SUPPLEMENTAL FILE

**Range eclipse leads to tenuous survival of a rare lizard species on a barrier atoll**

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DNA amplification

Polymerase chain reaction (PCR) primers used in this study are listed below. PCR thermocycling conditions adhered to the following steps: 94°C denaturation - 2 min; 94°C – 30 sec, 58-62°C – 30 sec, 72°C – 45 sec (30 cycles); 72°C extension – 8 min. We used ExoSAP-IT™ PCR Product Cleanup Reagent for enzymatic cleanup of amplified PCR product prior to sequencing.

ND2

L4437b 5'- AAG CAG TTG GGC CCA TRC C-3' (Macey et al., 1997)

ND2r102 5'- CAG CCT AGG TGG GCG ATT G-3' (Sadlier et al., 2004)

tRNA-Met 5'- AAG CTY TYG GGC CCA TAC CCC GA-3' (Richmond et al. 2020)

tRNA-Ala 5'- CVT TAA TKA AAG TGT KTG AGT TGC ATT CAG-3' (Richmond et al. 2020)

RAG-1

G425 5'-AAA GCA AGG ATA GCG ACA AGA G-3') (Sadlier et al., 2004)

G396 (R13) 5'-TCT GAA TGG AAA TTC AAG CTG TT-3') (Groth and Barrowclough, 1999)

G397 (R18) 5’-GAT GCT GCC TCG GTC GGC CAC CTT T-3’ (Groth and Barrowclough, 1999)

*C*mos

G303 5'- ATT ATG CCA TCM CCT MTT CC-3') (Smith et al., 2007)

G74 5'- TGA GCA TCC AAA GTC TCC AAT C-3') (Saint et al., 1998)

G708 5’- GCT ACA TCA GCT CTC CAR CA-3’ (Hugall et al., 2008)

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**Table S1**. Substitution model selection based on AICc scores calculated in PartitionFinder. The same models were selected for non-phased nuclear gene datasets.

|  |  |  |  |
| --- | --- | --- | --- |
| Subset | Best Model | #sites | Partition  |
| 1 | HKY+Г+X | 102 | tRNA |
| 3 | GTR+I+Г+X | 347 | ND2 pos\_1  |
| 4 | TRN+I+Г+X | 347 | ND2 pos\_2  |
| 5 | GTR+I+Г+X | 347 | ND2 pos\_3 |
| 2 | GTR+X | 642 | C-*mos* |
| 6 | TRN+I+X | 675 | R35 |
| 7 | HKY+Г+X | 102 | RAG1 |

**Table S2**. Haplotype identities and by name and island location (*N* = no. individuals).

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Species | *N* | Island(s) |
| Hap\_01 | *E. atrocostata\_*13, 17–18 | 3 | Dåno′ & Inarajan, Guam |
| Hap\_02 | *E. atrocostata\_*66–67 | 2 | Agrigan, Guam |
| Hap\_03 | *E. atrocostata\_*68–70 | 3 | Saipan |
| Hap\_04 | *E. slevini*\_01 | 1 | Sarigan |
| Hap\_05 | *E. slevini*\_02, 07–08 | 3 | Sarigan & Alamagan |
| Hap\_06 | *E. slevini*\_03–06 | 4 | Dåno′ |
| Hap\_07 | *E. cyanura*\_05 | 1 | Dåno′ |
| Hap\_08 | *E. caeruleocauda*\_09 | 1 | Guam |
| Hap\_09 | *E. caeruleocauda*\_19 | 1 | Dåno′ |

Fig. S1 Time-calibrated maximum clade credibility tree. Bulleted nodes indicate posterior branch support of ≥0.90; numbers on the branches are the median age estimates and blue bars indicate the 95%HPD.



Appendix I. Specimen locality data. Institutions are as follows: USNM (United States National Museum, now National Museum of Natural History, Smithsonian Institution), USGS (U.S. Geological Survey, San Diego Field Station), TNHC (Texas Natural History Collections), KUBI (University of Kansas Biodiversity Institute), QM (Queensland Museum), MVZ (Museum of Vertebrate Zoology), WAM (Western Australia Museum), CAS (California Academy of Sciences), LSU (La Sierra University). Field tag identifiers: JQR (Jonathan Richmond); RNR (Robert Reed); RNF (Robert Fisher); JAM (Jimmy McGuire); DB (Don Buden); LLG (L. Lee Grismer).

| **Institution** | **Specimen ID** | **Species** | **Species labels** | **Country** | **Locality** | **Lat** | **Long** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| USNM | 322723 | *E. adspersa* | *EMAD\_01* | Samoa  | Upolu Island, Apia, Vaiala Beach  | -13.829097 | -171.750434 |
| USGS | RNF7700 | *E. adspersa* | *EMAD\_03* | Samoa  | Upolu Island, Apia | -13.835528 | -171.744961 |
| USGS | JQR1073 | *E. lawesi* | *EMLAW\_01* | United States (territory) | American Samoa, Aunu'u, Pala Lake | -14.283313 | -170.550895 |
| USGS | JQR1074 | *E. lawesi* | *EMLAW\_02* | United States (territory) | American Samoa, Aunu'u, Pala Lake | -14.282819 | -170.550594 |
| USGS | F20 | *E. arnoensis* | *EMAR\_01* | Micronesia, Federated States of | Marshall Islands, Arno Atoll | 7.047261 | 171.643376 |
| USGS | F21 | *E. arnoensis* | *EMAR\_02* | Micronesia, Federated States of | Marshall Islands, Arno Atoll | 7.047261 | 171.643376 |
| USGS | RNF246 | *E. atrocostata* | *EMAT\_01* | Papua New Guinea | Madang, Pig Island | -5.169923 | 145.841338 |
| TNHC | 59695 | *E. atrocostata* | *EMAT\_02* | Indonesia  | Maluku Province, Kai Ketjil Island, Kepalauan Kai | -5.754255 | 132.728414 |
| KUBI | 304896 | *E. atrocostata* | *EMAT\_03* | Philippines | Cagayan Province, Municipality of Calayan, Barangay Magsidel | 19.287211 | 121.409173 |
| KUBI | 323195 | *E. atrocostata* | *EMAT\_04* | Philippines | Cagayan Province, Municipality of Casiguran | 16.286666 | 122.185830 |
| USNM | 533307 | *E. atrocostata* | *EMAT\_05* | Solomon Islands | Temotu Province, Reef Islands, Fenualoa Island | -10.28828 | 166.320492 |
| USNM | 533311 | *E. atrocostata* | *EMAT\_06* | Solomon Islands | Temotu Province, Santa Cruz Island, Lata | -10.75904 | 165.764424 |
| USNM | 576201 | *E. atrocostata* | *EMAT\_07* | Micronesia, Federated States of | Caroline Islands, Yap Island Group, Yap Island, Colonia | 9.511621 | 138.121546 |
| QM | A005425 | *E. atrocostata* | *EMAT\_08* | Australia | Queensland, Torres Strait Islands, Ugar | -9.507608 | 143.545173 |
| QM | A005426 | *E. atrocostata* | *EMAT\_09* | Australia | Queensland, Torres Strait Islands, Ugar | -9.509090 | 143.544050 |
| TNHC | CCA612 | *E. atrocostata* | *EMAT\_10* | Papua New Guinea | Madang | -5.155689 | 145.800167 |
| MVZ | JAM7673 | *E. atrocostata* | *EMAT\_11* | Indonesia  | Sulawesi, Central Sulawesi Prov., Kecamatan Bungku Selatan | -2.987930 | 122.277890 |
