



Feasibility of a Butterfly Farming initiative in Western Ecuador as a viable tool for sustainable development

This research received the Schmink Award for Innovation in Tropical Conservation and Development.

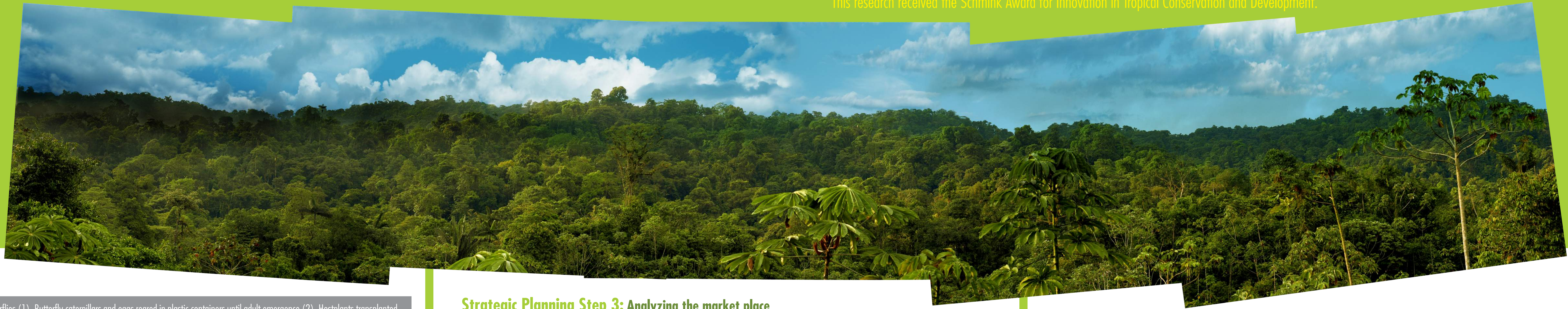
María F. Checa

mfcheca@ufl.edu <http://ecuadormariposas.wix.com/ecologia>

MDP, Center for Latin American Studies

Department of Entomology and TCD Program

McGuire Center for Lepidoptera and Biodiversity, FLMNH



BACKGROUND

Sustainable development is urgently required in Western Ecuador, one of the most important areas of biodiversity worldwide, where 70% of people are poor and less than 5% of forests remain. A development challenge thus exists of balancing and even combining biological conservation with economic benefits for local populations near reserves. Butterfly farming consists of rearing butterflies in captivity and marketing them to local or international exhibitions. A close link exists between butterfly farming and forest conservation since farmers rely on natural forests to obtain butterfly species and seedlings of host plants (plants butterfly caterpillars feed on) to develop their captive populations. Unlike many other Integrated Conservation and Development Projects, butterfly-farming projects have been economically successful in many developing countries, increasing sustainable livelihood opportunities, but also promoting women's empowerment, governance and conservation behavior in local people. Moreover, local butterfly exhibitions can diversify the attractions of natural reserves and therefore, increase revenues for their maintenance. Ecuador has a great potential to develop this type of projects since it is the most butterfly diverse country worldwide with an estimated diversity of 4,000 species.

OBJECTIVES

1. Develop a preliminary strategic planning for implementing a butterfly exhibition at Lalo Loo Dry Forest Reserve (LLDFR).
2. Determine the feasibility of a butterfly farming project at (LLDFR) in terms of economics (e.g., market demand), environment (e.g., diversity and natural history of butterflies) and social perspectives (e.g., buy-in of local people).
3. Address two main weaknesses that exist in order to implement the project: a) to build capacity of local people for butterfly research, and b) to generate the biological knowledge required for setting up a butterfly exhibition.

Figure 1. Location of Lalo Loo Dry Forest Reserve (LLDFR) in Western Ecuador, where the MDP practicum was carried out.



STUDY AREA

My field practicum was carried out at the LLDFR (Manabí province) in Western Ecuador (Fig. 1). The reserve is located just across a main highway connecting all beaches and towns along the coastal region in Ecuador. It is a private reserve administered by the US-based Ceiba Foundation. The major stakeholders are the local government (e.g., Ministry of Environment), Ceiba Foundation, researchers, academic institutions (Pontifical Catholic University of Ecuador (PUCE), University of Florida), and local communities.

