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Richness and abundance of wild birds in fragments of native forest and pine plantations in the community of Punilla

Riqueza y abundancia de la avifauna silvestre en fragmentos de bosque nativo y plantaciones de pino en la comunidad de Punilla

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Abstract

The investigation was carried out in the quewiñas native Forest. The forest plantations of Pine (*Podocarpus parlatorei*) and Eucalyptus (*Eucalipthus globulus*) located in the Punilla community, municipality of Sucre. The objective is to determine the Richness and Abundance of wild birds which are associated with fragments of native Forest and plantations of pine. This way, we compared them between both habitats to determine which habitat has more richness and abundance. For the count of birds there was in use the method of Points of Count with fixed radius. For the native Forest were detected16 species of birds were detected and for the forest plantations of Pine and Eucalyptus 7 species of birds. It is very clear that the natural forests have greater Richness of species of birds than the forest plantations. The abundance of bird activity seems more in the native forests than in the forest plantations. As a conclusion, it is necessary the conservation of patches of native forest to support and assure the diversity of birds of the area, this habitat is the shelters the greatest number of species of the zone.

Forest, Plantation of pine, Native forest, Habitat, Species

Resumen

La investigación se realizó en los meses comprendidos entre julio y octubre de 2009, en el bosque natural de quewiñas (*Polylepis spp*) y plantaciones forestales de Pino (*Pinustometella*) y Eucaliptus (*Eucalyptus globulus*) ubicados en la comunidad de Punilla perteneciente al municipio de Sucre, con el objetivo de "Determinar la Riqueza y Abundancia de aves silvestres asociadas a fragmentos de bosque nativo y plantaciones de pino", y así compararlas entre ambos hábitats para determinar cuál tiene mayor riqueza y abundancia. Para el conteo de aves se utilizó el método de conteo por puntos con un radio fijo propuesto por Wunderle (1994). Para el bosque nativo se detectaron 16 especies de aves y para las plantaciones forestales de Pino y Eucalipto se detectaron 7 especies de aves, quedando muy claro que los bosques naturales tienen una mayor riqueza de especies de aves que las plantaciones forestales. En cuanto a la abundancia de aves, se observa una mayor actividad en los bosques nativos que en las plantaciones forestales. Concluyendo que la conservación de parches de bosque nativo es necesaria para mantener y asegurar la diversidad de aves en la zona, ya que este hábitat es el que alberga el mayor número de especies en la zona.

Bosques, Aves, Plantaciones forestales, Diversidad

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Introduction

At a global level, native forests have suffered a strong deforestation process in the last half of the 20th century. During the 1990s and 2000s, the loss of forests in the world reached 16 million ha per year, which represents a 4% decrease in the area of native forests (FAO, 2002). In addition to the loss of forest area, the remaining forests have been fragmented, being the main threat to global biodiversity (Saunders et al., 1991; Didham et al., 1998). It is estimated that 85% of temperate forests have been deforested at least once (Groom and Schumaker, 1993). The forests of Bolivia have not been the exception, large areas of native forest have been converted to agriculture and forest plantations, mainly during the 20th century (FAO, 2002), becoming their fragmentation the main threat to biodiversity (Bustamante and Grez, 2004; Echeverria et al.

The fragmentation of a forest can be defined as the transformation of a continuous forest into many smaller and more isolated units, whose current extension is much smaller than that of the original forest (Bustamante and Grez, 1995). The remaining fragments vary in shape, size, degree of isolation and type of matrix that surrounds them, generating different landscape patterns. The matrix, for its part, can be made up of agricultural, forestry, livestock or urban systems, sometimes hostile to the biota residing in the original habitat (Noss and Csuti, 1994), inducing abiotic and biotic effects on the remaining fragments, particularly in its edges.

