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AREA OF FOREST OCCUPIED BY THE COLONIES OF MONARCH BUTTERFLIES IN MEXICO, DURING THE 2023-2024 OVERWINTERING PERIOD

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EXECUTIVE SUMMARY

During the second half of December of 2023, nine colonies of monarch butterflies -four in the state of Michoacán and five in the State of Mexico- were recorded to occupy a total of 0.9 hectares (*ha*) of forest, this represents a 59.3% decrease in relation to the area recorded in 2022 (2.21 *ha*). Five colonies (0.273 *ha*) were located inside of the Monarch Butterfly Biosphere Reserve (MBBR), and four (0.627 *ha*) were located outside of the MBBR. In Atlautla, east of the State of Mexico, and outside of the Monarch Region, a colony occupied 0.007 *ha* of forest.

INTRODUCTION

The monarch butterflies (*Danaus plexippus*) that overwinters in Mexico migrate from the Great Lakes region in Canada and the United States of America; their overwintering forests are located on the border of Michoacán and the State of Mexico (Fig. 1), and their main threats are: i. the decline of milkweed at breeding sites in the United States due to the use of herbicides; ii. land use change in North America and forest degradation in Mexico; and iii. climate change (Pleasants & Oberhauser, 2012; Vidal et al. 2013, Zylstra et al., 2021). The WWF-Telmex Telcel Foundation Alliance and the National Commission of Natural Protected Areas (CONANP) systematically monitored the overwintering of the monarch butterfly since 2004 and in this report, we include the area of occupied forests by the colonies of monarch butterflies in December of 2023. The smallest occupied area was recorded in 2013-14 with 0.67 hectares (*ha*) and the largest occupied area was recorded in 1996-97 with 18.19 *ha* (Rendón-Salinas et al., 2023).

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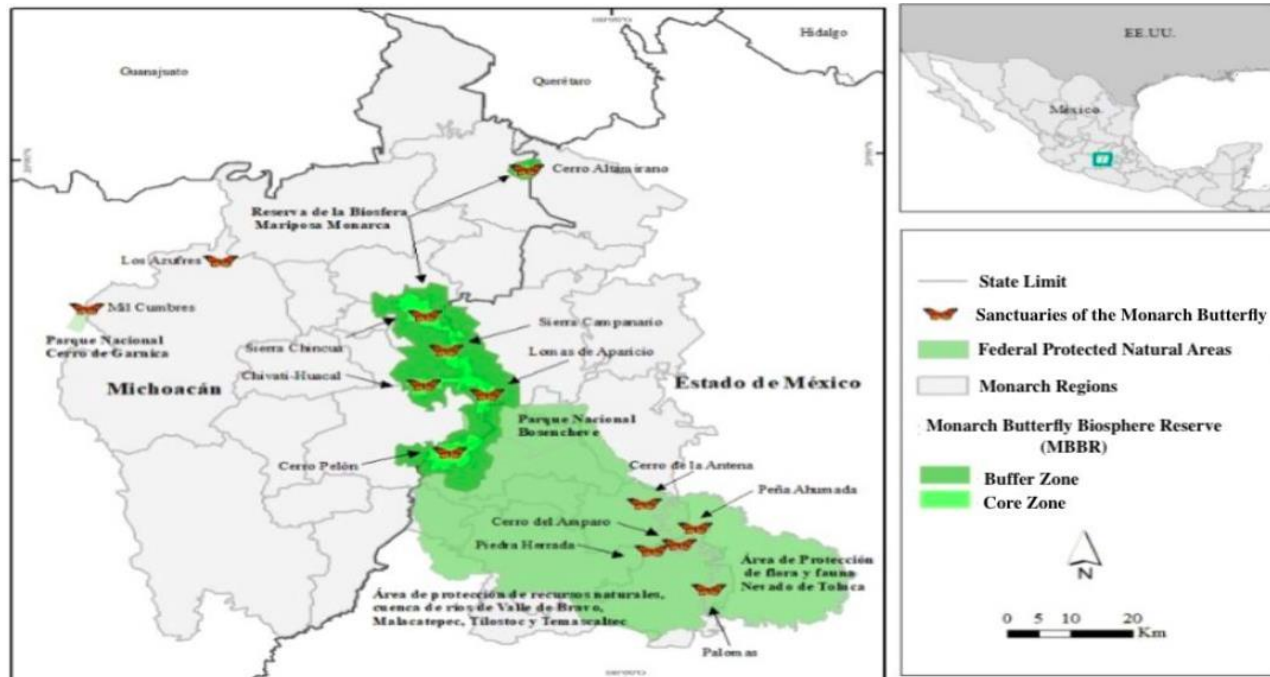


Figure 1. The Monarch Region includes the Monarch Butterfly Biosphere Reserve and other seven sanctuaries outside the reserve.

