

RAINFOREST EXPEDITIONS AND EARTHWATCH AS FUNDING PARTNERS FOR MACAW (*ARA SPP.*) RESEARCH IN SOUTHEASTERN PERU

Donald J. Brightsmith¹

Duke University, Department of Biology, Box 90325, Durham, North Carolina 27712, USA.

Resumen. – Rainforest Expeditions y Earthwatch como financieros de investigaciones sobre guacamayos (*Ara spp.*) en el sureste del Perú. – El ecoturismo ha sido presentado como una manera efectiva de conservar áreas naturales mediante la provisión de empleo para los pobladores locales y al generar ingresos para la conservación. Sin embargo, el ecoturismo puede también financiar efectivamente la investigación científica. Trabajar con voluntarios que pagan puede proveer financiamiento y mano de obra para los proyectos de investigación. En éste artículo, examino la efectividad del ecoturismo y de los voluntarios como mecanismos para facilitar la investigación en el campo de la conservación, considerando como ejemplo el Proyecto Guacamayo, un proyecto de investigación sobre ecología de loros y guacamayos. Durante los últimos 7 años, el proyecto ha trabajado con Rainforest Expeditions, una compañía comercial de ecoturismo, y el Instituto Earthwatch, un ONG que utiliza voluntarios para financiar la investigación científica. Rainforest Expeditions alojó al proyecto en uno de sus albergues, Tambopata Research Center, y ha contribuido al proyecto con cerca de \$40,000 anuales en salarios, donaciones, transporte, alimentación, alojamiento y logística. Desde 2001, Earthwatch ha proporcionado al proyecto 328 voluntarios y ~\$18,000 anuales en fondos de investigación. La logística de usar financiamiento a base de voluntarios y trabajar en un albergue ecoturístico posee retos únicos. Profundizo en estos retos para proporcionar una lista de criterios para investigadores que consideren trabajar con grupos de voluntarios y compañías ecoturísticas para ayudar a asegurar que tanto el investigador, como el proyecto y la compañía de turismo, están aptos para este tipo de colaboración. La combinación de ecoturismo y grupos de voluntarios tiene un gran potencial y debería ser considerada para proyectos de investigación que usen métodos laboriosos en monitoreos a largo plazo y estudios básicos de historia natural de especies carismáticas como los loros y guacamayos.

Abstract. – Ecotourism has been touted as an effective way to conserve natural areas by providing employment for local people and generating income for conservation. However, ecotourism can also effectively support scientific research. In addition, working with paying volunteers can provide funding and manpower for research projects. In this paper I examine the effectiveness of ecotourism and volunteers as mechanisms to facilitate conservation research through a case study of the Tambopata Macaw Project, an ongoing macaw and parrot ecology research project in southeastern Peru. Over the past 7 years the project has worked closely with Rainforest Expeditions, a for-profit ecotourism company, and the Earthwatch Institute, an NGO that uses volunteers to fund scientific research. Rainforest Expeditions hosted the project at their lodge, the Tambopata Research Center, and provided the project with about \$40,000 per year worth of salaries, donations, transportation, food, lodging, and logistics. Since 2001, Earthwatch has provided 328 volunteers and ~\$18,000 per year in research funding. The logistics of using volunteer-based funding and working in an ecotourism lodge posed unique challenges. I draw on these

¹Current address: Schubot Exotic Bird Health Center, Department of Veterinary Pathobiology, Texas A&M University, College Station, Texas 77843, USA. E-mail: dbrightsmith@cvm.tamu.edu

challenges to provide lists of criteria for researchers considering working with volunteer groups and ecotourism companies to help ensure that the researcher, the project, and the ecotourism company are suited to this type of collaboration. The combination of ecotourism and volunteer groups has great potential and should be considered for research projects using labor intensive methods to conduct long term monitoring and basic natural history studies of charismatic species like macaws and parrots. *Accepted 22 October 2007.*

Key words: Ecotourism, macaws, parrots, volunteers, funding, research.