Among the abiotic effects are the increase in temperature and luminosity and the decrease in relative humidity (Saunders et al., 1991; Bustamante and Grez, 1995, Didham and Lawton, 1999; Lindenmayer and Franklin, 2002; Burgos et al. , 2007). On the other hand, within the biotic effects are changes in abundance (number of individuals of a species in a given area; Smith and Smith, 2001), richness (number of species in a given area; Smith and Smith, 2001) and species composition, which in turn alters ecological interactions (sensu Noss, 1990; Murcia, 1995).

Materials and methods

The study was carried out in three fragments of native forest and three forest plantations, 9 counting points were determined for native forests distributed to three counting points per fragment.

In the same way it was done with forest plantations, having a total of 18 counting points in the study. Each counting point had a fixed radius of 50 meters and was sub-sampled for four days for a time of 15 minutes as established by (C. John Ralph et. Al. 1996). For the observation and identification of birds, 14x binoculars and 12 megapixel cameras with 8x optical zoom were used, with a bird guide (Birds of southern South America and Antarctica) and a bird program (Aves de Bolivia 2.0). To facilitate the identification of the birds, mist nets were placed in each fragment of native forest and forest plantations.

Results and discussion

A total of 16 species that inhabit the area were found, the 16 species can be found in native forests and 7 species that inhabit forest plantations.

Abundance of Birds Native Forest

In the first fragment of native forest composed of Polylepisse he observed 15 species of birds of the 16 that were identified in the study shown in the following graph where the relative abundance obtained by species is shown.

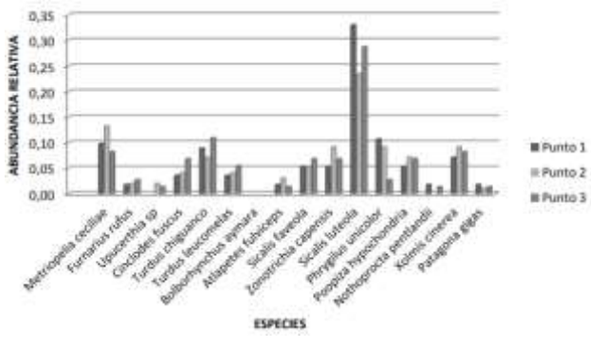

Figure 1 Relative abundance of bird sp (*polylepis sp native forest*)

It is seen that the most abundant species is Sicalisluteola (yellowish sparrow) followed by Metriopeliaceciliae (Andean dove). It can also be seen in the graph that there is a large presence of the species except for the species Bolborhynchusaymara (parrot) which is not found in this snippet.

In the second fragment composed of Quewiñas (Polylepissp) and Aliso (Alnusacuminata), in this fragment 14 species of birds of the 16 species were found.

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Showing the following graph of the relative abundance of the species present.

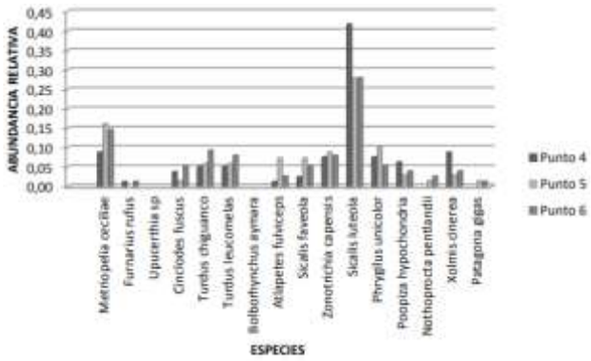

Figure 2 Relative Abundance of *Bird Sp* (*Polylepis Sp* & *Alnus Acuminata Native Forest*)

Like the previous graph, the most abundant species is Sicalisluteola and Metriopeliacesiliae and the other species are represented, although with a smaller number of individuals per species, it can be seen that in this fragment there are not two species Upucerthiasp and Bolborhynchusaymara. In the third fragment composed of quewiñas (Polylepis sp), you can see the 16 species.

