINEA	New Guinea Is., West Sepik, Telefomin, Mianmin	-4.9100	141.6330	600	2010-01-01		ASPNA1098-10									
CASENT0200250	Lasini	Nylanderia	NYL0002	Mid elevation forest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, S. Muller Range, 36km SW Kopijago	-5.6566	142.3046	1635	2009-09-11	A. Lucky	ASPNA1502-10									
MJ13186	Lasini	Nylanderia	NYL0002	Mid elevation forest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, S. Muller Range, 36km SW Kopijago	-5.6566	142.3046	1635	2009-09-15	A. Lucky	KP232049	KP232360	KP232531							
MJ13187	Lasini	Nylanderia	NYL0002	Mid elevation mossy forest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, S. Muller Range, 36km SW Kopijago	-5.6559	142.3056	1670	2009-09-12	A. Lucky & L.E. Alonso	KP232059	KP232361	KP232532							
MJ13188	Lasini	Nylanderia	NYL0002	Mid elevation forest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, S. Muller Range, 36km SW Kopijago	-5.6566	142.3046	1635	2009-09-16	A. Lucky	KP232048									
MJ13190	Lasini	Nylanderia	NYL0002	Mid elevation mossy forest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, S. Muller Range, 36km SW Kopijago	-5.6559	142.3056	1670	2009-09-12	A. Lucky	KP232052	KP232362	KP232533	KP231935	KP232797	KP232690				
MJ18279	Lasini	Nylanderia	NYL0002	Mid elevation forest	Primary	PAPUA NEW GUINEA	New Guinea Is., West Sepik, Mianmin	-4.9098	141.6331	600			KP232083									
MJ13216	Lasini	Nylanderia	NYL0021	Gardens	Secondary	PAPUA NEW GUINEA	New Guinea Is., Madang Province, Finisterre Mt., Yawan, Ubi camp, Stony Forest garden	-6.1595	146.8403	1650	2010-10-29	Janda & Plus	KP232164	KP232366	KP232537	KP231939	KP232801	KP232692				
MJ19407	Lasini	Nylanderia	NYL0021	Mountain rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Madang Province, Finisterre Mt., Yawan, Ubi camp	-6.1627	146.894	1719	2010-01-01		KP232232									
MJ19434	Lasini	Nylanderia	NYL0021	Mountain rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Madang Province, Finisterre Mt., Yawan, Ubi camp, Stony Forest garden	-6.1627	146.894	1719	2010-01-01		KP232233									
MJPN030	Lasini	Nylanderia	NYL0021	Mountain rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Eastern Highlands, Okapa, Nosokshite, Kimiagomo village	-6.4160	145.5780	2224	2009-12-22	K. Sagata	ASPNA1590-10									
B-LEWE09-72	Lasini	Nylanderia	helleri	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Enga Province, Kompiang, Lembua	-4.9610	143.9650	225	2009-01-09	Ibalm & Plus	ASPNA1353-10									
B-MIWE09-147	Lasini	Nylanderia	helleri	Mid elevation forest	Primary	PAPUA NEW GUINEA	New Guinea Is., West Sepik, Telefomin, Mianmin	-4.9100	141.6330	600	2010-01-01		ASPNA1264-10									
B-MIWE09-8	Lasini	Nylanderia	helleri	Mid elevation forest	Primary	PAPUA NEW GUINEA	New Guinea Is., West Sepik, Telefomin, Mianmin	-4.9100	141.6330	600	2010-01-01		ASPNA1013-10									
B-OHWE09-7	Lasini	Nylanderia	helleri	Lowland rainforest	Primary/Secondary	PAPUA NEW GUINEA	New Guinea Is., Madang, Ohu	-5.2170	145.6830	125	2009-01-11	Ibalm & Plus	ASPNA989-10									
B-WAW09-23	Lasini	Nylanderia	helleri	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Madang, Sogeram River, Wanang	-5.1430	145.0580	100	2007-05-01		ASPNA1399-10									
MJ18355	Lasini	Nylanderia	helleri	Mid elevation forest	Primary	PAPUA NEW GUINEA	New Guinea Is., West Sepik, Mianmin	-4.9098	141.6331	600			Ibalm & Plus	KP232221								
MJ19371	Lasini	Nylanderia	helleri	Mid elevation forest	Primary	PAPUA NEW GUINEA	New Guinea Is., West Sepik, Mianmin	-4.9098	141.6331	600	2010-01-18		Ibalm & Plus	KP232229								
MJ8699	Lasini	Nylanderia	helleri	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, Ok Todi area, Kaitangip vill.	-5.5466	141.5040	230	2008-03-21		ASPNA298-09	KP232424	KP232608	KP231955	KP232858	KP232720				
PK-EE091	Lasini	Nylanderia	helleri	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Madang Province, Middle Ramu, Wanang vill.	-5.2333	145.1830	150	2007-06-21	Klimes P et al.	ASPNA779-10									
MJ13222	Lasini	Nylanderia	NYL0004	Savanna	Semidisturbed	PAPUA NEW GUINEA	New Guinea Is., Western Province, Weam	-8.6287	141.1384		2010-10-12	Janda & Plus	KP232177	KP232374	KP232546	KP231946	KP232808	KP232694				
MJ13227	Lasini	Nylanderia	NYL0004	Savanna	Semidisturbed	PAPUA NEW GUINEA	New Guinea Is., Western Province, Weam	-8.6192	141.1203		2010-10-11	Janda & Plus	KP232182	KP232376	KP232551	KP231948	KP232810	KP232696				
MJ13860	Lasini	Nylanderia	NYL0004	Savanna	Semidisturbed	PAPUA NEW GUINEA	New Guinea Is., Western Province, Weam, TransFly	-8.6290	141.1380	10	2010-10-12	M. Janda	ASPNA1792-11									
B-MIWE09-115	Lasini	Nylanderia	NYL0005	Mid elevation forest	Primary	PAPUA NEW GUINEA	New Guinea Is., West Sepik, Telefomin, Mianmin	-4.9100	141.6330	600	2010-01-01		ASPNA1119-10									
B-MIWE09-149	Lasini	Nylanderia	NYL0005	Mid elevation forest	Primary	PAPUA NEW GUINEA	New Guinea Is., West Sepik, Telefomin, Mianmin	-4.9100	141.6330	600	2010-01-01		ASPNA1266-10									
B-MIWE09-170	Lasini	Nylanderia	NYL0005	Mid elevation forest	Primary	PAPUA NEW GUINEA	New Guinea Is., West Sepik, Telefomin, Mianmin	-4.9100	141.6330	600	2010-01-01		Ibalm & Plus	ASPNA1287-10								
B-MIWE09-219	Lasini	Nylanderia	NYL0005	Mid elevation forest	Primary	PAPUA NEW GUINEA	New Guinea Is., West Sepik, Telefomin, Mianmin	-4.9100	141.6330	600	2010-01-01		ASPNA1336-10									
B-MIWE09-48	Lasini	Nylanderia	NYL0005	Mid elevation forest	Primary	PAPUA NEW GUINEA	New Guinea Is., West Sepik, Telefomin, Mianmin	-4.9100	141.6330	600	2010-01-01		ASPNA1053-10									
B-MIWE09-65	Lasini	Nylanderia	NYL0005	Mid elevation forest	Primary	PAPUA NEW GUINEA	New Guinea Is., West Sepik, Telefomin, Mianmin	-4.9100	141.6330	600	2010-01-01		ASPNA1070-10									
MJ15403	Lasini	Nylanderia	NYL0005	Mid elevation forest	Primary	PAPUA NEW GUINEA	New Guinea Is., Sandaun Province, Mianmin						KP232085	KP232399	KP232579	KP231969	KP232828	KP232707				
MJ15405	Lasini	Nylanderia	NYL0005	Mid elevation forest	Primary	PAPUA NEW GUINEA	New Guinea Is., Sandaun Province, Telefomin						KP232084	KP232400	KP232580	KP231970	KP232829	KP232708				
MJ18269	Lasini	Nylanderia	NYL0005	Mid elevation forest	Primary	PAPUA NEW GUINEA	New Guinea Is., West Sepik, Mianmin	-4.9098	141.6331	600			Ibalm & Plus	KP232215								
MJ19282	Lasini	Nylanderia	NYL0005	Mid elevation forest	Primary	PAPUA NEW GUINEA	New Guinea Is., West Sepik, Telefomin, Mianmin	-4.9100	141.6330	600			KP232224									
B-BAWE09-25	Lasini	Nylanderia	NYL0003	Lowland rainforest	Secondary	PAPUA NEW GUINEA	New Guinea Is., Madang, Baitabag	-5.1330	145.7830	100	2009-01-11	M. Janda	ASPNA973-10									
B-BAWE09-43	Lasini	Nylanderia	NYL0003	Lowland rainforest	Secondary	PAPUA NEW GUINEA	New Guinea Is., Madang, Baitabag	-5.1330	145.7830	100	2009-01-11	M. Janda	ASPNA1197-10									
B-OHWE09-2	Lasini	Nylanderia	NYL0003	Lowland rainforest	Primary/Secondary	PAPUA NEW GUINEA	New Guinea Is., Madang, Ohu	-5.2170	145.6830	125	2009-01-11	Ibalm & Plus	ASPNA984-10									
B-WAW09-26	Lasini	Nylanderia	NYL0003	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Madang, Sogeram River, Wanang	-5.1430	145.0580	100	2007-05-01	M. Janda	ASPNA1402-10									
HP011	Lasini	Nylanderia	NYL0003	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Madang Province, Middle Ramu, Wanang vill.	-5.2333	145.1830	150	2007-03-17	Klimes P et al.	ASPNA729-09									KP232769
MJ13219	Lasini	Nylanderia	NYL0003	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Madang Province, Ohi Conservation Area	-5.2241	145.6851	100			Janda & Plus	KP232167								
MJ13221	Lasini	Nylanderia	NYL0003	Shore vegetation, small island	Semidisturbed coastal	PAPUA NEW GUINEA	Pig Is., Madang Province, Madang lagoon	-5.1698	145.8403	1	2010-11-06	Janda & Plus	KP232169									
MJ13223	Lasini	Nylanderia	NYL0003	Lowland rainforest	Secondary	PAPUA NEW GUINEA	New Guinea Is., Madang Province, Baitabag vill., coll5	-5.1417	145.7764	60			Janda & Plus	KP232171								
MJ13224	Lasini	Nylanderia	NYL0003	Gardens	Secondary	PAPUA NEW GUINEA	New Guinea Is., Madang Province, Astrolabe bay, South Coast hwy., SC1	-5.3066	145.7296	12	2010-11-05	Janda & Plus	KP232172									
MJ13228	Lasini	Nylanderia	NYL0003	Lowland rainforest	Secondary	PAPUA NEW GUINEA	New Guinea Is., Madang Province, Baitabag vill., coll5	-5.1417	145.7764	60	2010-11-03	Janda & Plus	KP232176									
MJ13838	Lasini	Nylanderia	NYL0003	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Madang, Baitabag, Kau Wildlife Area, COL13	-5.1390	145.7740	60	2012-03-11	M. Janda	ASPNA1775-11	KP232385	KP232562							
MJ1394	Lasini	Nylanderia	NYL0003	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Madang, Baitabag vill.						KP232192									
MJ14744	Lasini	Nylanderia	NYL0003	Gardens, Forest edge, Grasslands	Secondary	PAPUA NEW GUINEA	New Guinea Is., Madang, South Coast rd., Astrolabe Bay, SC2	-5.3090	145.7300	19	2010-11-05	M. Janda	ASPNA2271-11	KP232391								KP231960
MJ14851	Lasini	Nylanderia	NYL0003	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Madang, Ohu	-5.2170	145.6830	125	2009-11-07	M. Janda	ASPNA2243-11	KP232394	KP232570	KP231963	KP232822					
MJ18120	Lasini	Nylanderia	NYL0003	Coastal vegetation	Grassland, gardens, mangroves, seashore	PAPUA NEW GUINEA	New Guinea Is., Madang, Nagada station	-5.1560	145.7950	1			KP232205									
MJ18123	Lasini	Nylanderia	NYL0003	Coastal vegetation	Grassland, gardens, mangroves, seashore	PAPUA NEW GUINEA	New Guinea Is., Madang, Nagada station	-5.1560	145.7950	1			KP232206									
MJ18145	Lasini	Nylanderia	NYL0003	Coastal vegetation	Grassland, gardens, mangroves, seashore	PAPUA NEW GUINEA	New Guinea Is., Madang, Nagada station	-5.1560	145.7950													

