ABSTRACT

Palabras clave: Áreas protegidas, planes de conservación, biodiversidad.

El establecimiento de prioridades de la diversidad biológica y su aplicación son los objetivos de la Estrategia Nacional de Biodiversidad de Chile. Si bien todos los elementos técnicos parecen estar disponibles, las autoridades chilenas han fracasado en el apoyo técnico en la toma de decisiones para alcanzar las metas.

Key words: Protected areas, systematic conservation planning, biodiversity.

Setting biodiversity priorities and their implementation are the goals of the National Biodiversity Strategy of Chile. While all the technical elements seem to be available, Chilean authorities have failed in making technical supported decisions in order to accomplish such goals.

Setting biodiversity conservation priorities in Chile

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INTRODUCTION

Protection of biodiversity and the services biodiversity provides to humanity are currently a point in the political agenda. In Chile, several actions addressing this issue have been carried out in the last years. One of the goals of the National Biodiversity Strategy (CONAMA 2003) is that all of the most relevant ecosystems will be protected at least to the 10% of their surface by the year 2010. This is certainly a very ambitious objective, taking into account that most countries in the world protect less than 10% of their total area (Chape et al. 2008, Coad et al. 2009) but, unlike other goals included in the strategy, it imposes a measurable parameter that can be timely assessed. However some questions remain unanswered in this strategy: (1) What is understood by "protection"? (2) How will the "most relevant ecosystems" be identified? (3) Where should efforts be concentrated? Since this particular objective is related to surface percentages, the first question should necessarily be linked to (protected) areas rather than to punctual actions. Much of the discussion so far has been focused on the second question, which is considered to be a primary issue that involves the key point of setting priorities of protected areas.

Systematic Conservation Planning (Margules & Pressey 2000) is a process of decision-making aiming at setting protected areas and implementing conservation actions within them. Its main feature is that new protected areas are designed in order to maximize its contribution to biodiversity conservation, taking into account the already existing biodiversity in the established protected areas. Moreover, it needs clear goals and a measure of biodiversity. Furthermore, Margules & Pressey (2000) identified six stages in the process of systematic conservation planning, namely:

1. Measure and map biodiversity
2. Identify conservation goals for the planning region

3. Review existing protected areas
4. Select additional protected areas
5. Implement conservation actions on the ground
6. Management and monitoring of protected areas

Here we analyze the first four stages of the systematic conservation planning process described by Margules & Pressey (2000) in the Chilean case, as outlined in the National Biodiversity Strategy (CONAMA 2003) and its implementation (CONAMA 2005a,b).

1. MEASURE AND MAP BIODIVERSITY

One of the first decisions to be made in the conservation planning process is a choice of the element that will be considered as a surrogate of biodiversity. While this is not a trivial decision and involves some technical aspects, it mainly depends on the availability of information at the different levels of organization. Thus incomplete knowledge must be accepted in this case. Furthermore the information must be measurable, spatially explicit and possible to map.

Vegetation maps or environmental classes are usually available providing a spatially consistent measure and constitute a reasonable surrogate of biodiversity. In Chile, several terrestrial vegetation maps that cover nearly the whole territory have been developed in the last decades (Gajardo 1983, 1994, CONAF-CONAMA-BIRF 1997, NatureServe 2003, Luebert & Pliscoff 2006). Other biogeographical classifications covering the whole Chilean territory are also available (e.g., Schmithüsen 1956, Fuenzalida 1967, di Castri 1968, Dinerstein et al. 1995) and are generally based on main vegetation and environmental features and/or on the distribution of the most conspicuous terrestrial plant species. Some attempts have been also made at mapping animal biodiversity, where the works of Peña (1966), based on insects, and Artigas (1975), based on terrestrial animals, are noticeable. Parsimony analyses of endemicity (Morrone 1994), aiming at identifying areas of concentration of geographically restricted species, are rare at the level of the whole Chilean territory (e.g., Vidal et al. 2009), but some regional exercises are available (e.g., Cavieres et al. 2002, Pliscoff 2003, Rovito et al. 2004). Only a few general maps are available for marine and coastal ecosystems (Spalding et al. 2007).

