

**NATIONAL PROGRAM FOR ADVANCE RESEARCH CENTERS  
(FONDAP)**

**CONTINUITY PLAN EVALUATION REPORT**

This form is intended to facilitate your work as a referee and standardize the evaluation reports. Each topic is expected to be evaluated with concepts ranging from outstanding to poor and detailed technical comments supporting your views on the proposal and the site visit. If the proposal or the site visit does not contain information on the given topic, please indicate so in your evaluation. Your final overall comments and recommendations are an important part of the review process.

<b>I. PROJECT INFORMATION</b>
<b>CENTER'S NAME:</b> Center for Advanced Studies in Ecology and Biodiversity
<b>DIRECTOR:</b> Fabian Jaksic

<b>II. EVALUATION PANEL</b>			
<b>REFEREE NAME</b>	<b>ORGANIZATION/ INSTITUTION</b>	<b>E - MAIL</b>	<b>SIGNATURE</b>
Sandy Andelman	Conservation International	s.andelman@conservation.org	<i>S Andelman</i>
Alan Hastings	University of California, Davis	amhastings@ucdavis.edu	<i>Alan Hastings</i>
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### III. PROPOSAL EVALUATION

#### 1.- Goals and objectives for the next five-year period

##### i.- Comments

The CASEB's main goals are to improve scientific understanding of biodiversity: a) functioning; b) conservation; c) management; and d) disruptions. Advancing understanding in these focal areas of science is fundamental to developing both national and international policies to ensure the long-term persistence of Chile's biodiversity and natural systems in the face of accelerating human pressures. Further, the Center correctly recognizes that achieving these goals requires that ecology and biodiversity science at the CASEB, as well as elsewhere, become more integrative, synthetic and collaborative.

During the last five years, the CASEB has become a unique and important resource for Chile and for the world. To our knowledge, no comparable Center focusing on ecology and biodiversity exists elsewhere in Latin America, and the FONDAP should take steps to ensure that this important Center persists for the next five years and beyond. Based on the excellent record of scholarly achievement, on the collaborations that have been developed with other internationally recognized scientists, and on the quality of graduate students and postdoctoral fellows with whom we interacted, we are confident that the CASEB will achieve its goals for the next five-year period.

##### ii.- Evaluation



Outstanding



Very Good



Good



Poor

**2.- Expected educational impact of the center in the short and long term. Please analyze the Center strategy to influence on human resources formation (PhD students and postdoctoral fellows).**

**i.- Comments**

The past achievements of the CASEB with regard to education and professional training are significant and impressive in terms of quantitative and qualitative measures. The continuity plan for the next five years is equally ambitious, and arises logically from the accomplishments of the first five years. The Program has grown in size and quality, and is having a significant impact on the culture of science in ecology, transforming it to one that is collaborative, quantitative, multidisciplinary, and relevant to issues of great societal concern. Indeed, the Program is producing a cadre of highly qualified scientists to augment the scientific infrastructure of Chile, enabling it to address some of the most significant challenges to society in the 21<sup>st</sup> Century: sustainable growth and conservation of biodiversity. Similarly, the Program is producing the next generation of qualified doctoral graduates, who will staff the country's universities, environmental agencies, and related private enterprises, with experts to advance the well being of the nation and its citizens. Clearly, the CASEB has become a Center of international stature as a consequence of support from FONDAP, with a faculty, scientific infrastructure, and student body that is as impressive and productive as units of comparable size in Europe, Asia, Oceania and North America that benefit from far greater financial support. CASEB is a jewel in the crown of accomplishments that elevates academic programs in the country to the highest of international levels of reputation.

