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Sociocultural Importance of Dogs (*Canis lupus familiaris*) in Maya Subsistence Hunting: Revelations From Their Participation in the Traditional Group Hunting (*Batida*) in Yucatan

Elías Plata[1], Salvador Montiel[1], Julia Fraga[2], and Carlos Evia[3]

Abstract

Historically, dogs have played a prominent role in subsistence hunting. In the contemporary Mayab, the group hunting or *batida* provides multiple sociocultural benefits for those who practice it, in addition to wild meat. Here, we analyze the social perception of dogs used in *batida* as part of the cosmovision of Maya peasant-hunters in a rural community of Campeche, Mexico. We conducted semistructured interviews with 36 local *batida* hunters who owned a total of 51 dogs. *Batida* dogs provide different benefits (meat and social prestige for Maya peasant-hunters) depending on their roles as *maestros* (leader dogs) or *secretarios* (support dogs) and the type of prey captured. Hunting dogs go beyond their utilitarian value as a hunting technology and play an important role in the sociocultural dynamic of the *batida*, one of the main wildlife practices mediating the relationships between peasant communities and their natural surroundings in the Yucatan Peninsula.

Keywords

Maya peasant-hunter, wildlife use, wild meat, hunting dogs, Los Petenes Biosphere Reserve, Mexico

Introduction

For almost 30,000 years, human beings have used dogs (*Canis lupus familiaris*) in hunting activities (Bleed, 2006; Treves & Bonacic, 2016), taking advantage of their abilities to follow orders and participate efficiently in coordinated activities, thereby making it easier to catch game (Lupo, 2011; Range & Virányi, 2015). As such, over time the human–dog bond has been strengthened in different sociocultural contexts (Morey, 1994; Treves & Bonacic, 2016). In addition to their utilitarian value, dogs have become symbolic actors in myths and rituals present in ancestral and contemporary societies (Morey, 2006; Schwartz, 1998; Snyder & Moore, 2006).

In contemporary subsistence hunting, dogs support hunters in tracking, pursuing, and catching prey (Koster, 2008a), particularly terrestrial vertebrates whose meat is an important source of animal protein for hunters and their families (see Barrera-Bassols & Toledo, 2005; Koster, 2009). In this type of hunting, the use of dogs together with other hunting technologies, such as rifles (Koster, 2008a), can double the number of wild vertebrates caught, particularly in agroforestry systems (Koster, 2008b). Despite their key role in successful hunts, little is known about the sociocultural benefits of dogs in subsistence hunting (Hughes & Macdonald, 2013; Koster, 2008b; Young, Olson, Reading,

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Amgalanbaatar, & Berger, 2011), especially in the Yucatan Peninsula and other Mesoamerican rural communities where this hunting practice continues to be used (Oliva & Montiel, 2016; Plata, 2017; Rodríguez, Montiel, Cervera, Castillo, & Naranjo, 2012; Santos-Fita, Naranjo, Estrada, Mariaca, & Bello, 2015).

As part of the multiple-resource-use strategy attributed to the Maya culture (Barrera-Bassols & Toledo, 2005; Toledo, Barrera-Bassols, García-Frapolli, & Alarcón-Chaires, 2008), several hunting methods (performed individually or in a group) continue to be important for obtaining wild animals to feed the rural population (León & Montiel, 2008; Oliva, Montiel, García, & Vidal, 2014; Santos-Fita et al., 2015). In the Yucatan Peninsula, group or *batida* hunting is a collective method that permits Maya peasant-hunters (a) to obtain a portion of wild meat (ca. 2 kg per capita) per trip; (b) to establish space for recreation and coexistence; and (c) to increase status and prestige within the hunting group, which traditionally contributes to reaffirming the indigenous identity of the hunter (Rodríguez et al., 2012).

The *batida* consists of ambushing terrestrial animals, mainly white-tailed deer (*Odocoileus virginianus*) and collared peccary (*Tayassu tajacu*). A group of *pujeros* or beaters together with their accompanying dogs moves toward the interior of the hunting area (from one edge). If they locate an animal, the *pujeros* attempt to drive the potential prey toward the opposite edge of the hunting area, where the group of *tiradores* or shooters uses rifles to try to kill it (Montiel & Arias, 2008; Montiel, Arias, & Dickinson, 1999). The prey meat is shared among the hunting group participants, including the accompanying dogs (for a detailed description of *batida*, see Rodríguez et al., 2012).

