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Taxonomy's rebirth triggered by the international biodiversity policies :

An historical and anthropological approach

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Introduction

In 1985, the neologism « biodiversity » was invented by Walter G. Rosen during the preparation of the *National Forum on Biological Diversity* held in 1986 in Washington D.C. (Le Guyader 2008 : 7). For Marris 2006 and other authors, it is during this National Forum that the biologists gave the first important alert concerning the crisis of biodiversity which had a political and mediatised impact. For these biologists, biological diversity was disappearing so quickly that some of them do not hesitate any longer to call this crisis the 6th extinction, even though such an expression is disputed by other biologists (Le Guyader 2008 : 17-18).

A few years before this alert and the invention of the concept of biodiversity, a fogging experiment was conducted in 1982 by Terry Erwin on an isolated tree in the Amazonian forest. This fogging experiment had an unexpected result. It showed that the magnitude of species biodiversity was much higher than what was suspected before (Le Guyader 2008 : 8). This result was very instructive, Le Guyader goes on to say:

« The naturalists' dream – to describe exhaustively all the living species, to identify and to classify them vanished. The discrepancy in the order of magnitude (from 10 to 100 million species) shows that we are incapable of quantifying the number of species. And we realized then that to study species biodiversity, it will be necessary to use a much bigger strike force than the work of some isolated naturalists who work alone, without resources, during short period of time in rich environments” (Le Guyader 2008)¹

In the 80's, the biologists discovered simultaneously how very ignorant they were about species biodiversity and how much this species biodiversity was threatened. These discoveries would be crucial in driving several international initiatives which, during the 90's and the 2000's would try to provide some solutions to the following two problems:

¹« Le rêve des naturalistes – décrire exhaustivement l'ensemble des espèces, les répertorier et les classer, s'éloigne. Ensuite, le désaccord sur l'ordre de grandeur (de 10 à 100 millions d'espèces) indique que l'on est incapable de quantifier le nombre d'espèces. Et enfin, étudier la « biodiversité spécifique » nécessite une toute autre force de frappe que celle de quelques naturalistes isolés réalisant, sans trop de moyens, des missions de courte durée dans des environnements riches ».

- The clear lack of scientific knowledge on species biodiversity
- The necessity and the urgency of elaborating conservationists' policies on biodiversity before its disappearance.

The scientific discipline whose aim is to collect, to identify and to classify new species is taxonomy. But taxonomy is also in crisis, said all the specialists. At the beginning of the 90's the biologists considered that there was a "taxonomy impediment". This taxonomy impediment would considerably restrict the urgent production of new scientific knowledge on biodiversity and also the urgent need for new policies of conservation.

"The taxonomic impediment is a term that describes the gaps of knowledge in our taxonomic system (including knowledge gaps associated with genetic systems), the shortage of trained taxonomists and curators, and the impact these deficiencies have on our ability to manage and use our biological diversity". (Darwin Declaration, 1998, UNEP/CBD/COP/4/Inf.28, 2 may 1998).

During the 1990's and the 2000's many international answers have tried to overcome this taxonomy impediment. We can classify those answers in two groups.

The first group of answers are international initiatives, governmental and non governmental, trying to reinvent (or to modernize) taxonomy by using informatics, Internet and genetics in order to create new virtual and global networks of taxonomists all around the world or in order to change the way by which taxonomists identify new species.

Some examples of multi-governmental initiatives are :

- Since the first meeting (1993) of the Conference of the Parties of the Convention on Biological Diversity, the "taxonomy impediment" was highlighted. The experts said that it could prevent the implementation of the CBD. Such considerations would lead to the creation, in 2002, of the Global Taxonomy Initiative which was created to remove or reduce the "taxonomic impediment". "The GTI has been established to address the lack of taxonomic information and expertise available in many parts of the world, and thereby to improve decision-making in conservation, sustainable use and equitable sharing of the benefits derived from genetic resources". This is the first time in history that taxonomy has such recognition at this high level in international policy. (<http://www.cbd.int/gti/>)
- In 2001, in another governmental international organization, the Organization for Economic Cooperation and Development (OECD) (OCDE in French), the Biodiversity Informatics Subgroup of the Megascience Forum created the *Global Biodiversity Information Facility* (GBIF). The aim of the GBIF is to create a virtual portal on the Internet in order to make access to primary biodiversity data, free and open, for every one (individual, scientists, managers, politics, etc.). It is a meta data

base on biodiversity. “Facilitating digitisation and global dissemination of primary biodiversity data, so that people from all countries can benefit from the use of the information, is the mission of the Global Biodiversity Information Facility”
http://www.gbif.org/GBIF_org/bg10#whatdo)

Some examples of non governmental initiatives are :

- In 1993, creation of the Global Network for Taxonomy, called Bionet-International, dedicated to promoting taxonomy in the southern countries (<http://www.bionet-intl.org/opencms/opencms/whoWeAre/history.jsp>)
- In 2002, creation of the Consortium for the Barcode of Life (CBOL), devoted to developing DNA barcoding (le code-barre de l’ADN) as a global standard for the identification of biological species. DNA barcode sequences can be obtained reasonably quickly and cheaply”. <http://barcoding.si.edu/index.html>,
- etc.