MJ15136	Lasini	<i>Nylanderia</i>	veget	Mid elevation forest	Primary	PAPUA NEW GUINEA	New Guinea Is., Chimbu Province, Hala	-6.7110	144.9630	475		K. Tyardikova	ASPNA2648-12	KP232397	KP232575	KP231967	KP232826	KP232705		
MJ16124	Lasini	<i>Nylanderia</i>	veget	Primary rainforest	Primary	FIJI	Gau Is., Lomaviti, Delaco Mt., 3 km SE Navukailagi village	-17.9796	179.2763	408	2008-02-07	E.P. Economou	KP232063	KP232410	KP232590	KP231981	KP232840			
MJ18164	Lasini	<i>Nylanderia</i>	veget	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Madang, Batabag	-5.1433	145.7222	20.90	2004-01-01	Janda et al.	KP232208							
MP9413	Lasini	<i>Nylanderia</i>	veget	Gardens	Secondary	PAPUA NEW GUINEA	New Guinea Is., Madang, South Coast rd., Aotobale bay, South Coast 2	-5.3087	145.7295	19	2010-11-05	M. Janda	KP232249	KP232433	KP232618	KP232002	KP232865			
NYP903-2	Lasini	<i>Nylanderia</i>	veget	Disturbed forest	Disturbed	FEDERATED STATES OF MICRONESIA	Chuuk Islands, Weno Is., Xavier High School	7.4479	151.8838	81	2010-09-04	Clause, Sharma	KP232252		KP232622	KP232006	KP232873			
NYP904-1	Lasini	<i>Nylanderia</i>	veget	Disturbed forest	Disturbed	FEDERATED STATES OF MICRONESIA	Chuuk Islands, Weno Is.	7.4511	151.8496	30	2010-09-04	Clause, Sharma	KP232282	KP232437	KP232623		KP232874	KP232725		
NYP907-1	Lasini	<i>Nylanderia</i>	veget	Disturbed forest	Disturbed	FEDERATED STATES OF MICRONESIA	Chuuk Islands, Tol Is.	7.3266	151.6181	100	2010-09-07	Clause, Sharma, Techo family	KP232254	KP232439	KP232625	KP232008	KP232876			
NYP907-2	Lasini	<i>Nylanderia</i>	veget	Disturbed forest	Disturbed	FEDERATED STATES OF MICRONESIA	Chuuk Islands, Tol Is.	7.3266	151.6181	100	2010-09-07	Clause, Sharma, Techo family	KP232268	KP232440	KP232626	KP232009	KP232877	KP232727		
NYP908-1	Lasini	<i>Nylanderia</i>	veget	Disturbed forest	Disturbed	FEDERATED STATES OF MICRONESIA	Chuuk Islands, Tol Is.	7.3286	151.6197	139	2010-09-07	Clause, Sharma, Techo family	KP232255							
NYP908-2	Lasini	<i>Nylanderia</i>	veget	Disturbed forest	Disturbed	FEDERATED STATES OF MICRONESIA	Chuuk Islands, Tol Is.	7.3286	151.6197	139	2010-09-07	Clause, Sharma, Techo family	KP232269		KP232627	KP232010	KP232878			
NYP908-3	Lasini	<i>Nylanderia</i>	veget	Disturbed forest	Disturbed	FEDERATED STATES OF MICRONESIA	Chuuk Islands, Tol Is.	7.3286	151.6197	139	2010-09-07	Clause, Sharma, Techo family	KP232256							
NYP910-1	Lasini	<i>Nylanderia</i>	veget	Disturbed forest	Disturbed	FEDERATED STATES OF MICRONESIA	Chuuk Islands, Tol Is.	7.3259	151.6135	173	2010-09-07	Clause, Sharma, Techo family	KP232283						KP232879	
NYP910-2	Lasini	<i>Nylanderia</i>	veget	Disturbed forest	Disturbed	FEDERATED STATES OF MICRONESIA	Chuuk Islands, Tol Is.	7.3259	151.6135	173	2010-09-07	Clause, Sharma, Techo family	KP232274							
NYP911-1	Lasini	<i>Nylanderia</i>	veget	Disturbed forest	Disturbed	FEDERATED STATES OF MICRONESIA	Chuuk Islands, Tol Is.	7.3245	151.6135	124	2010-09-07	Clause, Sharma, Techo family	KP232273							
NYP913-2	Lasini	<i>Nylanderia</i>	veget	Disturbed forest	Disturbed	FEDERATED STATES OF MICRONESIA	Chuuk Islands, Tol Is.	7.3243	151.6141	120	2010-09-08	Clause, Sharma, Techo family	KP232257							
NYP914-1	Lasini	<i>Nylanderia</i>	veget	Mid elevation rainforest	Secondary	FEDERATED STATES OF MICRONESIA	Senyavin Islands, Pohpei Is., Nett Municipality, Lidifudniap Falls	6.9211	158.2013	157	2010-09-09	Clause, Sharma	KP232284						KP232880	
NYP916-1	Lasini	<i>Nylanderia</i>	veget	Mid elevation rainforest	Secondary	FEDERATED STATES OF MICRONESIA	Senyavin Islands, Pohpei Is., Nett Municipality, Lidifudniap Falls	6.9135	158.1973	197	2010-09-09	Clause, Sharma	KP232285				KP232011	KP232881		
NYP917-1	Lasini	<i>Nylanderia</i>	veget	Mountain rainforest	Secondary	FEDERATED STATES OF MICRONESIA	Senyavin Islands, Pohpei Is., Kiri Municipality, Enipen	6.8355	158.2148	280	2010-09-10	Clause, Eperiam, Sharma	KP232258							
NYP918-1	Lasini	<i>Nylanderia</i>	veget	Mountain rainforest	Secondary	FEDERATED STATES OF MICRONESIA	Senyavin Islands, Pohpei Is., Kiri Municipality, Enipen	6.8407	158.2150	308	2010-09-10	Clause, Eperiam, Sharma	KP232259							
NYP920-1	Lasini	<i>Nylanderia</i>	veget	Mountain rainforest	Secondary	FEDERATED STATES OF MICRONESIA	Senyavin Islands, Pohpei Is., Kiri Municipality, Enipen	6.8438	158.2153	447	2010-09-10	Clause, Eperiam, Sharma	KP232286							
NYP922-1	Lasini	<i>Nylanderia</i>	veget	Mountain rainforest	Secondary	FEDERATED STATES OF MICRONESIA	Senyavin Islands, Pohpei Is., Kiri Municipality, Enipen	6.8563	158.2162	669	2010-09-10	Clause, Eperiam, Sharma	KP232260							
NYP923-1	Lasini	<i>Nylanderia</i>	veget	Mountain rainforest	Secondary	FEDERATED STATES OF MICRONESIA	Senyavin Islands, Pohpei Is., Kiri Municipality, Enipen	6.8569	158.2170	666	2010-09-10	Clause, Eperiam, Sharma	KP232276							
NYP927-1	Lasini	<i>Nylanderia</i>	veget	Mountain rainforest	Secondary	FEDERATED STATES OF MICRONESIA	Senyavin Islands, Pohpei Is., Uh Municipality, Mt. Kapwurio trail	6.9464	158.2608	325	2010-09-11	Clause, Daniel, Sharma	KP232261							
NYP929-1	Lasini	<i>Nylanderia</i>	veget	Mid elevation rainforest	Secondary	FEDERATED STATES OF MICRONESIA	Senyavin Islands, Pohpei Is., Nett Municipality, Nanpil	6.9126	158.2174	118	2010-09-11	Clause, Daniel, Sharma	KP232275	KP232441	KP232628	KP232012	KP232882			
NYP931-1	Lasini	<i>Nylanderia</i>	veget	Disturbed forest	Disturbed	FEDERATED STATES OF MICRONESIA	Senyavin Islands, Pohpei Is., Madoleihmw Municipality, Kepirobi Falls	6.8455	158.2992	46	2010-09-13	Clause, Sharma	KP232271		KP232629	KP232013	KP232883			
NYP931-2	Lasini	<i>Nylanderia</i>	veget	Disturbed forest	Disturbed	FEDERATED STATES OF MICRONESIA	Senyavin Islands, Pohpei Is., Madoleihmw Municipality, Kepirobi Falls	6.8455	158.2992	46	2010-09-13	Clause, Sharma	KP232262							
NYP932-1	Lasini	<i>Nylanderia</i>	veget	Atoll forest	Secondary	FEDERATED STATES OF MICRONESIA	Senyavin Islands, Namadid Islands, near Pohpei Is., Na Is.	6.8531	158.3545	13	2010-09-15	Clause, Sharma	KP232267	KP232442	KP232630	KP232014	KP232884			
NYP932-2	Lasini	<i>Nylanderia</i>	veget	Atoll forest	Secondary	FEDERATED STATES OF MICRONESIA	Senyavin Islands, Namadid Islands, near Pohpei Is., Na Is.	6.8531	158.3545	13	2010-09-15	Clause, Sharma	KP232288							
NYP933-1	Lasini	<i>Nylanderia</i>	veget	Mountain rainforest	Secondary	FEDERATED STATES OF MICRONESIA	Senyavin Islands, Pohpei Is., Nett Municipality, Nahalad trail	6.8969	158.2018	508	2010-09-17	Clause, Sharma	KP232263	KP232443	KP232631	KP232015	KP232886			
NYP933-2	Lasini	<i>Nylanderia</i>	veget	Mountain rainforest	Secondary	FEDERATED STATES OF MICRONESIA	Senyavin Islands, Pohpei Is., Nett Municipality, Nahalad trail	6.8969	158.2018	508	2010-09-17	Clause, Sharma	KP232289							
NYP934-1	Lasini	<i>Nylanderia</i>	veget	Mountain rainforest	Secondary	FEDERATED STATES OF MICRONESIA	Senyavin Islands, Pohpei Is., Nett Municipality, Nahalad trail	6.8920	158.2009	673	2010-09-17	Clause, Sharma	KP232272							
NYP937-1	Lasini	<i>Nylanderia</i>	veget	Mid elevation rainforest	Secondary	FEDERATED STATES OF MICRONESIA	Senyavin Islands, Pohpei Is., Kiri Municipality, near Lohi Mesi	6.8301	158.1842	105	2010-09-20	Clause, Sharma	KP232264							
NYP941-1	Lasini	<i>Nylanderia</i>	veget	River shore, lowland forest	Primary	FEDERATED STATES OF MICRONESIA	Caroline Islands, Yap Is., Stone trail	9.5244	138.1098	71	2010-09-22	Clause, Sharma	KP232290				KP232016	KP232887		
NYP945-2	Lasini	<i>Nylanderia</i>	veget	Primary forest	Primary	FEDERATED STATES OF MICRONESIA	Caroline Islands, Yap Is., Mt. Madoged	9.5257	138.1150	159	2010-09-23	Clause, Sharma	KP232291							
NYP945-3	Lasini	<i>Nylanderia</i>	veget	Primary forest	Primary	FEDERATED STATES OF MICRONESIA	Caroline Islands, Yap Is., Mt. Madoged	9.5257	138.1150	159	2010-09-23	Clause, Sharma	KP232292							
PKSP561	Lasini	<i>Nylanderia</i>	veget	Valley, Syzygium forest	Semidisturbed	FRENCH POLYNESIA	Austral Islands, Raiatea Is.	-22.4500	-151.3650	217	2006-12-24	P. Krushelnycky	ASPNA1448-10	KP232456	KP232643	KP232025	KP232899	KP232730		
PKSP563	Lasini	<i>Nylanderia</i>	veget	Closed canopy forest, native orchids, Syzygium	Secondary	FRENCH POLYNESIA	Society Islands, Raiatea Is., Lower ridge off Mt. Otopio, southwestern part of island	-16.8640	-151.4210	254	2006-12-27	P. Krushelnycky	ASPNA1443-10	KP232457	KP232644		KP232900			
PKSP576	Lasini	<i>Nylanderia</i>	veget			FRENCH POLYNESIA	Marquesas Islands, Hiva Oa Is., Mount Ootua	-9.7833	-138.9667	875	2000-06-30	R. Gillespie	ASPNA1444-10				KP232026			
JCM-0088	Lasini	<i>Nylanderia</i>	veget	Secondary forest near very old cycled on hilltop	Secondary	PALAU	Babeldaob Is., Ngarehlong State	7.7242	134.6202	105	2008-02-07	J. Czekanski-Moir	ASPNA1444-10							
JCM-0100G	Lasini	<i>Nylanderia</i>	veget	Old secondary forest	Primary/Secondary	PALAU	Babeldaob Is., Ngardmau State	7.5878	134.5896	37.72	2008-02-07	J. Czekanski-Moir								
JCM-0133A	Lasini	<i>Nylanderia</i>	veget	Rainforest / Stand vegetation	Primary	PALAU	Kayangel Is., Kayangel State	8.0914	134.7157	2	2008-03-09	J. Czekanski-Moir								
JCM-0156C	Lasini	<i>Nylanderia</i>	veget	Old secondary forest	Primary/Secondary	PALAU	Babeldaob Is., Ngardmau State	7.5997	134.5643	47	2008-05-22	J. Czekanski-Moir								
JCM-0200F	Lasini	<i>Nylanderia</i>	veget	Urban area	Urban	PALAU	Angaur Is., Angaur State	6.8976	134.1321	3	2008-07-09	J. Czekanski-Moir								
JCM-0233F	Lasini	<i>Nylanderia</i>	veget	Urban area	Urban	PALAU	Peleliu Is., Peleliu State	7.0063	134.2261	5	2008-08-06	J. Czekanski-Moir								
JCM-0236A	Lasini	<i>Nylanderia</i>	veget	Swamp forest	Primary/Secondary	PALAU	Babeldaob Is., Ngarehlong State	7.5222	134.5463	6	2007-05-05	Olsen & Czekanski-Moir								
NYP903-1	Lasini	<i>Nylanderia</i>	veget	Disturbed forest	Disturbed	FEDERATED STATES OF MICRONESIA	Chuuk Islands, Weno Is., Xavier High School	7.4479	151.8838	81	2010-09-04	Clause, Sharma							KP232872	
NYP945-1	Lasini	<i>Nylanderia</i>	veget	Primary forest	Primary	FEDERATED STATES OF MICRONESIA	Caroline Islands, Yap Is., Mt. Madoged	9.5257	138.1150	159	2010-09-23	Clause, Sharma								KP232889
CR120625-48	Lasini	<i>Nylanderia</i>	VANU001	Primary montane rainforest, canopy height max 30m	Agathis, Tamano trees, Selaginella and ferns	VANUATU	Espirito Santo Is., Mt. Sarasi	-14.9847	166.6616	950	2012-06-25	C. Rabeling	KP232126	KP232317	KP232483	KP231898	KP232755	KP232658		
MJ16125	Lasini	<i>Nylanderia</i>	viterius	Primary rainforest	Primary	FIJI	Gau Is., Lomaviti, Delaco Mt., 3 km SE Navukailagi village	-17.9796	179.2763	408	2008-02-07	E.P. Economou	KP232064	KP232411	KP232591	KP231982	KP232841	KP232715		
BOR12-271	Lasini	<i>Nylanderia</i>	BOR002			MALAYSIA	Borneo Is., Mt. Api, Camp 5	4.1367	114.8936	152	2012-03-16	D.M. Sorger	KP232114	KP232304	KP232469	KP231885	KP232742	KP232652		
MJ19780	Lasini	<i>Nylanderia</i>	BOR002	Moist forest		MALAYSIA	Borneo Is., Sarawak State, Gunung Mulu National Park, Forest behind Mulu Airport	4.0567	114.8108		2010-07-24	D.M. Sorger	KP232071							
BOR12-130D	Lasini	<i>Nylanderia</i>	BOR003			MALAYSIA	Borneo Is., Danum Valley	4.9623	117.8021		2012-02-27	D.M. Sorger	KP232108	KP232299	KP232464	KP231881	KP232738			
BOR12-204B	Lasini	<i>Nylanderia</i>	BOR004			MALAYSIA	Borneo Is., Mt. Mulu, Camp 3	4.0381	114.8882	1344	2012-03-08	D.M. Sorger	KP232111	KP232301	KP232466	KP231883	KP232740			
BOR12-140	Lasini	<i>Nylanderia</i>	BOR005			MALAYSIA	Borneo Is., Mt. Marul, Ba'Kelalan, Joy Bridge	3.9360	115.5389	2088	2012-02-20	D.M. Sorger	KP232109	KP232300	KP232465	KP231882	KP232739	KP232650		
BOR12-204C	Lasini	<i>Nylanderia</i>	BOR006			MALAYSIA	Borneo Is., Mt. Mulu, Camp 3	4.0381	114.8882	1344	2012-03-08	D.M. Sorger	KP232112	KP232302	KP232467	KP231884	KP232741			
BBB096-01	Lasini	<i>Nylanderia</i>	CLM011001	Rubber plantation	Plantation	CHINA	Yunnan Prov., Xishuangbanna, Menglun town	21.9321	101.2709	640	2013-06-09	B. Guéhard, B. Blanchard, C. Liu	KP232103	KP232294	KP232460	KP231877	KP232733			
CL030-20	Lasini	<i>Nylanderia</i>	CLM011001	Young rain forest	Secondary	CHINA	Yunnan Prov., Xishuangbanna, Manai town	21.8581	101.2760	685										