In the context of *batida*, awarding prey meat to the accompanying dogs by their participation in this group hunting (León & Montiel, 2008; Rodríguez et al., 2012) offers a view of the sociocultural scope of dogs beyond their utilitarian value as "hunting technology" (*sensu* Koster, 2008a). The aforementioned is notable when considering that in Maya subsistence hunting the dogs increase the chances of obtaining socially valuable prey such as white-tailed deer, whose meat is preferentially consumed by Maya peasant-hunters and their families (Naranjo-Piñera, Tejeda, & Santos-Fita, 2012; Rodríguez et al., 2012).

This study provides ethnographic information showing the sociocultural role of dogs in Maya subsistence hunting. We document for the first time the versatile involvement of dogs in the dynamic of *batida,* emphasizing their value from the perspective of hunter in a rural Maya community of the Yucatan Peninsula.

Methods

Area and Study Community

The study was conducted in the Maya community of Los Petenes, one of the 19 rural communities located in the zone of influence of Los Petenes Biosphere Reserve (LPBR; 20°51′-19°49′ N, 90°45′-90°20′W), established in 1999 on the west coast of the Yucatan Peninsula (Figure 1). The regional climate is warm and subhumid, with a mean monthly temperature of 26°C and mean annual precipitation of 819 mm (Yáñez-Arancibia, Twilley, & Lara-Domínguez, 1998). Rains are highly seasonal with a dry season from December–May (mean monthly precipitation = 13.2 mm) and a rainy season from June–November (mean monthly precipitation = 149 mm) (Montiel, Estrada, & León, 2006).

The LPBR is a federal reserve (area = 282,858 ha; 36% terrestrial and 64% marine) that covers a coastal wetland of great ecological and social importance in the Maya region of Mesoamerica (Comisión Nacional de Áreas Naturales Protegidas, 2006). The LPBR presents hundreds of forest fragments or *petenes* (forming conspicuous clusters of forest-mangrove) that have developed naturally on a seasonally flooded matrix dominated by savannah and mangroves (González-Hamud, 2017; Montiel et al., 2006; Munguía-Rosas & Montiel, 2014). Inside and outside the LPBR, it has been documented that the local Maya populations continue to utilize a wide variety of fauna resources (ca. 54 species; Méndez-Cabrera & Montiel, 2007) for subsistence, mainly targeting terrestrial mammals (ca. 9 species; León & Montiel, 2008; Montiel, 2010).

As of the last decade, Los Petenes had a population of 885 inhabitants (467 men and 418 women; Instituto Nacional de Estadística y Geografía, 2010), the majority of them bilingual (Maya-Spanish), and 133 dogs (Weber, 2011). The men from the community mainly practice seasonal agriculture (*milpa*), charcoal production, and subsistence hunting (Oliva et al., 2014; Rodríguez et al., 2012). The latter is mainly performed collectively in *batida* by a group of a local hunters identified in previous studies (e.g., León & Montiel, 2008; Oliva et al., 2014; Rodríguez et al., 2012).

Data Collection and Community Work

Based on prospective visits (June–August 2016) to the community and information documented in previous studies on *batida* by our research group (León & Montiel, 2008; Oliva et al., 2014; Rodríguez et al., 2012), we designed a semistructured interview (including 72 questions) on three topics: (a) dog characterization, (b) dog–hunter relationship, and (c) interaction of the hunters and their dogs during *batida*. For a 6-month