The second kind of answer giving to overcome the taxonomic impediment is the organization of a new kind of naturalist expedition. The first expedition of this kind was organized by some French biologists in 2006, and was led on the island of Santo (Vanuatu, South Pacific). Its aim was to product new scientific knowledge on biodiversity before its extinction.

This list is not at all exhaustive. But it shows the existence of new dynamics, carried by different kinds of social actors at different levels, all dedicated to the same goal: to overcome the taxonomy impediment. Their common aim is to “modernize” taxonomy by using new technologies of information and communication (informatics and Internet) and genetics, so that taxonomy can be able to take on the new challenges identified by the biologists that is :

- to accelerate the production of new scientific knowledge on biodiversity ;
- and to contribute to a better management (or conservation) of biodiversity .

Towards a new kind of naturalist expedition on biodiversity : the case of Santo 2006²

² Organized by : Philippe Bouchet (National Museum of Natural History, Paris), Olivier Pascal (Pronatura-International), Hervé le Guyader (Institute for Research and Development, IRD). Contributing Foundations were the following: Stavros S. Niarchos Foundation, Total Foundation for Marine Biodiversity, Veolia Environnement Foundation, The Alfred P. Sloan Foundation, European Distributed Institute of Taxonomy, Fonds Pacifique, the French Ministry of Research, and the French Embassy in Vanuatu. Partner corporations were: Universal Sodexho, Ricoh, Solvay, Océan Vert, National Geographic, VRAI d'agriculture biologique, Telecom Vanuatu Limited.

Between march 2005 and november 2006, I studied, as an ethnographer, the preparation and the implementation of the biggest naturalist expedition of all time, according to the media. It had gathered, during 4 months, more than 150 scientists coming from 20 different countries, for the same goal: to make an inventory of all the biodiversity of Santo's Island.

For the three organizers (Philippe Bouchet, from the National Museum of Natural History of Paris, Hervé Le Guyader (Institut de recherche pour le développement (IRD) and Olivier Pascal (Pronatura-International, an NGO), the challenge and the main goal of this expedition was to document and to record primary data on all of the biodiversity of Santo before its disappearance. It was then to produce new scientific knowledge on the unknown biodiversity of this island.

The goal of this expedition was clearly within the tradition of Natural History as it was created and developed since the 18th century. If this expedition seems to look like its predecessors, a more precise analysis shows that it tried to renew this style by being embedded in contemporary geopolitical and scientific context and challenges, trying to overcome the taxonomy impediment.

If we can argue that, it is because of several of its specificities.

The first one is the size of the expedition. By gathering 150 scientists for the same goal on the same island during 4 months, the organizers thought it will help to produce a great amount of new scientific taxonomical knowledge on biodiversity.

The second one is the use of a new engine, called "Canopy Glider" (arboglisneur) which was very important to attract the media and private sponsors. Because of the size of this expedition and of the use of the Canopy Glider, the global cost (1,1 millions Euros) was high. But it served to attract both the media and private sponsors (mécènes). The privatization of the funding of this expedition and its media coverage were both two important features of Santo 2006. The media coverage was a real success for the organizers. Many journalists from radio, television, newspapers, well covered the event. From the point of view of the organizers, the media coverage is one crucial goal for changing public and political perceptions of the crisis of biodiversity.

