



MONITORING OF MONARCH BUTTERFLY HIBERNATING COLONIES, DECEMBER 2004: PRELIMINARY REPORT

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Executive Survey:

This report presents preliminary information on the monitoring of the monarch butterfly colonies in the Monarch Butterfly Biosphere Reserve and its outskirts during the 2004-2005 season. During December, there appeared to be 12 sites where butterflies regularly hibernate and five sites where butterflies were not found. In the seven remaining sites, colonies were located that utilize a surface that extends from 0.10 hectares to 1.06 hectares. The total surface of the seven colonies displayed during December varied from 2.17 to 2.19 hectares. This surface is the smallest documented during the past decade (1993-2004).

Introduction

Between November and March, the temperate forests Central Mexico harbor migrant monarch butterfly populations. The butterflies congregate by the millions in various sites in the heart of the Neo-Transvolcanic Range, particularly on the border between the states of Mexico and Michoacán.

In the Monarch Butterfly Biosphere Reserve and its outskirts, at least 22 places with butterfly colonies have been documented. Nevertheless, only 12 zones are considered permanent seasonal colonies, five inside the reserve and seven on the outskirts (Garcia-Serrano, et al. 2004).

Since the discovery of the butterfly colonies in Mexico, there have been attempts to estimate their populations, nevertheless, due to their great quantity and high aggregations, this has been very difficult (Calvert and Brower 1986, Calvert 2004).

¹ Information prepared by Eduardo Rendón Salinas y Carlos Galindo-Leal, WWF-Program México, Av. México No. 51, Col. Hipódromo, 06100 México D.F., México

During various years, a density estimation of 10 million butterflies per hectare was utilized (Calvert and Brower 1986, Brower 1995, Calvert 2004). Nevertheless the recent mortality in the winter of 2002, showed that said figure is an important understatement with respect to such great size of the butterfly population that hibernates in Mexico (Brower et al. 2004). More important than determining the number of butterflies per hectare is to know its populational tendencies. How do the colonies change year by year? How does the size of the colonies between sites compare with another? To know this, all that is needed is to consider an index of relative abundance.

Since the years of the 80s, indirect measures have been utilized to reckon the abundance of the butterflies, such as the area occupied by the colony or the number of occupied trees. These measures have some problems since the colonies can be very clustered and occupy little space or lightly clustered and occupy more space. The trees are occupied with great heterogeneity; in some their trunk and branches are occupied completely, while others are not. In spite of these problems, the determination of the area occupied for all the colonies during December has been one of the methods most regularly utilized.

During their stay in Mexico, the dynamics of the butterfly colonies pass through several phases that have been described thusly: arrival, establishment of the colonies, movement of the colonies, and dispersion (Calvert 1986, Garcia-Serrano, et al. 2004). Due to this, the measures of the surface occupied by the colonies have been made at the end of December, when the colonies are found in their established phase.

This report is part of the results of the work by the WWF Monarch Program, and its objective is to present the information on hibernating colonies during the established phase (December) of the colonies in the 2004-2005 season.

Area of interest

The area of interest includes the Monarch Butterfly Biosphere Reserve and its outskirts in the Neo-Transvolcanic system, between the borders of the state of Michoacán and the State of Mexico (19° 59' 42'' and 19° 18' 32'' north latitude and 100° 09' 54'' and 100° 06' 39'' western longitude) (Fig. 1). The Reserve comprises 56,259 hectares, of which 13,551.5 hectares were decreed in three nucleus zones in the three most mountainous regions. The north nuclear zone (588 hectares) includes Cerro Altamirano (3,320 m). The central nuclear zone (9,671 has.) includes the Sierra de Chincua, the Sierra de Campinarío (3,640 m) and the Sierra de Chivatí (3,180 m). The south nuclear zone (3,339 has.) includes Cerro Pelón (3,500 m) (Honey et al. 2003).