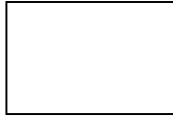
The graduate students in the department expressed a shared identity and deep appreciation for the quality of education and advanced research opportunities afforded to them as a result of formal and informal opportunities provided by CASEB. This is a significant improvement over the situation just two years ago. Formalization of the option for graduate students to be co-advised by faculty in each of two different programs represents a significant enhancement in the training of transdisciplinary scientists. This has the added value of strengthening linkages and integration between programs. In addition, the number of women engaged in the doctoral program increased greatly during the first five years of the program. The goal of equal numbers of male and female doctoral students by the end of the second five years is commendable and seems realistic. The plan to increase recruitment of graduate students from foreign countries is realistic, and is a sign of the increasingly visible nature of CASEB and its effectiveness in being a hemispheric leader in graduate programs related to the environment. During the past five years, the program's phenomenal success in recruiting high quality graduate students from Chile as well as from other countries in South and North America and Europe is remarkable. The majority of students is involved in the submission of manuscripts to well-respected international journals, and has expressed sincere appreciation for the quality mentorship and guidance that they receive from CASEB faculty.

In part, CASEB's high productivity in research and effective mentorship of students is enhanced by a group of capable and engaged postdoctoral fellows. The program should be congratulated for providing multiple avenues of professional growth to postdoctoral fellows, involving development of independent lines of research as well as collaborative research opportunities. Moreover, the training provided to postdoctoral fellows provides a bridge in support and a pipe-line for professionals who are provided with advanced training and experience that often integrates research and teaching. Finally, activities to provide experiential learning opportunities for undergraduates via internships with faculty in CASEB are an appropriate vehicle to engage students and increase the rigor of scientific programs at the university level.

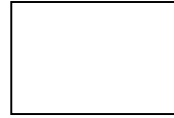
ii.- Evaluation



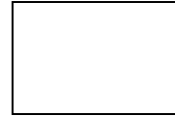
Outstanding



Very Good



Good



Poor

3.- Initiatives that would be undertaken by the Center related to scientific and technological innovation and its applications to the development of the country. Please analyze the Center strategy to get involved with problems to the development of the country.

i.- Comments

Many components of the Chilean economy, such as fisheries, agriculture, and forestry, depend critically on the environment. Consequently, understanding environmental impacts, and more generally, environmental dynamics, is critical to the long term sustainability of the Chilean economy. Other major parts of the Chilean economy, such as copper mining, produce environmental impacts due to runoff and ecotoxicological biocides. Moreover, use of forest products from paper mills can substantially compromise ecosystem services. Understanding the impacts of these economic activities on biodiversity generally, and more specifically on resources like fisheries or forests is of vital importance. Thus, as explained in the continuity plan, the research lines and proposed outreach have the potential to make large contributions to the national economy of Chile, especially if a long term view is taken. More specific aspects are discussed under many of the research programs and the outreach aims.

Major efforts will be directed at understanding the dynamics of coastal systems that will provide the scientific basis for sound decisions toward long-term sustainable use of marine resources. More specific work will consider the impacts of runoff from copper on the dynamics of these delicately balanced systems.

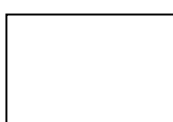
Climate change and its consequences are another general area of importance. This is being considered as impacts on fish and bivalve populations, on the dynamics of arid and temperate ecosystems and populations, and potential impacts through effects on cattle disease. The application of systematic conservation planning approaches to terrestrial and marine ecosystems in Chile is another important line of research. In this area and others, the ability to maintain and establish long term data sets is essential for a deeper understanding of environmental systems and for forecasting changes to those systems.

The transfer of basic knowledge for application to environmental problems is an important area, and CASEB has identified several mechanisms. CASEB scientists will be available in a variety of ways to provide the expertise whenever asked for this information.

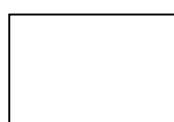
ii.- Evaluation



Outstanding



Very Good



Good



Poor

**4.- Main goal changes since the first proposal of the Center and their effects in the plan for the following period.**

**i.- Comments**

The CASEB has not made any major changes to the goals since the first five year plan. The CASEB scientists remain committed to the important goals of achieving close integration among the Center's scientists, as well as between the Center and other leading international research programs to advance scientific understanding of biodiversity functioning, conservation, management and disruptions.

Instead, the CASEB proposes six major modifications to the way they operate, with the aim of improving the quality and quantity of scientific outputs from the CASEB. These changes should be applauded, particularly those that provide for upward mobility of young outstanding scientists and the proposed internship program, which will involve undergraduate students to interdisciplinary and integrative research. The scientific basis for the proposed organizational and operational changes was not adequately developed in the proposal and the presentations.

