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Research Article

Analysis of the re-colonization of San Benito Archipelago by Guadalupe fur seals (*Arctocephalus townsendi*)

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ABSTRACT. Exploitation of the Guadalupe fur seal (GFS) during the XVIII and XIX centuries almost extirpated the species. GFS were distributed from the Revillagigedo islands (Mexico) to the gulf of Farallones (USA). At present, reproductive colonies are found at Guadalupe Island and San Benito Archipelago (SBA). The aim of this work was to analyze the process of re-colonization and the current status of GFS at SBA. The first births and the occupation of the west island of the SBA are also reported. Census data from 1997 to 2007 indicated an annual growth rate for the population of 21.6%. The population size, growth tendency of the colony, reproductive biology, and food preferences were also studied. A total of 2,227 GFS were counted at SBA. Three squid species (*Loligo opalescens*, *Onychoteuthis banksii*, *Dosidicus gigas*) were found to be the main dietary components. Territoriality, activity patterns, and reproductive behavior were similar for the seals from Guadalupe Island and SBA. The mean growth rate for pups from SBA was calculated and compared to that of the pups at Guadalupe Island (SBA: 6.7 ± 1.4 kg, 68.9 ± 2.64 cm; Guadalupe Island: 5.9 ± 0.5 kg, 67.29 ± 4.3 cm). The length of food foraging trips by females was measured, suggesting that the SBA colony is probably near an important feeding area. Maternal care patterns could indicate different strategies of nursing-foraging trips between the SBA and Guadalupe Island. The population of fur seals at SBA is expected to increase as there are no limitations in terms of reproductive space or available food resources in the area.

Keywords: *Arctocephalus townsendi*, San Benito Archipelago, re-colonization, population size and trend, reproductive biology, feeding behavior, Mexico.

Análisis de la recolonización del archipiélago de San Benito por el lobo fino de Guadalupe (*Arctocephalus townsendi*)

RESUMEN. La explotación del lobo fino de Guadalupe (LFG) durante los siglos XVIII y XIX casi extinguió a la especie. El LFG se distribuye desde las islas Revillagigedo (México) hasta el golfo de Farallones (USA). En la actualidad las colonias reproductivas se encuentran en la isla de Guadalupe y en el archipiélago de San Benito (ASB). El objetivo de este trabajo fue analizar el proceso de re-colonización y el estado actual del LFG en el ASB. También se informan los primeros nacimientos y la ocupación de la isla del Oeste del ASB. Con base en los censos de 1997 a 2007, la población creció con una tasa de incremento anual de 21,6%. Se estudió el tamaño de la población, la tendencia de crecimiento de la colonia, biología reproductiva y preferencias alimentarias. Se contaron 2,227 individuos en el ASB. Tres especies de calamar se encontraron como el principal componente de la dieta (*Loligo opalescens*, *Onychoteuthis banksii* y *Dosidicus gigas*). La territorialidad, los patrones de actividad y el comportamiento reproductivo, muestran una conducta similar entre los individuos de isla Guadalupe y ASB. Se calculó la tasa de crecimiento promedio de las crías del ASB y se comparó con la tasa de crecimiento de las crías de isla Guadalupe (ASB: 6.7 ± 1.4 kg y 68,9 ± 2.64 cm; isla Guadalupe 5.9 ± 0.5 kg, y 67.29 ± 4.3 cm). Se midió la duración de los viajes de alimentación de las hembras, indicando que la colonia de San Benito probablemente se encuentra cerca de una importante zona de alimentación. En cuanto a los patrones de asistencia materna, estos podrían indicar una estrategia de lactancia-viajes de alimentación diferente entre SBA e isla Guadalupe. Se puede esperar que la población de lobos finos en San Benito siga creciendo, ya que no hay limitantes en cuanto al espacio reproductivo y los recursos alimenticios disponibles en la zona.

Palabras clave: *Arctocephalus townsendi*, archipiélago de San Benito, re-colonización, tamaño y tendencia poblacional, biología reproductiva, comportamiento alimenticio, México.

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INTRODUCTION

Exploitation of Guadalupe fur seals (GFS) began in the late XVIII and early XIX century (Townsend, 1924) when it was almost extirpated. In 1954 they were rediscovered at Guadalupe island off Baja California Peninsula (Hubbs, 1956; Peterson *et al.*, 1968). The population before exploitation was estimated to have a minimum of 30,000 fur seals based on the size of the habitat and historical records from XIX century sealers (Seagars, 1984).