MJ13855	Lasini	<i>Paraparatrechina</i>	PARA001	Lowland rainforest, Forest edge	Primary	PAPUA NEW GUINEA	New Guinea Is., Madang, Baitabag, Kan Wildlife Area	-5.1382	145.7537	50-100	2010-11-07		ASPNA1790-11	KP232386	KP232563					
MJ7862	Lasini	<i>Paraparatrechina</i>	PARA002	Lowland rainforest	Primary	PAPUA NEW GUINEA	Bismarck Archipelago, New Britain Is., Kimbe Area, Buvasi-Mt. Muluus	-5.5798	150.3880	300	2007-12-29	M. Janda	ASPNA432-09	KP232422	KP232606	KP231993	KP232856			
MJ7876	Lasini	<i>Paraparatrechina</i>	PARA002	Lowland rainforest	Primary	PAPUA NEW GUINEA	Bismarck Archipelago, New Britain Is., Kimbe Area, Hot River	-5.4673	149.9740	40	2007-12-23	M. Janda	ASPNA446-09	KP232423	KP232607	KP231994	KP232857	KP232719		
CASENT0215281	Lasini	<i>Paraparatrechina</i>	PARA003	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, S. Muller Range, 45km SW Kopiago	-5.7278	142.2627	505	2009-09-08	A. Lucky & L.E. Alfonso	ASPNA1500-10							
MJ10251	Lasini	<i>Paraparatrechina</i>	PARA003	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, Kaiaungabip, Fly river	-5.5466	141.5041	180-280			ASPNA536-09	KP232356	KP232523	KP231931	KP232795	KP232689		
MJ8853	Lasini	<i>Paraparatrechina</i>	PARA003	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, Kaiaungabip, Fly river	-5.5466	141.5041	180-280	2008-03-16		ASPNA355-09							
HP0112	Lasini	<i>Paraparatrechina</i>	PARA004	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Madang Province, Middle Ramu, Wanang vill.	-5.2333	145.1830	150	2007-03-17	Climes P et al.	KP232151	KP232331		KP231911	KP232770			
CASENT0200716	Lasini	<i>Paraparatrechina</i>	PARA006	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, S. Muller Range, 45km SW Kopiago	-5.7295	142.2644	480	2009-09-09	A. Lucky	ASPNA1505-10							
MJ10227	Lasini	<i>Paraparatrechina</i>	PARA006	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, Kaiaungabip, Fly river	-5.5466	141.5041	180-280			ASPNA512-09							
MJ10249	Lasini	<i>Paraparatrechina</i>	PARA006	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, Kaiaungabip, Fly river	-5.5466	141.5041	180-280			ASPNA534-09	KP232355	KP232522	KP231930	KP232794	KP232688		
MJ8839	Lasini	<i>Paraparatrechina</i>	PARA006	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, Kaiaungabip, Fly river	-5.5466	141.5040	230		M. Janda	ASPNA494-09	KP232425	KP232609	KP231996	KP232859	KP232721		
CASENT0200282	Lasini	<i>Paraparatrechina</i>	pollida	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, S. Muller Range, 45km SW Kopiago	-5.7295	142.2644	480	2009-09-09	A. Lucky	ASPNA1498-10							
HP0013	Lasini	<i>Paraparatrechina</i>	pollida	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Madang Province, Middle Ramu, Wanang vill.	-5.2333	145.1830	100	2007-06-16	Climes P et al.	ASPNA669-09	KP232328	KP232494	KP231908	KP232766	KP232671		
MJ1202	Lasini	<i>Paraparatrechina</i>	pollida	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Madang Province, Ohu Conservation Area	-5.2326	145.6787	150-250			ASPNA058-08							
MJ13813	Lasini	<i>Paraparatrechina</i>	pollida	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Madang, Baitabag, Kan Wildlife Area	-5.1382	145.7537	50-100			ASPNA1753-11							
MJ15049	Lasini	<i>Paraparatrechina</i>	pollida	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Southern Highlands, Kutubu area, Fogomau vill.	-6.5080	143.0780	300	2008-01-25	Janda & Ibalim	ASPNA2578-12		KP232572	KP231964	KP232823			
MJ7735	Lasini	<i>Paraparatrechina</i>	pollida	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Southern Highlands, Mt. Bosawi, Fogomau	-6.5076	143.0779	240-404			ASPNA229-09		KP232605	KP231992	KP232855			
MJ7828	Lasini	<i>Paraparatrechina</i>	pollida	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Madang Province, Ohu Conservation Area	-5.2326	145.6787	150-250	2008-02-12		ASPNA398-09							
MJ7841	Lasini	<i>Paraparatrechina</i>	pollida	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Madang Province, Ohu Conservation Area	-5.2326	145.6787	150-250	2008-02-12		ASPNA411-09							
PK-EE016	Lasini	<i>Paraparatrechina</i>	pollida	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Madang Province, Middle Ramu, Wanang vill.	-5.2333	145.1830	150	2007-06-21	Climes P et al.	ASPNA776-10	KP232452	KP232638	KP232022	KP232894	KP232729		
MJ13590	Lasini	<i>Paraparatrechina</i>	lecumopteridis	Savanna	Semidisturbed	PAPUA NEW GUINEA	New Guinea Is., Madang Province, Middle Ramu, Wanang vill.	-8.6370	141.1380	7	2010-10-13	M. Janda	ASPNA1829-11							
MJ13862	Lasini	<i>Paraparatrechina</i>	lecumopteridis	Savanna	Semidisturbed	PAPUA NEW GUINEA	New Guinea Is., Western Province, Weam, TransFly	-8.6290	141.1380	10	2010-10-12	M. Janda & T. Pius	ASPNA1794-11							
MJ13869	Lasini	<i>Paraparatrechina</i>	lecumopteridis	Savanna	Semidisturbed	PAPUA NEW GUINEA	New Guinea Is., Western Province, Weam, TransFly	-8.6290	141.1380	10	2010-10-12	M. Janda & T. Pius	ASPNA1801-11							
MJ13874	Lasini	<i>Paraparatrechina</i>	lecumopteridis	Savanna	Semidisturbed	PAPUA NEW GUINEA	New Guinea Is., Western Province, Weam, TransFly	-8.6194	141.1349	10-20			ASPNA2281-11							
MJ13877	Lasini	<i>Paraparatrechina</i>	lecumopteridis	Savanna	Semidisturbed	PAPUA NEW GUINEA	New Guinea Is., Western Province, Weam, TransFly	-8.6290	141.1380	10-20	2012-10-12	M. Janda	ASPNA2284-11	KP232387	KP232564	KP231957	KP232816	KP232700		
MJ15196	Lasini	<i>Paraparatrechina</i>	lecumopteridis	Savanna	Semidisturbed	PAPUA NEW GUINEA	New Guinea Is., Western Province, TransFly, Weam	-8.6290	141.1380	10	2010-10-12	Janda & Pius	ASPNA2276-12							
MJ15203	Lasini	<i>Paraparatrechina</i>	lecumopteridis	Savanna	Semidisturbed	PAPUA NEW GUINEA	New Guinea Is., Western Province, TransFly, Weam	-8.6290	141.1380	10	2010-10-12		ASPNA2723-12							
MJ16073	Lasini	<i>Paraparatrechina</i>	lecumopteridis	Savanna Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, Weam, TransFly	-8.6194	141.1349	10-20			KP232097	KP232406	KP232587	KP231977	KP232856	KP232712		
MP1958	Lasini	<i>Paraparatrechina</i>	lecumopteridis	Savanna	Semidisturbed	PAPUA NEW GUINEA	New Guinea Is., Western Province, Weam, TransFly	-8.6430	141.1350	20	2010-10-16	M. Janda	ASPNA2006-11							
MP9279	Lasini	<i>Paraparatrechina</i>	lecumopteridis	Savanna	Semidisturbed	PAPUA NEW GUINEA	New Guinea Is., Western Province, Weam, TransFly	-8.6370	141.1380	7	2010-10-13	M. Janda & T. Pius	ASPNA2113-11							
MP9284	Lasini	<i>Paraparatrechina</i>	lecumopteridis	Savanna	Semidisturbed	PAPUA NEW GUINEA	New Guinea Is., Western Province, Weam, TransFly	-8.6370	141.1380	7	2010-10-13	M. Janda & T. Pius	ASPNA2118-11							
MP9313	Lasini	<i>Paraparatrechina</i>	lecumopteridis	Savanna	Semidisturbed	PAPUA NEW GUINEA	New Guinea Is., Western Province, Weam, TransFly	-8.6290	141.1380	10	2010-10-12	M. Janda	ASPNA2143-11	KP232428	KP232613		KP232862	KP232703		
MJ14804	Lasini	<i>Paraparatrechina</i>	PARA018	Coastal vegetation, small island	Semidisturbed	PAPUA NEW GUINEA	New Guinea Is., Madang, Baitabag, Nagada, Madang Lagoon, Simb Is.	-5.1317	145.8122	1			ASPNA2205-11	KP232392	KP232568	KP231961	KP232820	KP232703		
MJ14805	Lasini	<i>Paraparatrechina</i>	PARA018	Coastal vegetation, small island	Semidisturbed	PAPUA NEW GUINEA	New Guinea Is., Madang, Baitabag, Nagada, Madang Lagoon, Simb Is.	-5.1317	145.8122	1			ASPNA2198-11	KP232393	KP232569	KP231962	KP232821			
MJ19299	Lasini	<i>Paraparatrechina</i>	PARA018	Lowland rainforest	Secondary	PAPUA NEW GUINEA	New Guinea Is., Madang, Baitabag	-5.1330	145.7830	100			KP232226							
MJ5252	Lasini	<i>Paraparatrechina</i>	PARA018	Lowland rainforest	Secondary	PAPUA NEW GUINEA	New Guinea Is., Madang, Baitabag	-5.1330	145.7830	100			KP232238							
MJ5468	Lasini	<i>Paraparatrechina</i>	PARA018	Lowland rainforest	Secondary	PAPUA NEW GUINEA	New Guinea Is., Madang, Baitabag	-5.1330	145.7830	100			KP232240							
MD8737	Lasini	<i>Paraparatrechina</i>	PARA018	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, Kaiaungabip, Fly river	-5.5466	141.5041	180-280	2008-03-21		ASPNA304-09							
NAG11-0641	Lasini	<i>Paraparatrechina</i>	PARA018	Offshore island	Semidisturbed coastal	PAPUA NEW GUINEA	Pig Is., Madang, Madang Lagoon	-5.1690	145.8300	1	2011-08-29		ASPNA2889-12							
MJ18281	Lasini	<i>Paraparatrechina</i>	PARA019	Mid elevation forest	Primary	PAPUA NEW GUINEA	New Guinea Is., West Sepik, Telefolin, Mianmin	-9.1910	141.6330	600			KP232217							
CASENT0200139	Lasini	<i>Paraparatrechina</i>	PARA020	Decorative garden	Disturbed	PAPUA NEW GUINEA	New Guinea Is., Enga Province, Porgera Mine Camp	-5.4400	143.1970	2300	2009-09-03	A. Lucky	ASPNA1509-10							
CASENT0200358	Lasini	<i>Paraparatrechina</i>	PARA020	High elevation bog	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, S. Muller Range, 36km SW Kopiago	-5.6540	142.3150	2000	2009-09-17	A. Lucky	ASPNA1501-10							
MPNG049	Lasini	<i>Paraparatrechina</i>	PARA020	Mountain rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Eastern Highlands, Okapa, Agrenepe, Kckmkofa bush	-6.4290	145.5790	2344	2009-12-21	K. Sagata	ASPNA1607-10							
MPNG058	Lasini	<i>Paraparatrechina</i>	PARA020	Mountain rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Eastern Highlands, Okapa, Amfui old camp, binomso, Kintagomoi village	-6.4190	145.5720	2173	2009-12-23	K. Sagata	ASPNA1614-10	KP232434	KP232619	KP232003	KP232866	KP232723		
MPNG065	Lasini	<i>Paraparatrechina</i>	PARA020	Mountain rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Eastern Highlands, Okapa, Tafoga, Kintagomoi village	-6.4160	145.5770	2000	2009-12-22	K. Sagata	ASPNA1619-10							
B-LEW09-1	Lasini	<i>Paraparatrechina</i>	opaca	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Enga Province, Kompiam, Lembena	-4.9608	143.9650				ASPNA1130-10							
B-LEW09-62	Lasini	<i>Paraparatrechina</i>	opaca	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Enga Province, Kompiam, Lembena	-4.9610	143.9650	225	2009-01-09		ASPNA1343-10							
MJ15399	Lasini	<i>Paraparatrechina</i>	opaca	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Enga Province, Kompiam, Lembena	-4.9608	143.9650	225			KP232080	KP232398	KP232577	KP231968	KP232827	KP232706		
MJ15406	Lasini	<i>Paraparatrechina</i>	opaca	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Enga Province, Kompiam, Lembena	-4.9608	143.9650	225	2009-09-07		KP232204	KP232401	KP232581	KP231971	KP232830			
HP0104	Lasini	<i>Paraparatrechina</i>	PARA021	Lowland rainforest	Secondary/Disturbed	PAPUA NEW GUINEA	New Guinea Is., Madang Province, Middle Ramu, Wanang vill.	-5.2333	145.1830	100	2007-08-01	Climes P et al.	ASPNA274-09	KP232330		KP231910	KP232768	KP232673		
HP0162	Lasini	<i>Paraparatrechina</i>	PARA021	Lowland rainforest	Secondary/Disturbed	PAPUA NEW GUINEA	New Guinea Is., Madang Province, Middle Ramu, Wanang vill.	-5.2330	145.1830	150	2007-05-24	P. Klimes	ASPNA1682-10	KP232333						
HP0178	Lasini	<i>Paraparatrechina</i>	PARA021	Lowland rainforest	Secondary/Disturbed	PAPUA NEW GUINEA	New Guinea Is., Madang Province, Middle Ramu, Wanang vill.	-5.2330	145.1830	150	2007-09-17	P. Klimes	ASPNA1689-10	KP232334	KP232497	KP231913	KP232772	KP232675		
HP0188	Lasini	<i>Paraparatrechina</i>	PARA021	Lowland rainforest	Secondary/Disturbed	PAPUA NEW GUINEA	New Guinea Is., Madang Province, Middle Ramu, Wanang vill.	-5.2330	145.1830	150	2007-09-17	P. Klimes	ASPNA1700-10							
JSL120627-02	Lasini	<i>Paraparatrechina</i>	OR001	Rotten logs on soil	Primary	CAMBODIA	Pursat Province, Cardamom Mts.	12.0467	103.1997	570	2012-06-27	J.S. LaPolla	KP232155	KP232350	KP232517	KP231925	KP232789	KP232683		
CR120619-01-02	Lasini	<i>Paraparatrechina</i>	VANU002	Primary montane rainforest, canopy height max 30m		VANUATU	Espirito Santo Is., Mt. Wutman	-14.9691	166.6564	968	2012-06-19	C. Rabelling	KP232124	KP232315	KP232480	KP231896	KP232753	KP232657		
CASENT0171073	Lasini	<i>Paratrecchina</i>	longicornis	Part of entry/city		FIJI	Viti Levu Is., Lautoka Port	-17.6050	177.4400	5	2007-02-15	E.M. Sarnat	ASPNA869-10							