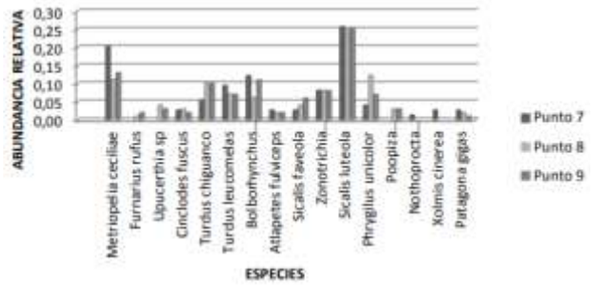

Figure 3 Relative abundance of bird sp (*polylepis sp native forest*)

It can be seen that the abundant species of this fragment are *Sicalisluteola* and *Metriopeliaceciliae* followed by *Turduschiguanco, Bolborhynchusaymara, Turdusleucomelas, Phrygilius* unicolor and *Zonotrichiacapensis*, the others are represented although with a smaller number of individuals per species.

Forest plantations

In the first forest plantation composed of Eucalyptus (*Eucalipthus globulus*) and Pine (*Poducarpus parlatorei*) in this place there is a predominance of Eucalyptus plants compared to those of pine.

In this site it was possible to observe 5 species of birds, which below shows the relative abundance of bird species by species.

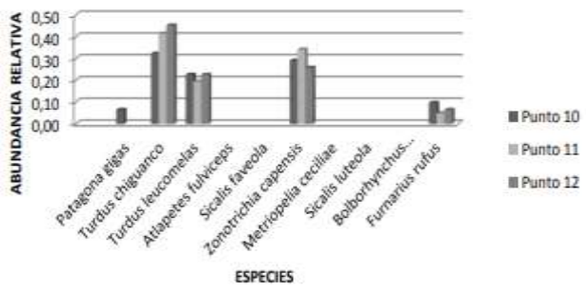

Figure 4 Relative abundance of bird sp (*eucalyptus* & *pine forest plantation*)

Three abundant species can be observed compared to the others, these abundant species are Turdus Chiguanco, Zonotrichiacapensis turdusleucomelas, as it can also be observed that only in point 10 is the Patagona gigas species in a smaller number.

Second forest plantation is composed of pine (*Podocarpus parlatorei*) in front of the fragment of native forest of Quewiñas and Aliso separated by the Mamahuasi river. The forest plantation covers an approximate area of 10 hectares. Where it was possible to identify 5 species of birds that inhabit this site where the relative abundance of this plantation is shown respectively.

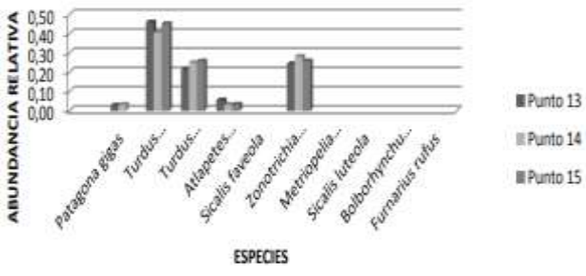

Figure 5 Relative abundance of sp of birds (*pine forest plantation*)

It can be seen in this graph that only 5 species of birds are present, the ones that stand out are Turduschiguanco, Zonotrichiacapensis and Turdusleucomelas, the other two have less abundance. Third forest plantation made up of pines (Podocarpus parlatorei) and Eucalyptus (Eucalyptus globulus). In this area there is a predominance of pine plants compared to the pine trees, it should be noted that this area is at a height of 3400 masl limiting with a fragment of Bosque de Quewiñas.