INTRODUCTION

The study and conservation of biological diversity usually requires a great deal more funding than can be made available by traditional government grants or the international community (Frickmann Young 2005). In addition, the past few decades have seen a shift in funding away from natural history studies and biological monitoring towards molecular biology (Wilson 1994). The repercussions of this trend are especially severe in tropical ecosystems, where basic natural history remains unknown, even for many large charismatic species. As a result, scientists working to fill the void in our knowledge of basic tropical ecology could benefit from exploring alternative funding sources.

Nature-based tourism has been touted as a mechanism to promote ecosystem conservation and sustainable development, especially in the developing world. While the promise of such tourism is often overstated (Bookbinder *et al.* 1998), numerous case studies show conservation and local communities can benefit from their association with tourism (Getz *et al.* 1999, Stronza 2000, Báez 2002). When nature-based tourism is responsibly conducted (e.g., ecotourism), local communities benefit from sales of products and handicrafts, increased employment, profit-sharing, vocational training, and increased empowerment (Goodwin 1996, Fennell 2001, Donohoe & Needham 2006). Conservation gains from ecotourism can include funding protected areas, increased

size and effectiveness of protected areas, reduced hunting, reduced land clearing, and increased involvement and support of local people. In turn, responsible ecotourism operators that aid conservation and local communities can reap the benefits through improved reputations, international awards, and more sustainable operations (Goodwin & Swingland 1996, Ayala 2000, Stronza 2000, Okello 2005).

In addition, great potential exists for mutually beneficial collaboration between ecotourism and scientific research. In Panama, a national level strategic plan proposed combining tourism, conservation, and research to increase the quality and quantity of tourism while studying and protecting the nation's key cultural and biological resources (Ayala 1997). In this triumvirate, 1) tourism provides economic incentives and funding for conservation; 2) conservation ensures the long term viability of the resources; and 3) research provides knowledge which can be used to promote and conserve the resources (Ayala 2000). While the link between research and tourism has great theoretical appeal, few published case studies investigate the practical workings of such collaborations.

Aside from the obvious shortage of funding for basic biological and conservation research, there is also a shortage of manpower (Darwall & Dulvy 1996, Foster-Smith & Evans 2003). In many instances, the data that are needed are simple enough to collect that laymen can be quickly trained. In such cases, volunteers can make a great contribution (Birchenough *et al.* 2001). Volunteer labor

must be employed cautiously as inter-observer error from complex and technical protocols reduce data accuracy (Darwall & Dulvy 1996, Foster-Smith & Evans 2003). Despite this, volunteers have collected important data on basic natural history and long term biological trends (Becker & Ghimire 2003, Foster-Smith & Evans 2003). When volunteers can also provide research funding, the benefits are greatly enhanced. One organization which specializes in this is the Earthwatch Institute. Since its founding in 1971, Earthwatch has provided over 1300 scientific research projects with \$4.2 million and over 10.8 million h of volunteer labor (Earthwatch Institute 2007b).

Macaws and parrots are large, charismatic birds which are recognized by people all over the world. This aesthetic appeal makes them great subjects for volunteer-based research projects. However, this same appeal has led to their capture in large numbers for the pet trade, which in turn contributes to their high level of endangerment. Currently nearly 25% of all parrot taxa are threatened with extinction (Birdlife International 2006). Despite our familiarity with these birds in captivity, parrots remain poorly studied in the wild (Collar 1998, Masello & Quillfeldt 2002). Because wild parrots are a valuable ecotourism resource, their study and conservation is an ideal theme for collaboration among ecotourism companies and researchers (Munn 1992, Brightsmith 2006). In this article I provide information from my experience funding basic ecological research on macaws and parrots through partnerships with a for-profit ecotourism company, Rainforest Expeditions, and a non-profit volunteer-based granting agency, the Earthwatch Institute.

