NEW RECORDS, RECONFIRMED SITES AND PROPOSALS FOR THE CONSERVATION OF BLACK LION TAMARIN (*LEONTOPITHECUS CHRYSOPYGUS*) IN THE MIDDLE AND UPPER PARANAPANEMA

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Abstract

The Black Lion Tamarin (BLT, *Leontopithecus chrysopygus*) is an endangered species, endemic to the State of Sao Paulo, Brazil. The conservation of the species depends on the effective management of the populations and forest conservation but also on the updated knowledge of its areas of occurrence. Here, we report the record of a new site of BLT occurrence in the municipality of Guareí and confirm the presence of this species in two municipalities, Taquarivaí and Borebi, which (Borebi) is the first record since the last two decades in the Middle Paranapanema basin. Direct observations of BLT groups occurred after the use of playbacks of BLT vocalizations (Guareí), during the prospection of the area (Taquarivaí) and the monitoring of the fauna (Borebi). These three sites are located close to known BLT populations. The occurrence of BLTs in anthropized landscapes with low forest cover, but with a considerable presence of riparian forests, gives evidence of the ecological resilience of the species and underlines the conservation value of such habitats. We are initiating scientific based projects and environmental education programs to increase the knowledge about the ecology and tolerance of BLTs in human altered landscapes. The confirmation of occurrence areas and new records of BLT populations is the starting point for the conservation success of the species.

Key Words: *Leontopithecus chrysopygus*, anthropized landscapes, riparian forests, conservation program.

Resumo

O Mico-leão-preto (MLP, *Leontopithecus chrysopygus*) é uma espécie ameaçada de extinção, endêmica do Estado de São Paulo, Brasil. A conservação da espécie depende não só do manejo eficaz das populações e da conservação das florestas, mas também do conhecimento atualizado das suas áreas de ocorrência. Neste artigo, reportamos o registro de uma nova área de ocorrência de MLP no município de Guareí e confirmamos a presença da espécie em dois outros municípios, Taquarivaí e Borebi, o qual (Borebi) é o primeiro registro da espécie nas duas últimas décadas na bacia do Médio Paranapanema. As observações diretas dos MLPs ocorreram após o uso de *playbacks* das vocalizações da espécie (Guareí), durante a prospecção da área (Taquarivaí) e durante trabalhos de monitoramento da fauna (Borebi). As três áreas são localizadas próximas de populações já conhecidas de MLPs. A ocorrência de MLPs em paisagens antropizadas com baixa porcentagem de cobertura vegetal, mas com a presença de matas ciliares, evidenciam certa flexibilidade e resiliência da espécie e enfatiza o valor que estes habitats têm para a conservação da espécie. Estamos iniciando projetos de pesquisa e programas de educação ambiental para melhorar o conhecimento sobre a ecologia e tolerância a paisagens antropizadas. A confirmação das áreas de ocorrência e novos registros de populações de MLPs são a base para o sucesso da conservação da espécie nestas localidades.

Palavras-Chave: *Leontopithecus chrysopygus*, paisagens antropizados, mata ripária, programa de conservação.

Introduction

Endemic to the State of São Paulo, with its geographical distribution restricted to the interfluve of the Tietê-Paranapanema (Hershkovitz, 1977; Mittermeier, 2013), a region that has suffered intense occupation and deforestation, the black lion tamarin (BLT, *Leontopithecus chrysopygus*) was considered to be extinct (not seen since 1905), but was rediscovered in the late 1960s in the Pontal do Paranapanema region (Coimbra-Filho, 1970). In 2000, the BLT was listed as one of the 25 most endangered primate species in the world (Mittermeier et al., 1985). Many studies on the ecology of this species, long-term conservation programs (Valladares-Padua, 1987; Valladares-Padua, 1993; Albernaz, 1997; Passos, 1998), and the finding of new populations in the basin of the upper Paranapanema River (Lima et al., 2003; Röhe et al., 2003; Rodrigues et al., 2014) brought new hope for its successful conservation. Because of the discovery of these additional populations, and the conservation efforts on behalf of this species, there was a proposal to downgrade the threat category from Critically Endangered in the updated list of threatened species in the state of São Paulo (São Paulo, 2008; Kierulff and Port-Carvalho, 2009). Currently, the BLT is classified as "Endangered" in all threatened species lists; state (São Paulo, 2014a), national (Brasil, 2014), and global (Kierulff et al., 2008).