METHOD

Starting in December 2023, each of the 13 overwintering sanctuaries inside and outside of the “Monarch Region” were visited twice a month; when a colony was found its location was established with a Garmin® Geo positioning device in UTM projection, with WGS 84 datum. The perimeter of the forest occupied by the butterflies was determined from the tree that was found on the highest point of the slope, then we recorded the direction and distance of the consecutive and peripheral tress of the colony. The polygonal perimeter data was processed with the ArcView 3.3 geographic information system (GIS) to establish the area occupied by the colonies (Calvert, 2004; Vidal y E. Rendón-Salinas, 2014; Rendón-Salinas et al., 2023). The Atlautla colony was also visited, whose area is not counted in the historical graph as it is located outside of the Monarch Region.

RESULTS

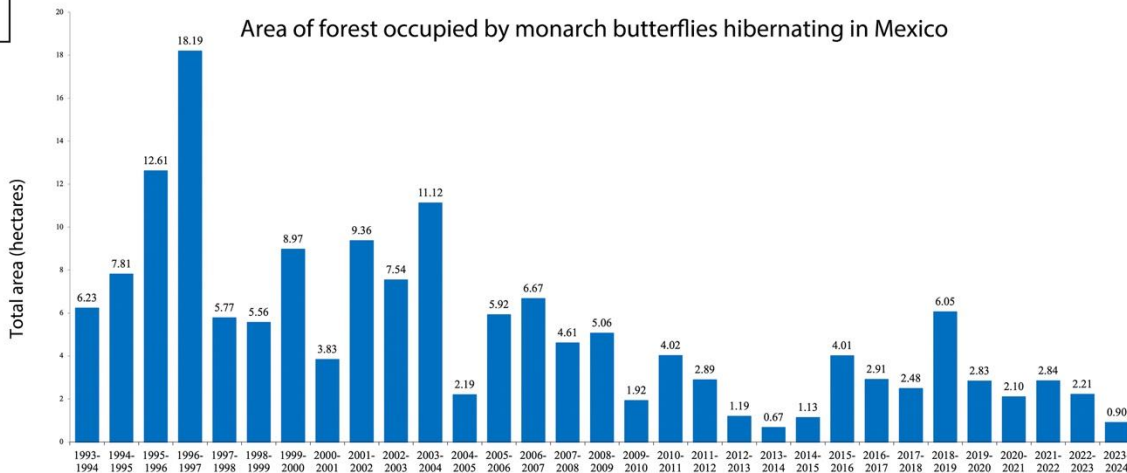
In the second half of December 2023, nine colonies of the monarch butterflies were recorded, four in Michoacán and five in the State of Mexico. The colonies of San Francisco Oxtotilpan and Ojo de Agua were measured up until the first half of January because it was not possible to measure them during December. The nine colonies occupied an area total of 0.9 *ha* and it was determined that five colonies (0.273 *ha*) were located within the Monarch Butterfly Biosphere Reserve, while four (0.627 *ha*) were located outside of it (Table 1). This surface represents a decrease of 59.3% compared to the occupied area in 2022, which amounted to 2.21 *ha* (Fig. 2). The largest colony (0.346 *ha*) was recorded in the San Antonio Albarranes ejido (Palomas sanctuary) and the smallest colony (0.003 *ha*) was located on the Federal Property (Sierra Chincua sanctuary). The Atlautla colony that is adjacent to the Iztaccihuatl - Popocatepetl National Park and outside the Monarch Region occupied 0.007 *ha*.



Table 1. Forest areas occupied by monarch butterflies' colonies throughout the second half of December 2023.

Location	State	Sanctuary	Colony (Agrarian Properties)	Area (ha)
Inside the Monarch Butterfly Biosfera Biosphere Reserve (MBBR)	State of México	Cerro Pelón	E. El Capulín	*
			E. Mesas Altas de Xoconusco	*
			C.I. San Juan Xoconusco	*
			C.I. San Pablo Malacatepec	0.029
		Sierra Campanario	E. San Joaquín Lamillas	*
			E. La Mesa	*
	Michoacán	Cerro Altamirano	E. Contepec	*
		Cerro Pelón	E. Nicolás Romero	*
		Chivatí-Huacal	C.I. Carpinteros	*
			C.I. Donaciano Ojeda	*
		Sierra Campanario	E. El Rosario	0.196
		Sierra Chincua	Propiedad Estatal	0.031
			Propiedad Federal	0.003
			E. Cerro Prieto	0.014
	E. El Calabozo Fracción 1		*	
Lomas de Aparicio	E. Crescencio Morales	*		
Area Occupied Inside the MBBR				0.273
Outside the RBMM	State of México	Cerro del Amparo	E. San Francisco Oxtotilpan	0.013
		Palomas	E. San Antonio Albarranes	0.346
		Piedra Herrada	E. San Mateo Almomoloa	0.051
		Peña Ahumada	E. Ojo de Agua	0.217
		Cerro de la Antena	E. El Potrero	*
	Michoacán	Los Azufres	P.P. San Andrés	*
		Mil Cumbres	E. Río de Parras	*
Area Occupied Outside the MBBR				0.627
Total Occupied Area				0.900

E= Ejido, C. I.= Indigenous Community, P.P.= Small Property, * No colony present.



Data collected from December to January every year

Figure 2. Forest area occupied by the monarch butterfly colonies in Mexico from the 1993-94 winter to the 2023-24 winter.



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