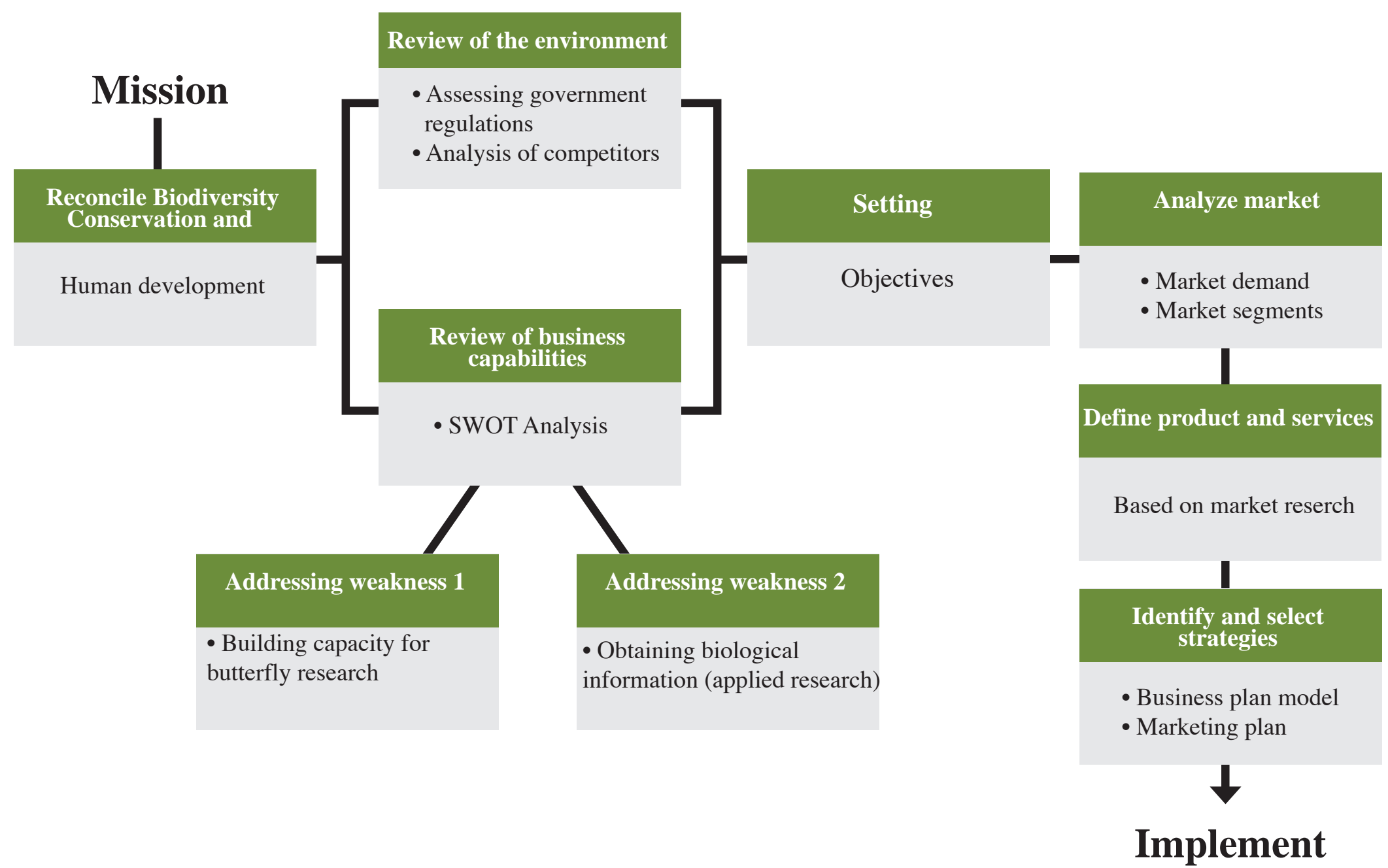
METHODOLOGY

Conceptual framework: The strategic planning process

The strategic planning process to set up a butterfly exhibition involved seven steps (Fig. 2). I developed all these steps during the MPD practicum, excepting for objective setting, business plan and project implementation. The review of the environment and SWOT Analysis were done using information gathered from field research, literature review, and a semi-structured interview with the director of the Ceiba Foundation.