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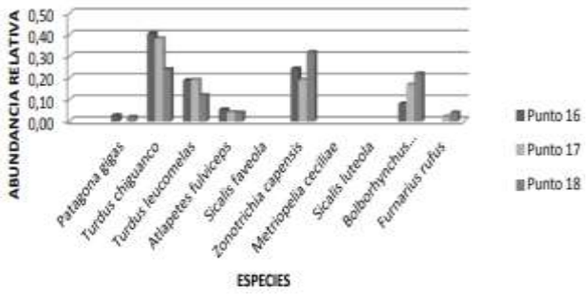

Figure 6 Relative abundance of bird sp (*pine* & *eucalyptus forest plantation*)

It shows us that in this forest plantation there are more species of birds compared to the other forest plantations, being registered for this forest plantation 7 species of birds, the most outstanding are 4 species that are Turduschiguanco, Zonotrichiacapensis, Turdusleucomelas and Bolborhynchusaymara.

Species Shared Between Fragments Of Native Forest And Forest Plantations

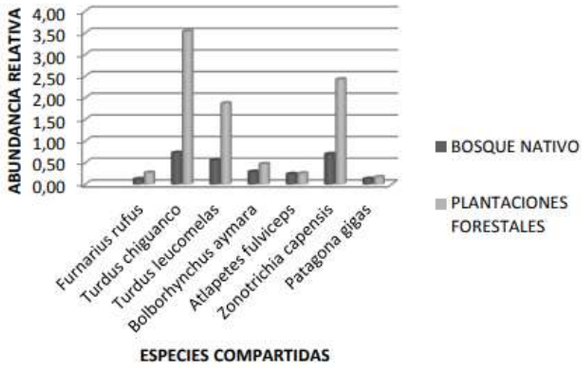

Figure 7 Relative abundance of *shared sp* of birds

It can be seen that there are shared species in the native forest fragments with the forest plantations. There are 7 species that are shared, these species are detailed according to abundance in descending order; Turduschiguanco, Zonotrichiacapensis, Turdusleucomelas, Bolborhynchusaymara, Atlapetesfulviceps, Furnariusrufus, and Patagona gigas. It is observed that three species in particular have adapted better in forest plantations: Turduschiguanco, Zonotrichiacapensis and Turdusleocomelas.

Bird Wealth

In the fragments of native forest, a large presence of bird species can be observed, as seen in the Figure, where at no counting point is less than 12 species observed.

With point 4 being the lowest record of species in the forest fragments. native forest. Analyzing the results, it can be seen that the species richness ranges between 12 and 15 species at each counting point.

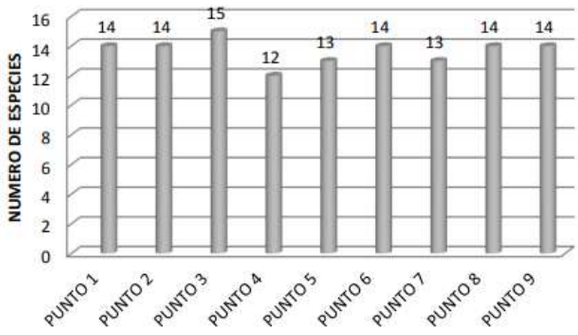

Figure 8 *Sp richness* of birds for each point count in native forest fragments

The richness of bird species in forest plantations is limited to 4 species, being the lowest record and the maximum 7 species, more presence is seen in points 16, 17, 18 that belong to the associated forest plantation of Pine & Eucalyptus.