Here we report on a newly found population of the BLT in the municipality of Guareí, and confirm its presence in two municipalities, Borebi and Taquarivaí. We discuss actions and joint projects that are underway that contribute to our understanding of the eoclogy of the BLT, and new local initiatives for its conservation.

Methods

In Guareí, we used playbacks of BLT vocalizations, following a method developed in other callitrichid census studies (Kierulff and Rylands, 2003; Neves, 2008), along the gallery forests of the Guareí River, from 27–31 October, 2014, and from 13–18 August, 2015. We found out about the presence of BLTs in Taquarivaí during an expedition to identify new sites for ecotourism. BLTs were fully habituated by the farm owner who simply called them to make them approach. They fed almost daily on fruits provided by the owner. The records in Borebi originate from monitoring studies on birds and mammals conducted by the Lwarcel Celulose Company. During the sightings, vocalizations of BLT were recorded, photographs taken and the geographic coordinates were noted.

Results

On 29 October 2014, in response to playback, two adults and one young BLT were sighted in a fragment of gallery forest along the Guareí River, about 100 m from a busy municipal road. On 3 August 2015, six individuals were seen crossing the road of the bridge over the Areia Branca River to feed on the palm (*Syagrus romanzoffiana*) while three other individuals passed under the bridge in the same direction. Finally, on 18 August 2015, three individuals (one adult male and one adult female were identified) responded to playback in the gallery forest along the Guareí River and were observed for 10 minutes and then were lost by the observers (Fig. 1, Table 1). We were unable to determine for certain whether the observations were from one or different groups. However, based on the location and the number of individuals observed, we think that the second observation in Guareí was of a different group than the first and third sightings.

In the same basin of the Upper Paranapanema River, in the region of Itapeva, on 22 May 2011, eight individuals were seen coming from the gallery forests of the Apiaí-Guaçu River in Taquarivaí to feed on fruits provided by the owner of the Farm, about 15 m from the forest (Fig. 2; Table 1). The sites in Borebi were on the property of the Lwarcel Celulose Company in the gallery forests along the Rio Claro River, in the middle Paranapanema River region. As the records were made during different field visits in 2007, 2010, 2013 and 2015, it was not possible to determine whether the sightings were from one or several BLT groups (Fig. 3; Table 1).

Discussion

There are already known occurrences of BLT populations close to the new or confirmed sites reported in this paper (Holst et al., 2006; Rylands et al., 2008; Rodrigues et al., 2014). The sightings of a BLT group in Guareí occurred in the riparian forest of the Guareí and Areia Branca rivers that connects to a population of the Angatuba Ecological Station 12 km away that was the focus of a recent population survey. At this specific location, local residents frequently observe BLTs crossing a busy road (the Domiciano de Souza municipal road, GRI 253), and road kills of three adult and 2 young BLTs were recorded in 2013. The busy municipal road connects the cities of Guareí and Angatuba and has a constant flow of heavy vehicles transporting timber. For this spot, emergency measures, such as speed reducing bumps, informative boards and, suspended walkways have been initiated to prevent further road kills in the BLT group's home range. Studies on the ecology of this population and more specifically on the group frequently seen crossing the road started in the second half of 2015.

The records in Taquarivaí were made in the gallery forests remaining along the Apiaí-Guaçu River already indicated with BLT sightings in the municipality of Buri (Lima et al., 2003). In the case of the record in Borebi, the nearest known population occurs in the gallery forests of the Rio Claro farm owned by Duratex SA, located in Lençóis Paulista, studied by Mamede-Costa and Gobbi (1998) and part of a BLT meta-population management project in the 1990s (Medici, 2001). Notably, this is the first record in

the last two decades of a population in the Middle Paranapanema basin, although there are other locations where the occurrence of BLTs have yet to be confirmed, such as the riparian forests of the Pardo River basin (Griese & Port-Carvalho pers. comm.).