Analyzing the market for a butterfly exhibition and product definition: Surveys were carried out with tourists, who were conveniently sampled on the peak tourism season in Manabí province (July 2013) at different locations (Pedernales, Canoa, Bahía de Caráquez). Surveys were performed on the beaches surrounding the reserve because, rather than creating 'new' tourism at its initial stages, the butterfly exhibition can take advantage of the 'well established' tourism, and further complement it.

Figure 2. The strategic planning process to establish a butterfly exhibition at LLDFR. I also addressed two main weaknesses: lack of technical capacity and biological knowledge about butterflies.



Addressing weakness 1: Lack of biological information

Which species to include in the exhibition?

I set up a butterfly monitoring program at LLDF in June 2009, which consisted of sampling butterflies using traps with baits during 7 days, every two months (Fig. 3). This monitoring has continued until Nov 2014, and has provided information about effects of climate and habitat change on butterfly communities (analysis to be included in my PhD Dissertation), and also strong indications about which species could be included in a butterfly farming project, taking into account their abundance and distribution (where and when they occur).

Figure 3. Model of traps to collect butterflies (1). Butterfly caterpillars and eggs reared in plastic containers until adult emergence (2). Hostplants transplanted to plastic bags (3) and maintained in a nursery closed to the reserve station (4).



How to farm butterflies?

A second research component focused on gathering biological information required to farm butterflies, including information about hostplants. This study was carried out from June through August 2012. Butterfly eggs or caterpillars were collected in the forest and reared in the reserve station using plastic containers until adult emergence (Fig 3). A nursery of hostplants was also established. The nursery was developed with seedlings collected in the forests, which were transplanted into plastic bags and maintained in a small plot close to the rearing station (Fig. 3).

Addressing weakness 2: Lack of technical capacity to research butterflies

Local People from nearby communities

I trained local people about butterfly research within the monitoring scheme set up at the LLDFR. Training was provided during five field trips from March to November 2014. During the field trips, trainees assisted me to check 32 traps daily, and learned how to collect and identify butterflies using a photographic guide. Local people also received training about butterfly rearing techniques.