The distribution of the GFS prior to decimation is not well known. Rick *et al.* (2009) and Repenning *et al.* (1971) concluded that fur seals were distributed from the Farallon islands near San Francisco California, to the Channel islands in southern California. It has been suggested that the species was distributed along 2.400 km from the Revillagigedo Islands, Mexico (18°N) to the Monterey Bay, California (37°N) (Townsend, 1924; Hamilton, 1951) and could have reached as far north as the Farallon islands, California (38°N) (Starks, 1922). Probable breeding sites were located at the Channel islands (Walter & Craig, 1979), Guadalupe Island, San Benito Archipelago (SBA), Cedros Island and Socorro Island, Revillagigedo Archipelago (Berdegué, 1956; Peterson *et al.*, 1968; Repenning *et al.*, 1971).

Between 1938 and 1993 there were several sightings of GFS individuals at SBA (Gallo-Reynoso, 1994), also Winlund *et al.* (1988) report sightings of solitary fur seals in the seventies at San Benito Archipelago. In the summer of 1997, Maravilla-Chavez & Lowry (1999) reported the presence of nine pups and 247 adults at San Benito del Este Island, being this the first record as a breeding area for this island since 1874 (Scammon, 1874). In 2000, the number of individuals at San Benito del Este Island was approximately 500 (Aurioles-Gamboa & Hernández, 2001).

From 1892 to 1993, the population of GFS at Guadalupe Island increased at an average annual growth rate of 6.8% (Gallo-Reynoso, 1994). During the period 1955-1993, the population grew exponent-tially at an annual rate of 13.7% (Gallo-Reynoso, 1994; Gallo-Reynoso *et al.*, 2004). The Mexican population in 2003 was estimated at 14,000 (Gallo-Reynoso *et al.*, 2004). GFS are currently protected under the Mexican law by NOM-059-ECOL-2010, listed as an endangered species and subject to special protection; it is also classified as a near threatened species by the International Union for Conservation of Nature Red List (Melin & DeLong, 1999; DOF, 2002; IUCN, 2003).

The aim of this study was to document the re-colonization et at SBA by Guadalupe fur seals. We describe the size of the colony, population growth, pup production, feeding preferences, reproductive behavior and territoriality, pup attendance, and female's (with pup) feeding trip duration.

MATERIALS AND METHODS

Study area

The San Benito Archipelago (SBA) is located 31.5 km WNW off de Cedros Island, 110 km SE off isla Guadalupe, and 130 km E off the Baja California Peninsula (Fig. 1). The archipelago is over a wide continental platform that extends from Sebastián Vizcaíno Bay on Baja California Peninsula. The archipelago is composed by three major islands with numerous islets and exposed rocks, all of which are of volcanic origin: (1) San Benito del Este Island (28°30'N, 115°32'50"W), (2) San Benito del Centro Island (28°30'N, 115°32'50"W), and (3) San Benito del Oeste Island (28°30'75"N, 115°32'50"W). All islands are surrounded by kelp (*Macrocystis pyrifera*) that extends for almost two kilometers offshore (Fig. 2) (Esperón-Rodríguez, 2008).

Census

During June and July 2007, GFS were censused at the three islands of the archipelago. San Benito del Este Island (SBE) was censused on June 28 and July 15, and San Benito del Oeste Island (SBO) was censused on June 30. Censuses were conducted from sea and from land, to obtain a correction factor for each category, by dividing the number of animals counted at land between the animals counted at land. Counts were made with binoculars from a slow moving 5-7 m skiff at a distance of 5-10 m from the shore, and rowing in some areas. Seals were counted by age-sex class categories based on the descriptions of Gallo-Reynoso (1994): 1) adult males, approximately 2.19 ± 0.19 m in length from nose to tail, weighing 160-170