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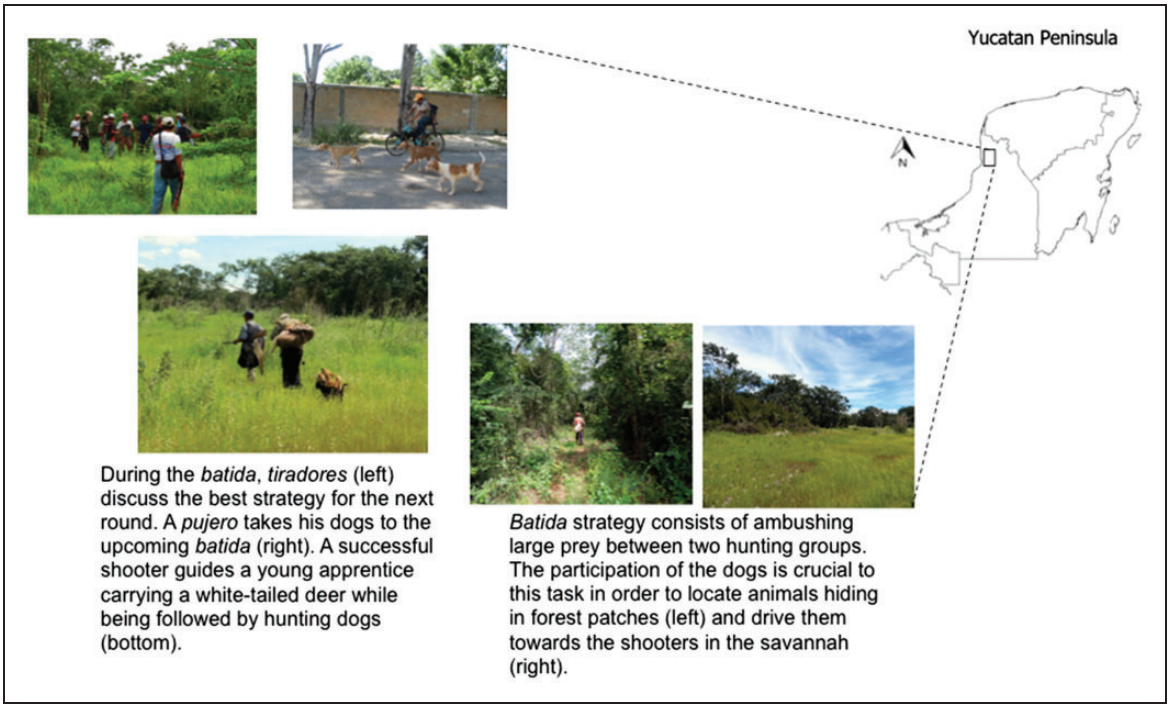


Figure 1. Peasant-hunters and their companying dogs in surroundings areas of Los Petenes, a Mayan community on the west coast of the Yucatan, Peninsula, Mexico.

period (starting in September 2016), semistructured interviews were applied to *batida* hunters in the community of Los Petenes. In-depth interviews were also applied to local prestige hunters to gain a complementary view of the role of dogs in hunting, underscoring their interaction with hunters, including traditional ceremonies.

To contextualize the relationship between hunters and their dogs during hunts, the first author (E. P.) carried out participant observation in four hunting trips using the *batida* method. The information obtained in the interviews (semistructured and in-depth) was recorded in audio/video format with the prior consent of the interviewees. Finally, to validate and contextualize the ethnographic information obtained during the fieldwork, a community workshop was held in Los Petenes following the form of a focus group (*sensu* Newing, 2011). Particularly, this approach was important to highlight consensus about symbolic issues related to dog's participation in the *batida*.

Data Analysis

To evaluate the hunters' perceptions of the dogs participating in *batida,* the response percentages of the interviewees were compared for each of the three topics included in the semistructured interview. The linkage matrix proposed by Oliva and Montiel (2016) was adjusted to identify the sociocultural importance of dogs in subsistence hunting by means of (a) sociocultural dimensions of *batida* and (b) local elements associated with the dog–hunter relationship in the context of *batida*.

For this study, we defined three sociocultural dimensions applied to traditional group hunting based on the ethnographic data previously published (Rodríguez et al., 2012): (a) *practical dimension* oriented toward its implementation, emphasizing the execution of the hunting strategy to obtain wild meat; (b) *social dimension* that express the relationships between individuals (humans and canines) that strengthen or weaken the construction of the group; and (c) *symbolic dimension* focused on the traditional beliefs and rituals that form part of a shared system of meaning in the practice of hunting. A set of 32 local elements on dogs' features was inferred based on the majoritarian responses from semistructured interviews and then complemented with the ethnographic data from participant observation, in-depth interviews, and the focus group.

The sociocultural importance of dogs in subsistence hunting was inferred from the local elements and their correspondence with the three sociocultural dimensions of *batida* in two potential ways: (a) paired correspondence (one element and one dimension) and (b) multiple correspondence (one element and two or three dimensions).

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Results

Batida *Hunters*

In Los Petenes, a total of 36 men (94% of them heads of households) practice *batida* in the vicinity of the community. They identified themselves as peasant-hunters and mentioned 33% of them have taken their dogs to the *batida*. On average, these hunters were aged 48 years (range = 16–81) and had four family dependents (range = 1–9).