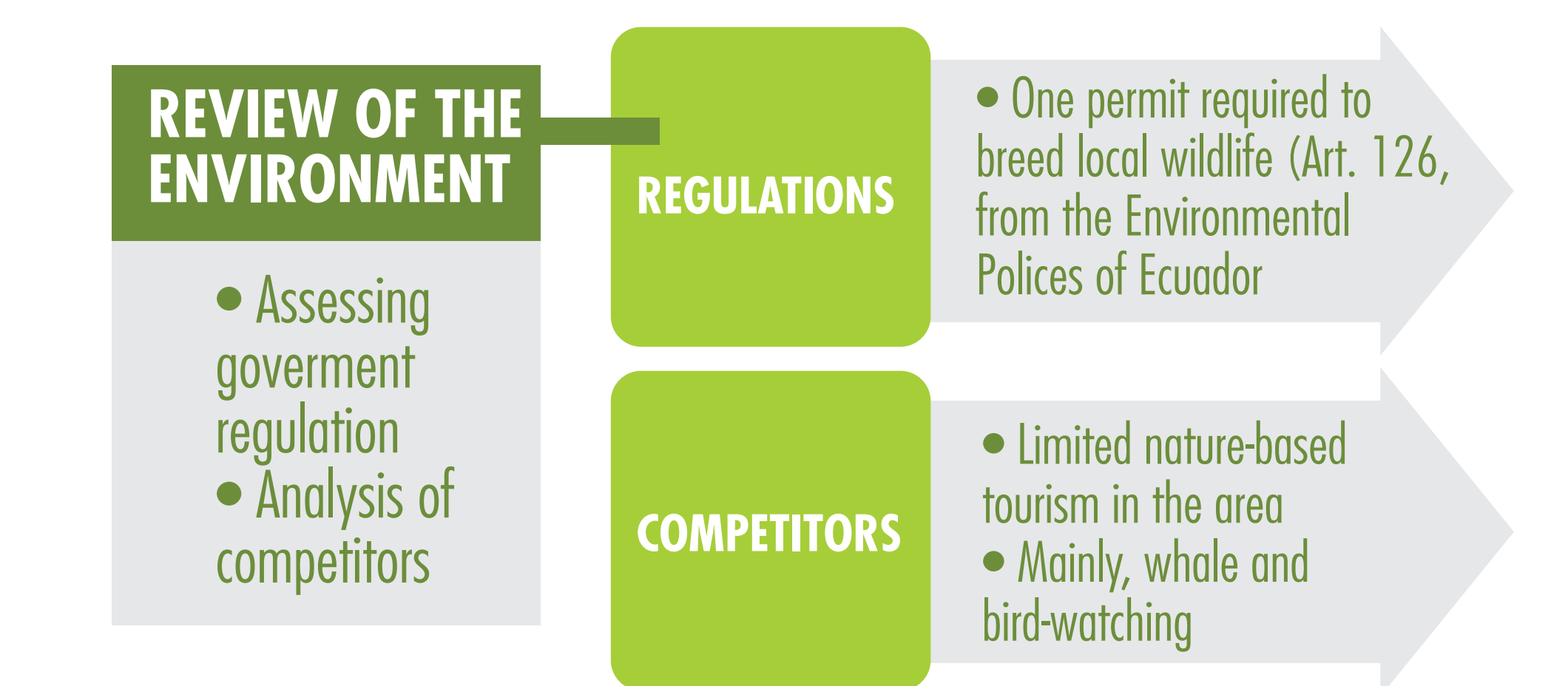
Undergraduate students

Three practical classes on biological monitoring techniques and applied research were given to students from PUCE. Two courses were taught as intensive field courses for 7-8 days at LLDFR, one in July 2013 and the second in January 2014. A third course, was given throughout the semester at PUCE in Quito, but was complemented with a 3-day workshop at the LLDFR in March 2013.

RESULTS

Strategic Planning Step 1: Review of the external environment

Figure 4. Results of the environment review to establish a butterfly exhibition at the LLDFR.



Strategic Planning Step 2: Review of business capabilities through SWOT

Figure 5: SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis for a butterfly exhibition at LLDFR in Manabí Province, Ecuador.

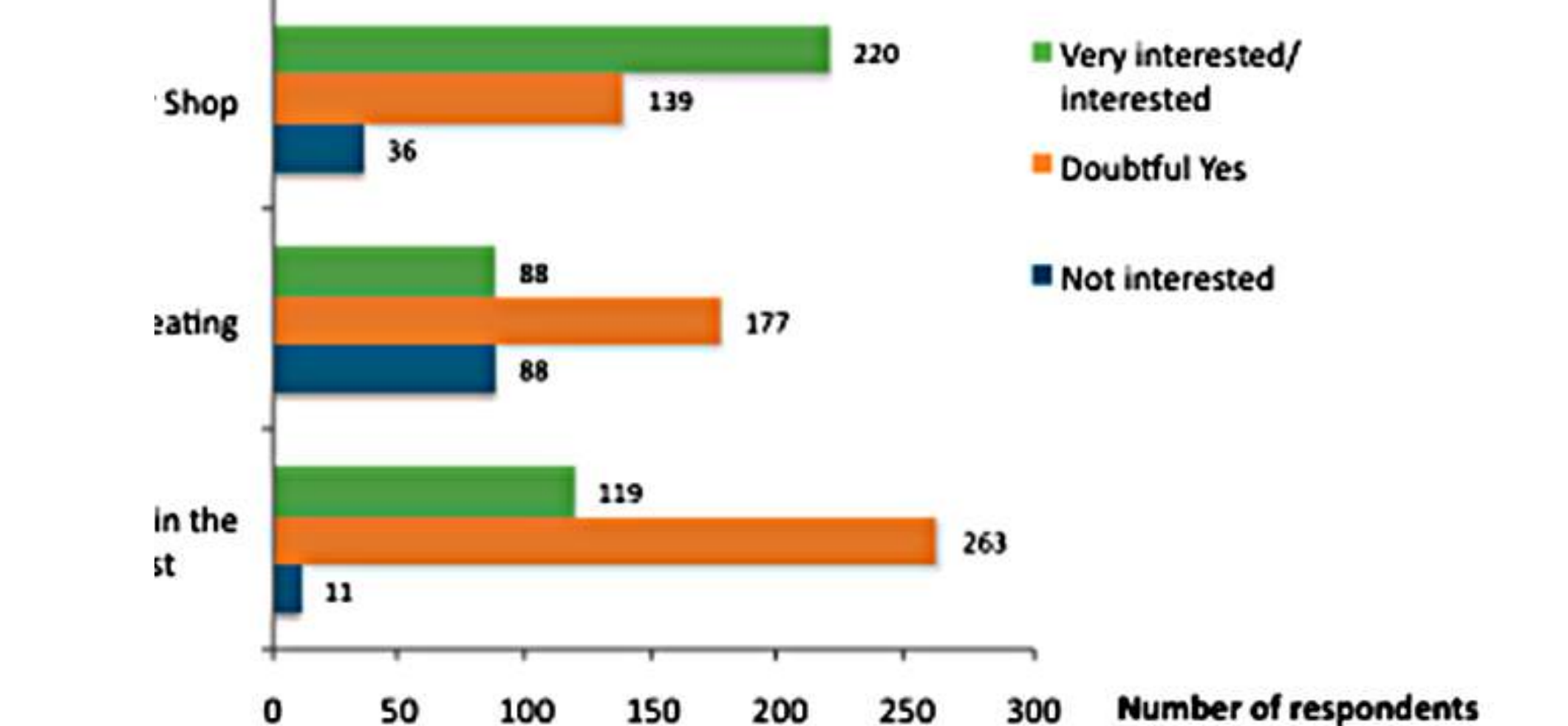
	Strengths	Weaknesses
Internal origin	<ol style="list-style-type: none">1. Access and proximity to markets (recognized beach destinations)2. Extensive biodiversity/natural beauty3. Expertise on local conservation projects (e.g., environmental education for local people).4. A butterfly exhibition fits the management plan of the reserve.5. Well-established relationship among stakeholders	<ol style="list-style-type: none">1. Lack of biological information2. Lack of technical capacity for butterfly farming3. Lack of business vision at the reserve.4. Very basic infrastructure available.
External origin	<ol style="list-style-type: none">1. Emerging domestic and international markets for tourism.2. Extensive littoral and marine resources.3. Low competition for natural-based touristic activities in the region.	<ol style="list-style-type: none">1. Natural Disasters (flooding).2. National/International recession