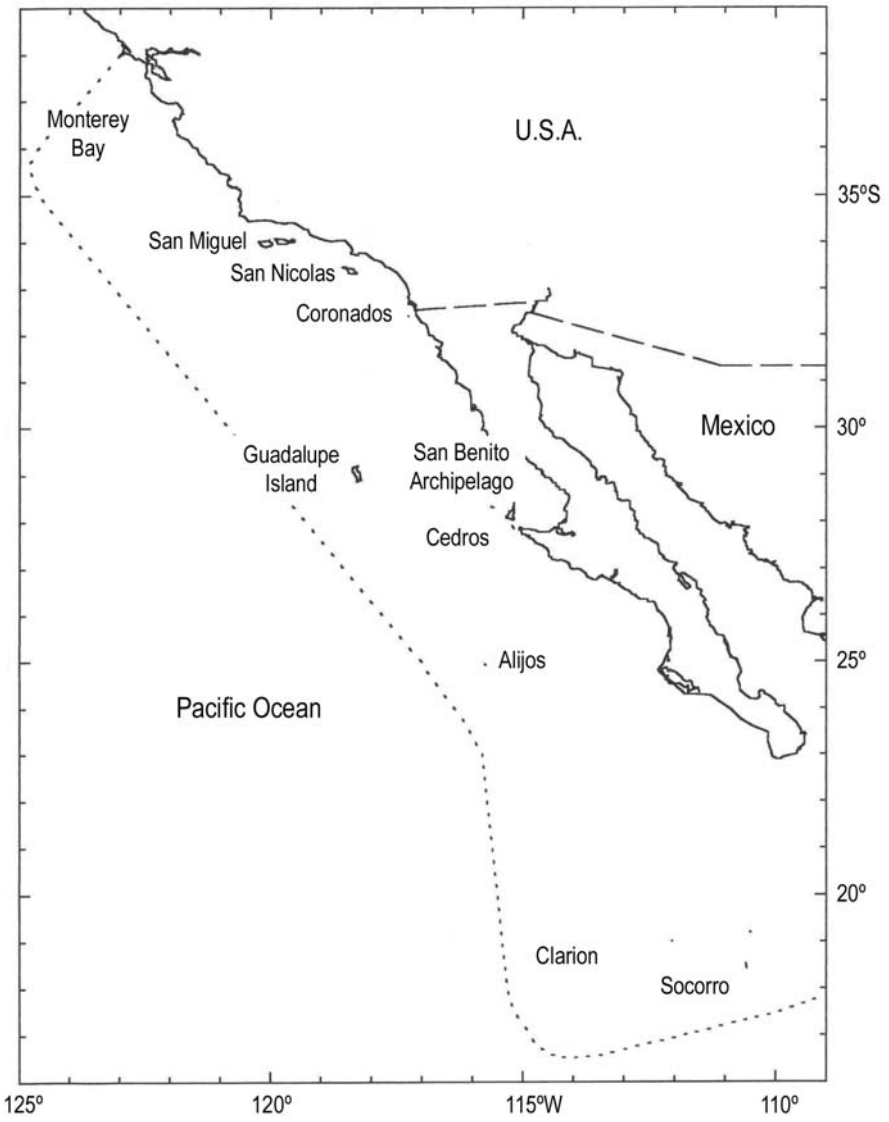

Figure 1. Geographical distribution of the Guadalupe fur seal showing two breeding sites, Guadalupe Island and San Benito Archipelago.

Figura 1. Distribución geográfica del lobo fino de Guadalupe, mostrando dos sitios de reproducción, isla Guadalupe y archipiélago de San Benito.

kg, dark brown with a lighter colored chest, usually holding a territory and presenting defensive behavior; 2) sub-adult males, 1.8 ± 0.12 m and 124-136 kg, with defensive behavior, some holding marginal territories; 3) adult females, 1.48 ± 0.09 m and 40-50 kg, dark brown and gray color, with or without offspring; 4) juveniles, smaller than females and larger than the offspring, brown or gray; 5) pups, black color when born, an average length of 0.50 m and 5 kg; pups change continuously, they double their mass within the first 70 days of life, and reach around 0.89 m and 14 kg prior to weaning (145 days) (Gallo-Reynoso & Figueroa-Carranza, 2010), and 6) undetermined (*e.g.* individuals within caves or swimming/floating, females calling their pups or males investigating females making characteristic noises).

Population density, population growth and birth rate were estimated using data from Maravilla-Chavez & Lowry (1999), Aurioles-Gamboa & Hernández (2001), Gallo-Reynoso *et al.* (2004, 2005), and our 2007 census.