The interviewees reported performing traditional group hunting in areas near the community, which were selected under the guidance of local leaders or *chingones*, who also coordinated the groups of *tiradores* and *pujeros*. In Los Petenes, hunters mentioned to participate mainly as *tiradores* (81%), recognizing only two *chingones* per *batida* trip. During the participant observation, we recorded that dogs are guided by *pujeros* into the hunting area.

Hunting Dogs in Los Petenes

The 36 *batida* hunters own 51 dogs. The majority of these dogs were male (57%) with an estimated average age of 3 years (range = 0.5–7 years). At least 50% of the hunters interviewed had acquired their dogs for the purpose of hunting.

Most local hunters (69%) obtained their juveniles dogs (puppies) through gifts from relatives or friends. The interviewees seek to conserve the lineage of a good hunting dog by placing its puppies with relatives and friends, then obtaining puppies in return from subsequent litters.

> I gave [puppies] to other partners, so they would raise them too, so they have good dogs, because the day my dog dies, I can get one from there. (Hunter aged 48)

In contrast, the purchase of puppies was a less commonly reported method (14%) for obtaining hunting dogs by peasant-hunters seeking good tracking dogs, which are greatly appreciated for hunting deer. The rest of dogs were stray dogs (11%) lifted from nearby communities or breeded at home (6%).

In Los Petenes, the *batida* hunters are assisted by at least two dogs per hunting trip. Interviewees hunters recognized two types of hunting dogs: (a) *malix* dogs or mongrels ($n = 44$), derived from interbreeding local dogs without a specific or distinguishable breed, and (b) *sabuesos* or scent hounds ($n = 7$), identified as dogs specialized in tracking prey, which have been introduced to the community in the last 30 years. The *malix* type is a cheap dog obtained as a gift and can be fed with leftover food from the household. In addition to withstanding the rigors of the hunt, *malix* dogs are appreciated for their versatility in other everyday tasks such as guarding agricultural areas (*milpa*) and homes. During *batida*, the hunters preferred *malix* dogs (a) for pursuing prey due to the speed of this type of dog and (b) to acquire a greater variety of prey, including those that are aggressive and potentially difficult to face (e.g., coatis and collared peccaries).

Meanwhile, *sabuesos* were valued for their abilities to track particular prey such as white-tailed deer, an ungulate that is highly appreciated by the Maya families in the region. The hunters stated that these dogs are expensive (ca. 100 US$) and in contrast with *malix* dogs, required better food (with greater protein content), as well as vitamin supplements acquired by hunters in veterinary clinics, normally in neighboring communities.

> *Sabuesos* are refined; when they don't give them special food, they don't do it [the hunting]. (Hunter aged 54)

Dogs in Batida

According to the *batida* hunters, the dogs can participate from the age of 6 months, 79% of the hunters train the juvenile dogs in the wild so they can be exposed to the scents of prey species. The dogs learn to follow the trail of an animal and are also stimulated by the hunter, exposing them to tracks, excretions, or blood of specific prey. The other 21% of hunters take juvenile dogs on the *batida* to participate in the tracking and pursuit of prey following more experienced hunting dogs.

During the observed hunt, up to 10 dogs participated in *batida* trips, with at least two experienced hunting dogs for each *batida*. According to the *batida* hunters, the accompanying dogs can fulfill two roles: (a) leader dogs or *maestros,* central to the *batida* hunting strategy, that track and effectively drive the deer toward the group of *tiradores* and (b) support and apprentice dogs or *secretarios* that are not effective for hunting deer without the guidance of *maestro* dogs. During *batida*, we observed a greater number of *secretarios* (78%) than dogs participating as *maestros* (22%).

> Sometimes they also take the poor ones [*secretario* dogs], but they don't know how to track deer. The *maestro* is the one that will find them. (Hunter aged 48)

As referred by interviewees and confirmed during participant observation, if the *maestro* dogs are not available or are withdrawn by their owners during the *batida*, hunters are unwilling to participate and the hunt can even be canceled. Although the *secretarios* are not expected to play an important role specifically when catching deer, their participation in the *batida* can be useful for catching prey such as coatis (*Nasua narica*),

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iguanas (*Ctenosaura similis*), or ocellated turkeys (*Meleagris ocellata*).

All but one of the hunters acknowledged that their dogs obtained a reward for participating in *batida* (Figure 2). The reward depended on the merits of the participation of each dog: (a) the *maestro* dogs obtained a portion of meat equivalent to that received by human hunters in the *batida*, while (b) the *secretario* dogs only obtained remains such as blood and entrails due to their limited role in catching prey.