MJ7843	Lasini	<i>Pseudolasia</i>	PSEU002	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Madang Province, Ohu Conservation Area	-5.2326	145.6787	150-250	2008-02-12	ASPNA413-09							
MJ7856	Lasini	<i>Pseudolasia</i>	PSEU002	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Madang, Batabag, Kai Wildlife Area	-5.1382	145.7537	50-100	2008-05-01	ASPNA426-09							
MJ7857	Lasini	<i>Pseudolasia</i>	PSEU002	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Madang, Batabag, Kai Wildlife Area	-5.1382	145.7537	50-100	2008-05-01	ASPNA427-09							
MJ9384	Lasini	<i>Pseudolasia</i>	PSEU002	Mid elevation forest	Primary	PAPUA NEW GUINEA	New Guinea Is., Port Moresby, Variata National Park	-9.4369	147.3692			ASPNA1825-11	KP232431	KP232615	KP232000	KP232863	KP232722		
B-LEW09-34	Lasini	<i>Pseudolasia</i>	PSEU003	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Enga Province, Kompiam, Lembena	-4.9608	143.9650	225	2009-01-09	Ibalim & Plus							
B-LEW09-39	Lasini	<i>Pseudolasia</i>	PSEU003	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Enga Province, Kompiam, Lembena	-4.9608	143.9650	225	2009-01-09	Ibalim & Plus							
MJ13140	Lasini	<i>Pseudolasia</i>	PSEU003	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, S. Muller Range, 45km SW Kapiago	-5.7312	142.2629	445	2009-09-07	A. Lucky	KP232050						
MJ13142	Lasini	<i>Pseudolasia</i>	PSEU003	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, S. Muller Range, 45km SW Kapiago	-5.7287	142.2634	500	2009-09-05	A. Lucky et al.	KP232055	KP232358	KP232525	KP231933	KP232796		
MJ13145	Lasini	<i>Pseudolasia</i>	PSEU003	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, S. Muller Range, 45km SW Kapiago	-5.7287	142.2634	500	2009-09-05	A. Lucky et al.	KP232054						
MJ13148	Lasini	<i>Pseudolasia</i>	PSEU003	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, S. Muller Range, 45km SW Kapiago	-5.7292	142.2627	485	2009-09-06	A. Lucky & L. E. Alonso	KP232057	KP232359	KP232526	KP231934			
MJ13156	Lasini	<i>Pseudolasia</i>	PSEU003	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Western Province, S. Muller Range, 45km SW Kapiago	-5.7284	142.2625	505	2009-09-05	A. Lucky	KP232045						
MJ16066	Lasini	<i>Pseudolasia</i>	PSEU003	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Enga Province, Kompiam, Lembena	-4.9600	144.1083	150-301			KP232078	KP232403	KP232583	KP231973	KP232832	KP232710	
MJ16067	Lasini	<i>Pseudolasia</i>	PSEU003	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Enga Province, Kompiam, Lembena	-4.9600	144.1083	150-301			KP232079	KP232404	KP232584	KP231974	KP232833		
MJ16068	Lasini	<i>Pseudolasia</i>	PSEU005	Lowland rainforest	Primary	PAPUA NEW GUINEA	New Guinea Is., Enga Province, Kompiam, Lembena	-4.9600	144.1083	150-301			KP232081						
MJ6928	Lasini	<i>Pseudolasia</i>	PSEU005	Lowland rainforest		PAPUA NEW GUINEA	New Britain Is., Hot River, Kimbe area												
PHISQ0006	Lasini	<i>Pseudolasia</i>	<i>typhlops</i>			PHILIPPINES	Luzon Is., Camarines Sur, Panicusan	13.6600	123.3100		2004-03-07	M. Janda	KP232247	KP232417	KP232599	KP231987	KP232850		
PHISQ0013	Lasini	<i>Pseudolasia</i>	<i>typhlops</i>			PHILIPPINES	Luzon Is., Camarines Sur, Panicusan	13.6600	123.3100		2004-03-07		KP232090	KP232446	KP232634	KP232019	KP232891		
JSL120625-05	Lasini	<i>Pseudolasia</i>	ORR02	Dry forest, nest in dry rotting branch on ground and partly in soil	Primary/Secondary	CAMBODIA	Pursat Province, Cardamon Mts.	12.3757	103.0941	301	2012-06-25	J.S. LaPolta	KP232091	KP232447		KP232020			
Ingroup taxa available from GenBank																			
ParaM-41	Lasini	<i>Euprenolepis</i>	<i>procera</i>				Borneo					F982439	F982485	F982565	-	F982523	KT443506		
ParaM-39	Lasini	<i>Euprenolepis</i>	<i>vitrei</i>				Continental Malaysia					F982440	F982486	F982566	F982609	F982524	-		
BLF-8002	Lasini	<i>Nylanderia</i>	<i>amblyops</i>				Malagasy					F982441	F982487	F982567	F982610	F982525	-		
ParaM-15	Lasini	<i>Nylanderia</i>	<i>amblyops</i>				Malagasy					F982442	F982488	F982568	F982611	F982526	-		
ParaM-23	Lasini	<i>Nylanderia</i>	<i>bourbonica</i>				Pan-tropical					F982443	F982489	F982569	F982612	F982527	-		
ParaM-5	Lasini	<i>Nylanderia</i>	<i>bourbonica</i>				Pan-tropical					F982444	F982490	F982570	F982613	F982528	-		
ParaM-7	Lasini	<i>Nylanderia</i>	<i>bourbonica</i>				Pan-tropical					F982445	F982491	F982571	F982614	F982529	-		
ParaM-6	Lasini	<i>Nylanderia</i>	CHR01									F982446	F982492	F982572	F982615	F982530	-		
ParaM-38	Lasini	<i>Nylanderia</i>	<i>coccinea</i>				Neartic					F982447	F982493	F982573	F982616	F982531	-		
CASENTO059506	Lasini	<i>Nylanderia</i>	<i>dido</i>				Malagasy					F982448	F982494	F982574	F982617	F982532	KT443519		
ParaM-36	Lasini	<i>Nylanderia</i>	DMR01				Caribbean					F982449	F982495	F982575	F982618	F982533	-		
CASENTO106329	Lasini	<i>Nylanderia</i>	<i>emmae</i>				Tropical Asia					-	KT443188	KT443244	-	KT443300	KT443532		
ParaM-13	Lasini	<i>Nylanderia</i>	<i>faismensis</i>				Neartic					F982450	F982496	F982576	F982619	F982534	-		
ParaM-31	Lasini	<i>Nylanderia</i>	<i>vitensis</i>				Fijian					F982451	F982497	F982577	F982620	F982535	-		
ParaM-1	Lasini	<i>Nylanderia</i>	GUY01				Neotropical					F982452	F982498	F982578	F982621	F982536	-		
ParaM-2	Lasini	<i>Nylanderia</i>	GUY02				Neotropical					F982453	F982499	F982579	F982622	F982537	-		
ParaM-4	Lasini	<i>Nylanderia</i>	GUY03				Neotropical					F982454	F982500	F982580	F982623	F982538	-		
CASENTO106037	Lasini	<i>Nylanderia</i>	<i>hyaris</i>				Neartic					F982455	EF013316	EF013478	F982624	EF013742	EF013614		
ParaM-19	Lasini	<i>Nylanderia</i>	<i>madagascariensis</i>				Malagasy					F982456	F982501	F982581	F982625	F982539	-		
CASENTO049168	Lasini	<i>Nylanderia</i>	MAD01				Malagasy					F982457	F982502	F982582	F982626	F982540	KT443520		
ParaM-29	Lasini	<i>Nylanderia</i>	<i>parvula</i>				Neartic					F982458	F982503	F982583	F982627	F982541	-		
ParaM-8	Lasini	<i>Nylanderia</i>	PER01				Neotropical					F982459	F982504	F982584	F982628	F982542	-		
ParaM-9	Lasini	<i>Nylanderia</i>	PER02				Neotropical					F982460	F982505	F982585	F982629	F982543	-		
ParaM-24	Lasini	<i>Nylanderia</i>	<i>phantasma</i>				Neartic					F982461	F982506	F982586	F982630	F982544	-		
ParaM-37	Lasini	<i>Nylanderia</i>	<i>fulva</i>				Neartic & Neotropical					F982462	F982507	F982587	F982631	F982545	-		
ParaM-22	Lasini	<i>Nylanderia</i>	<i>terricola</i>				Neartic					F982463	F982508	F982588	F982632	F982546	-		
ParaM-32	Lasini	<i>Nylanderia</i>	<i>vaga</i>				Pan-Pacific					F982464	F982509	F982589	F982633	F982547	-		
ParaM-34	Lasini	<i>Nylanderia</i>	<i>vitensis</i>				Fijian					F982465	F982510	F982590	F982634	F982548	-		
ParaM-25	Lasini	<i>Nylanderia</i>	<i>viduala</i>				Pan-tropical					F982466	F982511	F982591	F982635	F982549	-		
ParaM-26	Lasini	<i>Nylanderia</i>	<i>viduala</i>				Pan-tropical					F982467	F982512	F982592	F982636	F982550	-		
ParaM-27	Lasini	<i>Nylanderia</i>	<i>wojtki</i>				Neartic					F982468	F982513	F982593	F982637	F982551	-		
ParaM-16	Lasini	<i>Paraparatrechina</i>	<i>glabra</i>				Malagasy					F982469	F982514	F982594	F982638	F982552	KT443523		
ParaM-102	Lasini	<i>Paraparatrechina</i>	PHL01				Philippines					-	-	-	F982640	F982554	-		
ParaM-103	Lasini	<i>Paraparatrechina</i>	PHL02				Philippines					F982472	-	F982596	F982641	-	-		
ParaM-104	Lasini	<i>Paraparatrechina</i>	PHL03				Philippines					F982473	-	F982597	F982642	F982555	-		
BLF-2139	Lasini	<i>Paraparatrechina</i>	<i>weissi</i>				Afrotropical					F982474	F982516	F982598	F982643	F982556	-		
CASENTO914212	Lasini	<i>Paratrechina</i>	<i>antigua</i>				Malagasy					-	KT443181	KT443237	-	KT443293	KT443525		
ParaM-28	Lasini	<i>Paratrechina</i>	<i>longicornis</i>				Worldwide					F982475	F982517	F982599	F982644	F982557	-		
ParaM-105	Lasini	<i>Paratrechina</i>	<i>longicornis</i>				Worldwide					F982476	-	F982600	F982645	F982558	-		
CASENTO280583	Lasini	<i>Paratrechina</i>	<i>zanjensis</i>				Afrotropical					-	KT443183	KT443239	-	KT443295	KT443527		
CASENTO105052	Lasini	<i>Zania</i>	<i>albomaculata</i>				Caribbean					F982477	EF013329	EF013491	F982646	EF013754	EF013626		
CASENTO106035	Lasini	<i>Prenolepis</i>	<i>imparis</i>				Neartic					F982478	EF013330	EF013492	F982647	EF013755	EF013627		
ParaM-30	Lasini	<i>Prenolepis</i>	<i>imparis</i>				Neartic					F982479	F982518	F982601	F982648	F982559	-		
ParaM-21	Lasini	<i>Prenolepis</i>	<i>nitens</i>				Palaearctic					F982480	F982519	F982602	F982649	F982560	-		
ParaM-17	Lasini	<i>Prenolepis</i>	PHL01				Philippines					F982481	F982520	-	F982650	F982561	-		
CASENTO106005	Lasini	<i>Pseudolasia</i>	<i>australis</i>				Australia					F982482	EF013339	EF013501	F982651	EF013763	EF013635		
ParaM-107	Lasini	<i>Pseudolasia</i>	PHL01				Philippines					F982483	-	F982603	F982652	F982562	-		
ParaM-106	Lasini	<i>Pseudolasia</i>	<i>typhlops</i>				Philippines					F982484	-	F982604	F982653	F982563	-		
Gozek-1	Lasini	<i>Zania</i>	<i>gloriosa</i>				Caribbean					JX426031	JX426002	JX425949	JX425920	JX425975	-		
Gozek-2	Lasini	<i>Nylanderia</i>	<i>arenifera</i>				Neartic					JX426032	JX426003	JX425950	JX425921	JX425976	-		
Gozek-3	Lasini	<i>Zania</i>	<i>clipa</i>				Caribbean					JX426033	JX426004	JX425951	JX425922	JX425977	-		
Gozek-4	Lasini	<i>Nylanderia</i>	<i>microps</i>				Caribbean					JX426034	JX426						