Strategic Planning Step 3: Analyzing the market place

In total, 401 surveys were carried; most of the respondents were Ecuadorians (361, corresponding to 90%), females (55%) and aged 15-34 years (54%). The majority of respondents (354) or 88% were interested in visiting a butterfly exhibition at LLDFR; 6% were not sure; and 6% were not interested

Market segment: The market segment of potential customers was characterized by Ecuadorians (91%), females (56%) and people aged 15-34 years old (56%). Results (Fig. 6) showed evidence of a market demand for a butterfly exhibition and a souvenir shop at LLDFR. There is less clear evidence of market demand for the other activities: lodging/eating and walking in the forests.

Figure 6. Interest of potential customers to carry out different activities at LLDFR: walking in the forest, visiting a souvenir shop, and staying overnight and having a meal. 'Doubtful yes' represents people that provided a 'yes' as answer but showed doubt, during survey.



Strategic Planning Step 4: Definition of products and services

Defining what customers will actually buy is not an easy task, and a 'handful of surveys isn't like to uncover the answer'. Hence, a small butterfly exhibition could be initially set up at LLDFR to test the market demand found through survey data. The exhibition might be small (greenhouse 14 x 12 m) built with basic infrastructure to exhibit 8-10 species.

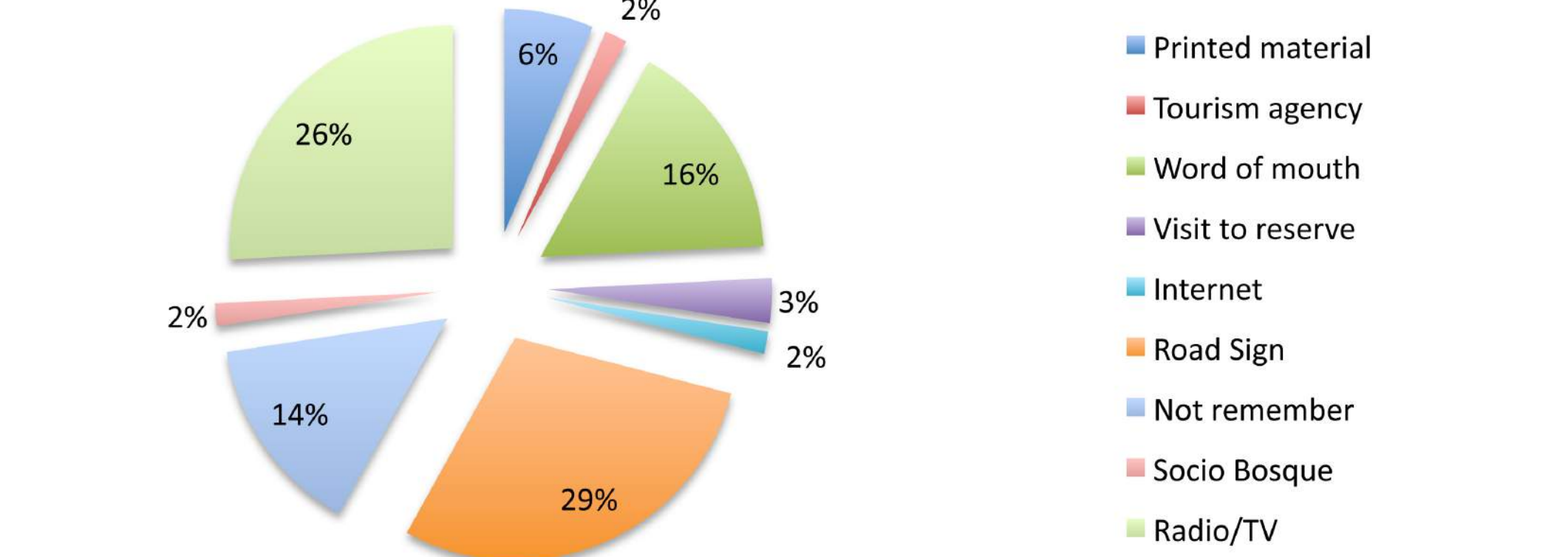
The exhibition could be complemented with a coffee and a souvenir shop as customers are interested in finding these services. A souvenir shop offers additional economic opportunities for more local people to get engaged in the project. Other butterfly farming projects have successfully implemented this component, which provided economic income for local women through the elaboration of handicrafts such as jewelry and frames using butterfly wings.

Pricing Strategy: Survey results suggested that Ecuadorians were willing to pay a higher average entrance fee (US\$ 4.9) in comparison with foreigners (US\$ 4.6) to visit a butterfly exhibition at LLDFR.

Strategic Planning Step 5: Information for advertising and promotional Strategies

Only 62 (15%) respondents had heard about the LLDFR prior to the surveys; from this sample, only 8 people had actually visited the reserve.

Figure 7: Information sources of respondents who previously knew about the Lalo Loo Dry Forest Reserve in Manabí, Ecuador.



Results suggest the reserve needs to develop marketing and advertising strategies in order to increase number of tourists, and hence revenues. A business plan to implement a butterfly exhibition is also key. Business plans for ecotourism projects can prevent several problems by making vulnerable areas of business detectable in advance, and are an effective tool to guide business strategies.

Addressing weakness 1: Lack of biological information

An approximate 150 caterpillars and eggs were reared at the LLDFR. From this sample, I gathered relevant information for a butterfly farming project for 12 species (see Figure 8). Information to farm these species is now available. Additional research efforts are required to rear other highly attractive species in order to include them in the exhibition (see examples in Fig. 9)

Figure 8. Life stages (egg, caterpillar, pupa and/or adult) of reared butterflies: a. *Scato zemira*, b. *Consul fabius*, c. *Itabalia marana* and d. *Dryas iulia*.