All these biodiversity maps are conceived at different scales, where the terrestrial vegetation maps are the most detailed. More comprehensive classifications of vegetation or other aspects of biodiversity do not exist in Chile, in particular, neither a classification nor detailed mapping of wetlands. Environmental classifications based on different layers such as climate, soil, geology and vegetation are potentially available. But, to our knowledge, no formal attempt at integrating them over the whole Chilean territory has been made so far, in order to generate meaningful environmental classes. Distributions of taxa are also possible to use, given the availability of modelling techniques (Guisan & Thuiller 2005), environmental layers (e.g., www.worldclim.org) and locality records in databases (e.g., www.gbif.org). Special care has to be placed wherever third party databases are used because they might contain significant errors both in specifying the localities and in the determination of the species. Unfortunately these errors could be transferred further on to the final models and ultimately may influence the planning process.

Spatial information on ecological and evolutionary processes is even scarcer and we do not know any attempt at collecting and spatializing all the available information. Such a task is very complex given the heterogeneity of the territory and the diversity of potential sources. Using such information for setting conservation goals is even more difficult (see below).

2. IDENTIFY CONSERVATION GOALS FOR THE PLANNING REGION

The goal of the Chilean National Biodiversity Strategy of conserving 10% of the surface of every relevant ecosystem is certainly a goal of representativeness. This is surely very general and does not specify which of the available information is going to be taken into account to recognize ecosystems, neither at which scale or scales those ecosystems are going to be considered, although it is in principle better to set general goals than not to set any at all. The National Strategy of Wetland and its action plan (CONAMA 2005c) partially addresses the problem of the scale, recognizing the existence and the protection of ecosystems that are too small to appear in a low-scale national classification of ecosystems.

In setting goals it may be useful to consider that some places/ landscapes/ ecosystems/ species, etc., could require different levels of conservation and that the settlement of protected areas is not the only way to place biodiversity under protection. In Chile, the latter has been accounted for by including the goals of the protected areas system in the context of a broader strategy of biodiversity (CONAMA 2003). The former is however not explicitly recognized. Setting a minimum of 10% of protection means, in principle, that some ecosystems, which would require more protection could eventually been assigned a higher percentage of its surface. In particular it is not clear whether this percentage applies to the potential extension of an ecosystem or to its remnant area. Ecosystems that are potentially more threatened, for instance, being more intensively replaced by cultural land uses, might require higher levels of protection; however, considering this percentage in relation to the remnant (current) area rather than the historical area could led to a lower protection, even when higher percentages of protection are considered. Taking into acount such sort of information while setting up the priorities could be indeed relevant, but treating it as the only source of information, as sometimes happens, is clearly inappropriate.

All the aspects mentioned above are biodiversity patterns. Margules & Pressey (2000) pointed out that biodiversity processes should also be addressed as conservation goals. They suggested that some aspects of ecological and evolutionary theory, such as biogeographical theory, metapopulation dynamics, source–sink population structures, etc., can provide guidelines in the process of setting conservation targets. This might be a problem if the technical skills necessary to adequately integrate these aspects into a political decision-making process are not available at the governmental institutions responsible of such decisions. We think this has probably led the Chilean governments to lack clear goals regarding biodiversity processes.

3. REVIEW EXISTING PROTECTED AREAS

The most used tool to review existing protected areas is the gap analysis. Gap analysis basically consists in identifying the elements of the biodiversity that have zero or low protection by the system of current reserves (Scott et al. 1993). Several gap analyses have documented that the Chilean natural reserves system is not balanced in relation to the conservation of some components of biodiversity, such as woody plant species (Armesto et al.1992), land mammals (Mella & Simonetti 1994, Tognelli et al. 2008) or vegetation (Luebert & Becerra 1998, Luebert & Pliscoff 2006, Pliscoff & Fuentes-Castillo 2008). These studies have shown that several elements remain underprotected, while others are clearly overprotected.

Information about the extension of replaced areas is provided by the actualized version of CONAF-CONAMA-BIRF (1997) and was used by Luebert & Pliscoff (2006) to calculate remnant areas. The result of that analysis was that the majority of the highly threatened vegetation units (i.e., those with higher level of replacement), generally receive lower levels of protection in the SNASPE (Pliscoff & Luebert 2006, Figure 1). This result confirms what was announced in previous studies (e.g., Armesto et al. 1992).