The subpopulations of BLTs in these above mentioned regions are part of the extinction debt still to be paid with a loss of biodiversity as a consequence of natural habitat destruction and landscape conversion (Metzger et al., 2009; Lira et al., 2012). However, the records of BLTs in landscapes with low forest cover, few small remaining forest fragments, but with a considerable presence of riparian forests, give evidence of their notable resilience, allowing this species to persist in these remaining habitat settings, even in small groups with a low flux of individuals between them. The confirmation of still existing groups opens up promising opportunities for the conservation of this species. However, the threats of stochastic events (disease, predation and road kills) remain and may lead to local extinctions of small BLT subpopulations. There is already enough evidence for the severity of these threats as seen with the road kill reports in Guareí in 2013 and the sudden outbreak of yellow fever in municipalities within the geographic distribution of BLTs in the Middle and Upper Paranapanema River in 2009 (Mascheretti et al., 2013). Integrated programs on a local scale can mitigate the consequences of stochastic events whereas the development of regional landscape

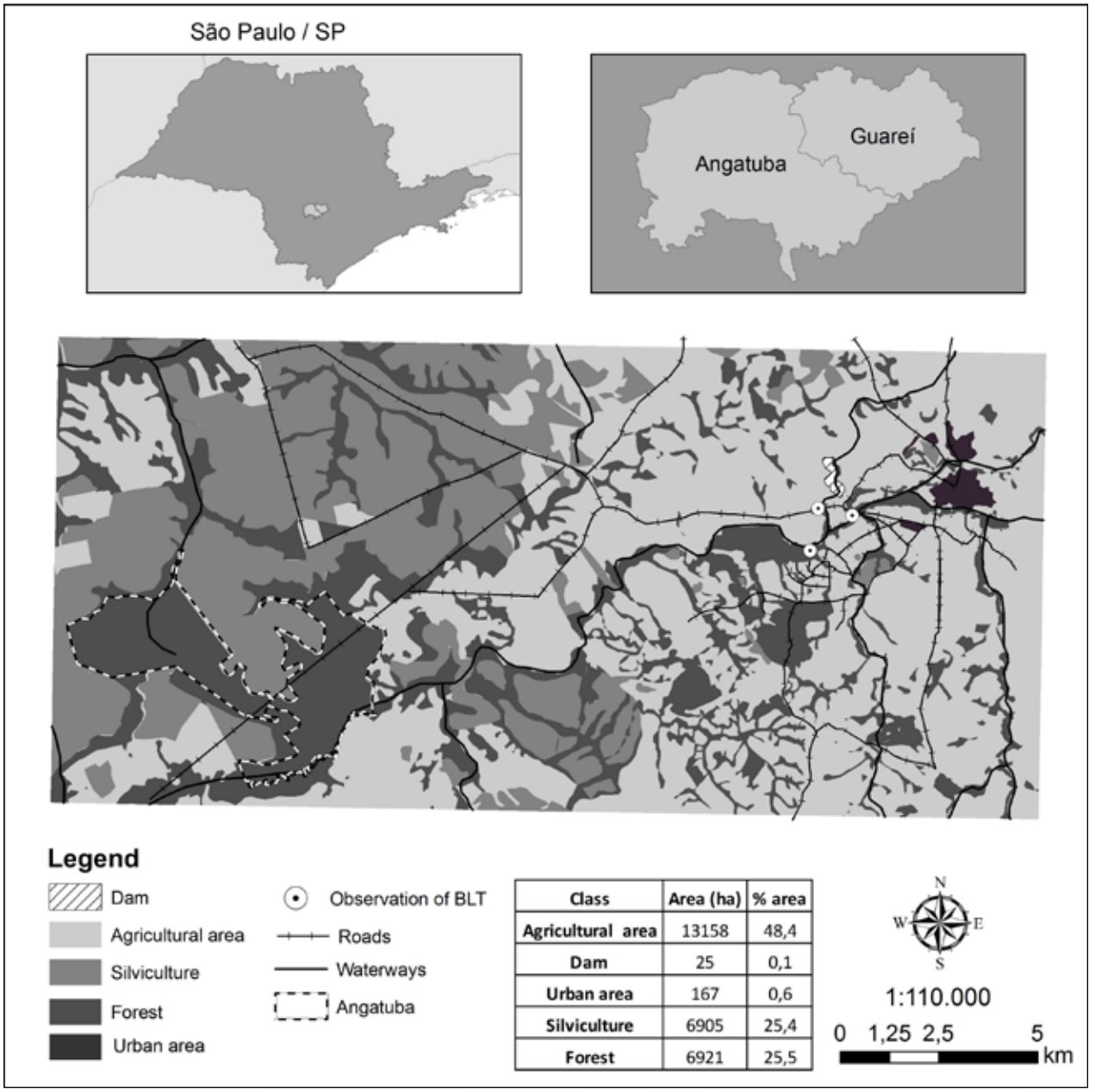

Figure 1. Location of a new record for the occurrence of the black lion tamarin in the municipality of Guareí, Upper Paranapanema basin (Sao Paulo state) and percentages of different land use and forest cover in the landscape. The closest conservation unit where BLTs also occur is the Angatuba Ecological Station.