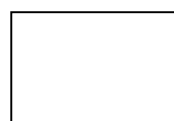
**ii.- Evaluation**



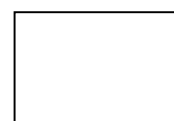
Outstanding



Very Good



Good



Poor

## 5.- Research lines of the Center, including their feasibility and updating validity.

### i.- Comments

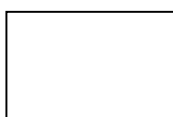
Originally, the Center was organized around seven programmatic areas that were a consequence of the research expertise of the PIs. These research areas were rich and complex, including terrestrial and marine systems; plant, animal and microbial biotas; observational, experimental and modeling approaches; and basic and applied perspectives. Each of these programmatic areas comprised a number of interrelated research foci. As an emergent property of faculty interactions and interest, three cross-cutting areas of research surfaced during the first five years of support. These areas, in addition to the original research foci, are now formally recognized and supported activities during the second five year request. The three cross-cutting programs (El Nino, Bioinvasions, and Molecular Diversity) are particularly relevant to issues confronting Chile, as human induced change threatens to modify the composition and structure of biological communities, with unknown consequences to ecosystem services on which much of the national economy depends (e.g., fisheries, forestry, agriculture).

The evolution of research within the core programs and the formalization of cross cutting programs is realistic and effective from scientific and financial perspectives. It represents a cost-effective means to retain focus, while exploring productive areas of integrative research that are innovative and synthetic, as well as of societal concern. Many of these programs critically involve the use of long-term research sites, as well as the maintenance of long-term data. This is a distinguishing characteristic of research in the environmental sciences, where variation in space and time must be the focus of study, otherwise understanding is superficial, and prediction and forecasting may be inaccurate and misleading. Activities of CASEB have rightly incorporated empirical (both observational and experimental) and theoretical perspectives to understand the basis of change and its consequences to critical ecosystem processes in hotspots of biodiversity and regions of economic value to Chile.

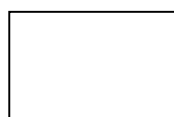
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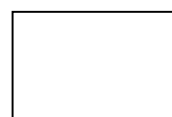
Outstanding



Very Good



Good



Poor

6.- When applicable, new lines of research that aroused during this period and how they were considered in the present proposal.

**i.- Comments**

The most important new lines of research that have emerged are the "Cross-cutting Teams" focusing on collaborations among previously separate programs to look at key environmental issues. This is important because many environmental and ecological problems require approaches that transcend disciplinary boundaries. The specific areas of El Nino, Bioinvasions, and Molecular Diversity are of prime importance and the recognition of these areas is very positive. More generally, providing specific recognition of the importance of collaborative research is going to lead to changes in the culture of science that will have very positive long-term benefits. The continuation of these themes, and the integration that has been obtained, partly through having students with co-advisors is important and positive.

Additionally, there have been appropriate changes and adjustments within specific programs. Positive aspects include a greater emphasis on theoretical bases for the research in several programs. Several of the programs will place more emphasis on coupling across systems or at different scales, which is an essential part of linking biodiversity studies to practical questions. A broad examination of the impacts of global change on selected Chilean systems would be an important direction for the future.

**ii.- Evaluation**



Outstanding



Very Good



Good



Poor



7.- Synergies and interactions between the members of the Center and their purpose in the Continuity Plan (not only based on publications or thesis, but also, for example, on emerging new research lines (areas) in the nearest future). Remember that the whole should be greater than the sum of work of individual researchers.

i.- Comments

It is clear that the CASEB has become an important Center – not only in Chile, but throughout the world - that facilitates collaborative and integrative research in ecology and biodiversity science. The creation of the CASEB has led to an expanded web of international collaborations. In addition, the CASEB program is attracting an outstanding group of Chilean and international graduate students. In particular, the growing number of international graduate students and postdoctoral fellows (from Argentina, Uruguay, Brazil, Mexico, United States, Canada, United Kingdom and France) attracted to the CASEB, provide evidence of the high caliber of the program.