On the other hand, there is a lack of information about the protection of the different levels of biological organization. For example, a bibliographic compilation reveals that only 39 protected areas in Chile pos-

sess floristic catalogues (i.e., a list of plant species) published in the scientific literature to August 2009, while the flora of all the other protected areas remains practically unknown. Moreover, the information from the published literature has not been systematized yet. This makes it impossible to know how many species are protected in those 39 areas. The lack of information about the other levels (e.g., populations, genes) is surely more critical. Consequently, the government counts on very fragmentary, or no information at all, about what is protected in the current system of reserves. This in addition to the lack of scientific capacity in the Chilean public institutions, makes it very difficult to set national conservation priorities and leaves the information about vegetation units as almost the only available tool to be used systematically.

4. SELECT ADDITIONAL RESERVES

It seems clear that conservation planning in Chile has not been systematic (Pauchard & Villarroel 2002). The creation of new protected areas has been historically guided by land availability rather than by conservation priorities (Armesto et al. 1998). When the Chilean National System of Protected Areas (SNASPE) was created in 1984, 47 out of 83 plant formations (Gajardo 1983) where already protected in a total of 60 protected areas. Between 1984 and 2005, 34 new protected areas were incorporated to the SNASPE. Eighteen plant formations were newly protected during the same period, of which 12 were protected in more than 1% and only 3 in more than 10% (Luebert, Pliscoff and Fuentes-Castillo, unpubl. data). The further inclusion of all the priority sites defined in the National Biodiversity Strategy (CONAMA 2003, 2005a), in addition to the areas of the SNASPE plus Natural Sanctuaries, the protected areas under the responsibility of the Chilean Ministry of National Heritage (Ministerio de Bienes Nacionales) and the private protected areas, will leave more than 40 (out of 127) vegetation belts (Luebert & Pliscoff 2006) with less than 10% of protection (Pliscoff & Fuentes-Castillo 2008, compare Figure 1).

But selecting new protected areas based only on ecosystems or vegetation representativeness is the most basic step. Currently, there are numerous optimization methods which make it possible to address several conservation goals simultaneously using a variety of sources of information (Possingham et al. 2000, Watts et al. 2009). Although these methods have been applied to the Chilean reality (e.g., Ramirez de Arellano 2007, Tognelli et al. 2008), there are no signs that the Chilean authorities are taking such studies into account. This becomes evident considering the fact that they are currently carrying out a technical discussion to decide which is "the" ecosystem classification to assess representativeness in order to evaluate the goal of 10% of protection of each relevant ecosystem. Such a search is not necessary. What is really needed is a political decision, rather than a technical discussion on the available classification to be used. Modern tools allow optimizing representativeness of several classifications simultaneously, thus spending time and resources looking for one classification seems nonsense. In addition, such methods allow penalizing the restrictions, such as the cost of land. Including costs may lead to realistic prioritizations of protected areas (Bode et al. 2008). Otherwise it is assumed that costs are the same everywhere and such assumntion is violated in most of the cases, thus claims of efficiency are unsupported (Underwood 2008). But without clear goals and an explicit budget the results of the prioritizations may be inefficient both in terms of conservation targets and financial restrictions. Conservation priorities that are both systematically planned and economically viable, could constitute the base of a new system of protected areas in Chile.