Table 1. Dates, geographic coordinates and details about the context of the observations of BLTs (River, basin, method, and number of individuals observed – N° ind) in the new (Guareí) and reconfirmed sites (Borebi and Taquarivaí) of BLT occurrence.

Municipality/Date	Coordinates	River/ Basin	Method	N° ind
Guareí/SP, 29/10/2014	23°22'37.20"S 48°12'24.85"W	Guareí / UP	*Playback*	3
03/08/2015	23°22'32.70"S 48°12'53.20"W	Areia Branca / UP	Oe[a]	9
18/08/2015	23°23'06.50"S 48°12'59.70"W	Guareí / UP	*Playback*	3
Taquarivaí/SP, 22/05/2011	23°54'59.12"S 48°39'56.34"W	Apiaí-Guaçu / UP	Regularly baited in a private property	8
Borebi/SP, 2007	22°45'41.22"S 49° 1'19.11"W	Rio Claro / MP	*Playback*	1
05/2010	22°45'31.56"S 49° 1'11.56"W	Rio Claro / MP	Oe[a]	4
03/2013	22°46'25.58"S 49° 4'33.33"W	Rio Claro / MP	Oe[a]	5
08/2013	22°45'47.79"S 49° 3'47.78"W	Rio Claro / MP	*Playback*	3
02/2015	22°45'29.79"S 48°59'32.48"W	Rio Claro / MP	Oe[a]	4

[a] Occasional encounters

management programs that promote the reconnection of isolated groups and ecological features may ensure the survival of BLTs in these disturbed cultural landscapes.

The landscapes sampled in this study have considerably less forest cover than the proposed threshold of 30% for conservation of the Atlantic Forest's biodiversity (Pardini et al., 2010; Martensen et al., 2012). Landscapes with less than 20% forest cover indicate a tendency to the extinction of a large part of the biodiversity, which may have already occurred. These landscapes are considered to have low resilience, and a huge investment demand for their restoration, and even then with little chance of success (Calmon et al., 2011; Tambosi et al., 2014). Conservation actions become more effective and efficient if they strengthen the resilience of endangered species and of the landscapes they inhabit. The recent alterations of the Brazilian forest code that reduce the width of legally protected riparian forests that should be restored when already destroyed implies a considerable reduction in habitat resilience (Metzger et al., 2010) and thus threatens the last remaining opportunities for the survival of BLTs in these landscapes.

The publication of new records of occurrence of endangered species is an important contribution to existing biological and biogeographical data on a small scale, but gains special relevance when incorporated in multiple-scale approaches and initiatives for new strategies for biodiversity conservation in the Atlantic Forest (Ribeiro et al., 2013). Over the past decades, there have been initiatives by various institutions and researchers on state, federal and international levels for the conservation of BLTs (Rylands et al., 2008; Rezende, 2014), overseen by the international management committee for the lion tamarins and ands evidenced by the population and habitat viability workshops (Holst et al., 2006), management plans for protected where BLTs occur (São Paulo, 2006; Brasil, 2007; São Paulo, 2008; Duratex, 2013), the creation of new protected areas, the development of a National Action Plan for the Conservation of the mammals of the Central Atlantic Forest (Brasil, 2010; Brasil, 2012; Brasil, 2014), the updated lists of endangered species (Brasil, 2014; Kierulff et al., 2008; São Paulo, 2014a), specific environmental education programs, the declaration of BLTs as an environmental heritage of the state of São Paulo and as a symbol of conservation (São Paulo, 2014b), the creation of the standing committee for the conservation of primates in the state of São Paulo (São Paulo, 2014b), the state programs with incentives for municipalities to protect natural resources, such as the program Blue Green Municipality and the environmental registry for rural properties (for details see:www.ambiente.sp.gov.br/), numerous meetings for fund-rasing and to integrate researchers and institutions involved, and the development and dissemination of research projects concerning the species (Instituto de Pesquisas Ecológicas,