Table A.2. Stepping-stone analyses to determine the best-fitting partitioning strategy. ESS: Effective Sample Size; BF-ss: Bayes Factor; SSML: Stepping-Stone Marginal Likelihood. The codon partitioning strategy outperformed other strategies.

Partition strategy	N. of partitions	ESS	Harmonic mean	SSML	BF-ss [A]	BF-ss [B]	BF-ss [C]	BF-ss [D]	BF-ss [E]
A (All)	1	4857.67	-45575.8	-47051.77	-				
B (By Genome)	2	5558.82	-43714.9	-45298.93	1752.84	-			
C (By Gene)	7	4615.77	-43616.8	-45276.41	1775.36	22.52	-		
D (By Bin)	3	5617.15	-42812.3	-44411.47	2640.3	887.46	864.94	-	
E (By Codon)*	21	1589.76	-42133.6	-44012.32	3039.45	1286.61	1264.09	399.15	-

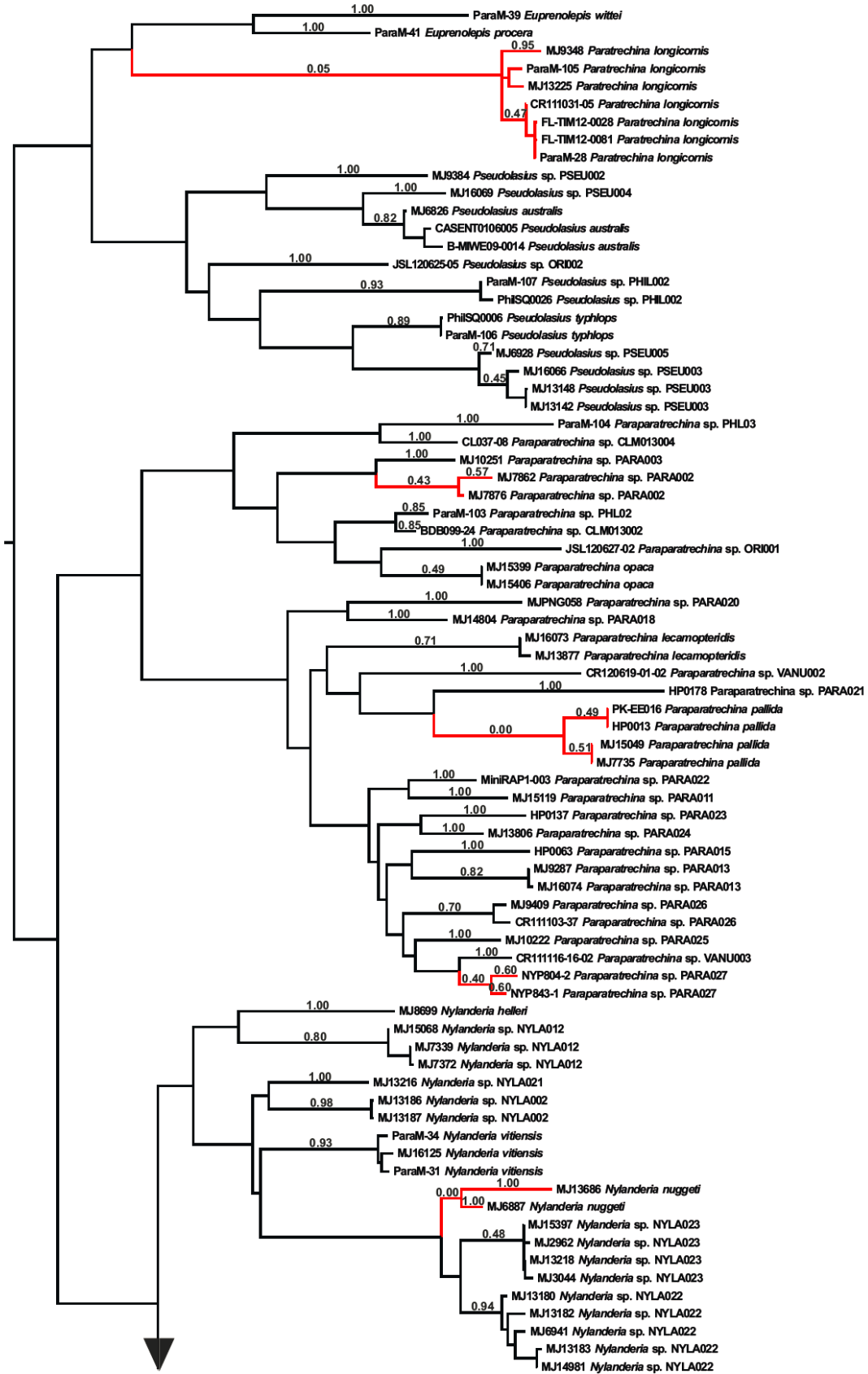
Table A.3. Manual dispersal multipliers (upper right) and areas allowed (lower left) settings used in the stratified biogeographical analyses in BioGeoBEARS. The areas were defined as 1) Oriental-Palaearctic (Or), 2) Malay Archipelago (MA), 3) northern New Guinea (NGn), 4) southern New Guinea (NGs), 5) Australia (Au), 6) Micronesia (Mi), 7) eastern Melanesia (eMe), 8) New World (NW), and 9) Afrotropics (Af).