METHODS

Study site. The Tambopata Macaw Project is headquartered at Tambopata Research Cen-

ter (13°07'S, 69°36'W, 250 m a.s.l.) in southeastern Peru on the border between the Tambopata National Reserve (275,000 ha) and the Bahuaja-Sonene National Park (537,000 ha, Foster *et al.* 1994). Rainfall totals 3200 mm and is weakly seasonal (Brightsmith 2004). Primary tropical moist forest, *Gnadua* bamboo patches, *Mauritia* palm swamps, and riparian successional forest of differing ages surround the site (Griscom & Ashton 2003).

Tambopata Research Center and the Tambopata Macaw Project. In 1989, Eduardo Nycander and Kurt Holle founded the Tambopata Research Center. The center was established as a site to host ecotourism and conduct macaw conservation research. In 1992, they founded the for-profit ecotourism company Rainforest Expeditions, S.A.C., of which Tambopata Research Center was their first lodge. From 1999 to February 2005, the lodge had 13 rooms holding 26 guests, and additional accommodations for 16 staff and researchers. Since expansion in February 2005, the lodge has 18 rooms holding 36 guests, plus an additional 34 researchers and staff.

From 1989 to 1993, Nycander and Holle simultaneously ran the ecotourism operations and the macaw research (the Tambopata Macaw Project) at Tambopata Research Center. The research resulted in the publication of various popular magazine articles, the most noteworthy being Munn (1994) and one book chapter summarizing the scientific findings (Nycander *et al.* 1995). After 1993, the two focused on running Rainforest Expeditions and had little direct involvement with the macaw research. From 1993 to 1998, the macaw research was conducted by young Peruvians working simultaneously as guides and researchers, but no scientific publications were produced. In 1999, Rainforest Expeditions hired the author to take over the macaw and parrot research. From November 1999 to today (February 2007), the author has directed

the macaw and parrot research at Tambopata Research Center (TRC). The project work force has consisted of a mix of foreign (non-Peruvian) volunteers who paid \$10 per day to Rainforest Expeditions for room and board, Peruvian volunteers, and paid Peruvian employees.

Earthwatch Institute. The Earthwatch Institute is an international non-profit organization that supports scientific field research through the use of volunteers (Haag 2005, Earthwatch Institute 2007a). Earthwatch invests a great deal of resources and staff time in recruiting volunteers and preparing them for their trip. Research funding is on a *per capita* rate, based on the number of volunteers that work on the project. In 2000, the author received a grant from the Earthwatch Institute which provided funding and teams of volunteers from January 2001 to today (February 2007).

RESULTS

Since 1999 the Tambopata Macaw Project has generated data on many aspects of psittacine biology including clay lick use, nesting, chick growth, diets (species and nutritional composition), food availability, movements, abundance, group sizes, diseases, and survival and reproduction of released macaws. This has resulted in 20 scientific reports, 3 manuscripts in conference proceedings, and 7 peer-reviewed publications (five published and one in press and one submitted as of February 2007). The average annual budget for the research was approximately \$20,000 in cash (excluding salary for the author). Nearly 90% of this money was provided by Earthwatch, the rest came from zoos, universities, bird clubs, and private individuals.

Earthwatch Institute. From January 2001 to February 2007, Earthwatch provided 26 teams totaling 328 volunteers. Team visits ranged

from 10 days in 2001 and 2002 to 12 days in 2003–2007. Earthwatch volunteers worked for 6 h per day for 6 to 7 days per trip, spending the rest of the days in transportation and training. Teams were approximately one per month from November to February. Rainforest Expeditions handled all of the logistics for the groups including food, lodging, and transportation. The company also provided two or three professional guides per group to escort volunteers to assignments and give guided walks during volunteers' free time. Earthwatch paid Rainforest Expeditions directly for this service.

Earthwatch provided the author about \$18,000 per year in research funds (N = 7 years) while volunteers produced over 13,000 h of data collection (e.g., nest observations, clay lick observations, and video analysis), data entry, sample processing, and trail marking. Nearly 100% of the video data and clay lick data are useable while about 85% of the nest observations are useable. The majority of the 15% of the nest observation data that were unusable were from the first trips in 2001 when training was inadequate or from observers who confused codes and protocols during their first few days of data collection. For the principal investigator, grant writing was limited to the initial proposal and a fourth year renewal, and annual reports. Grant renewals from Earthwatch are not guaranteed, but are likely for projects that continuously attract volunteers and produce good scientific results.

Rainforest Expeditions. The company provided about \$40,000 in services per year including free and reduced cost food and lodging, work space, boat transportation, logistical support, help obtaining permits from local government agencies, and a part time salary for the author. A separate publication detailing the expenses and financial gains from hosting the macaw research is in preparation.

Research and tourism interactions. On a daily basis, there was little conflict between research and tourism. Rainforest Expeditions put no restrictions on the research activities, but did request that researchers explain their activities to the guests when they engaged in potentially high impact activities like trapping parrots at the clay lick. The conflicts that did occur were usually related to transportation, interpersonal relations, and use of space. The main priority of Rainforest Expeditions is tourism, therefore tourists are almost always given priority. One of the most obvious manifestations of this is that the researchers have little control over the movements of boats between town (Puerto Maldonado) and Tambopata Research Center. Boats are programmed based on the movements of tourists and researchers are allowed to travel on these boats, space permitting. On occasion this has resulted in researchers waiting 1 to 4 extra days for boat transportation.

The staff at TRC, especially cooks and boat drivers, frequently performed extra work for the researchers, yet were given no extra compensation. Support from upper level management, located in Lima, was excellent. Conflicts with middle level management were common: 4 of 6 managers at TRC and 2 of 5 managers in the regional office in Puerto Maldonado clashed to some extent with the author. These conflicts resulted in elevated stress levels and additional logistical problems with food and transportation. Researchers were required to maintain basic levels of hygiene and behavior when in the lodge for the benefit of the guests. On three occasions research assistants were banned from work at TRC due to negative interactions with the lodge manager, staff, or guests.

The most common source of conflict between researchers and company staff at TRC was over the use of space. From November to December 1999, researchers slept in the com-

munal guide room, tents, or tourist rooms (moving from the latter when the lodge became full) and shared a 3 x 2.5 m work area. From January 2000 to May 2005, the researchers had a 3 x 2.5 m office for their exclusive use but sleeping arrangements remained the same. From June 2005 to present, the researchers use a 9 x 6 m research area, five 3 x 3 m bedrooms, and a 3 x 12 m work area. Researchers often reacted negatively when they had to move from their sleeping or working areas to accommodate personnel and guests.

DISCUSSION

Over the past 7 years, Rainforest Expeditions and Earthwatch supported the macaw research with over \$450,000 in cash, goods and services. This represented over 95% of the total budget for the research. These two sources of support allowed the research to continue without interruption for nearly the entire period. Running an academic research program within an ecotourism company, funded by a volunteer organization while highly successful, was not particularly easy and would not work for all researchers or projects.

Earthwatch Institute. This NGO provided the Tambopata Macaw Project with reliable, long-term funding and volunteer labor. Supervising the Earthwatch teams was made easier for the author because Rainforest Expeditions handled all the logistics. Supervising the teams was rewarding because many volunteers were visibly moved by the experience of living in the tropical forest and working with macaws. In addition, the author learned new skills from volunteers and was forced to refine and improve his data protocols and research conclusions through the numerous questions asked by volunteers during training, presentations, and casual conversations (see also

Foster-Smith & Evans 2003). However, supervising the teams required a great deal of people management skills, time, and energy by the author to keep the group happy and focused on the research. Despite this, the combination of Rainforest Expeditions and Earthwatch was an attractive funding option for this research project. Investigators considering working with Earthwatch or other volunteer based organizations should carefully weigh the advantages and disadvantages.

Advantages

- 1) Earthwatch is an ideal funder for long term monitoring projects as they are willing to continue funding as long as the volunteers continue to sign up, remain happy with their experience, and the project makes scientific progress.
- 2) Volunteers are eager workers and genuinely want to help (Foster-Smith & Evans 2003), and in fact, the worst thing to do with an Earthwatch group is not give them enough to do (pers. observ.).
- 3) Many Earthwatch volunteers come with special skills, and adaptable researchers who can exploit these strengths stand to learn a great deal and explore new research avenues.
- 4) The author improved his data collection protocols through repeated training of Earthwatch volunteer groups.