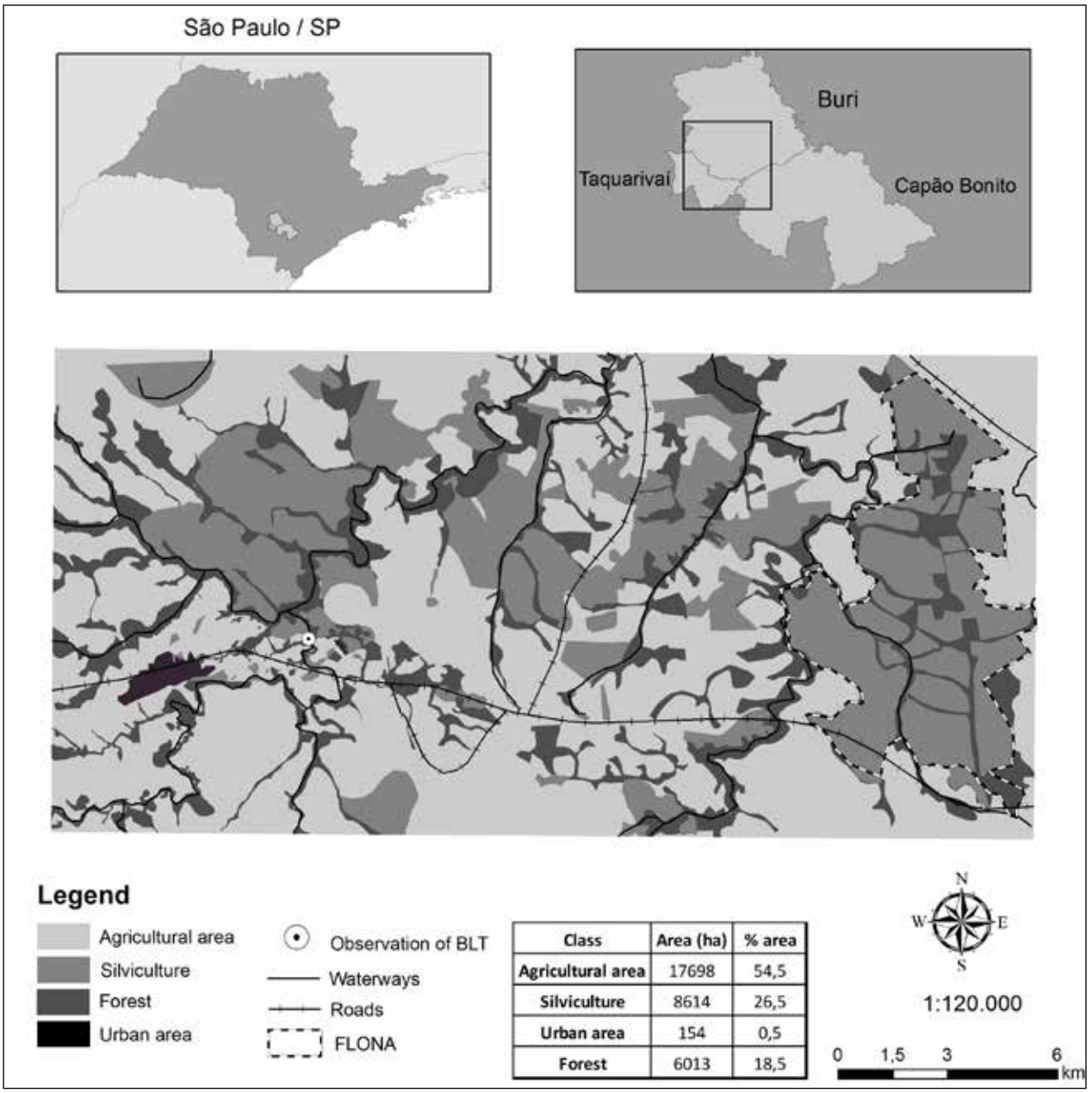

Figure 2. Location of a reconfirmed site for the occurrecne of BLT in the municipality of Taquarivaí, Upper Paranapanema basin (São Paulo state), and percentages of different land use and forest cover in the landscape. The closest conservation unit where BLT also occur is the Capão Bonito National Forest (FLONA).

2013; Instituto de Pesquisas Ecológicas, 2014; Fundação Parque Zoológico de São Paulo, 2014).

In line with these actions, we are initiating research projects in Guareí and Borebi in order to better understand the ecology and resilience of BLTs in human-altered landscapes. Knowledge on resources, habitat, and matrix use is being integrated into impact and viability analysis to develop mitigation and landscape management measurements and incentives for the creation of private natural heritage reserves. Relevant stakeholders and local communities are being involved in democratic, bottom-up approaches in order to locally fulfill the agendas, proposals and guidelines of the current forums and working groups for the conservation of BLTs in their habitat.