Time Period: 5–15 Ma									
	Or	MA	NGn	NGs	Au	Mi	eMe	NW	Af
Or	1	0.5	0.1	0.1	0.01	0.01	0.001	0.01	0.5
MA	1	1	0.5	0.5	0.1	0.5	0.1	0.0001	0.001
NGn	1	1	1	0.5	0.5	0.5	0.5	0.0001	0.001
NGs	1	1	1	1	0.5	0.5	0.5	0.0001	0.001
Au	1	1	1	1	1	0.1	0.5	0.001	0.001
Mi	1	1	1	1	1	1	0.5	0.001	0.0001
eMe	1	1	1	1	1	1	1	0.001	0.0001
NW	1	1	1	1	1	1	1	1	0.001
Af	1	1	1	1	1	1	1	1	1
Time Period: 15–25 Ma									
	Or	MA	NGn	NGs	Au	Mi	eMe	NW	Af
Or	1	0.5	0.01	0.01	0.001	0.000001	0.0001	0.1	0.5
MA	1	1	0.1	0.1	0.01	0.000001	0.01	0.01	0.01
NGn	1	1	1	0.1	0.1	0.000001	0.1	0.00001	0.0001
NGs	1	1	1	1	0.1	0.000001	0.1	0.00001	0.0001
Au	1	1	1	1	1	0.000001	0.1	0.0001	0.0001
Mi	0	0	0	0	0	0	0.000001	0.000001	0.000001
eMe	1	1	1	1	1	0	1	0.0001	0.00001
NW	1	1	1	1	1	0	1	1	0.001
Af	1	1	1	1	1	0	1	1	1
Time Period: 25–47 Ma									
	Or	MA	NGn	NGs	Au	Mi	eMe	NW	Af
Or	1	0.5	0.1	0.01	0.0001	0.000001	0.001	0.1	0.5
MA	1	1	0.5	0.01	0.001	0.000001	0.01	0.01	0.01
NGn	1	1	1	0.1	0.1	0.000001	0.5	0.01	0.01
NGs	1	1	1	1	0.5	0.000001	0.1	0.001	0.001
Au	1	1	1	1	1	0.000001	0.1	0.01	0.001
Mi	0	0	0	0	0	0	0.000001	0.000001	0.000001
eMe	1	1	1	1	1	0	1	0.0001	0.00001
NW	1	1	1	1	1	0	1	1	0.001
Af	1	1	1	1	1	0	1	1	1
Time Period: > 47 Ma									
	Or	MA	NGn	NGs	Au	Mi	eMe	NW	Af
Or	1	0.1	0.000001	0.000001	0.00001	0.000001	0.000001	0.5	0.1
MA	1	1	0.000001	0.000001	0.00001	0.000001	0.000001	0.1	0.01
NGn	0	0	0	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001
NGs	0	0	0	0	0.000001	0.000001	0.000001	0.000001	0.000001
Au	1	1	0	0	1	0.000001	0.000001	0.1	0.001
Mi	0	0	0	0	0	0	0.000001	0.000001	0.000001
eMe	0	0	0	0	0	0	0	0.000001	0.000001
NW	1	1	0	0	1	0	0	1	0.001
Af	1	1	0	0	1	0	0	1	1

Table A.4. Geographical ranges, habitat preference, and elevational range for each species in Melanesia and the tropical South Pacific. In geographical range: As=Sundaland, including Philippines; Wa=Wallacea; NG=New Guinea (*n*: northern, *s*: southern); Au=Australia; Mi=Micronesia, including Palau and the Federated States of Micronesia; Va=Vanuatu; Fi=Fiji; and Po=Polynesia. In vegetation, UF=undisturbed rainforest; DF=disturbed forest; SP=savanna and pastures; CS=coastal scrubs; and UG=urban and gardens. In elevation, lw=lowlands; lm=lower montane; and mo=montane. The habitat preference recorded only in other islands/archipelagos but not in New Guinea are depicted as "Is". The number of examined colonies from our own field sampling are shown in the last column.

Voucher codes and species IDs	Geographical Range	Vegetation	Elevation	Field records
BDB086_11_Nylanderia_bourbonica	As-Wa-Mi-Po	DF-SP-CS-UG	lw	17
BDB096_01_Nylanderia_CLM011001	As	-	-	-
BDB096_04_Nylanderia_CLM011005	As	-	-	-
BDB099_24_Parapatrechina_CLM013002	As	-	-	-
BOR12_130D_Nylanderia_BOR003	As	-	-	-
BOR12_140_Nylanderia_BOR005	As	-	-	-
BOR12_204B_Nylanderia_BOR004	As	-	-	-
BOR12_204C_Nylanderia_BOR006	As	-	-	-
BOR12_244_Nylanderia_BOR001	As	-	-	-
BOR12_271_Nylanderia_BOR002	As	-	-	-
CASENTO200454_Parapatrechina_PARA029	NG(s)	UF	lm	1
CL018_19_Nylanderia_CLM013001	As	-	-	-
CL037_08_Parapatrechina_CLM013004	As	-	-	-
CR111103_37_Parapatrechina_PARA026	NG(n)-Va	UF(Va)-CS-UG(NG)	lw	2
CR111116_16_02_Parapatrechina_VANU003	Va	UF	mo	1
CR120619_01_02_Parapatrechina_VANU002	Va	UF	mo	1
CR120625_48_Nylanderia_VANU001	Va	UF	mo	1
FL_TIM12_0038_Nylanderia_TIMO001	Wa	UF-DF	lw	10
FL_TIM12_0050_Nylanderia_vaga	Wa-NG(n-s)-Mi-Va-Fi-Po	UF-DF-CS-UG	lw(NG)-lm-mo(ls)	67
FL_TIM12_0076A_Nylanderia_NYLA027	Wa	UF-UG	lw	3
HP0013_Parapatrechina_pallida	NG(n-s)	UF	lw	15
HP0063_Parapatrechina_PARA015	NG(n)	UF	lw	2
HP0112_Parapatrechina_PARA004	NG(n)	UF	lw	1
HP0137_Parapatrechina_PARA023	NG(n)	UF	lw	2
HP0178_Parapatrechina_PARA021	NG(n)	DF	lw	4
JCM_0062_Nylanderia_PALA002	Mi	UF	lw	1
JCM_0136D_Parapatrechina_minutula	NG(n)-Au-Mi	UF(NG&ls)-CS(NG)	lw(NG&ls)-lm(ls)	3
JCM_0283A_Nylanderia_PALA001	Mi	UF-DF	lw	11
JSL120625_05_Pseudolasius_ORI002	As	-	-	-
JSL120626_01_Nylanderia_ORI003	As	-	-	-
JSL120627_02_Parapatrechina_ORI001	As	-	-	-
JSL120627_03_Nylanderia_ORI004	As	-	-	-
JSL120629_04_Nylanderia_ORI005	As	-	-	-
MiniRAP1_003_Parapatrechina_PARA022	NG(s)	UF	mo	3
MJ10222_Parapatrechina_PARA025	NG(s)	UF	lw	1
MJ10251_Parapatrechina_PARA003	NG(s)	UF	lw	3
MJ13142_Pseudolasius_PSEU003	NG(n-s)	UF	lw	9
MJ13190_Nylanderia_NYLA002	NG(s)	UF	lm	7
MJ13213_Nylanderia_NYLA030	NG(n)	UF-DF-UG	mo	5
MJ13216_Nylanderia_NYLA021	NG(n)	UF-DF-UG	mo	4
MJ13220_Nylanderia_NYLA009	NG(n)	CS	lw	5
MJ13225_Paratrechina_longicornis	All	All	All	29
MJ13236_Nylanderia_NYLA020	NG(s)	SP	lw	2
MJ13237_Nylanderia_NYLA004	NG(s)	SP	lw	3
MJ13240_Nylanderia_glabrior	NG(n-s)-Au-Mi-Fi-Po	UF-SP	lw(NG)-lm-mo(ls)	14
MJ13243_Nylanderia_NYLA024	NG(s)	SP	lw	3
MJ13806_Parapatrechina_PARA024	NG(s)	UF	lm	1
MJ13855_Parapatrechina_PARA001	NG(n)	UF	lw	6
MJ13877_Parapatrechina_lectamopteridis	NG(s)	SP	lw	12
MJ13888_Parapatrechina_PARA012	NG(s)	SP	lw	3
MJ13913_Nylanderia_NYLA025	NG(s)	UF-SP	lw	2
MJ14804_Parapatrechina_PARA018	NG(n)	CS	lw	6
MJ14851_Nylanderia_NYLA003	NG(n)	ALL	lw	90
MJ15022_Parapatrechina_PARA028	NG(s)	UF	lw	1
MJ15119_Parapatrechina_PARA011	NG(s)	UF	lw	1
MJ15399_Parapatrechina_opaca	NG(n)	UF	lw	4
MJ15403_Nylanderia_NYLA005	NG(s)	UF	lm	10
MJ16065_Nylanderia_NYLA022	NG(s)	UF	lw-lm	20
MJ16069_Pseudolasius_PSEU004	NG(n)	UF	lw	7
MJ16074_Parapatrechina_PARA013	NG(s)	UF-SP	lw	6
MJ16121_Parapatrechina_oceanica	Fi	UF-DF-SP-UG	lw-lm-mo	2
MJ16123_Nylanderia_FJ03	NG(n)-Fi	UF-DF(Fi)-CS-UG(NG)	lw(NG)-lm-mo(ls)	3
MJ16125_Nylanderia_vitiensis	Fi	UF-DF	lm-mo	2
MJ18281_Parapatrechina_PARA019	NG(n)	UF	lm	1
MJ18414_Parapatrechina_PARA014	NG(n-s)	UF	lw	3
MJ3044_Nylanderia_NYLA023	NG(n)	UF	lw	15
MJ6826_Pseudolasius_australis	NG(n-s)-Au	UF-DF	lw-lm	22
MJ6887_Nylanderia_nuggeti	NG(n-s)	UF-DF	lw-lm	3
MJ6928_Pseudolasius_PSEU005	NG(n)	UF	lw	2
MJ6933_Nylanderia_NYLA026	NG(s)	UF-DF-SP	mo	3
MJ7339_Nylanderia_NYLA012	NG(s)	UF	lw-lm	7
MJ7781_Parapatrechina_PARA010	NG(s)	UF	lw	2
MJ7862_Parapatrechina_PARA002	NG(n)	UF	lw	2
MJ8699_Nylanderia_helleri	NG(n-s)	UF	lw-lm	9
MJ8839_Parapatrechina_PARA006	NG(s)	UF	lw	4
MJ9198_Nylanderia_obscura	NG(s)-Au-Va	DF-SP-UG	lw-lm	16
MJ9384_Pseudolasius_PSEU002	NG(n-s)	UF	lw	6
MJPNG058_Parapatrechina_PARA020	NG(n-s)	UF-UG	mo	5
MJPNG069_Parapatrechina_PARA016	NG(s)	UF	mo	6
MJPNG081_Nylanderia_NYLA029	NG(n)	UF	mo	1
NYP843_1_Parapatrechina_PARA027	Mi	UF-DF	lw-lm-mo	4
ParaM_39_Euprenolepis_wittei	As	-	-	-
ParaM_41_Euprenolepis_procera	As-NG(n)	-	-	-
PHILSQ0006_Pseudolasius_typhlops	As	-	-	-
PHILSQ0015_Nylanderia_PHL003	As	-	-	-
PHILSQ0026_Pseudolasius_PHL002	As	-	-	-
PL_03_K010_Nylanderia_AUST001	Au	DF-SP	lm	1

Fig. A.1. Species delimitation analysis using bPTP based on a combined dataset consisting of 164 specimens with unique COI haplotypes and at least one gene marker sequenced. The input tree was the maximum likelihood phylogeny inferred by RAxML. bPTP calculated Bayesian supporting values (shown along branches) for each delimited species. We consider highly supported species boundaries to probabilities of more than 0.8. Conflicts between species delimitations based on morphology and bPTP are highlighted as red coloured branches, whereby bPTP suggested further split into two species for each lineage. Taxon label at each tip consists of each specimen voucher code and species name.



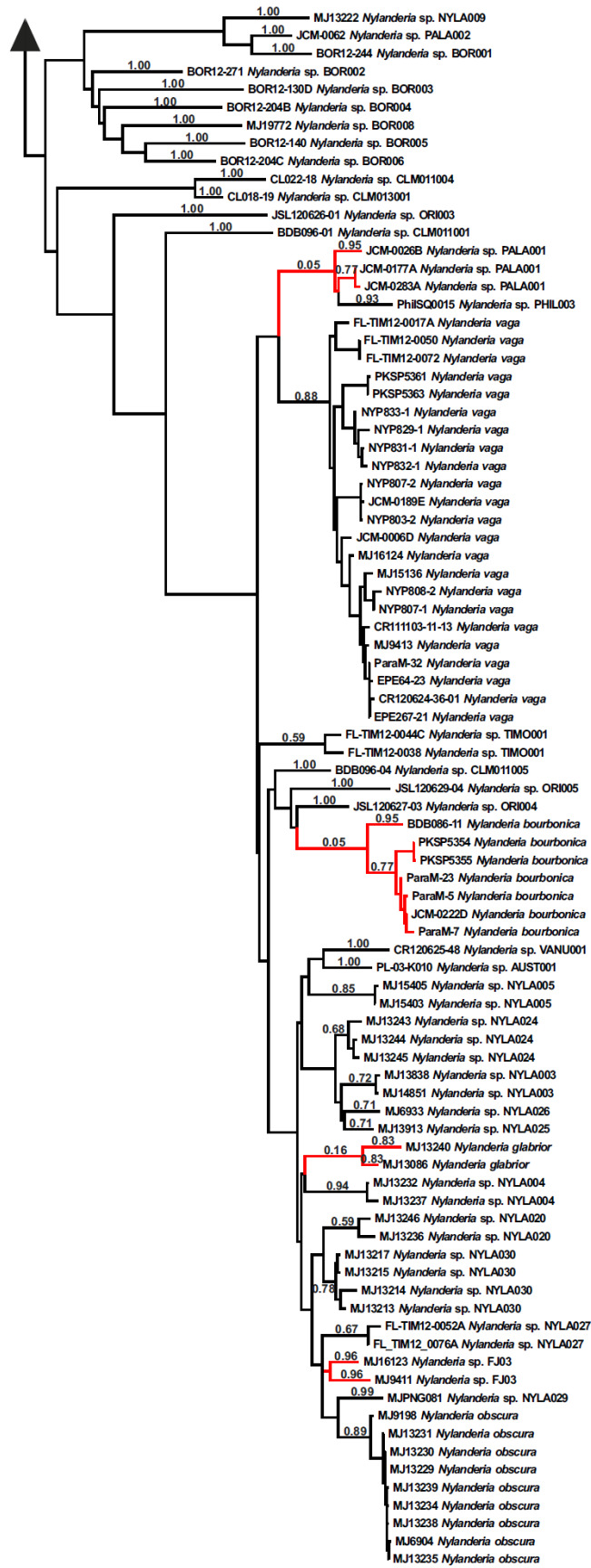


Fig. A.2. Consensus tree under the 50% majority rule of the multi-locus dataset using Bayesian inference as implemented in MrBayes. Branch lengths represent expected substitutions per site. Posterior probabilities from MrBayes and bootstrap support values from RAxML (1000 re-sampling events) are shown as coloured stars following the legend next to the tree. Taxon label at each tip consists of each specimen voucher code and species name. Major defined clades in the main manuscript are presented as numbered nodes on each major clade.