Disadvantages

- 1) The annual grant is based on the number of volunteers that sign up for the project, so funding levels fluctuate and never reached the grant maximum. Researchers must be prepared to deal with this reality.
- 2) Earthwatch explicitly prohibits researchers

from soliciting funds from volunteers, so this is not a good way to build up a group of project donors.

- 3) Earthwatch grants do not pay university overhead or principal investigator's salary. The latter may be important for untraditional principal investigators like the author who did not hold a paying university position during most of the study or graduate students that do not have scholarships or paying assistantships.
- 4) Working closely with volunteer groups is simultaneously rewarding and exhausting. Researchers with limited interpersonal skills should avoid working with Earthwatch.
- 5) Research tasks and data collection must be simple enough so that naïve volunteers can be trained quickly to do the task reliably (Foster-Smith & Evans 2003). Also researchers should invest time in making high quality training materials.
- 6) Arranging logistics for large Earthwatch groups can be very time consuming unless special personnel or established companies (like Rainforest Expeditions) are contracted for this purpose.

Rainforest Expeditions. The free and reduced cost food, lodging, and transportation provided by Rainforest Expeditions, coupled with the use of volunteer labor, guaranteed that the research could continue without interruption even if the amount of cash income from Earthwatch and other sources fluctuated. This also allowed the author to solicit funds from private individuals and small donors and ensure them that 100% would go to the purchase of field gear, nest boxes, etc., and not be spent on lodging and transportation.

Conducting research within an established ecotourism facility was very successful for the Tambopata Macaw Project. The conflicts that did occur were apparently no more severe than those researchers can encounter when working at many designated field research centers. As a result, I encourage more scientists and ecotourism companies to consider entering in to mutually beneficial agreements. However, such agreements would not work for all projects. In order for this model to work, both the ecotourism company and the researcher must be willing to make real sacrifices. Before entering in to an agreement, I suggest that both the company and the researcher(s) consider the following list of criteria.

The ecotourism company should:

- 1) Be truly committed to supporting the research. This support must come from the highest levels of management and be based on the understanding that research provides a broad range of benefits for the company, not just direct income.
- 2) Inform staff at all levels of the company about the importance of research to the success of the company.
- 3) Be willing to invest money and staff time in providing services for researchers. Many companies may be unwilling to invest money in research activities which provide indirect benefits and direct payoffs at unspecified times in the future.
- 4) Provide space for the exclusive use of researchers and not ask them to move. This is especially true for work and gear storage areas.
- 5) Minimize restrictions on researcher activities. If the company plans on prohibiting

any activities due to their impacts on the ecotourism activities, this should be done by upper level management and explained clearly in advance to avoid conflicts after researchers' plans have been made.

- 6) Identify ecotourism activities that negatively impact research activities or study species and discuss ways to study, mitigate, or eliminate these impacts.
- 7) Communicate clearly and regularly with researchers. Researchers are much more willing to make sacrifices, change plans, etc. when they understand the reasons for these activities.

The researchers should:

- 1) Be flexible. Researchers working within an ecotourism facility must recognize that the main priority of the facility is ecotourism. This means that researchers must be flexible about travel schedules, living arrangements, meals, and other details.
- 2) Choose a charismatic study system. While not absolutely necessary, it helps if ecotourists and potential volunteers are interested in the study system.
- 3) Communicate well with the general public. Good written and verbal communication skills with a general audience (magazine articles, presentations, and casual conversations) are important.
- 4) Invest time in interacting with guests, providing presentations and explaining the importance of the research.
- 5) Interact well with the company staff. Good personal relationships with company staff are very helpful in ensuring that the staff promptly complies with researcher requests. Communicating with staff in

their native language is usually an important step in this process.

- 6) Help educate the staff about the importance of the research to the overall success of the company. This provides incentives for the staff to help researchers.
- 7) Maintain basic hygiene levels and adhere to codes of acceptable conduct. Ecotourism companies do not tolerate complaints by tourists about researcher appearance and conduct, and researchers who generate such complaints will be asked to leave.
- 8) Be aware of research activities that negatively impact ecotourism activities. Researchers should take steps to mitigate or eliminate these impacts and inform the company and guests of the importance of these activities.

Ecotourism is by no means a panacea. The failures of ecotourism can often be linked to companies that do not care sufficiently about the welfare of the resources they exploit (Fennell & Weaver 2005). However, this paper shows that 1) ecotourism can effectively support scientific research, 2) objective scientific research can be conducted within the confines of an ecotourism company, and 3) volunteer organizations, such as the Earthwatch Institute can provide an important source of labor for research projects. Obtaining funding for natural history studies and long term monitoring is difficult, especially in the tropics. However, we still know relatively little about the basic biology of most tropical species. It is the hope of the author that more ecotourism companies will host or even hire researchers to conduct high quality basic science and help us fill in the gaps in our knowledge of tropical flora and fauna.

ACKNOWLEDGMENTS

Thanks to K. Holle and E. Nycander for having the vision to incorporate serious research in to their ecotourism company and to the staff and managers of Tambopata Research Center, Posada Amazonas and Refugio Amazonas for their daily support of researchers. Thanks also to the myriad of research assistants who collected the research data especially my field leaders B. Wilkerson, M. Dragiewicz, O. Gonzales, A. Figari, A. Bravo, A. Johnson, D. Matsufuji, G. T. Vigo, and K. Quinteros. As indicated above, the macaw research was funded by Rainforest Expeditions, the Earthwatch Institute and private donors. K. Holle (Rainforest Expeditions) and H. Pruiksma (Earthwatch) compiled data for this paper. The abstract was translated by Patricia Mendoza. This paper was improved by the comments of Bernadette Plair and Thomas White.

REFERENCES

- Ayala, H. 1997. Resort ecotourism: a catalyst for national and regional partnerships. *Cornell Hotel Rest. Admin. Quart.* 38: 34–45.
- Ayala, H. 2000. Panama's TRC action plan. *Cornell Hotel Rest. Admin. Quart.* 41: 108–119.
- Bález, A. L. 2002. Sky walk - sky trek: a successful community project in the mountains of Monteverde, Costa Rica. *Mt. Res. Dev.* 22: 128–131.
- Becker, C. D., & G. Ghimire. 2003. Synergy between traditional ecological knowledge and conservation science supports forest preservation in Ecuador. *Conserv. Ecol.* 8: 1.
- Birchough, A. C., S. M. Evans, & D. F. Welsh. 2001. A tyne for change. *Science Public Affairs* August: 18–19.
- Birdlife International. 2006. Data zone. <http://www.birdlife.org/datazone/species/>. Accessed 15 August 2006.
- Bookbinder, M. P., E. Dinerstein, A. Rijal, H. Caley, & A. Rajouria. 1998. Ecotourism's support of biodiversity conservation. *Conserv. Biol.* 12: 1399–1404.