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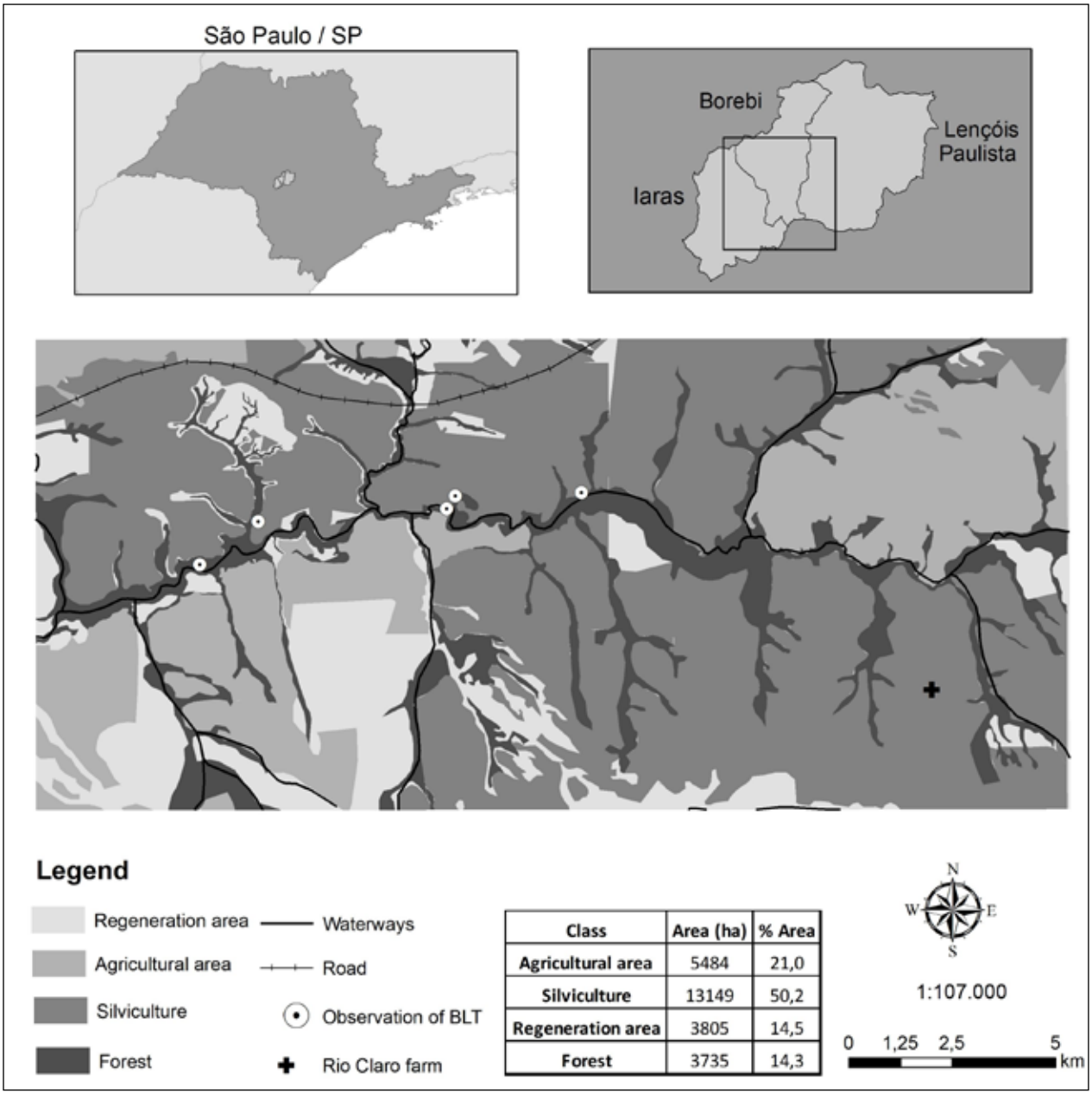

Class	Area (ha)	% Area
Agricultural area	5484	21,0
Silviculture	13149	50,2
Regeneration area	3805	14,5
Forest	3735	14,3

Figure 3. Location of a reconfirmed site for the occurrence of the black lion tamarin in the municipality of Borebi, Middle Paranapanema basin (São Paulo state) and percentages of different land use and forest cover in the landscape. The closest conservation unit where the BLT also occurs is the Fazenda Rio Claro, today protected as a private natural heritage reserve (RPPN Olavo Egydio Setubal).

allowing us to collect data in the Turvinho Farm (Borebi, SP).

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