Reproductive behavior

Three reproductive territories were studied at the southern coast of SBO. Territorial quality was eva-

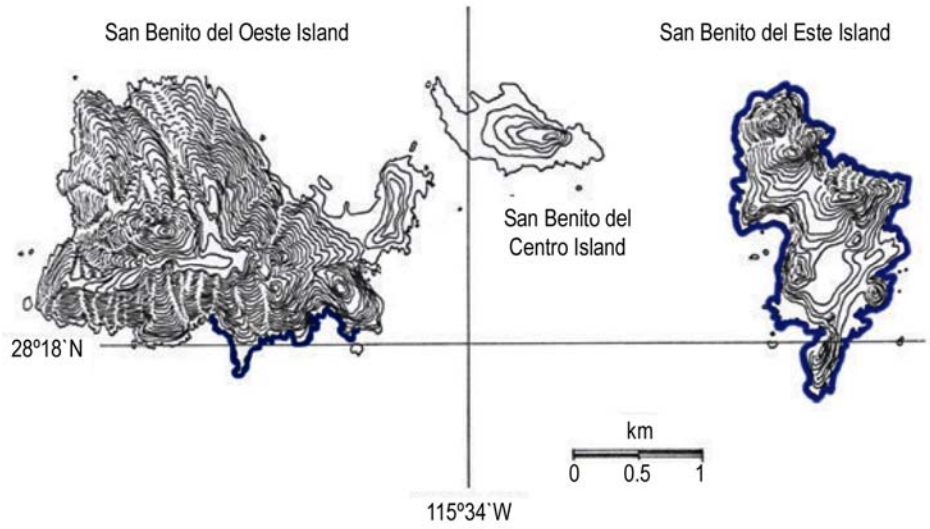

Figure 2. San Benito Archipelago and areas occupied by the Guadalupe fur seal.
Figura 2. Archipiélago de San Benito y las áreas ocupadas por el lobo fino de Guadalupe.

luated based on the following parameters (following Gallo-Reynoso, 1994): 1) size of territory (area), 2) presence of caves, 3) presence of shadows, 4) direct access to sea, 5) presence of tidal pools, 6) rocks (boulders), 7) bedrock, 8) pebbles, 9) protected or exposed to high tides and waves, and 10) protected or exposed to prevailing winds. The higher the value of each variable, the better the territorial quality, which according to Gallo-Reynoso (1994), results in a greater number of females per territory.

The activity within the territory was observed and recorded in ethograms, measuring 27 activities for females, 28 for pups, and 26 for males (Table 1). Night time behavior was not observed. Pup attendance data from four mothers was recorded (frequency and lactation interval, food demand (which consisted in counting the number of times that the pup or the mother initiated suckling) and mother-pup recognition), and assessment of the duration of feeding trips of each female (from departure, to return to the territory) and the periods spent on land attending the pup. The duration of a female's foraging trips at San Benito was compared to foraging trips duration at isla Guadalupe (Figueroa-Carranza, 1994; Gallo-Reynoso, 1994).

Pups were captured at the beginning of the field work (June 29) (we estimated an average age of seven days based on the presence of umbilical chord still attached at pup's belly) and at the end of the field work (July 15) to estimate mean growth rate in body mass (kg day^{-1}) and body length (cm day^{-1}). We also measured total length (TL), width of waist (WW); length of the right anterior fin (AF), and length of the rear fin right (FR).

Feeding preferences

Scat samples were collected to determine the GFS´s diet; we collected 36 scats from juveniles and 49 scats from subadult individuals. These collections were done by noting preferential resting areas for both age categories. Scats were collected on 29 June 2007, and on 2, 3 and 11 July 2007. They were placed in self-sealing plastic bags with a data label describing animal category, place and date of collection. Scats were soaked in a solution of one part liquid dishwashing detergent to 100 parts of sea water for 24 h to allow the emulsification of organic material. Hard parts were separated and sorted through three sieves (mesh size of 2.0, 1.4, 1.0 and 0.45 mm) at the laboratory. Squid beaks, fish otoliths, soft parts and parasites were collected and stored in vials containing 70% ethyl alcohol. Squid beaks and fish otoliths were identified with a stereoscopic microscope. The upper and lower beak rostrum were used to identify the squid species, but only the upper beak was measured to estimate mantle size (mm) and weight (g) by using the squid growth curves from Wolff (1984). Also, fish species were identified from otoliths found, despite their low presence (5.8%). All material is stored at Laboratorio de Ecofisiología, CIAD-Guaymas. For each species we calculated the percent occurrence (OP*i*) (Lowry & Oliver, 1986) and the frequency of ocurrence.

RESULTS

Census

We estimated a total population in the archipelago of 2.227 individuals for summer of 2007 (Table 2), and

Table 1. Activities measured in ethograms for the categories: adult males, adult females and pups of the Guadalupe fur seal at San Benito Archipelago, in the territory with the best conditions of observations and individuals, from July 1 to July 18, 2007.

Tabla 1. Actividades medidas a través de etogramas, para las categorías: machos adultos, hembras adultas y crías de lobo fino de Guadalupe en el archipiélago de San Benito, en el territorio que presentaba las mejores condiciones de observación y de individuos, desde el 1 al 18 de julio de 2007.

Female activities	Male activitie	Pup activitie
Sleeping	Huse male	Resting
Breastfedding	Resting	Calling to the mother
Resting	Sleeping	Grooming
Answering the pup	Upright posture	Going to the tidal pool
Grooming	Huse female	Breastfeeding
Upright posture	Marking/Urinate	Calling in movement
Calling the pup	Dislodges males	Feeding requirement
Fondling one another	Grooming	Movement without calling
Presentation to the male	Fin to the air	Upright posture
Feeding requirement	Barks at territorial limit	Lonely play
Aggression to female	Going to the tidal pool	Answering the mother
Aggression to male	Herds female	Approachement to the pup
Displaced by male	Going to the sea	Sniffing the pup
Going to tidal pool	Answering the pup	Fin to the air
Sniffing the pup	Displacemente	Fondling with the mother
Investigate by the male	Calming females	Molested by a juvenile
Sniffing by the male	Calling the pup	Molested by a subadult
Going to shade	Cough	Scrathing with stones
Pup calling with no answer	Investigate the female	Aggression to pup
Bite ti pup	Allowing the female going to the sea	Aproachement to mother
Displaced by female	Herds pup	Sniffing the male
Urinate	Growling	Cough
Copula	Biting	Answering to the male
Goingo to the sea	Displacing females	Displaced by the mother
Neck lift	Copula	Displaced by the pup
Notice to the male of a subadult	Threating	Stumbling
Cough		Herd by an adult male
		Swept away by wave

Table 2. Censuses at San Benito del Oeste (SBO) and San Benito del Este (SBE) on June 28, 30 and July 15, 2007 with the correction factor (CF) for the age and sex classes: adult males (AM), subadult males (SM), juveniles (J), adult females (AF), pups (P) and undetermined (U) individuals of Guadalupe fur seal.

Tabla 2. Censos realizados en las islas San Benito del Oeste (SBO) y San Benito del Este (SBE) el 28 y 30 de junio y 15 de julio de 2007, con el factor de corrección (CF) para todas las clases de edad y sexo: machos adultos (AM), machos subadultos (SM), juveniles (J), hembras adultas (AF), crías (P) e individuos indeterminados (U) de lobo fino de Guadalupe.

	AM	SM	J	AF	P	U	Total
SBO	172	239	590	631	10	106	1748
CF	1.4	1.4	1.5	1.5	-	-	
SBE	2	54	124	124	6	54	479
CF	-	2.0	1.33	1.33	-	-	

we determined a population density for areas occupied by fur seals of over 4 ind 100 m^2. Population structure was as fallow: adult males represented the 7.8% of the population, sub-adult males accounted for 13.2%, juveniles for 37.2%, females for 33.9%, pups for the 0.7%, and indetermined individuals for 7.2%.

The population growth rate (r) was obtained from the total number of individuals at different years; for 1997-2000 was 22.3%, and from 2000 to 2007 was 21.3%, these high values indicate the importance of immigration to the San Benito Archipelago. The average population growth for the period 1997-2007 was 21.6%. The birth rate (b) was determined by dividing the total number of births between the total population, resulting in: b = 35.16 in 1997; b = 66.35 in 2004; b = 7.56 in 2005 and b = 7.13 in 2007.

Reproductive behavior

As expected we found few adult males at SBA. Due that males exert guarding behavior to females at their

territories; adult males spent more time engaged in territorial defense behavior (34.8 ± 1.1%), than resting or sleeping (10.7 ± 0.66%). Females used most of their time sleeping or resting (17.1 ± 3.76%), and nursing (15.5 ± 1.05%). Pups spent more time resting (15.5 ± 1.05%), than calling their mothers (13.8 ± 0.36%) or grooming (8.6 ± 2.21%).

Females spent 32.9% of their time nursing, and 67.1% resting between periods of lactation. We observed 45 lactation episodes, from which the average feeding time was 27 ± 18.42 min and the average resting time was 58.5 ± 57.64 min. No significant difference was found between periods of lactation (P = 0.76) and between resting (P = 0.43). Food demand was initiated by the pup in 90% of the observations, and by the mother in 10%. Pup mean mass increased over the study period (23 days) was 6.7 ± 1.4 kg (males: 7.7 ± 1.26 kg, n = 3; females: 6.1 ± 1.2 kg, n = 5), and pup mean length increased from 68.9 ± 2.64 cm (males: 71.3 ± 2.52 cm, n = 3; females: 67.4 ± 1.3 cm, n = 5). At the end of the sampling period the average growth rate increased of such 0.045 kg day^{-1} and the average lenght incresead of such 0.24 cm day^{-1}. Percentage increase and growth rate are summarized in Tables 3 and 4. We only report data from seven pups that were able for being measured at the beginning and at the end of field work.

Foraging trips of four adult females averaged 4.6 ± 2.22 days (range: 1 - < 9 days). Mean attendance periods on land averaged 1.9 ± 2.9 days (range: 1-5 days). Adult females nursing a pup spent approximately 23.8% of their time on land and 76.2% of their time foraging at sea.

Feeding preferences

We collected 36 scats from juveniles and 49 scats from subadult males, finding otoliths or squid beaks in all the samples. Obtaining 1040 beaks; from these, 638 (61.4%) were determined to specific level. Six squid species were identified from the scats: *Loligo opalescens, Onychoteuthis banksii, Dosidicus gigas, Histioteuthis dofleini, Pterygioteuthis giardi* and *Symplectoteuthis luminosa*. Fish remains were found in eight scats, five of them were represented only by otoliths, two had otoliths and vertebrae, and one scat had a fish jaw (which could not be identified). From the fish remains only two species were identified: *Synodus lucioceps* y *Porychthys notatus.*

For prey species percent occurrence (OP*i*), *Loligo opalescens* was considered the main prey in the diet of GFS, with a frequency estimated of 84%, while the less frequently found squid species was *H. dofleini* (4.8%) (Table 5).

DISCUSSION

At Guadalupe Island, Gallo-Reynoso *et al.* (2005) estimated the growth rate of GFS at 13.7% for 1955-1993; Hernández-Montoya (2009) reported a population growth of 34% between 1993 and 2006 and also estimated a rate of 13.7% in the period from 1954 to 2006. Gallo-Reynoso *et al.* (2005) reported 12,176 ind, while Hernández-Montoya (2009) reported 11,625 ind in August 2006 (with the following population structure: females 33.4%, pups 26.7%, adult males 15.1%, sub-adults 11.0% and juveniles

Table 3. Percentage increase of: weight, total length (TL), width of waist (WW), length of the right anterior fin (AF), and length of the rear fin right (FR). Growth rate in weight (kg day^{-1}) and length (cm day^{-1}) of seven pups of Guadalupe fur seal at San Benito Archipelago in 23 days at summer 2007.

Tabla 3. Porcentaje de incremento de: peso, longitud total (TL), ancho de la cintura (WW), longitud de la aleta anterior derecha (AF) y longitud de la aleta posterior derecha (FR). Tasa de crecimiento en peso (kg día^{-1}) y longitud (cm día^{-1}) de siete crías de lobo fino de Guadalupe en el archipiélago de San Benito, en 23 días durante el verano de 2007.