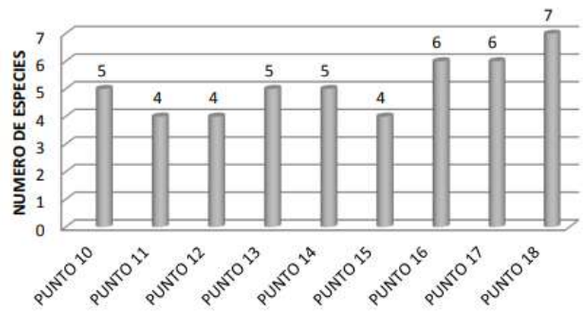

Figure 9 Bird sp richness for each counting point in forest plantations

Relative Abundance for each counting point											
N°	Familia	species	Pointone	Pointtwo	Point3	Point4	Point5	Point6	Point7	Point8	Point9	full abundance
1	Columbidae	metriopelaceci	0.10	0.13	0.08	0.09	0.16	0,5	0.20	0,11	0.13	1.16
2	Furnariidae	liae	0.02	0.02	0.03	0.01		0.01		0.01	0.02	0.12
3	Furnariidae	furnariusrufus		0.02	0.01					0.04	0.03	0.10
4	Furnariidae	sipocorthiasp	0.04	0.04	0.07	0.04	0.01	0.05	0.03	0.03	0.02	0.33
5	Muscicapidae	Cinclodesfusco	0.09	0.07	0.11	0.05	0.06	0.09	0.05	0.10	0.10	0.73
6	Muscicapidae	s	0.04	0.04	0.05	0.05	0.06	0.08	0.09	0.07	0.07	0.56
7	Psittacidae	Turduschiguan							0.12	0.06	0,11	0.29
8	Sub Filia.	co	0.02	0.03	0.01	0.01	0.07	0.03	0.03	0.02	0.02	0.24
9	Cardinalinae	Turdusleocome	0.05	0.05	0.07	0.03	0.07	0.05	0.03	0.04	0.06	0.45
10	Sub Filia.	tbe	0.05	0.09	0.07	0.08	0.09	0.08	0.08	0.08	0.08	0.70
11	Emberizinae	Bolborhynchus	0.33	0,23	0.29	0.42	0.28	0.28	0.26	0.26	0.25	2.59
12	Sub Filia.	Aymara	0.11	0.09	0.03	0.08	0.10	0.05	0.04	0.12	0.07	0.69
13	Emberizinae	Atlapetesfulvic	0.05	0.07	0.07	0.06	0.03	0.04		0.03	0.03	0.39
14	Sub Filia.	eps	0.02		0.01		0.01	0.03	0.01			0.09
15	Emberizinae	Sicalisfaveola	0.07	0.09	0.08	0.09	0.03	0.04	0.03			0.43
61	Sub Filia.	Zonotrichiacap	0.02	0.01	0.01		0.01	0.01	0.03	0.02	0.01	0.13
17		ensis	14	14	15	12	13	14	13	14	14	16

Table 1 Native forest fragments

Table 1 shows us the relative abundance of the species for each counting point and the total of native forest fragments. On the other hand, it shows us the record of species present for each point (species richness). And the total registry of species of the fragments of native forest, with 16 species being registered for the fragments of native forest.

aboundRelative Percentage For Each Counting Point												
N°	Familia	species	Pointone 0	PointIone	PointItwo	Point13	Point14	Point15	Pointone 6	Pointone 7	Point18	Tosuch
1	Trochilidae	patagonia gigas	0.06			0.03	0.03		0.03		0.02	0.17
2	Muscicapidae	Turduschiguanco	0.32	0.41	0,45	0.46	0.41	0,45	0.41	0.38	0.24	3.53
3	Muscicapidae	Turdusleuconelas	0,23	0,11	0,23	0.22	0.25	0.26	0.19	0.19	0.12	0.7
4	Sub	atlapetesfulviceps				0.05	0.03	0.03	0.05	0.04	0.04	0.25
5	Cardinal e	Zonotrichiacapensis	0.29	0,3. 4	0.26	0.24	0.28	0.26	0.24	0.19	0.32	2.43
6	Sub	Bolborhynchusayma							0.08	0.17	0.22	0.47
7	Emberizinae	ra	0.10	0.05	0.06					0.02	0.04	0.27
8		furnariusrufus	5	4	4	5	5	4	6	6	7	7

Table 2 Forest Plantation

Table 2 Shows the richness of species present for each counting point within the forest plantations, as well as, on the other hand, shows the species and their relative abundance in each point and the total of the species present in the forest plantations, leaving 7 Species of birds registered in forest plantations. As can also be seen that points 16, 17, 18 have more activity and registering in these a Bolborhynchusaymara species (a variety of parrot, in Quechua quechichi). This species is also recorded in native forests at points 7, 8, 9 with more abundance than in forest plantations.