These mountains are covered principally by forests of oak (*Quercus laurina*, *Q. acutifolia*, *Q. rugosa*, *Q. castanea*, *Q. obtusata*, *Q. salicifolia*, *Q. crassifolia*) up to 2,900 m,

of pine-oak and of pine (*Pinus pseudostrobus*, *P. oocarpa*, *P. michoacana*, *P. rudis*, *P. teocote*, *P. ayacahuite*, *P. hartwegii*) between 1,500 and 3,000 m, and of fir (oyamel) (*Abies religiosa*) between 2,400 and 3,600 m. Other associations with smaller representation, are cedar forest (*Cupressus lindleyi*) between 2,400 and 2,600 m (SEMARNAT 2001). Also there exist in the area, thickets of juniper (*Juniperus deppeana*, *J. monitcola*) and meadows (*Potentilla candicans*). Inside the nucleus zone, areas of cultivation are located.

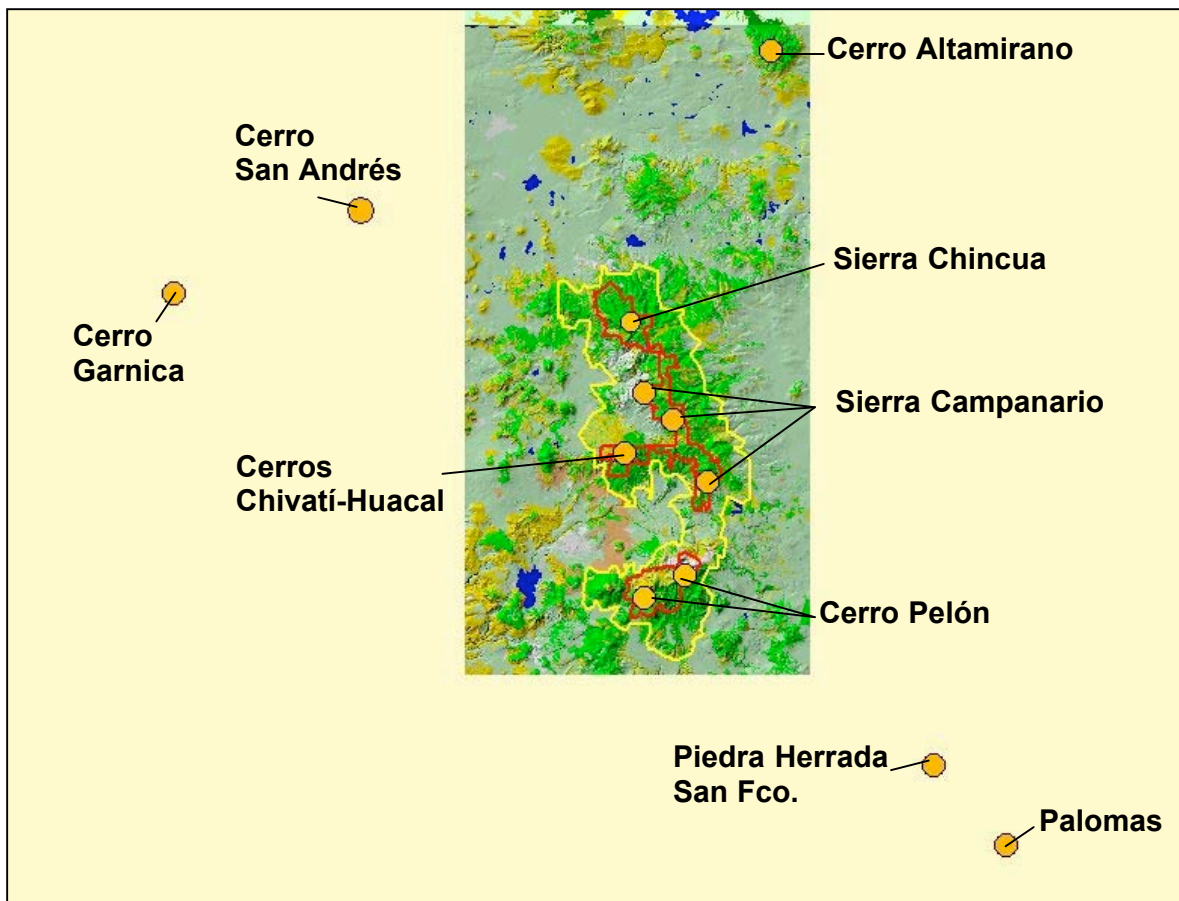


Figure 1. The Monarch Butterfly Biosphere Reserve in the State of Mexico and the state of Michoacán. The orange circles represent the hibernating colony sites). Also there they are colonies identified to the east of the Reserve in the region Valle de Bravo and near Nevado de Toluca and the state of México, and toward the west in Sierra de Mil Cumbres and Los Azufres.

Method

During the December 2004 monitoring, three methods were utilized to obtain the butterflies' relative abundance. In this preliminary report only the results of the first method are presented, which consists of the surface occupied by the hibernating colonies, since this has been the method traditionally utilized in the monitoring. The results of other methods will be included in a future report.

1. Surface occupied by the colonies

During December the hibernating colonies were located by means of field trips (Picture 1). The position of each group was registered with a geositional devise (GPS) in a UTM projection and based on the WGS 84 datum utilizing a central point in the colony

Chart 1. Grounds and sanctuaries (mountains) with historic presence of colonies of butterflies that were monitored during December of 2004. These grounds can have more than one colony, in which case both colonies were measured

Michoacán	State of México
Biosphere Reserve	
El Rosario, Sierra Campanario	El Capulín, Cerro Pelón
Cerro Prieto y la Zona Federal, Sierra Chincua	La Mesa "Las Palomas", Sierra Campanario
Contepec, Cerro Altamirano	
Crescencio Morales, Lomas de Aparicio	
San Cristóbal, San Felipe de Los Alzati,	
Carpinteros y Donaciano Ojeda, Chivatí-Huacal	
Outside the Reserve	
San Andrés, Los Azufres	Palomas, en San Antonio Albarranes
Rio de Parras, Mil Cumbres	San Francisco Oxtotilpan
	Herrada, Los Saucos