> Only the *maestro* dog gets his share [of meat], the others don't get any, the entrails are shared out among the other dogs. (Hunter aged 48)

Fifty-six percent of hunters stated that a *maestro* dog can provide social recognition through the respect and admiration of other hunters. Similarly, 51% indicated that owners of this type of dog are habitually invited to take part in *batida* or their dogs are requested for rental. A similar portion of meat distributed to each *batida* participant is given to the owner of a *maestro* dog, even if that person did not participate in the hunting activity.

> If you have a dog that follows deer, they come and ask you for it, even if you don't go on the *batida*. If they shoot one, they bring you venison. (Hunter aged 54)

Symbolism Associated With Hunting Dogs

In addition to their role in hunting, the majority of hunters (70%) acknowledged that their dogs serve to look after their owner in the forest. Furthermore, 65% mentioned that the dogs protect against potential dangers posed by spiritual beings (*aluxes*) and supernatural illnesses (for instance, *mal viento* or "bad wind"), both popular beliefs in the community.

> It's like they feel the bad vibrations and bad winds. The dogs look after you. If you are lost, the dog will stay by your side. He won't leave. Whenever he sees something, he'll bark and he won't leave. (Hunter aged 54)

Forty-three percent of hunters acknowledged that instead of them, their dogs can become ill in the forest due to *mal viento*, the symptoms of which are a debilitation of the dog and unusually aggressive behavior. To cure this illness, 41% of hunters cut the tips of the dog's ears and tail to remove the bad wind as the principal remedy. Others also expose dried chili and copal incense to the nostrils of the dog, or rub alcohol on the dog's body, as traditional remedies for curing and preventing bad wind.

> If the dog falls ill and gets bad winds, we have to cut his ear or tail to get it out. We just cut a small piece; that cures him. (Hunter aged 35)

Only 27% of hunters use traditional methods to bestow luck on the dog and improve its performance in *batida*. Exposing the nostrils of the dog to different substances (dried chili, deer's blood, and copal incense smoke) has the dual purpose of bestowing luck on the dog and protecting it from bad winds. Another method consists of extracting a substance described as a "powder" from



Figure 2. Distribution of meat at the end of a *batida*. A group of hunters can be observed (left image) dividing up the portions of meat obtained into equal parts in the colored recipients. Two of these recipients correspond to the dogs that actively took part in the *batida*. Once the distribution is complete (right image), the dogs look for remains of blood and entrails of the animal that was butchered on a bed of leaves.

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between the hooves of a deer, known as the secret of the deer, and giving the dog this substance to eat so that it never loses the trail of the animal. The purposes of these practices were confirmed in the focus group.

> Yes, first they said it was chili in his nose to give him a better sense of smell, another thing was deer's foot powder, the dog should eat it and that's enough. (Traditional healer aged 80)

Sociocultural Dimensions of Hunting Dogs

Based on the ethnographic information collected, it was possible to define 32 local elements associated with the sociocultural connotation of dogs in *batida* (Table 1). Of all of the local elements associated with hunting dogs, 56% had a multiple correspondence and 44% had a paired correspondence with the *batida* sociocultural dimensions. In the first case, the practical and social dimensions shared the greatest correspondence of elements (72%), followed by the elements shared between the three dimensions (17%). The elements corresponding to the practical and symbolic dimensions had the lower correspondence (11%).

Discussion

This study demonstrates the multidimensional value of dogs in the contemporary context of Maya hunting for the first time. This multidimensional value underscores the importance of hunting dogs not just in the actual execution of a subsistence practice such as *batida* but also integrating them into the multiple-natural-resource-use strategy conceived and exercised by the Yucatec Maya ethnic group (Barrera-Bassols & Toledo, 2005; Toledo et al., 2008).

Hunting Dogs in Los Petenes

In Los Petenes, most *batida* dogs were *malix* or mongrels, of Mesoamerican ancestry prior to the European conquest (Ramos, 2009; Valadez, Padilla, Galicia, Rodríguez, & Jiménez, 2003) and subsequently interbreeding or replaced with their Eurasian conspecifics, brought to America by Europeans starting in the 16th century (see Leonard et al., 2002; Schwartz, 1998). *Malix* are valued because they can subsist on leftovers from the homestead (Ley-Lara, Vela-Padilla, & Götz, 2015) and provide significant support in hunting (León & Montiel, 2008; Rodríguez et al., 2012).