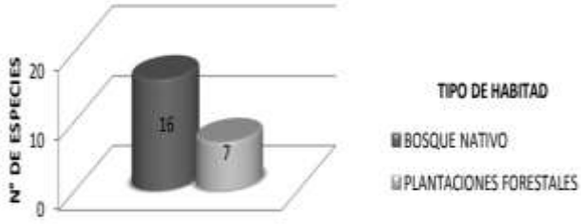

Figure 10 Bird sp richness

The total bird species richness of the native forest fragments was 16 species and in forest plantations it was 7 as shown in the graph. In this way, native forests are home to 9 more species than forest plantations.

Discussion

The present study carried out gives us clear results where it shows us that there is a great richness of bird species in native forest fragments compared to forest plantations, the same result can be seen in the relative abundance of native forest fragments.

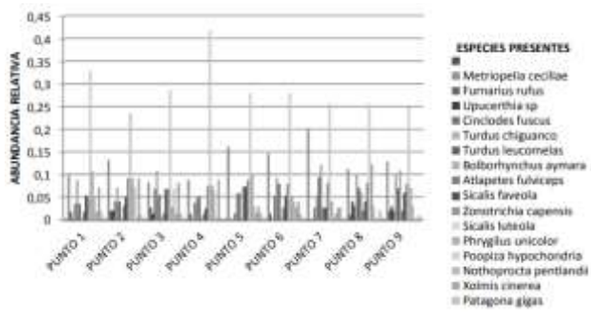

Figure 11 Relative abundance of sp of birds in native forest

In the native forest fragments of quewiña and aliso, a large presence of several species can be seen, a total of 16 species (Graph 14.11), the species present can be observed for each counting point of all the native forest fragments if we compare with Graph 12 shows the species present in all the counting points of the forest plantations, showing the great difference that exists in terms of the presence of bird species and their abundance.

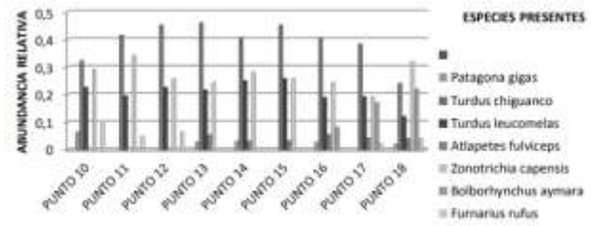

Figure 12 Relative abundance of sp of birds in forest plantations

According to the bibliography consulted on similar studies in other nearby countries such as Peru and Chile, they show that in the native forests of Quewiña in particular there are birds specialized in this type of forest, of which little was seen in this study, and the key species that indicate the status of these forest types none were recorded indicating that these native forest fragments are losing their diversity in terms of birds. You can clearly see the difference that exists in this study on the richness and abundance of birds that native forests present. If forest plantations continue to be established, the diversity of these types of forests will continue to be lost. The bird species that inhabit the native forests of Quewiña (Polylepis spp.). In particular, they support great anthropic pressure, but this can end up because only small fragments of native forest are left and the other species cannot easily adapt to forest plantations and these will necessarily have to migrate to another type of region or they will perish in the place.

Conclusions

The hypothesis proposed for this study was accepted: There are differences in the richness and abundance of birds in native forest fragments compared to forest plantations.

Forest plantations result in a lower richness of species, both migratory and resident, since the composition of avifauna is affected by the lack of easy adaptation of bird species. While the fragments of native forest present a greater richness of species, showing that this habitat provides better conditions for the species of the area. The conservation of patches of native forest is necessary to maintain and ensure the diversity of birds in the area, since this habitat is the one that houses the largest number of species in the area.

Native forest fragments, despite presenting changes in the structure and composition of the forest, present optimal conditions to maintain a significant richness and abundance of birds, being an option for the conservation of certain bird species.