To determine the surface occupied by the colonies, the perimeter of all occupied hibernating colonies was measured and registered biweekly using compass and topographical tapes. The perimeter of each colony was marked with colored plastic tapes. The measuring began the third week of November, when the butterflies initiate the establishment of the colonies and which will be finalized in March with the departure of the butterflies.

The calculation of the surface occupied by each colony –poligonal- was carried out by means of using the program Letter Linx 1.2. Using the biweekly recording of the surface occupied by the colonies of butterflies, information on the seasonal displacement of the colonies and their utilization of habitat will be generated. Other methods utilized will be described in the extensive report.

Preliminary results

In this report only the information of the surface areas occupied by the hibernating colonies during December 2004 is presented. The remainder of the information will be analyzed and published subsequently. During the first week of December, 12 sites were measured and four of these were measured two times (the second during the second two-week period of December).

In five of the 12 sites no butterfly colonies were found (Picture 2). In the seven remaining sites, were located colonies with surface areas that varied from 0.10 hectares to 1.06 hectares. The grand total of the seven colonies varied from 2.17 to 2.19 hectares. Only seven places had colonies that in their sum tally occupied an

area of 2.17 hectares. This surface is the smallest one documented during the past decade (Fig. 3).

Chart 2. Sites measured during December 2004

Sanctuary	Site	Date (Dec.04)	Total	Elevation (meters)	Location UTM x	Location UTM y
Sin Mariposas						
Cerro Altamirano	Contepec	6	0.00			
Cerros Chivatí-Huacal	Chivatí	5	0.00			
San Andrés	San Andrés	14	0.00			
Sierra El Campanario	Las Palomas, La Mesa	2	0.00			
Mil Cumbres	Las Palomas	9	0.00			
Con Mariposas						
Sierra Chincua	Cerro Prieto	11	0.20	3284	363413	2176419
Sierra Chincua	Cerro Prieto	30	0.36			
Sierra El Campanario	Lomas de Aparicio	7	0.10	3320	373971	2157485
Sierra El Campanario	Lomas de Aparicio	21	0.10			
Sierra El Campanario	El Rosario	11	1.06	3350	367638	2167128
Sierra El Campanario	El Rosario	28	0.88			
Cerro Pelón	Capulín	8	0.24	3107	366520	2144355
Cerro Pelón	Capulín	22	0.24			
Palomas	Palomas	12	0.35	3331	408470	2112072
Piedra Herrada	Piedra Herrada	12	0.14	3162	398910	2121609
San Fco. Oxtotilpan	San Fco. Oxtotilpan	23	0.10	3322	403979	2122852

