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

Philippe BOUCHET
Muséum national d'Histoire naturelle, Département Systématique et Évolution,
case postale 51, 57 rue Cuvier, F-75231 Paris cedex 05 (France)
pbouchet@mnhn.fr

Hervé LE GUYADER
UMR 7138 "Systématique, Adaptation, Évolution",
Université Pierre & Marie Curie,
7 quai Saint Bernard, F-75252 Paris cedex 05 (France)

Olivier PASCAL
Pro-Natura International, 15 avenue de Ségur, F-75007 Paris (France)

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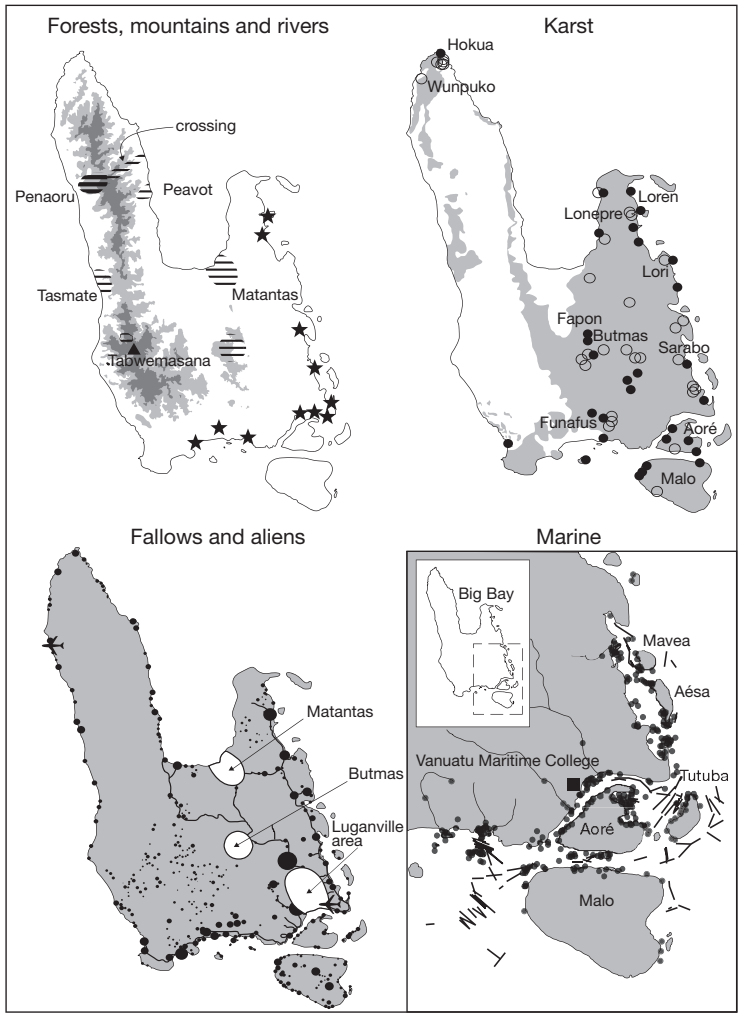
When the description of the gecko *Lepidodactylus buleli* was published in October 2008, one of the journalists that reported the discovery in Vanuatu entitled his press release "Better later than never". Yet, less than two calendar years had elapsed between the collecting of suspect eggs in the forests 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



Location on Espiritu Santo of the study sites for each of the four themes that structured the SANTO 2006 Global Biodiversity Survey. **Forests, mountains and rivers**: thick stipples, intensive sampling (Penaoru area); thin stipples, less intensive sampling; ★, scattered sampling. **Karst**: ●, dry caves; ○, caves with aquifer. **Fallows and aliens**: a very disturbed site (Luganville area), a site less intensively transformed (Matantas) and a low pressure site (Butmas); as background, the map shows the population density (1988 census, population of Luganville not shown), tracks and airfields. **Marine**: ●, dive and intertidal sites; segments, trawl or dredge hauls.

around 1.8 million species, and continue to describe new species at the pace of 16 000 per year. By the end of the 19th century, the big picture of biogeographical realms was already clear: the "Southern Seas" formed a single biogeographical marine province – part of the vast Indo-West Pacific region –, while each island or island group was rich in terrestrial endemics. The quest to delineate the finer details of this big picture continues to this day, and the SANTO 2006 Global Biodiversity Survey (Bouchet *et al.* 2008) was part of this long tradition. But we now live in an age of environmental anxiety, and taxonomists are not good at delivering in a timely fashion facts and data that are meaningful for nature management and conservation. Taxonomists are obsessed with species and their names, and they consider their work "done" only when the last specimen of the last sample has been bestowed with a species identification. As a result, it takes years – many years – for taxonomists to deliver their results: this time lag is part of what has been called the "taxonomic impediment" (see, e.g., Evenhuis 2007, but see also Flowers 2007). Ten years, even five years, is not a time frame that fares well in our age of immediacy: managers, funding bodies, decision makers, like to have "immediate" results. These limitations of taxonomical work have paved the way for a new approach to biodiversity research and monitoring, i.e. biodiversity assessments. Conservationists need "immediate" science-based facts to inspire decisions and policy on land and sea use and management. But conservationists are daunted by the magnitude of the biodiversity they want to highlight, promote, and conserve. The "taxonomic impediment" is real. As a consequence, biodiversity assessments focus on a few selected taxa for which there is the knowledge and work force to identify them on the spot: birds