The ability of certain species to choose specific habitats makes them ideal elements to assess the disturbance in an area and carry out natural resource management plans. The quewiñas forests present a great diversity of bird species, being an important area for both resident and migratory species, which depend on the resources of the area to survive.

Acknowledgments

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References

ArmoníaBirdLife (2007) ―Book of Abstracts – VIII Congress of Ornithology and Conservation of Birds in Bolivia‖ La Paz – Bolivia.

Associated beetles in a fragmented temperate forest. Chilean Journal of Natural History 77: 107-120. Bennett, A. 2004. Linking the landscape: the role of corridors and connectivity in conservation of the gone wild Trad. JM Blanch. San Jose, CR. IUCN. 1278 pages

B. aker, V; Van Vuren, D. 2003. Gap-crossing decisions by the red squirrel, a forest-dependent small mammal. Conservation Biology. Vol. 18(3): 689-697.

B. Ustamante-Sánchez, MA, AA Grez, and JA Simonetti. 2004. Dung decomposition and Rapid deforestation and fragmentation of Chilean temperate forests. Biological Conservation 130: 481-494 Bustamante, R. and A. Grez. 1995. Ecological consequences of the fragmentation of native forests. A.MGood and Development 11: 58-63.

B. Urgos, A., AA Grez, and RO Bustamante. 2007. Seed production, pre-dispersal seed predation and germination of Nothofagusglauca (Nothofagaceae) in a temperate fragmented forest in Chile. Forest Ecology and Management 255: 1226-1233.

Cardenas, G; Harvey, C; Ibrahim, M; Finegan, B. 2003. Diversity and richness of birds in different habitats in a fragmented landscape in Cañas, Costa Rica. Agroforestry in the Americas. Vol.10:39-40.

Castellón, T; Sieving, K. 2005. An experimental test of matrix permeability and corridor use by an endemic understory bird. Conservation Biology. Vol.20 (1):135-145

Cantebury, G; Martin, T; Petit, D; Petit, L; Bradford, D. 2000. Bird communities and habitats as ecological indicators of forest condition in regional monitoring. Conservation Biology. Vol.14 (2):544-558.

Didham, RK, Hammond, PM, Lawton, JH, Eggleton, P. and NE Stork. 1998. Beetle species responses to tropical forest fragmentation. Ecological Monographs 68: 295-323.

Didham, RK and JH Lawton. 1999. Edge structure determines the magnitude of changes in microclimate and vegetation structure in tropical forest fragments. Biotropica 31: 17-30.

Echeverría, C, D. Coomes, J. Salas, JM Rey-Benayas, A. Lara and A. Newton. 2006.

Fjeldsa, J. & N. Krabbe. 1990. Birds of the High Andes. Copenhagen: University of Copenhagen &Svendborg: Apollo Books.

Fjeldsa J. & Kessler M. (2004) ―Biodiversity Conservation in the Polylepis Forests of the Bolivian Highlands‖

Fjeldsa J. & Kessler M. (2004) ―Biodiversity Conservation in the Polylepis Forests of the Bolivian Highlands‖

FAO (Food and Agriculture Organization of the United Nations). 2002. Global Forest Resources Assessment 2000. Rome, Italy. 367p.

Fjeldsa, J. & M. Kessler. 1996. Conserving the Biological Diversity of Polylepis Woodlands of the Highland of Peru and Bolivia. A contribution to sustainable natural resource management in the Andes. NORDECO. Copenhagen, Denmark.

Groom, MJ and N. Schumaker. 1993. Evaluating landscape change: pattern of worldwide deforestation and local fragmentation. Pp 24-44. In: Kareiva, PM, JG Kingsolver and RB Huey. (eds.). Biotic interactions and global change. Sinauer, Sunderland.

Hensen, I. 1992. The flora of the Chorojo community, its use, scientific and vernacular taxonomy. Technical Series No 28 (AGRUCO), Cochabamba, Bolivia. 25 p.m.