| MVZ | JAM8597 | *E. atrocostata* | *EMAT\_12* | Indonesia  | Sulawesi, Central Sulawesi Prov., Uekuli River | -1.366800 | 121.163680 |
| USGS | JQR737 | *E. atrocostata* | *EMAT\_13* | United States (territory) | Mariana Islands, Guam, Dånó | 13.234776 | 144.647179 |
| WAM | WAM109565 | *E. atrocostata* | *EMAT\_14* | Indonesia | Maluku Province, Aru Islands, Tanahbesar, Pulau Meirang | -5.844542 | 134.310321 |
| WAM | WAM109566 | *E. atrocostata* | *EMAT\_15* | Indonesia | Maluku Province, Aru Islands, Tanahbesar, Pulau Meirang | -5.843868 | 134.302824 |
| WAM | WAM109779 | *E. atrocostata* | *EMAT\_16* | Indonesia | Maluku Province, Pulau Kai Besar | -5.681604 | 133.006555 |
| WAM | WAM109780 | *E. atrocostata* | *EMAT\_17* | Indonesia | Maluku Province, Pulau Kai Besar, Elat | -5.715631 | 132.962484 |
| USGS | DB\_3763 | *E. atrocostata* | *EMAT\_18* | Micronesia, Federated States of | Carloline Islands, Yap Island Group, Yap Island, Colonia | 9.516301 | 138.121335 |
| USGS | DB\_3765 | *E. atrocostata* | *EMAT\_19* | Micronesia, Federated States of | Carloline Islands, Yap Island Group, Yap Island, Colonia | 9.516308 | 138.121339 |
| USGS | RNF9012 | *E. atrocostata* | *EMAT\_25* | Papua New Guinea | Manus Province, Admiralty Islands, Manus Island  | -2.022466 | 147.270424 |
| USGS | RNF9013 | *E. atrocostata* | *EMAT\_26* | Papua New Guinea | Manus Province, Admiralty Islands, Manus Island  | -2.022466 | 147.270424 |
| USGS | JQR1064 | *E. atrocostata* | *EMAT\_27* | United States (territory) | Mariana Islands, Guam, Inarajan  | 13.271287 | 144.747553 |
| USGS | JQR1065 | *E. atrocostata* | *EMAT\_28* | United States (territory) | Mariana Islands, Guam, Inarajan  | 13.271337 | 144.747509 |
| USGS | JQR1208 | *E. atrocostata* | *EMAT\_29* | Japan | Ryukyu Islands, Miyako Islands, Miyakojima Island-1 | 24.800482 | 125.321917 |
| USGS | JQR1209 | *E. atrocostata* | *EMAT\_30* | Japan | Ryukyu Islands, Miyako Islands, Miyakojima Island-2 | 24.804118 | 125.326215 |
| USGS | JQR1210 | *E. atrocostata* | *EMAT\_31* | Taiwan | Lutao Island | 22.663484 | 121.472519 |
| USGS | JQR1211 | *E. atrocostata* | *EMAT\_32* | Taiwan | Lutao Island | 22.672974 | 121.498186 |
| USGS | JQR1212 | *E. atrocostata* | *EMAT\_33* | Taiwan | Lanyu Island | 22.060727 | 121.569377 |
| USGS | JQR1213 | *E. atrocostata* | *EMAT\_34* | Taiwan | Lanyu Island | 22.038389 | 121.568462 |
| USGS | JQR1214 | *E. atrocostata* | *EMAT\_35* | Taiwan | Lanyu Island | 22.028224 | 121.583449 |
| USGS | JQR1215 | *E. atrocostata* | *EMAT\_36* | Taiwan | Lanyu Island | 22.018333 | 121.596994 |
| USGS | JQR1216 | *E. atrocostata* | *EMAT\_37* | Taiwan | Lanyu Island | 22.004809 | 121.578357 |
| CAS | CAS236321 | *E. atrocostata* | *EMAT\_38* | Republic of Palau | Ngeruchubtang Island | 7.085315 | 134.332608 |
| CAS | CAS236437 | *E. atrocostata* | *EMAT\_39* | Republic of Palau | Ngermalk Island | 7.336717 | 134.464900 |
| CAS | CAS236444 | *E. atrocostata* | *EMAT\_40* | Republic of Palau | Ngeaur Island | 6.899211 | 134.127263 |
| CAS | CAS238136 | *E. atrocostata* | *EMAT\_41* | Republic of Palau | Ngedbus Island | 7.054000 | 134.263900 |
| CAS | CAS248693 | *E. atrocostata* | *EMAT\_42* | Republic of Palau | Ngercheu Island Group; Turtle Cove Island | 7.090933 | 134.265433 |
| CAS | CAS248833 | *E. atrocostata* | *EMAT\_43* | Republic of Palau | Southwest Islands, Sonsorol Island | 5.332066 | 132.219550 |
| CAS | CAS248939 | *E. atrocostata* | *EMAT\_44* | Republic of Palau | Malakal | 7.327202 | 134.452056 |
| CAS | CAS248957 | *E. atrocostata* | *EMAT\_45* | Republic of Palau | Babeldaob, Airai State, Airai Village, | 7.349376 | 134.536870 |
| CAS | CAS249310 | *E. atrocostata* | *EMAT\_46* | Republic of Palau | Koror: Koror town, Ngesaol Hamlet | 7.349516 | 134.506850 |
| LSU | LLG4793 | *E. atrocostata* | *EMAT\_49* | West Malaysia | Pahang, Pulau Tulai | 2.913569 | 104.107166 |
| LSU | LLG4794 | *E. atrocostata* | *EMAT\_50* | West Malaysia | Pahang, Pulau Tulai | 2.914501 | 104.105573 |
| LSU | LLG5183 | *E. atrocostata* | *EMAT\_20* | West Malaysia | Johor, Pulau Seri Buat | 2.683770 | 103.912267 |
| LSU | LLG5194 | *E. atrocostata* | *EMAT\_21* | West Malaysia | Johor, Pulau Seri Buat | 2.690312 | 103.916476 |
| LSU | LLG5770 | *E. atrocostata* | *EMAT\_22* | West Malaysia | Johor, Pulau Sibu | 2.226346 | 104.062379 |
| LSU | LLG5771 | *E. atrocostata* | *EMAT\_23* | West Malaysia | Johor, Pulau Sibu | 2.226346 | 104.062379 |
| LSU | LLG5772 | *E. atrocostata* | *EMAT\_47* | West Malaysia | Johor, Pulau Sibu | 2.200975 | 104.085620 |
| LSU | LLG5773 | *E. atrocostata* | *EMAT\_48* | West Malaysia | Johor, Pulau Sibu | 2.200360 | 104.085945 |
| LSU | LLG5801 | *E. atrocostata* | *EMAT\_58* | West Malaysia | Johor, Pulau Sibu Kukus | 2.179838 | 104.110778 |
| LSU | LLG5806 | *E. atrocostata* | *EMAT\_59* | West Malaysia | Johor, Pulau Sibu Tengah | 2.186566 | 104.102942 |
| LSU | LLG5815 | *E. atrocostata* | *EMAT\_60* | West Malaysia | Johor, Pulau Sibu Papan | 2.196118 | 104.071284 |
| LSU | LLG6179 | *E. atrocostata* | *EMAT\_24* | East Malaysia | Sabah (Borneo), Turtle Island | 6.185105 | 118.118535 |
| LSU | LLG6271 | *E. atrocostata* | *EMAT\_57* | West Malaysia | Pahang, Pulau Tulai | 2.910718 | 104.100446 |
| LSU | LLG6275 | *E. atrocostata* | *EMAT\_56* | West Malaysia | Pahang, Pulau Tulai | 2.910886 | 104.098254 |
| LSU | LLG6333 | *E. atrocostata* | *EMAT\_55* | West Malaysia | Johor, Pulau Nangka Besar | -2.406597 | 105.795551 |
| LSU | LLG6362 | *E. atrocostata* | *EMAT\_51* | West Malaysia | Johor, Pulau Simbang | 2.265431 | 104.150750 |
| LSU | LLG6363 | *E. atrocostata* | *EMAT\_52* | West Malaysia | Johor, Pulau Simbang | 2.265054 | 104.151217 |
| LSU | LLG6406 | *E. atrocostata* | *EMAT\_53* | West Malaysia | Johor, Pulau Sibu Tengah | 2.187238 | 104.101422 |
| LSU | LLG6407 | *E. atrocostata* | *EMAT\_54* | West Malaysia | Johor, Pulau Sibu Tengah | 2.186944 | 104.102278 |
| USGS | DB\_4015 | *E. atrocostata* | *EMAT\_61* | Micronesia, Federated States of | Sorol Atoll | 8.134948 | 140.380779 |
| USGS | DB\_4016 | *E. atrocostata* | *EMAT\_62* | Micronesia, Federated States of | Sorol Atoll | 8.134948 | 140.380779 |