Pup	Island	Percentage increase of weight and size						
		Weight	LT	AC	AD	AT	Weight	Lenght
I	S.B.O.	6.25	7.38	6.12	9.09	14.71	0.03	0.37
II	S.B.O.	6.25	6.58	4.23	4.76	6.06	0.03	0.33
III	S.B.O.	6.25	1.45	3.06	4.55	2.94	0.06	0.11
IV	S.B.O.	6.25	5.71	5.26	7.14	6.06	0.03	0.27
0	S.B.E.	6.25	1.45	6.10	2.38	7.41	0.07	0.07
1	S.B.E.	6.25	3.50	5.88	6.38	8.57	0.04	0.19
2	S.B.E.	6.25	5.13	7.70	14.89	8.11	0.04	0.31

Table 4. Growth rate in weight (kg day^{-1}) and length (cm day^{-1}) average of pups categorized as: males and females, and pups from San Benito del Este (SBE) and San Benito del Oeste (SBO) islands in 18 days at summer 2007.

Table 4. Promedios de la tasa de crecimiento en peso (kg día^{-1}) y longitud (cm día^{-1}) de las crías categorizadas en: machos, hembras y crías de las islas San Benito del Este (SBE) y San Benito del Oeste (SBO) en 18 días durante el verano de 2007.

Category	Growth rate in weight (kg day^{-1})	Lenght (cm day^{-1})
Males	0.03	0.34
Females	0.06	0.16
SBO.	0.04	0.19
SBE.	0.05	0.27

Table 5 Number of samples (n), ocurrence percentage (OP*i*), and frequency of occurrence (FO) calculated for six squid species and two fish species consumed by Guadalupe fur seal at San Benito Archipelago during summer of 2007 in 85 collected scats.

Tabla 5. Número de muestras (n), porcentaje de ocurrencia (OP*i*) y frecuencia de ocurrencia (FO) calculadas para las seis especies de calamar y las dos especies de peces consumidas por el lobo fino de Guadalupe en el archipiélago de San Benito durante el verano de 2007, identificadas en 85 excretas colectadas.

	n	OP*i*	FO
Squid species	71	62.61	84.16
Loligo opalescens			
Onychoteuthis banksii	22	18.26	25.46
Dosidicus gigas	34	28.70	40.3
Symplectoteuthis luminosa	6	3.48	6.86
Pterygioteuthis giardi	5	4.35	5.84
Histioteuthis dofleini	5	5.22	6.08
Fish species			
Synodus lucioceps	2	1.7	2.4
Porychthys notatus	2	1.7	2.4

6.1%). Hernández-Montoya suggested that the decrease between 2005 and 2006 may indicate that the population at Guadalupe Island is reaching the carrying capacity of the suitable area, causing the migration to San Benito and the odd population structure that we found at the archipelago in 2007, which was predicted by Gallo-Reynoso *et al.* (2004). We postulate that SBA is closer to a major feeding area so GFS tend to stay at SBA rather than return to IG. Guadalupe Island has large areas of available habitat for GFS and is far from reaching capacity.

Although the population of fur seals at SBA has increased rapidly, most of the observed individuals were juveniles and females. Juveniles formed the bulk of the population during the summer of 2007; this is usually the dominant category in a re-colonization process (Baker, 1978). The high number of juveniles can be the cause for the high population growth rate (Lima & Páez, 1997). This large amount of juveniles coupled with the low number of adult males with reproductive territories and offspring, might indicate that the colony of San Benito has not been consolidated yet as a breeding colony, and that is used mainly as a resting and foraging place. However, the continuous number of births at the archipelago may prove that San Benito constitutes a breeding colony.

A small and growing population is composed primarily of juvenile individuals with an age distribution that tends to present younger age categories (Baker, 1978), while the population reaches equilibrium; this trend is less marked when the current population size reaches its balance (Charlesworth, 1980).

Females were the second most numerous category at SBA. Adult females do not use SBA for breeding (indicated by the low number of pups counted at SBA), but appear to use it as a resting area before returning to Guadalupe. GFS adult females from Isla Guadalupe that were instrumented with geolocation-time-depth recorders foraged near SBA (Gallo-Reynoso *et al.*, 1994, 2008).

Gallo-Reynoso *et al.* (2008) found the mean distance to the foraging area from Guadalupe Island at 444 ± 151 km. The migration of individuals from established populations can be caused by food competition due to high population densities (Johnson, 1969; Baker, 1978) or by the sparse distribution of food (Bluhm & Gradinger, 2008). The population at San Benito is very small compared to Guadalupe Island, perhaps now there is less food competition, and thus, foraging resources are more abundant; however, it is more likely that this behavior is due to a greater abundance of food over the continental shelf than in the pelagic environment, which in turn makes the foraging trips shorter. That GFS are found in great numbers and with high variability of its age/ sex class composition may indicate that the foraging route for GFS from Guadalupe Island pass very close to SBA, which has elicited the re-colonization of the SBA. Grandi *et al*. (2008) also found a similar behavior of the South American sea lions (*Otaria flavescens*) and suggested that potential areas for the expansion could be closer to areas where growing colonies already

Table 6. Comparison of average mass (kg) and length (cm) among fur seal pups of San Benito (age *ca.* seven days, n = 8) and of Guadalupe Island (age eight days, n = 17) (from Gallo-Reynoso & Figueroa-Carranza, 2010).