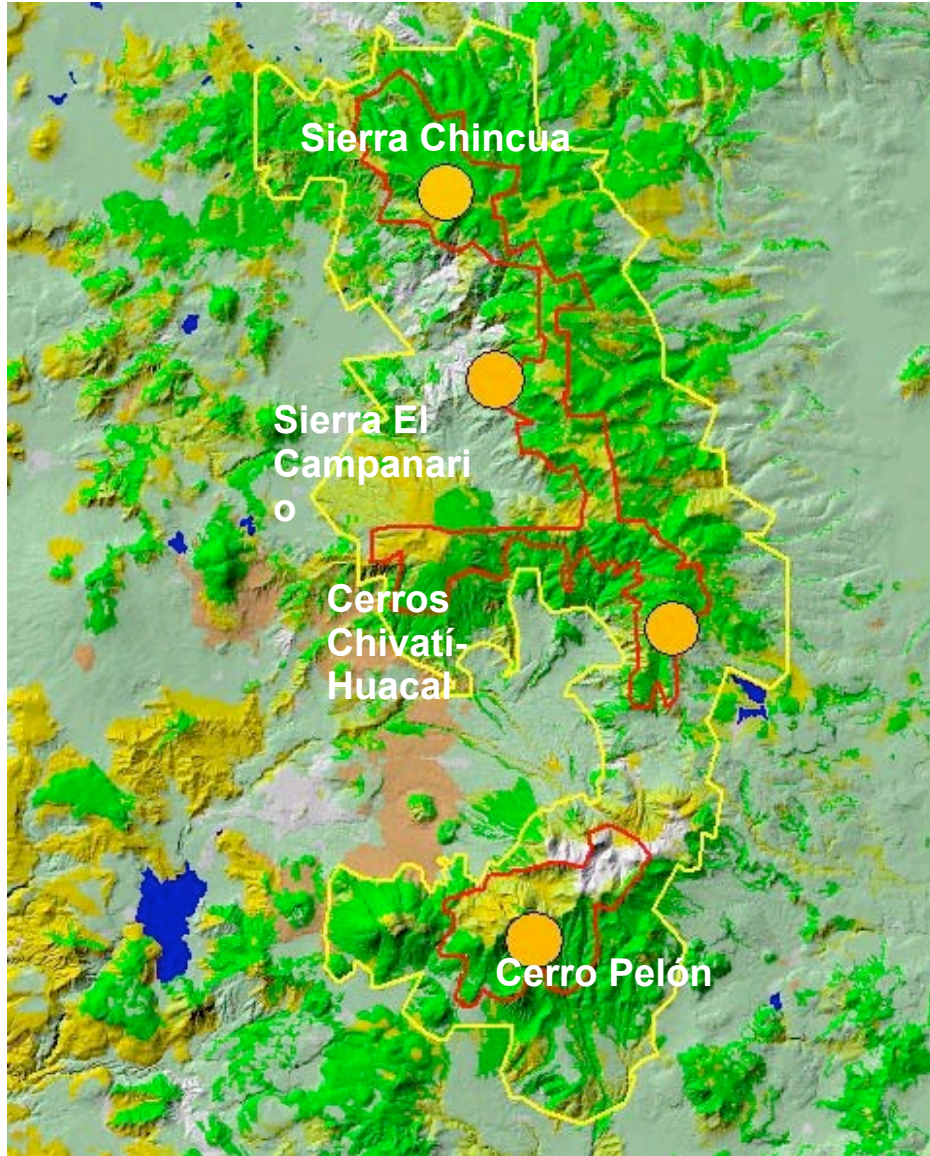


Figure 2. Location of the hibernation sites with butterflies (orange circles) inside the Reserve.