For *batida* hunters in Los Petenes, the *malix* type is easy to obtain (abundant and usually acquired as a gift), does not have specific care or dietary requirements, and withstands the demanding *batida*. These characteristics are common in dogs from Mesoamerican rural areas where subsistence hunting is practiced (see Koster, 2008a, 2009).

In contrast to *malix* dogs, *sabuesos* are experts at tracking prey. This ability (usually considered innate by the hunter) distinguishes this type of hunting dog, beyond just its physical characteristics (e.g., long ears, tail, and snout) perceived subjectively by each individual hunter. At the time of the study, only five dogs of the *sabueso* type were identified. Despite being highly appreciated by the hunters, they stressed the costs to acquire and feed them.

The small number of *sabuesos* found in Los Petenes permits the assumption that these specialized hunting dogs are not accessible to all *batida* participants, despite being highly valued for their utility in tracking prey (deer) and as a result, promoting participation in complex exchange networks (Koster, 2009). Although elsewhere specialized dogs are especially useful for catching prey that defend themselves aggressively when pursued (Redford & Robinson, 1987), the Los Petenes hunters avoid these confrontations for fear of *sabuesos* getting injured. Catching dangerous prey such as coatis or peccaries was the role of *malix* dogs.

In Los Petenes, dogs are mainly used for locating and driving large game animals (e.g., deer) into an ambush laid by the waiting group in *batida*. Elsewhere, hunters in tropical zones (for America, Alves, Mendonça, Confessor, Vieira, & Lopez, 2009; Koster, 2008a and for Africa, Lupo, 2011) used their dogs instead for tracking and cornering smaller size prey (e.g., armadillos and pacas) or prey injured through other hunting techniques.

In Los Petenes, the participation of dogs contributes to a better benefit–cost ratio in hunter activity compared with other nongroup hunting methods (see León & Montiel, 2008) and reduces the number of human hunters necessary to obtain large game (Lupo, 2011). Furthermore, dogs increase encounter rates and reduce prey pursuit times (Koster, 2008a) and, as occurs in *batida*, are especially effective in conjunction with firearms (i.e., rifles) (Koster, 2008b).

Batida is more successful with greater participation of *malix* dogs that perform risky tasks (i.e., pursuing dangerous prey species), which potentially can discourage hunters from taking part in this hunting method (Rodríguez et al., 2012). In the Neotropics, the risks faced by dogs in forest areas (e.g., snakebites, hunting accidents and attacks from other animals) have frequently been reported in hunting (Koster, 2009) and may encourage hunters to use *malix* dogs in scenarios expected to be risky.

Sociocultural Benefits of Dogs in Batida

Dogs perform an active role in the sociocultural dynamic of *batida* through their incorporation as *maestros* or

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Table 1. Hunting Dog Elements (Local Elements) and Sociocultural Dimensions of *batida*.