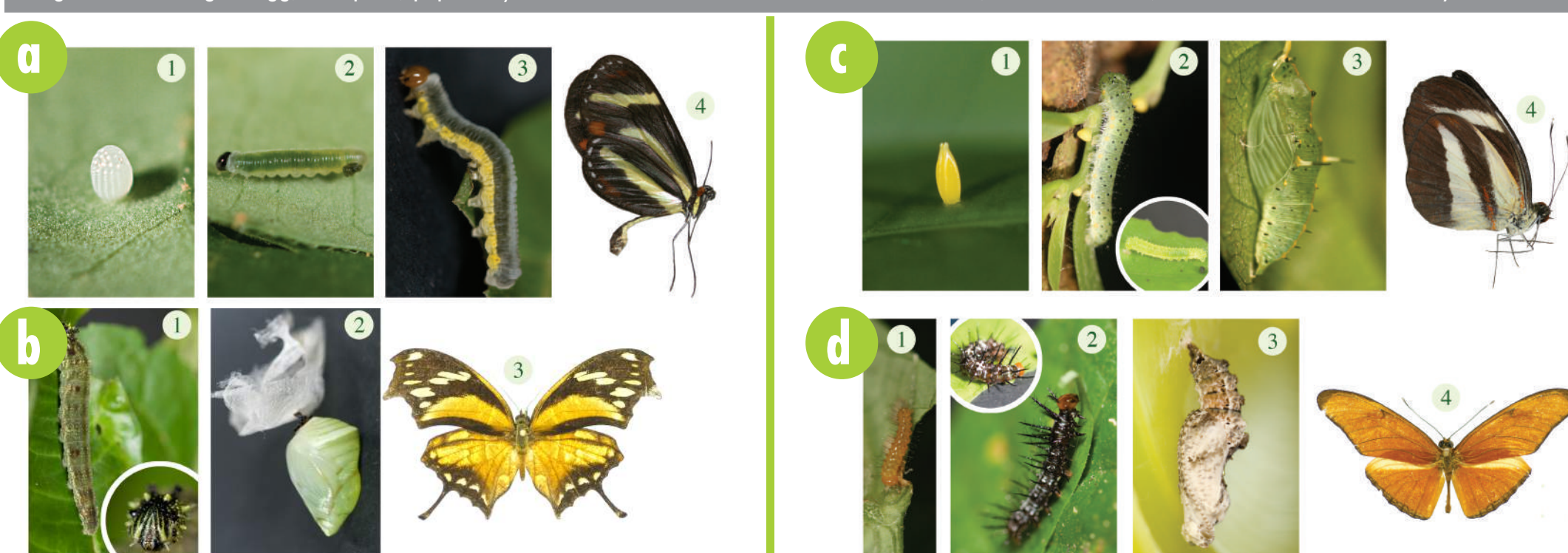


Figure 9. Other butterfly species that could be included in a butterfly house: *Morpha helenor*, *Caigo atreus*, *Historia adius* and *Archaeopreona demophon*



Addressing weakness 2: Lack of technical capacity

Undergraduate students: A total of 39 undergraduate students in Biology received the courses given. These students also became trainers of local people, who have continuously participated as parabiologists in the butterfly monitoring scheme at the LLDFR since the MDP practicum started.

Figure 10. Undergraduate students learning how to collect butterflies using traps with baits (1-2) and identify species names using photographic guides in the field and other tools (3-5). Students getting in touch with biodiversity in the field (6).



Local people: Four people from the surrounding communities of LLDFR received training on how to research and rear butterflies. Women were more enthusiastic and further participated in the project compared to men. An important constraint for men's involvement was the irregular nature of work, since trainees were only required to work every two months for one week, and each received a payment of US\$ 100 per week. This finding might indicate that women would be more willing to participate if the project is implemented. Women's empowerment might be promoted due to new sources of income and jobs for women. Two women have continued to work and received training in the butterfly monitoring project.

Figure 11. Local people from the surrounding communities of LLDFR receiving training about how to identify butterflies (1), and collect them using traps with baits (2-3).



CONCLUSIONS

1. It is feasible from environmental, economic (market demand exist) and social perspectives ('buy in' of stakeholders) to implement a butterfly farming initiative as a tool for promoting sustainable development in Western Ecuador.
2. Additional biological research and capacity building of local people is required in order to implement the project. I was able to complement my ongoing scientific research for my PhD Thesis to monitor butterfly responses to climate and habitat change with additional activities linked to the MDP. In this way, my field practicum offered the opportunity to broaden my scientific research 'vision' to encompass and facilitate the achievement of social goals.
3. My results and analysis showed how the sustainable use of natural resources (as tiny and charming as butterflies) can generate, if wisely implemented, both economic benefits and positive conservation outcomes.

Acknowledgments

I am very grateful to my supervisory committee, Marianne Schmink and Bob Buschbacher, for their mentoring and valuable comments that greatly improved this research. I deeply thank Keith Willmott, my PhD advisor, Marianne Schmink and Glenn Galloway for their continuous support that allowed me to pursue a joint degree (MDP and PhD Program). I also thank the following institutions for providing support and/or funding for fieldwork:

