Editorial. SANTO 2006, new taxa from the bottom of the sea to montane forests

Beach and lagoon, West coast of Cumberland peninsula, near Penaoru, Espiritu Santo Island, Vanuatu. Photo: Emmanuel Boitier.

This special issue of *Zoosystema* brings together taxonomical contributions concerning specimens and data collected during the SANTO 2006 Global Biodiversity Survey that took place between August and December 2006 in Espiritu Santo (Vanuatu). The goal of this expedition, which was initiated by the Muséum national d'Histoire naturelle, Paris (MNHN), Institut de Recherche pour le Développement (IRD) and ProNatura International, was to document the organisms, both marine and non-marine, living on or around this tropical oceanic island (see the introduction by the three directors of SANTO 2006, Philippe Bouchet, Hervé Le Guyader and Olivier Pascal, p. 401). All major environments were sampled, from deep offshore sea bottoms to coral reefs, beaches, caves, rivers, forests and mountains. Field work was conducted by 153 scientists, volunteers and students from 25 countries (Bouchet *et al.* 2008).

Because it is composed of classical peer-reviewed articles, this special issue cannot act as an introduction to the Santo fauna. That is the aim of the forthcoming book, *The Natural History of Santo*, which will also be published under the auspices of the MNHN (Bouchet *et al.* in press). Nor can this special issue accurately reflect the sampling effort made during the expedition, which would require the equivalent of many annual volumes of *Zoosystema* over the coming years. Surprisingly, this special issue provides a broad and relatively balanced overview of the different components of Santo's zoological diversity from the bottom of the sea to the mountains.

All of the contributions – except for one – are about invertebrates. The terrestrial fauna of vertebrates is known to be poor on oceanic islands, and most of the species have already been described. Four new species of vertebrates were, however, discovered during SANTO 2006. The first is a gecko, *Lepidodactylus buleli* Ineich, 2008 (Reptilia, Gekkonidae), that I was lucky enough to find while looking for ants inside of epiphytic, myrmecophytic Rubiaceae during the few days the reptile specialist was present in the same area (see Ineich 2008). The three others are fishes, two damselfishes (Pomacentridae) (Pyle *et al.* 2008) and one goby fish, which is described in this issue (see the contribution by Keith *et al.*, p. 471).

In a few words, and to give an idea of the amount of new data provided by this special issue, I shall briefly review below the taxa (species, but also genera)

that are new to science thanks to SANTO 2006, emphasizing those that have been given taxonomic designations in honour of Vanuatu.

The sea bottom off of Santo (between 32 and 481 m depth) revealed four new species of crustaceans from the genus *Munida* and one from the genus *Raymunida* (Galatheidae) (see the contribution by Macpherson, p. 431, which also describes two new species of *Munida* collected during recent excursions carried out around the Loyalty Islands and Vanuatu). A new species of *Asterodiscides* (Echinodermata, Asteroidea, Asterodiscididae) was also discovered (105-135 m depth, Malo island) (see the contribution by Lane & Rowe, p. 419).

The shallow sublittoral area around the island provided two new species of crustaceans from the Pagurapseudidae family including *Pagurapseudes queirosi* Bamber, 2009, which was named in honour of the Spaniard who named Santo in 1606 (see the contribution by Bamber, p. 407).

Collections made in the brackish environment of the intertidal coast revealed the presence of a very strange new species of sea slug (an acochlidian gastropod), *Pseudunela espiritusanta* Neusser & Schrödl, 2009, whose precise description required computer-based, 3-dimensional reconstruction (see the contribution by Neusser & Schrödl, p. 453).

The littoral sands of Santo revealed 18 species of Collembola. All are reported for the first time from Vanuatu, which doubles the number of known species for this country; however, no species new to science was discovered in this habitat (see the contribution by Thibaud, p. 499).

The new species of goby fish, *Stiphodon mele* Keith, Marquet & Pouilly, 2009 (Gobiidae, Sicydiinae) that is described in this issue (see the contribution by Keith *et al*. p. 471), was named for the Mele falls (Efate island) where the holotype was found. Due to its peculiar behaviour, this species, whose range also includes New Caledonia, also provides a good link between the marine and the non-marine world as it is amphidromous. Adults spawn in freshwater; the embryos drift downstream to the sea where they undergo a planktonic phase before returning to the rivers to grow.

Rivers are not only the domain of fish; they also shelter aquatic invertebrates, at least during their larval stage. These riparian environments provided a new species of damselfly, *Vanuatubasis santoensis* Ober & Staniczek, 2009, which has been attributed to a new genus, *Vanuatubasis*, and which is described and illustrated in this issue (see the contribution by Ober & Staniczek, p. 485) based on specimens collected from the different islands of Vanuatu (Aneityum, Espiritu Santo, and Malekula).

Arthropods undoubtedly constitute the bulk of terrestrial biodiversity. On Santo they were collected from sea level to mountain summits, mostly in forests but also inside or at the entrance of caves. Two new species of Collembola (Neanuridae family) were extracted from the litter, including *Friesea santo* Weiner, Bedos & Deharveng, 2009 (found in a cave entrance) (see the contribution by Weiner *et al.*, p. 507, which also describes two new species from New Caledonia). A team of Orthoptera specialists conducted a remarkable study of the different terrestrial environments on the island. Their contributions provide a quantity of information about this order. Thirteen new species of crickets from Santo are reported, including *Phaloria faponensis* Desutter-Grandcolas, 2009 (named for the Fapon cave in Butmas) and *P. pentecotensis* Desutter-Grandcolas, 2009 (named for the type locality, Pentecost island), *P. walterlinii* Desutter-Grandcolas, 2009 (species dedicated to Walter Lini, founding Prime Minister of Vanuatu who led the country to independence) (see the contribution by Desutter-Grandcolas, p. 619), *Cardiodactylus tankara* Robillard, 2009 (named for the Tankara plateau), *Lebinthus santoensis* Robillard, 2009 and *L. nattawa* Robillard, 2009 (from the Nattawa locality) (see the contribution by Robillard, p. 577, which includes the description of four additional new species from different Vanuatu islands). The contribution of Desutter-Grandcolas (p. 619) also honours Vanuatu with a new subspecies of cricket *Cophonemobius faustini funafus* (named after the type locality, close to Funafus village on Santo). Two new species of Gryllacrididae are also reported: *Amphibologryllacris butmasi* Hugel, 2009 (from Butmas) and *Psilogryllacris tchancha* Hugel, 2009 (borrowed from the local name for the insect) (see the contribution by Hugel, p. 525).

The IBISCA-Santo programme took place in the Penaoru valley with the aim of quantifying variations

Views of the canopy (top) and undergrowth (bottom) of the tropical forest in Saratsi range near Penaoru valley, at *c.* 900 m of elevation, Espiritu Santo Island, Vanuatu. Photos: Emmanuel Boitier.

in the biodiversity along an altitudinal gradient. It takes time for such an effort to produce an overall result; nevertheless some of the specimens collected from the altitudinal forest transect – included or not in the protocol – have already allowed species new to science to be described.

Thus a scorpion, *Lychas santoensis* Lourenço, 2009 (Buthidae), that is new to science was collected in the forest at 900 m a.s.l. (see the contribution by Lourenço, p. 731).

The use of Malaise traps during the IBISCA project resulted in some interesting preliminary results concerning Hymenoptera and Diptera. This is the case for a new genus of Pompilid wasps from the Ageniellini tribe, *Melanagenia* Wahis, 2009, and two new endemic species, *Melanagenia penaoru* Wahis & Durand, 2009 and *Anoplius santo* Wahis & Durand, 2009 (see the contribution by Wahis *et al.*, p. 707). Concerning bees (Apoidea), a new species, *Lasioglossum* (*Chilalictus*) *vanuatu* Pauly, 2009 was discovered in the kauri forest between 600 and 900 m a.s.l. (see the contribution by Pauly & Villemant, p. 719). Malaise traps also permited to discover a new species of hymenopteran ectoparasitoid from the Dryinidae family, *Anteon molisae* Olmi, 2009 (named in honour of Grace Mera Molisa, poet, campaigner for women's equality in politics, who dedicated herself to the independence of Vanuatu). *Anteon molisae* was collected on two IBISCA sites at *c.* 900m a.s.l. (see the contribution by Olmi & Villemant, p. 691). Finally, a new species of empidid fly (Diptera, Empididae, Hemerodromiinae) was collected in the mountain forest at 1200 m a.s.l. (see the contribution by Plant & Daugeron, p. 519). Ground-level flight intercept traps installed along the elevation transect (see photo p. 403) allowed for the collection of eight new species of myrmecophilous beetles (Histeridae), two species of which were named in honour of the country *Ceratohister vanuatu* Tishechkin, 2009 and *Eucurtiopsis penaoru* Tishechkin, 2009 (see the contribution by Tishechkin, p. 661).

The 17 contributions to this special issue reflect only a very small part of the SANTO 2006 sampling effort. No doubt that many other results will be published in the coming years which will considerably broaden our knowledge of the biodiversity of Santo.

This special issue of *Zoosystema* is dedicated to the inhabitants of Vanuatu.

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The SANTO 2006 Global Biodiversity Survey: an attempt to reconcile the pace of taxonomy and conservation

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When the description of the gecko *Lepidodactylus buleli* was published in October 2008, one of the journalists that reported the discovery in Vanuatu entitled his press release "Better later than never". Yet, less than two calendar years had elapsed between the collecting of suspect eggs in the forests of Penaoru, their rearing in captivity by reptile buffs, the recognition of a new species and its description by Ivan Ineich, and finally its publication in the taxonomy journal *Zootaxa* (Ineich 2008). To an academic research scientist, this was a remarkably swift sequence of events. To a lay person, this is an agonizingly long period of time. We live in an age of immediacy, and the journalist's "Better later than never" epitomizes the difficulty in reconciling the pace of academic research with that of environmental decision-making.

Historically, the time-proven approach to documenting biodiversity – and certainly the most familiar to the readers of this journal – is undoubtedly that of taxonomical inventories. Taxonomists travel the world to discover species, document where they live, name them and establish their classification. To a taxonomist, "every species counts". They return to their "home" institution with specimens of taxa that have attracted their attention for one reason or another (suspected new species, rare or seldom seen species, population with unusual variation, etc.). After two and half centuries of such exploration, taxonomists have successfully documented