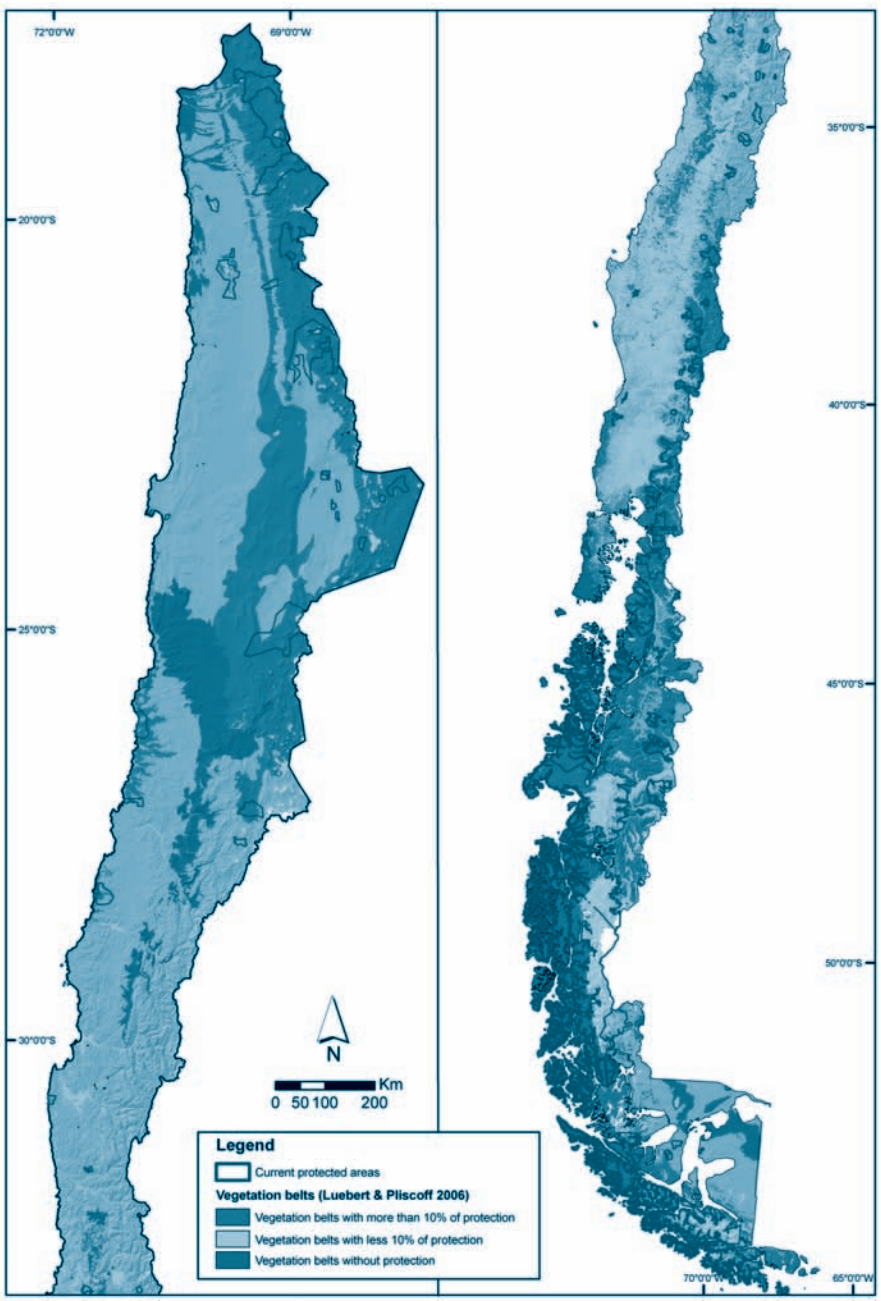
FINAL REMARKS

In spite of the unclear directives about the establishment of biodiversity conservation priorities in Chile, some areas of advancement could be identified. Definition of general protection goals and the development of the conservation strategies by CONAMA are fundamental and necessary. The goal of effective protection of at least the 10% of each relevant ecosystem is far from being accomplished, although an increase in the representation of different vegetation types due the increase of protected areas can be visualized.

Systematic conservation planning could be a useful decision-making framework to assess current actions and define the next steps in the context of a conservation priorities definition. The main problems in the accomplishment of the goals specified in the Chilean biodiversity strategies seem to be (1) the lack of a budget for acquiring land to put under protection and (2) the incapacity of the environmental institutional actors to use the information generated by conservation scientists. While these situations are not solved, the materialization of a systematic planning to set conservation priorities of the Chilean biodiversity seems to be a utopia.

Figure 1

Map of continental Chile with vegetation belts (Luebert & Pliscoff 2006) classified according to percentage of surface protected. Current protected areas are indicated and include the National System of Protected Areas (SNASPE), Natural Sanctuaries (Santuarios de la Naturaleza) and areas of the Chilean Ministry of National Heritage (Ministerio de Bienes Nacionales).



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