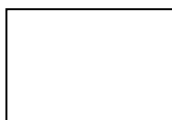
After only five years, it already is clear that the investment in the CASEB has resulted in substantive changes in the culture of ecological science in Chile and in significant improvements in the institutional capacity for integrative and collaborative research on biodiversity. Merely investing the same amount of money in individual research grants would not have had a comparable impact.

To further promote synergies and interactions among members of the CASEB, we recommend that the Center hold an annual meeting or retreat to focus on scientific discussions related to the CASEB's mission and the strategies for attaining its goals. It is particularly important that such a meeting be held during the first quarter of the first year of the new five year period.

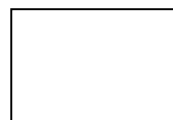
ii.- Evaluation



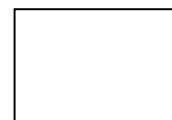
Outstanding



Very Good



Good



Poor

**8.- Center organization net including its nearest links (companies, associated institution, other units within the same institution, etc), and international and national collaboration.**

**i.- Comments**

Clearly, CASEB has enhanced its scholarly productivity, diversified the educational experience of its students, and augmented its financial revenues through the development of a broad network of interactions and associations. Individual scientists within each program have developed strong and diverse linkages to scientists of international reputation, forming productive collaborations in research. Moreover, the linkage between two disciplines of biological sciences within PUCC – Ecology and Molecular Genetics & Microbiology – is particularly promising and effective from both research and educational perspectives. The co-location of these departments in a state-of-the art new building at PUCC, and the sharing of some infrastructural elements between departments, should enhance this kind of integrative interaction into the future.

Via technical assistance, CASEB has developed linkages to a diversity of governmental agencies in Chile including the Ministry of Agriculture (SAG and CONAF), Ministry of Economy, Mining & Energy (SUBPESCA, CIMNM, COCHILCO), Ministry of the Presidency (CONAMA) and Ministry of Foreign Affairs (Undersecretariat of International Affairs). Similarly, CASEB is linked to private enterprises as a consequence technical assistance provided to Arauco's Valdivia Paper mill, Mueva Aldea Paper mill and Price-Waterhouse-Coopers (environmental audits). In addition, formal agreements of collaboration exist between CASEB and a number of international partner organizations including University of Connecticut, Station Biologique de Roscoff, the Nature Conservancy, Universite de Paris VI, and the European Union (via Framework VI). A strong linkage to the Fundacion Senda Darwin is a model for developing outreach programs in which faculty, students, and local communities jointly engage in developing models of sustainable management in rural landscapes of Chile and the World.

While maintaining strong north (Europe and US) to south (Chile) linkages, CASEB strategically plans to concentrate on the establishment of east to west linkages via collaborations with institutions in Australia and South Africa. This is particularly important because of shared concerns and possible fruitful collaborations about anthropogenic effects on Mediterranean ecosystems. We recommend the development of stronger linkages with other organizations that share a focus on biodiversity and sustainability, particularly those that have successfully integrated social scientists.

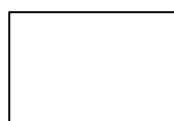
**ii.- Evaluation**



Outstanding



Very Good



Good



Poor

## 9.- Outreach strategy.

### i.- Comments

CASEB has identified different target audiences for outreach, all of which will receive some attention. The overall theme is the use of scientific knowledge to provide background for making sound environmental decisions at a range of scales. CASEB expresses a willingness to provide scientific advice to governmental agencies in ways that would improve decisions that affect the environment. Similar efforts at more local and regional scales will also be aimed at Chilean Non-Governmental Organizations, specifically "Fundacion Senda Darwin", which has a target audience ranging from local landowners and managers to teachers and schoolchildren. Here, some of the goal is to change future generations and to promote sustainable development. The general public will be reached through a variety of means. Specific private enterprises will include providing advice to two paper mills with the goal of reducing environmental impact.

These are the appropriate audiences for outreach, and the goals and objectives are both important and well described. The implementation appears very successful in some cases, such as the programs that reach out to schoolchildren. Other aspects can be much more difficult to implement, and might require substantial resources.