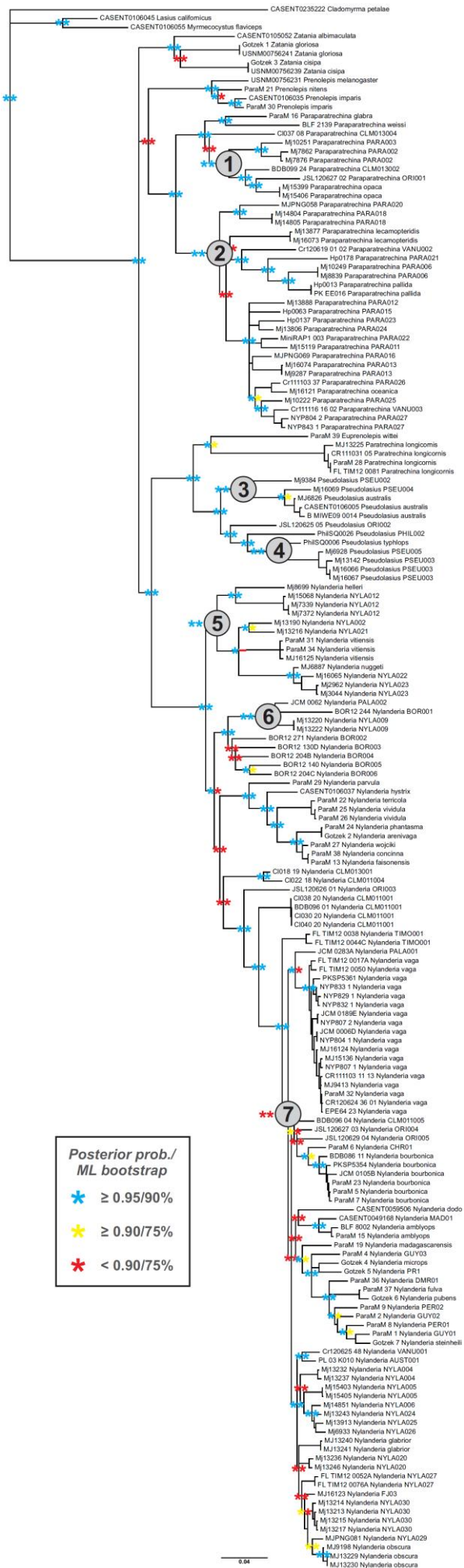
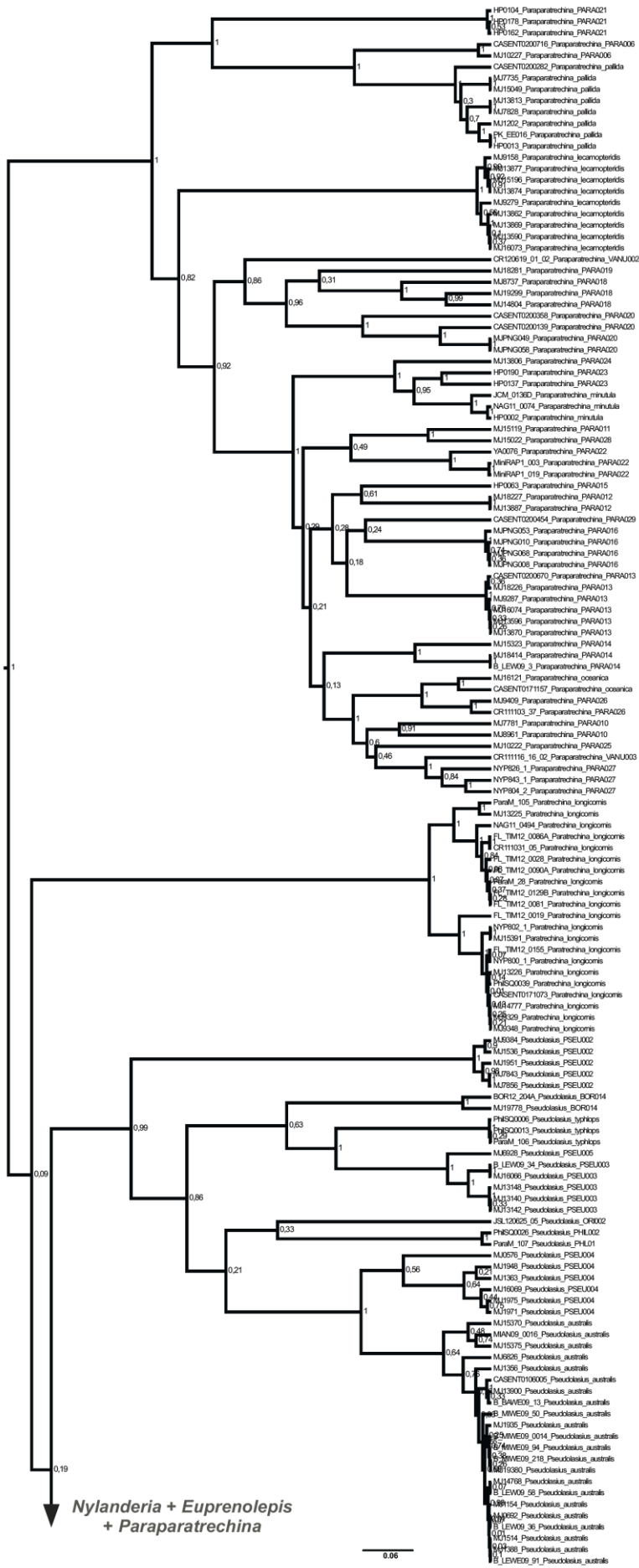


Fig. A.3. Gene tree inferred in BEAST based on a dataset consisting of unique COI haplotypes. Posterior probabilities are presented next to each node. Taxon label at each tip consists of each specimen voucher code and species name.