Harvey, C; ; Medina, A; Merlo, D; Vilchez, S; Hernandez, B; Saenz, J; Maes, JM; Casanoves, F; Sinclair, F. 2006. Patterns of animal diversity in different forms of tree cover in agricultural landscapes. Ecological Applications. Vol.16 (5):1986-1999.

Ibisch PL et al. (2002) "Explanatory Memory, Map of the Andean Forests" La Paz - Bolivia.

J. Cruz Bolorges Baños and L. Lopez Mata (2005) ―Richness and Diversity of Bird Species in a Medium Evergreen Forest in Central Veracruz, Mexico‖.

Kessler, M. 1995. The genus Polylepis in Bolivia. Candollea. 50:131-171.

Kattan, GH. 2002. Fragmentation: patterns and mechanisms of species extinction. In Guariguata, MR; Kattan, G.H. (eds). Ecology and conservation of neotropical forests. EULAC/GTZ. First edition. LUR editions. Carthage, CR. Pp. 561-590.

Lindenmayer, DB & JF Franklin. 2002. Conserving forest biodiversity. A comprehensive multiscaled approach. Island Press, Washington DC, USA. 351p.

Margalef, R (1989) "Ecology". Ed. Omega, Barcelona - Spain.

Murcia, C. 1995. Edge effects in fragmented forests: implications for conservation. Trends in Ecology and Evolution 10: 58-62.

Martin R. de la Peña & Maurice Rumboll 1998.―Illustrate checklists Birds of Southern South America and Antarctica‖. Ed. Princeton University Press. Princeton-New Jersey.

Navarro, G. 1997. Contribution to the ecological and floristic classification of Bolivian forests. Rev. Bol. de Ecol. 2: 3-37.

Navarro G. & Ferreira W. 2007. ―Mapa De Vegetacion De Bolivia‖ Technical Edition CD – ROM J. Chambi [TheNatureConservancyProtentigNaturePreservigLife]

Navarro G. & Maldonado M. (2002). "Ecological Geography of Bolivia". Editorial Patiño Ecology Center. Cochabamba – Bolivia.

Noss, R. and B. Csuti. 1994. Habitat fragmentation. pp. 237-264. In: Meffe, GK, Carroll, CR (eds). Principles of conservation biology. Sinauer Associates, Sunderland, Mass.

Noss, RF 1990. Indicators for monitoring biodiversity: a hierarchical approach. Conservation Biology 4: 355-364.

Navarro, G. 1997. Contribution to the ecological and floristic classification of Bolivian forests. Rev. Bol. de Ecol. 2: 3-37.

Robinson, D; Angehr, G; Robinson, T; Petit, L; Petit, D; Drawn, J. 2004. Distribution of bird diversity in a vulnerable Neotropical landscape. Conservation Biology. Vol.18 (2):510-518.

Ramírez, L. 2006. Ecological and cultural contribution of silvopastoral systems for the conservation of biodiversity in Matiguás, Nicaragua. Mag. Thesis Sc. Turrialba, CR, CATIE. 175p.

Sjoerd Mayer 1998. ―Birds of Bolivia 2.0‖ Interactive bird CD

Stotz, D., J. Fitzpatrick, T. Parker Iii& D. Moskowits. Nineteen ninety six. Neotropical birds, Ecology and Conservation. University of Chicago Press, Chicago, USA

Smith, RT and TM Smith. 2001. Ecology 4th edition. Pearson Education, SA, Madrid. 664p.

Saunders, DA, RJ Hobbs, and CR Margules. 1991. Biological consequences of ecosystem fragmentation: a review. Conservation Biology 5: 18-32

Wust, W.H. 2000. Fparrot TOndina. Address www.Parquesyreservasnaturales/flora Y wowna/flora andina.Es010506b.htm.

Watson, J; Whittaker, R; Freudenberger, D. 2005. Bird community responses to habitat fragmentation: how consistent are they across landscapes? Journal of Biogeography. Vol. (32):1353-1370.