To better integrate the CASEB outreach goals with the need to train doctoral students for careers in both academia and the private sector, we recommend that the Center develop an internship program for graduating students in NGOs, government agencies and private industry. Potential external funding sources for such internships should be considered, to avoid depleting the limited FONDAP funds.

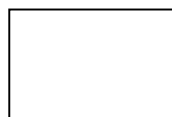
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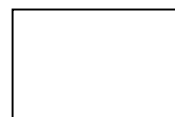
Outstanding



Very Good



Good



Poor

10.- Economic feasibility: coherence between needs, operational costs, new positions, major equipment, traveling and per diem, among others, and proposed activities (1US\$ ≈ 550 Chilean pesos).

i.- Comments

During the first five-year period, the CASEB has achieved or exceeded its major goals, and scientists at the CASEB have attained an outstanding level of scholarship. CASEB's goals for the next five years are even more ambitious, given the fixed level of financial resources available. In general, our assessment is that the Center's resources have been allocated efficiently. Overall, the proposed budget and allocation of financial resources appears to be efficient and feasible. However, to further encourage integration among programs and scientists at the CASEB, we recommend that 10-15% of the CASEB's budget be set aside for innovative, cross-cutting research and educational activities.

Given the nature of ecological systems, as well as the dependence of the Chilean economy on natural systems for fisheries, agriculture and forestry, long-term continuity of funding for ecological and biodiversity research through continued funding of the CASEB, for the next five years and beyond, is essential for Chile.

ii.- Evaluation



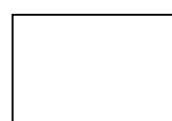
Outstanding



Very Good



Good



Poor

11.- Economic feasibility for Institutional commitment: coherence between needs, operational costs, new positions, major equipment, traveling and per diem, infrastructure, among others, and proposed activities (1US\$  $\approx$  550 Chilean pesos). Resources coming from other sources considering that other funds make the Center activities more consistent.

**i.- Comments**

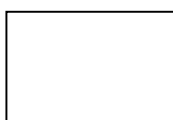
The institutional commitment of the PUCC to the activities of CASEB is significant and enduring, both in terms of its annual financial allotment to the program (25-33% annual cost) and in terms of its infrastructural support to the Department. The new building to house CASEB will be completed in 3 months, and provides first-class infrastructure to support integrated research and education in the coming decades. This world-class facility will be the envy of scientists throughout Latin American and the World.

The allocation of resources to major categories of expense has been reasonable in the past, and is projected in an equally reasonable manner for the next five year. A realignment of finances to differentially support the needs of the various programs is appropriate and responsible.

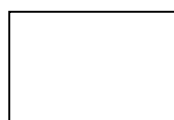
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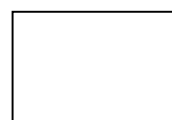
Outstanding



Very Good



Good



Poor

## 12.- Final overall comments and recommendations.

### i.- Comments

CASEB is a center that has produced and will clearly continue to produce world class science, and train scientists who can successfully compete anywhere in the world, in the disciplines of ecology and biodiversity. We commend CASEB for its important leadership in this important area, and for providing compelling evidence that future research and students will be of similarly high quality. The overall return on investment has been very positive.

Science in general, and ecology in particular, both in Chile and across the world, have long had a culture in which individual research is rewarded. Yet, a successful center must be more than the sum of its parts, and so cultural changes are needed. We see evidence of this change in the training of students, many of whom are integrating across areas, and in the growing number of collaborative research projects. These efforts should be applauded and should be redoubled in the future.

We do recommend that even more substantive steps be taken to promote activities of the center as a whole. These can include yearly retreats, symposia at which all students get to present research (which could also have some sessions, perhaps in the evening, open to the public) and other imaginative ideas.

Another important issue is that the work of this center clearly will not be finished in 5s years time. Environmental problems require long-term monitoring, and interruptions for a year or more are a significant problem. Thus, plans for supporting the continuation of the research efforts and the integration obtained under CASEB should start soon, and cannot wait until the end of the next five year period.

### ii.- Evaluation



Outstanding



Very Good



Good



Poor