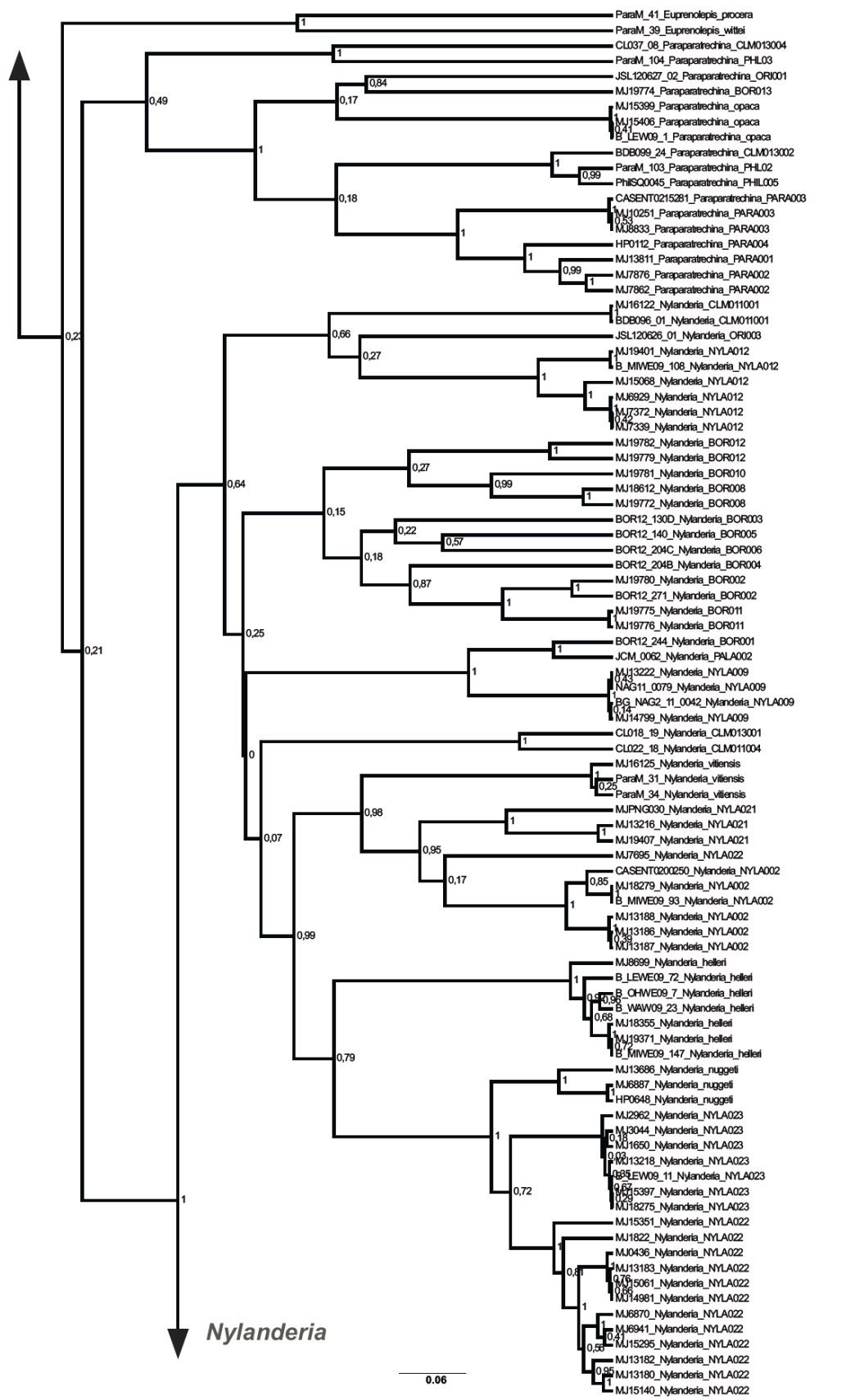
Parapatrechina

Paratrechina

Pseudolasius

Nylanderia + *Euprenolepis*
+ *Paraparatrechina*

0.06



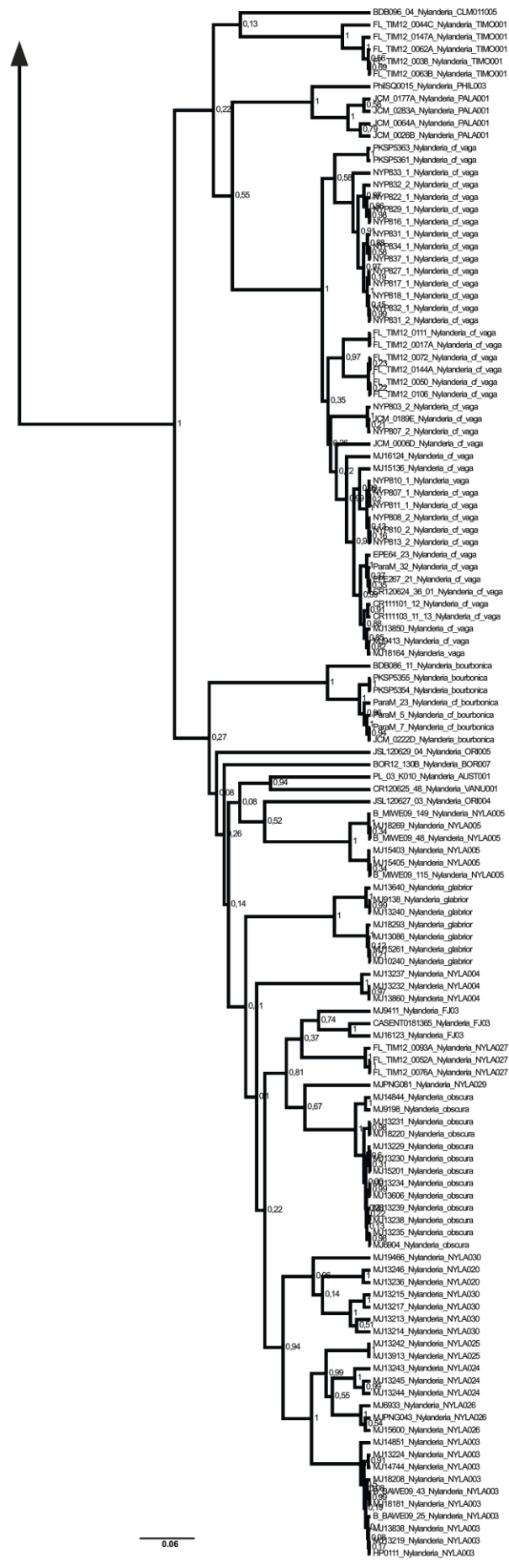
Parapatrechina

Nylanderia

Nylanderia

0.06

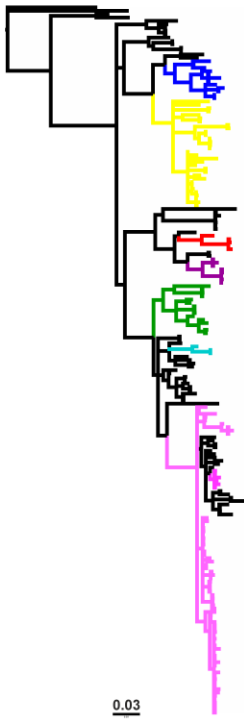
- ParaM_41_Euprenolepis_procera
- ParaM_39_Euprenolepis_wittiei
- CL037_08_Parapatrechina_CLM013004
- ParaM_104_Parapatrechina_PHL03
- JSL120627_02_Parapatrechina_ORI001
- MJ19774_Parapatrechina_BOR013
- MJ15399_Parapatrechina_cpaca
- MJ15406_Parapatrechina_cpaca
- B_LEW09_1_Parapatrechina_cpaca
- BBO099_24_Parapatrechina_CLM013002
- ParaM_103_Parapatrechina_PHL02
- PhISQ0045_Parapatrechina_PHL005
- CASENT0215281_Parapatrechina_PARA003
- MJ10251_Parapatrechina_PARA003
- MJ8833_Parapatrechina_PARA003
- HP0112_Parapatrechina_PARA004
- MJ13811_Parapatrechina_PARA001
- MJ7876_Parapatrechina_PARA002
- MJ7862_Parapatrechina_PARA002
- MJ16122_Nylanderia_CLM011001
- BBO096_01_Nylanderia_CLM011001
- JSL120626_01_Nylanderia_ORI003
- MJ19401_Nylanderia_NYLA012
- B_MIWE09_108_Nylanderia_NYLA012
- MJ15068_Nylanderia_NYLA012
- MJ6929_Nylanderia_NYLA012
- MJ7372_Nylanderia_NYLA012
- MJ7339_Nylanderia_NYLA012
- MJ19782_Nylanderia_BOR012
- MJ19779_Nylanderia_BOR012
- MJ19781_Nylanderia_BOR010
- MJ18612_Nylanderia_BOR008
- MJ19772_Nylanderia_BOR008
- BOR12_130D_Nylanderia_BOR003
- BOR12_140_Nylanderia_BOR005
- BOR12_204C_Nylanderia_BOR006
- BOR12_204B_Nylanderia_BOR004
- MJ19780_Nylanderia_BOR002
- BOR12_271_Nylanderia_BOR002
- MJ19775_Nylanderia_BOR011
- MJ19776_Nylanderia_BOR011
- BOR12_244_Nylanderia_BOR001
- JCM_0062_Nylanderia_PALA002
- MJ13222_Nylanderia_NYLA009
- NAG11_0079_Nylanderia_NYLA009
- BG_NAG2_11_0042_Nylanderia_NYLA009
- MJ14799_Nylanderia_NYLA009
- CL018_19_Nylanderia_CLM013001
- CL022_18_Nylanderia_CLM011004
- MJ16125_Nylanderia_villensis
- ParaM_31_Nylanderia_villensis
- ParaM_34_Nylanderia_villensis
- MJFNG030_Nylanderia_NYLA021
- MJ13216_Nylanderia_NYLA021
- MJ19407_Nylanderia_NYLA021
- MJ7695_Nylanderia_NYLA022
- CASENT0200250_Nylanderia_NYLA002
- MJ18279_Nylanderia_NYLA002
- B_MIWE09_93_Nylanderia_NYLA002
- MJ13188_Nylanderia_NYLA002
- MJ13186_Nylanderia_NYLA002
- MJ13187_Nylanderia_NYLA002
- MJ8699_Nylanderia_helleri
- B_LEWE09_72_Nylanderia_helleri
- B_CHWE09_7_Nylanderia_helleri
- B_WAW09_23_Nylanderia_helleri
- MJ18355_Nylanderia_helleri
- MJ19371_Nylanderia_helleri
- B_MIWE09_147_Nylanderia_helleri
- MJ13686_Nylanderia_ruggesii
- MJ6867_Nylanderia_ruggesii
- HP0648_Nylanderia_ruggesii
- MJ2962_Nylanderia_NYLA023
- MJ3044_Nylanderia_NYLA023
- CLM01650_Nylanderia_NYLA023
- MJ13218_Nylanderia_NYLA023
- B_LEW09_11_Nylanderia_NYLA023
- MJ15397_Nylanderia_NYLA023
- MJ18275_Nylanderia_NYLA023
- MJ15351_Nylanderia_NYLA022
- MJ1822_Nylanderia_NYLA022
- MJ0436_Nylanderia_NYLA022
- MJ13183_Nylanderia_NYLA022
- MJ15061_Nylanderia_NYLA022
- MJ14981_Nylanderia_NYLA022
- MJ6870_Nylanderia_NYLA022
- MJ6941_Nylanderia_NYLA022
- MJ15295_Nylanderia_NYLA022
- MJ13182_Nylanderia_NYLA022
- MJ13180_Nylanderia_NYLA022
- MJ15140_Nylanderia_NYLA022



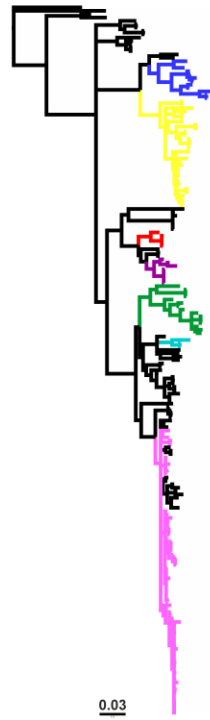
Nylanderia

Fig. A.4. Phylogenetic analyses of single gene markers in MrBayes. Branch lengths are represented in the same scale, thus, they are proportionate and comparable among trees. For single-gene analyses only, we included and excluded introns from the alignment in separate analyses to further investigate congruence among datasets. Branches are coloured for each genus following the legend next to the figure.

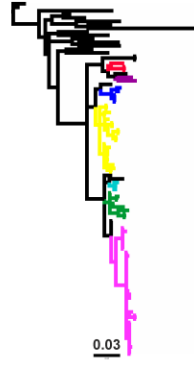
CAD gene, only exons



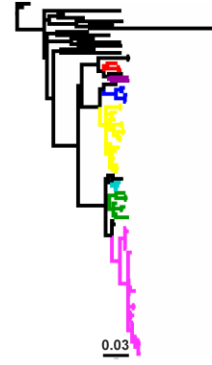
CAD gene, exons & introns



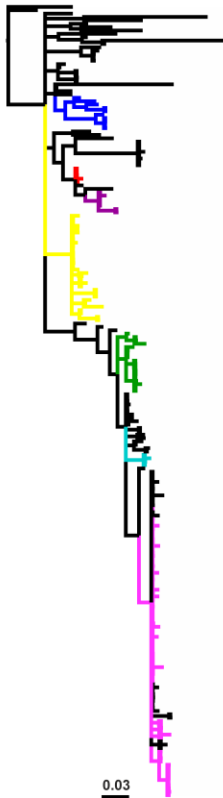
LWR gene, only exons



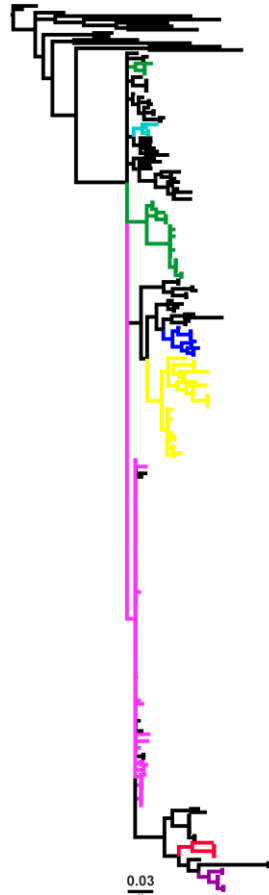
LWR gene, exons & introns



EF1 gene



EF2 gene



wingless gene

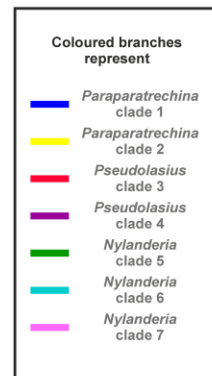
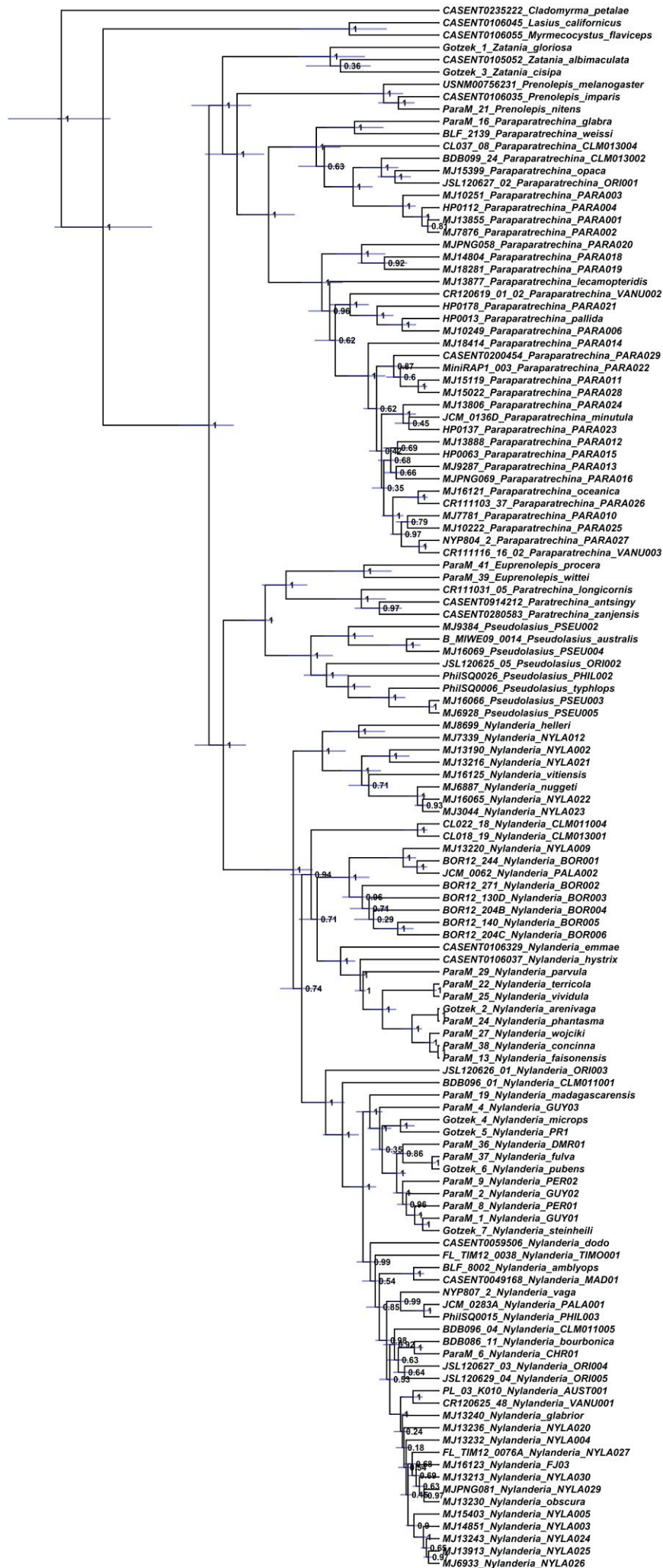


Fig. A.5. Divergence time estimation under the Yule tree prior in the program BEAST. The chronogram was summarized under the Maximum Clade Credibility approach and node information as the median estimate. 95% confidence interval displayed as bars on nodes. Posterior probabilities are labelled on each node. Time axis in million years ago.



-85 -80 -75 -70 -65 -60 -55 -50 -45 -40 -35 -30 -25 -20 -15 -10 -5

Fig. A.6. Output tree including pie charts from the biogeographical reconstruction analysis in BioGeoBEARS. The analyses was conducted under the preferred DEC+J model and the phylogeny was stratified in four time periods. The first tree shows on each node the most probable geographic range, while the second tree shows the pie chart probabilities for each node.

BioGeoBEARS DEC+J on Nylanderia stratified
ancstates: global optim, 9 areas max. d=0.0263; e=0.0026; j=0.2465; LnL=-298.42