Tabla 6. Comparación entre el porcentaje en peso (kg) y longitud (cm) entre las crías de lobo fino del archipiélago de San Benito (edad aproximada de siete días, n = 8) e isla Guadalupe (ocho días de edad, n = 17) (Tomado de Gallo-Reynoso & Figueroa-Carranza, 2010).

	San Benito Archipelago		Guadalupe Island	
	Mass (kg)	Length (cm)	Mass (kg)	Length (cm)
Males	7.7 ± 1.26	71.3 ± 2.52	6.1 ± 0.4	69.68 ± 3.5
Females	6.1 ± 1.2	67.4 ± 1.3	5.7 ± 0.5	64.9 ± 3.7
Males and females	6.7 ± 1.4	68.9 ± 2.64	5.9 ± 0.5	67.29 ± 4.3

exist and reported the importance of the juvenile age classes and the areas adjacent to colonies in the overall recovery of any population of pinnipeds.

Duration of foraging trips and female's attendance period showed differences between Guadalupe Island and San Benito; at Guadalupe Island the average female attendance period was 5.03 days, followed by a foraging trip with a mean of 11.5 days at the sea; while at San Benito the average female attendance period was 4.58 days, followed by a foraging trip of 1.88 days. Even with this different strategies between females at both colonies, no difference in pup's mass gain rate for both sexes were found, but differences in the length rate of increase were noted, according to findings at Guadalupe Island by Gallo-Reynoso & Figueroa-Carranza (2010) (Table 6).

Fidelity to breeding sites, may explain why the reproductive rate is so low at San Benito, this also can explain the lower number of births, since the individuals born at San Benito are reaching the age of reproduction and might be expected to return to San Benito to breed. Even that the number of pups born at SBA is small (15), pups showed a similar growth pattern compared to pups at Guadalupe Island, this might be an evidence that San Benito´s GFS colony has potential to become a well structured breeding colony.

Camacho-Ríos (2004) found at San Benito Archipelago, that the diet of GFS was composed of 95.6% cephalopods with a 4.4% of fish, *L. opalescens* being the most important prey consumed during winter of 2001 and spring of 2002. Hernández-Montoya (2009) reported that feeding composition at Guadalupe Island comprised 92% of squid and 8% of fish, and according to the importance index (IIMP) the most important species were: *L. opalescens, O. banksii, Gonatus sp*. and *D. gigas*. In this study (summer of 2007) we found that *L. opalescens* was the most important prey in the diet of fur seals (51.1% of all the items found in the diet), and that squid composed the 92.6% and fish accounted for the 7.4%, similar to the findings of Camacho-Ríos (2004) and Hernández-Montoya (2009). It is important to note that between 2001 and 2007, the diet has remained similar for GFS at San Benito.

The GFS presents a clear pelagic feeding strategy (Gallo-Reynoso, 1994; Gallo-Reynoso *et al.*, 2008) specializing in cephalopods. Hernández-Montoya also elucidate that GFS is a specialist predator feeding on prey present in one trophic level. Squids have been identified as the main prey in the diet of GFS (Gallo-Reynoso, 1994; Hanni *et al.*, 1997; Camacho-Ríos, 2004). At Guadalupe Island and San Benito, fur seals feed mainly on pelagic and coastal squids. Food availability does not seem to be a limiting factor for the species at these fur seal colonies. This certainly enhances the growth of the GFS population, if no other factor is limiting (i.e. competition with other species, environmental variability and population density (from Gallo-Reynoso, 1994)). Presumably, many of the feeding preferences of fur seals observed in this work reflect adaptations to local environmental conditions.

GFS population at San Benito is expected to continue increasing, especially if juveniles keep on migrating and the individuals born at the archipelago reproduce successfully there.

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