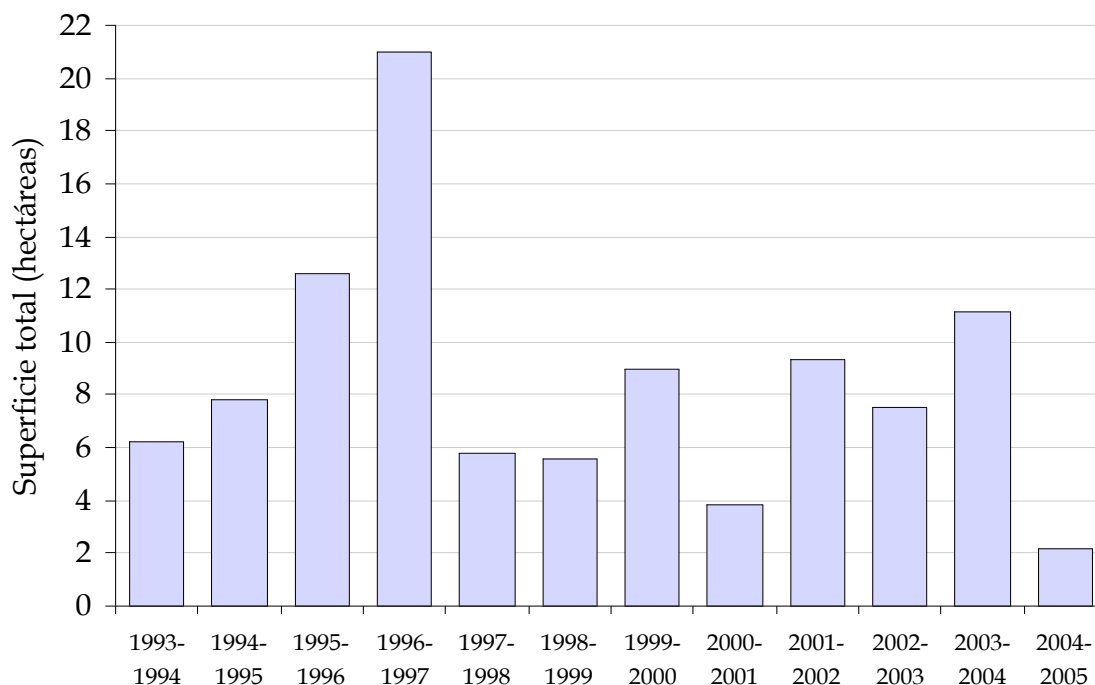


Figure 3. Total surface of the monarch butterfly colonies from 1993 to 2004. The information stems from the reports of monitoring (García-Serrano and Mora 1997, García Serrano, 1998-2002, Taylor 2003, Rendón-Salinas 2004).

In comparison with the December 2003 sampling, there was a reduction of at least 75% in the size of the colonies, with the exception of Palomas, where the reduction was 28%. In the Cerros Chivatí-Huacal (San Christobal) in December 2004, no colonies were measured (Picture 3). More information is needed to know the cause or causes of this unprecedented decrease in the surface areas occupied by the butterflies that hibernate in Mexico.

Cuadro 3. Comparison of the areas occupied in December 2003 & 2004

Santuario	Dic 2003	Dic 2004	Reducción (%)
Cerro Pelón	1.33	0.24	81.62
San Cristóbal	0.41	0.00	100.00
Palomas	0.49	0.35	28.47
Piedra Herrada	0.56	0.14	75.48
San Fco. Oxtotilpan	0.75	0.10	86.53
Sierra Chincua	2.84	0.20	93.00
Sierra El Campanario	4.74	1.16	75.50

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