- Brightsmith, D. J. 2004. Effects of weather on avian geophagy in Tambopata, Peru. *Wilson Bull.* 116: 134–145.
- Brightsmith, D. J. 2006. Natural history and conservation of Blue-and-gold Macaws in Peru. Pp. 13–17 *in* Proceedings of the 32nd Annual Convention. American Federation of Aviculture, Dallas, Texas.
- Collar, N. J. 1998. Information and ignorance concerning the world's parrots: an index for twenty-first century research and conservation. *Papageienkunde* 2: 201–235.
- Darwall, W. R. T., & N. T. Dulvy. 1996. An evaluation of the suitability of non-specialist volunteer researchers for coral reef fish surveys. Mafia Island, Tanzania—a case study. *Biol. Conserv.* 78: 223–231.
- Donohoe, H. M., & R. D. Needham. 2006. Ecotourism: the evolving contemporary definition. *J. Ecotourism* 5: 192–210.
- Earthwatch Institute. 2007a. About us. <http://www.earthwatch.org/site/pp.asp?c=dsJSK6PFJnH&b=386451>. Accessed 16 January 2007.
- Earthwatch Institute. 2007b. Earthwatch fact sheet. <http://www.earthwatch.org/site/pp.asp?c=dsJSK6PFJnH&b=399087>. Accessed 20 February 2007.
- Fennell, D., & D. Weaver. 2005. The ecotourism concept and tourism-conservation symbiosis. *J. Sustain. Tourism* 13: 373–390.
- Fennell, D. A. 2001. A content analysis of ecotourism definitions. *Curr. Issues Tourism* 4: 403–421.
- Foster-Smith, J., & S. M. Evans. 2003. The value of marine ecological data collected by volunteers. *Biol. Conserv.* 113: 199–213.
- Foster, R. B., T. Parker, A. A. H. Gentry, L. H. Emmons, A. Chicchón, T. Schulenberg, L. Rodríguez, G. Larnas, H. Ortega, J. Icochea, W. Wust, M. Romo, C. J. Alban, O. Phillips, C. Reynel, A. Kratter, P. K. Donahue, & L. J. Barkley. 1994. The Tambopata-Candamo Reserved Zone of southeastern Peru: a biological assessment. RAP working papers 6, Conservation International, Washington, D.C.
- Frickmann Young, C. E. 2005. Financial mechanisms for conservation in Brazil. *Conserv. Biol.* 19: 756–761.
- Getz, W. M., L. Fortmann, D. Cumming, J. du Toit, J. Hilty, R. Martin, M. Murphree, N. Owen-Smith, A. M. Starfield, & M. I. Westphal. 1999. Sustaining natural and human capital: villagers and scientists. *Science* 283: 1855–1856.
- Goodwin, H. 1996. In pursuit of ecotourism. *Biodivers. Conserv.* 5: 277–291.
- Goodwin, H., & I. R. Swingland. 1996. Ecotourism, biodiversity and local development. *Biodivers. Conserv.* 5: 275–276.
- Griscom, B. W., & P. M. S. Ashton. 2003. Bamboo control of forest succession: *Guadua sarcoarpa* in southeastern Peru. *Fo. Ecol. Manage.* 175: 445–454.
- Haag, A. 2005. A trip of a lifetime. *Nature* 435: 1018–1020.
- Masello, J. F., & P. Quillfeldt. 2002. Chick growth and breeding success of the Burrowing Parrot. *Condor* 104: 574–586.
- Munn, C. A. 1992. Macaw biology and ecotourism, or when a bird in the bush is worth two in the hand. Pp. 47–72 *in* Beissinger, R. S., & N. F. R. Snyder (eds.). *New World parrots in crisis*. Smithsonian Institution Press, Washington, D.C..
- Munn, C. A. 1994. Macaws winged rainbows. *Natl. Geogr.* 185: 118–140.
- Nycander, E., D. H. Blanco, K. M. Holle, A. d. Campo, C. A. Munn, J. I. Moscoso, & D. G. Ricalde. 1995. Manu and Tambopata: nesting success and techniques for increasing reproduction in wild macaws in southeastern Peru. Pp. 423–443 *in* Abramson, J., B. L. Spear, & J. B. Thomsen (eds.). *The large macaws: their care, breeding and conservation*. Raintree Publications, Ft. Bragg, California..
- Okello, M. M. 2005. A survey of tourist expectations and economic potential for a proposed wildlife sanctuary in a Maasai group ranch near Amboseli, Kenya. *J. Sustain. Tourism* 13: 566–589.
- Stronza, A. L. 2000. Because it is ours: community-based ecotourism in the Peruvian Amazon. Ph.D. diss., Univ. of Florida, Gainesville, Florida.
- Wilson, E. O. 1994. *Naturalist*. Island Press, Washington, D.C.