Insect trapping using intercept flight traps (top) and scuba diver collecting fish in deep reefs “twilight zone” (bottom) during SANTO 2006 Global Biodiversity Survey. Photos: Xavier Desmier.

and mammals, trees, reef corals and fishes, and, at best, a handful of charismatic invertebrates such as butterflies and dung beetles. Conservation International, the influent Washington-based Non Governmental Organization, has coined (and trademarked!) the term Rapid Biological Assessment for this approach. Typically, conservationists leave the field with "data" and species lists for selected taxa, and (very) marginally with specimens. On a global scale, the Rapid Assessment approach has been successful in highlighting areas of conservation interest, in raising and disseminating environmental awareness, and in bringing together the worlds of public agencies (the World Bank, USAID, etc.), private funding (corporate and foundations) and public opinion. But Vanuatu does not have any of the charismatic vertebrates that, elsewhere, are the flagships of conservation (e.g., primates, cats, or even crocodiles), and this may be the reason why none of the major international NGOs are operating in the country. Yet, serious science-based conservation in the South Pacific cannot afford to ignore, e.g., the snails, the weevils or the geckos, all of which have astonishingly high levels of single-island or island-group endemism, and are threatened by loss of habitat and the spread of aliens.

It is precisely this gap between taxonomy and conservation that the SANTO expedition has attempted to bridge, and reconciling the pace of the two disciplines has not proven to be straightforward. However, well before the present issue of *Zoosystema* was published, descriptions of new species from Santo started to appear in less than six months after the expedition: Roland Gerstmeier and Jürgen Schmidl (Gerstmeier & Schmidl 2007) very appropriately named the first "SANTO 2006 new species" after the island of Espiritu Santo itself, the cleriid beetle *Omadius santo*. The "spirit of the place" also haunted Damia Jaume and Eric Queinnec when they named a new freshwater isopod *Exosphaeroides quirosi* after Pedro Fernandez de Quirós [also spelled Queiros], the first European to reach Espiritu Santo in 1606, exactly 400 years before the SANTO 2006 expedition (Jaume & Queinnec 2007). The specific epithet of the mayfly *Caenis vanuatensis* Malzacher & Staniczek, 2007, requires no explanation. With the publication of the paper by Richard Pyle, John Earle and Brian Greene describing new species of damselfishes from deep coral reefs of the Pacific Ocean, the 1st of January 2008 was a special day in the development of "cybertaxonomy", a modern form of publishing and disseminating the results of taxonomy (Pyle *et al.* 2008). This was the first work to embed links to a whole new generation of databases: ZooBank (http://www.zoobank.org), Barcode of Life Database (BOLD, http://www.boldsystems.org), MorphBank (http://www.morphbank.net) and more, and it is not insignificant that it contained the descriptions of two new species from Santo, *Chromis brevirostris* and *C. earina*. In fact, at the time of this writing, we can be satisfied that a small menagerie of new species from Santo has already been described, including also a millipede (Golovatch *et al.* 2008), a crab (Ng & Naruse 2007), and several marine snails (Kantor *et al.* 2008; Terryn & Holford 2008).

For such species, and those described in the present volume of the journal *Zoosystema*, the time lag between collection and description of new species has been successfully reduced. And this is the half-full glass. But these new species represent only a fraction of the new species from Santo awaiting formal identification and description. And this is the half-empty (or much less!) glass. For instance, Paolo Albano has segregated to morphospecies the collection of Triphoridae, a family of sinistral marine microgastropods, collected during the expedition. No less than 23 238 specimens were sampled, representing 259 species, of which 85 are represented by molecular samples. To place these figures in perspective, it should be recalled that the whole of European seas have only 19 species, and the whole of Japan – from the Kuriles in the North to tropical Ryukyus in the South – has only 109. Given the current chaos in triphorid systematics, it might take a decade, or more, to actually bridge the gap between these 259 morphospecies and named entities. However names are essential to communicate about properties and attributes of species (Thompson 1997), and there is justifiable concern for the gap between discovering and documenting the diversity of the world and backing

Collection of freshwater animals in a small creek during SANTO 2006 Global Biodiversity Survey. Photo: Xavier Desmier.

this exercise with sound nomenclature (Bouchet & Strong in press).

The SANTO 2006 Global Biodiversity Survey did not "solve" the taxonomic impediment. It was perhaps only moderately successful in bridging the mentality gap between academic biodiversity exploration and operational conservation. But it did attempt to reconcile the pace of taxonomical research and conservation action, and it succeeded spectacularly in communicating with the general public the exhilaration of exploration and discovery, and this in a Pacific island nation without primates, cats or crocodiles.

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Philippe Bouchet,
Hervé Le Guyader,
Olivier Pascal
Directors, SANTO 2006 Global Biodiversity Survey

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