We can read on the website of Pronatura International:

"With Santos-2006, we were able to show:

- That the necessary change of scale for the knowledge of biodiversity is possible and brings quantifiable results. Thanks to the human and technical resources available in this unprecedented operation, more than 10,000 species were inventoried, hundreds of which are new to science. While the field of investigation in biodiversity is overwhelming, we confirmed that the challenge can be met with meticulous and exhaustive exploration techniques.
- That it is possible to share the results of a difficult subject with a large audience by integrating the different domains of science, technology and communication in the same operation. The diffusion of the operation through different media channels

(Internet, daily publications, films and books) reached a large audience”
<http://www.pronatura.org/?lang=en&page=biodiversity>, page consultée le 15 mai 2008)

The third specificity of the expedition is more ethical and political. From the beginning, the organizers announced the crucial importance for them to respect the CBD’s spirit. What does this mean? It means first to obtain the Prior Informed Consent of local populations. It means also to share, with the inhabitants of Santo, some benefits of the access and uses of biodiversity. Concretely these benefits consisted of:

- the restoration of a local ship funded by the expedition (the cost was 10% of the total budget of the expedition) ;
- the implication of some Ni-Vanuatu students, researchers and governmental officers in the expedition ;
- some forms of local and national restitution : communication, reports and a final collective book (in progress) called the Natural History of Santo.

For the organizers, it was essential to respect the “CBD’s spirit”. It was a matter of ethics, of politics but also of science. They know that it is a *sine qua non* condition if they want to organize others such expeditions in southern countries, which means being able to pursue their work of documenting and recording biodiversity before its loss.

The fourth specificity of the expedition was the use, for marine biodiversity, of DNA barcoding, along with morphological identifications. DNA barcoding is a new method used for the identification of species:

“A molecular barcode is a sequence of DNA present in all living organisms. And this sequence of DNA is the very same in all specimens of the same species. It then allows determining which species a specimen belongs to even if we only know its DNA’s sequence. It can be used as a taxonomical identification tool for living organisms, in the same way as barcodes for commercial products” (Nicolas Puillandre, <http://accres.inrp.fr/santo/donnees/biodivmarine/barcoding/quest-ce-que-le-barcode>, page consultée le 21 mai 2008).

In Expedition Santo 2006, the presence of both “barcoders” and morphological taxonomists led to some disputes and controversies. The barcoders tended to qualify the morphological taxonomists as “collectors of rare post-stamps”. And the morphological taxonomists tended to see the molecularists as young “idiots” who were only interested by small pieces of flesh of animals, and who were incapable of recognizing any specimen with their own eyes. One challenge of this expedition was to gather and to conciliate those two different methods of identifying species.

Our Planet Reviewed. Biodiversity Hotspots : Taking a closer look at the ‘rich and famous’.

For the organizers, this expedition was such a success that they have implemented a new strategic plan “for filling key gaps in our knowledge of the world’s major biodiversity areas”. This plan is called “*Our Planet Reviewed. Biodiversity ‘hotspots’ : taking a closer look at the ‘rich and famous’*”.

It consists on “expeditions over the next decade that will focus on little-known sites and on neglected animal and plant groups (invertebrates, fungi...), especially those whose study requires special organizational skills and logistical resources”.

On the website of Pronatura-International, they explain their new strategy in the following way:

“Despite significant efforts made over the last several decades, the biodiversity of our planet remains largely unknown and is disappearing many times faster than we discover it. Pro-Natura International and its partner, The National Museum of Natural History (MNHN) in Paris, are now developing a new initiative to help address this issue, aimed at significantly boosting our knowledge of Earth’s biodiversity by filling gaps through the exploration and description of a carefully selected set of key sites.

The new challenge for our project teams is to apply their scientific and technical knowledge in regions of the world where the most pressing issues of Biodiversity and Conservation converge. We will thus focus on areas that are recognized as global hotspots for biodiversity, but where numerous knowledge gaps constitute a serious impediment to sound conservation and resource management”.

http://www.pronatura.org/projects/planet_reviewed_en.pdf, page consultée le 15 mai 2008.

Conclusion

To conclude, we can say that the international taxonomical landscape (or network) seemed to have change since the 80’s, thanks to the politicization (*mise en politique*) of the “taxonomy impediment”.

One of the most important innovations brought by the Expedition Santo 2006 and the program *Our Planet Reviewed* is maybe their focus on invertebrates. Indeed, invertebrates constitute the most important part of biodiversity, in quantitative terms, but maybe also in terms of ecosystem services. And it is the less studied and the less known part of biodiversity. It is also the part of biodiversity that interests the least “public opinion”, media, politics, but also the international conservationist community and even the biologists, as some members of Santo 2006’s expedition told me. For all of them (except invertebrate specialists), it is much more prestigious to work on mammals or birds than on arthropods or molluscs.

We can then consider that terrestrial and marine invertebrates have found new “spokesmen” and a new “apparatus” (dispositif) to exist, thanks to this new kind of expedition. By succeeding in interesting the media and a large sector of the public in those little neglected

animals, some of which are even invisible to the human eye, this new kind of naturalist expedition may contribute to changing the occidental relationship to nature.