| USGS | JQR1889 | *E. atrocostata* | *EMAT\_63* | Solomon Islands | Choiseul Province, Taro Island | -6.711430 | 156.39920 |
| USGS | JQR1890 | *E. atrocostata* | *EMAT\_64* | Solomon Islands | Choiseul Province, Taro Island | -6.711430 | 156.39920 |
| USGS | JQR2528 | *E. atrocostata* | *EMAT\_65* | United States (territory) | Mariana Islands, Agrigan (Guam) | 13.243350 | 144.708784 |
| USGS | JQR2529 | *E. atrocostata* | *EMAT\_66* | United States (territory) | Mariana Islands, Agrigan (Guam) | 13.243557 | 144.708751 |
| USGS | JQR2533 | *E. atrocostata* | *EMAT\_67* | United States (territory) | Mariana Islands, Agrigan (Guam) | 13.243282 | 144.708728 |
| USGS | RNR295 | *E. atrocostata* | *EMAT\_68* | United States (Commonwealth) | Northern Mariana Islands, Saipan, Isleta Maigo Luao | 15.150791 | 145.790101 |
| USGS | RNR296 | *E. atrocostata* | *EMAT\_69* | United States (Commonwealth) | Northern Mariana Islands, Saipan, Isleta Maigo Luao | 15.150791 | 145.790101 |
| USGS | RNR297 | *E. atrocostata* | *EMAT\_70* | United States (Commonwealth) | Northern Mariana Islands, Saipan, Unai Laggua | 15.273712 | 145.828388 |
| USNM | 576213 | *E. boettgeri* | *EMBO\_01* | Micronesia, Federated States of | Caroline Islands, Pohnpei | 6.957597 | 158.210438 |
| USGS | F28 | *E. boettgeri* | *EMBO\_02* | Micronesia, Federated States of | Marshall Islands, Arno Atoll: Jabonwod Dist. | 7.062704 | 171.551110 |
| USGS | FS01 | *E. nativitatus* | *EMNA\_01* | Australia | Christmas Island, Egeria Point | -10.508695 | 105.541263 |
| USGS | FS03 | *E. nativitatus* | *EMNA\_02* | Australia | Christmas Island, Egeria Point | -10.511907 | 105.543765 |
| USNM | 536082 | *E. slevini* | *EMSL\_01* | United States (Commonwealth) | Northern Mariana Islands, Sarigan Island | 16.711148 | 145.770796 |
| USNM | 536083 | *E. slevini* | *EMSL\_02* | United States (Commonwealth) | Northern Mariana Islands, Sarigan Island | 16.713744 | 145.776885 |
| USGS | Es\_02 | *E. slevini* | *EMSL\_03* | United States (territory) | Mariana Islands, Dånó | 16.713744 | 145.776885 |
| USGS | Es\_03 | *E. slevini* | *EMSL\_04* | United States (territory) | Mariana Islands, Dånó | 16.713744 | 145.776885 |
| USGS | Es\_04 | *E. slevini* | *EMSL\_05* | United States (territory) | Mariana Islands, Dånó | 16.713744 | 145.776885 |
| USGS | Es\_05 | *E. slevini* | *EMSL\_06* | United States (territory) | Mariana Islands, Dånó | 16.713744 | 145.776885 |
| USGS | JQR2538 | *E. slevini* | *EMSL\_07* | United States (Commonwealth) | Northern Mariana Islands, Alamagan | 16.713744 | 145.776885 |
| USGS | JQR2551 | *E. slevini* | *EMSL\_08* | United States (Commonwealth) | Northern Mariana Islands, Alamagan | 16.713744 | 145.776885 |
| CAS | CAS184020 | *E. cyanura* | *EMCY\_05* | United States (territory) | Mariana Islands, Dånó | 13.240163 | 144.657306 |
| USGS | JQR736 | *E. caeruleocauda* | *EMCA\_09* | United States (territory) | Mariana Islands, Guam | 13.650323 | 144.856280 |
| USGS | Ec\_02 | *E. caeruleocauda* | *EMCA\_09* | United States (territory) | Mariana Islands, Dånó | 13.237310 | 144.650720 |