Hunting dog elements	Sociocultural dimensions			Explanatory bases of the relationship
	P	S	Sy	
Dog characterization				
Acquirement purpose	●			Participation of the dog in hunting.
Type of dog	●			*Malix* (low cost and resistant to the fatigue of *batida*) and scent hound (specialized in deer tracking).
Acquirement method	●	●		Gift and purchase (in the case of scent hounds).
Nourishment	●			Fed with household leftovers. Pellets and meat for good hunting dogs.
Disease	●	●	●	Parasites, fatigue acquired in *batida* and bad wind.
Additional care	●			Vitamins for good hunting dogs.
Shelter	●			Shelter of good hunting dogs to prevent them wandering around the town.
Commands for cohabitation	●	●		Commands that permit the incorporation of the dog into domestic life.
Dog–hunter relationship				
Recognized capabilities	●			Stamina and speed when pursuing prey and olfactory capacity of *batida* dogs were recognized.
Behavioral attributes	●	●		Obedience, a calm temperament and defensive character of the dogs during *batida* were recognized.
Interbreeding control	●			Only in the case of scent hounds or to conserve the lineage of a good hunting dog.
Juvenile management	●	●		Juvenile dogs given as gifts to strengthen friendships and conserve the lineage of a good hunting dog.
Primary use	●	●	●	Primary use for hunting activity and secondary for looking after the *milpa* and homestead. In the forest, the dogs take on a value as a guardian against supernatural threats.
Age of onset in hunting	●			Incorporation into *batida* from 6 months when the puppy can withstand the fatigue.
Hunting training	●	●		Training through practice prompted by the hunter and the guidance of more experienced dogs.
Local element				
Perception and interaction of hunters with dogs				
Number of dogs per *batida*	●	●		Average of 3 dogs (range = 1–3) per hunting trip. The lack of a dog collectively recognized as a *maestro* can lead to the cancelation of the *batida*.
Function in *batida*	●	●	●	Facilitates obtaining prey with high social value such as white-tailed deer. A good hunting dog obtains an additional portion of meat for his owner and improves his status within the hunting hierarchy.
Types of prey	●	●		*Maestros* obtain larger prey (e.g., deer). *Secretarios* are useful for obtaining smaller prey (e.g., iguanas and coatis).
Commands to the dog during *batida*	●	●		Commands from hunters to their dogs for coordinated execution of *batida*.
Dog–hunter communication during *batida*	●			Mutual recognition of body and voice signals among hunters and dogs during *batida*.
Awarding of meat	●	●		Portion of meat for dogs that obtain deer (i.e., *maestros*).
Recognition of the hunter because of his dog	●	●		Gaining of prestige due to the participation of his dogs in *batida*.
Loan of dogs	●	●		Norms recognized by the hunting group govern the benefits awarded to the owner of the dog and obligations of the person who loans it from them.
Risks in *batida*	●			Venomous snakebites, being injured by potential prey (e.g., coatis), receiving an accidental gunshot and fatigue during *batida*.
Norms associated with the dog	●	●		Norms recognized by the hunting group to minimize potential risks to the dogs in *batida*.
Time invested to recover dogs in *batida*	●			Hunters recover dogs in the event they get lost in the forest.
Initiative for hunting	●	●		Hunting dogs can join in *batida* without the knowledge of their owners. Obtaining prey earns the recognition of the hunting group through a portion of meat.

(continued)

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Table 1. Continued

Hunting dog elements	Sociocultural dimensions P	S	Sy	Explanatory bases of the relationship
Utility of dogs beyond *batida*	●		●	Protecting the owner from supernatural beings, venomous snakes and jaguars.
Ability to detect beings imperceptible to the hunter			●	Detection of different classes of harmful spirits by dogs.
Hunting ritual	●		●	Exposure of the dog's nose to deer's blood and copal incense smoke.
Protection ritual and practices			●	Use of alcohol, dried chili and copal incense smoke.
Healing ritual and practices			●	Cuts to the ears and tail of the dog to cure bad wind.

P = Practical; S= social; Sy = symbolic. The hunting dog elements (left) are ordered into three categories defined by the semi-structured interviews. In the middle, the P, S, and Sy sociocultural dimensions of batida show the correspondence with hunting dog's elements. Note that paired and multiple correspondence are indicated with one or two or three dots, respectively. In the ethnographic database (right), the key information that supports this correspondence is presented.

secretarios in the hunting hierarchy, as well as subsequently awarding them with game biomass, showing that the dogs are recognized as members of the hunting group. In other subsistence hunting contexts, rewarding dogs (as in the case of *secretarios*) with prey remains (e.g., entrails and blood) is a common practice (see Koster, 2009; Lupo, 2011). However, in the *batida* context, rewarding dogs depends on their role into the group dynamic and merits attained when executing the hunting strategy.

In Los Petenes, we observed that only the *maestro* dogs that actively participated in obtaining prey (mainly deer) got the same portion of meat to what the human hunters participating in the *batida* received. Given that the *secretario* dogs participate in *batida* without any incentive other than the remains of the prey, this revels that the meat awarded only to the *maestro* dogs is a recognition analogous to that received by other *batida* hunters.

Hunting dogs that obtain prey such as deer (e.g., *maestro* dog) also engender respect and admiration toward their owners by other hunters. This confirms that having good hunting dogs increase the prestige among *batida* hunters, complementing their abilities (e.g., tracking animals and shooting a moving prey) acknowledged in this collective hunting (Rodríguez et al., 2012). This could be of great benefit to inexperienced or less skillful hunters, because a *maestro* dog not only guarantees them a portion of meat but also a better status in the hunting group hierarchy.

Batida dogs can mediate the relationships within and outside of the hunting group, mainly through their participation in exchange networks as gifts and the norms that govern loaning them for hunting activities. Hunting is one of the main mediating activities between nature and culture, transforming sociocultural values of human groups and their relationship with nature (Ingold & Pálsson, 2001). In *batida,* dogs go beyond their primary function as a hunting accessory and become a *gift* (something given without obligation or guarantee that creates a social relationship, see Mauss, Lévi-Strauss, & Martín-Retortillo, 1971) in the exchange networks maintained by the hunters.

In Los Petenes, the norms recognized by the hunters also contemplate the participation of the dogs, allowing to govern aspects (e.g., precautionary measures to reduce the risk suffered by the dogs during the hunting activity or obtaining additional meat and social prestige) that can incentivize the owners of hunting dogs to take them to the *batida* or dissuade them from doing so. Consequently, the *batida* group must maintain good relationships with these *maestro* dog owners, allowing them to accumulate social relationships that promote cooperation for mutual benefit or social capital (Putnam, 1993). This suggests that some dogs may be key for the relationships of the hunting group, promoting the hunt as an ideal space for mediating intragroup relationships (Nothnagel, 2001).

Symbolism Associated With Hunting Dogs

Maya traditional beliefs are extended to the *batida* through rituals that seek, in one hand to provide dogs with luck by exposing their noses to copal smoke an act known as *sahumar* or "perfuming", which represents a pre-Hispanic practice for purifying people, animals and objects (Olivier, 2015), and on the other hand, offering prayers for the intervention of divine forces in favor of the hunter and his dog. Another practice mentioned in Los Petenes was rubbing the body and nose of the dog, for example, with deer's blood or dried chili. The exposure of the dog (mainly via its nose) to different substances constitutes a common practice reported in other traditional hunting contexts (see Bennett & Alarcón, 2015; Koster, 2009; Lupo, 2011).

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The significance of dogs to contemporary Maya peasant-hunters goes beyond the merely utilitarian and social aspects of hunting activity, positioning them as symbolic guardians against various otherworldly beings. In Los Petenes, the hunters maintain the belief in deities and guardian spirits of nature, collectively known as "owners of the forest," notable among which are *Yum K'aax* or "lord of the forest," *Zip* or "king of the deer," the *aluxes* and the personification of evil or "bad wind," which are widely held across the Yucatan Peninsula (Terán & Rasmussen, 1994; Villa-Rojas, 1978) and with parallels in all of Mesoamerica (see Dehouve, 2008; Olivier, 2015). The belief that dogs detect beings imperceptible to humans is widely held among *batida* hunters. For example, it is believed that if the hunter applies the ocular secretions (rheum) of the dog to his eyes, this will give the hunter the ability to see otherworldly beings such as *aluxes*, bad winds, or malignant spirits. In the forest, the dogs can warn of the presence of spirits by barking or howling, preventing them from harming the hunter.

The symbolic guardian character of dogs has been described as part of the cosmovision of the pre-Hispanic Maya and other Mesoamerican peoples, emphasizing them as an important mythological element (e.g., civilizing being and carrier of divine fire) and as a guide and protector of human beings on their final journey to the underworld (De la Garza, 1997). The view of dogs as protectors of human beings and their role as barriers against otherworldly spirits make dogs appear vulnerable to the potential harm that these beings can cause, such as illnesses related to bad wind (excessive debilitation and insanity). In Los Petenes, the hunters identified protective (e.g., balms based on alcohol and dried chili) and curative remedies (via induced bleeding of the animal's ears and tail) for dogs accompanying their owners in the forest.

Implications for Conservation

In the contemporary Mayab, *batida* provides sociocultural benefits to its participants through the individual merits demonstrated during the hunting activity. The owners of dogs that obtain prey valued by the hunters (i.e., deer and peccaries) acquire additional benefits in the form of additional portions of wild meat and social prestige. In addition to this, the dogs not only participate as mediators of the relationships within and outside of the hunting group (exchange networks and dog loans) but also as protectors against the spiritual beings in the cosmovision of contemporary Maya peasant-hunters.

Acknowledging the importance of involving local stakeholders in management strategies in biosphere reserves (as in the case of LPBR), it is of great importance to take into account the possible multidimensional implications of traditional practices, especially for subsistence purposes (Oliva & Montiel, 2016). Hunting dogs go beyond their utilitarian value as a hunting technology and play an important role in the sociocultural dynamic of the *batida*, one of the main wildlife practices mediating the relationships between peasant communities and their natural surroundings in the Yucatan Peninsula.

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