

# Assessing White-tailed Deer Abundance in the Town of Barnstable, Cape Cod, Massachusetts

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## Abstract

White-tailed deer (*Odocoileus virginianus*) are abundant throughout most of the eastern United States. However, in and around the town of Barnstable on Cape Cod, Massachusetts, there is a notable relative paucity of the species. I sought to seek rough population numbers/trends of deer through direct sightings and tracking (on sand, dirt, and snow) over the past 16 years (1993 – 2009). I also conducted informal interviews (50-100 per year) with the general public/residents and civic employees of the town. Results indicate that deer were only abundant (density of 10 + deer per mi<sup>2</sup>) in about 5% of the town, in moderate abundance (~5-10 deer per mi<sup>2</sup>) in about 30% of the town, in low numbers (< 3-4 deer per mi<sup>2</sup>) in about 25% of the town and were rare or absent in ~ 40% of the town. Notable trends indicate that most deer (i.e., moderate abundance) are located north of Route 6, which encompasses approximately 33% of the town of Barnstable, along with deer south of Route 6 in the West Barnstable Conservation Area and Hyannis Woods north of the Hyannis Airport. Subsequently, deer were notably rare or absent in most of the southern 50% of the town with the exception of Cotuit and the edge of Hyannis, where deer were in low numbers. Reasons for this overall low density of deer in the town of Barnstable is likely a very liberal deer hunting season (2.5 months of deer hunting is allowed and most hunters receive a doe/antlerless license) which keeps deer numbers low in core areas and, perhaps more importantly, probably prevents deer from increasing (i.e., dispersing) to subsequent areas where they are rare or absent, but where adequate deer habitat remains. Additionally, eastern coyotes (*Canis latrans x lycaon*) are prevalent throughout the town but currently have an unknown influence on deer population dynamics. To satisfy all of the users of wildlife, including hunters, wildlife watchers, scientists, and animal welfare interests, I recommend not issuing antlerless deer tags within the town of Barnstable for a minimum of 5-10 years to allow deer numbers to recover in heavily hunted areas and to allow them to colonize areas (from core habitats) where they are currently rare or absent.

*Key Words:* *Canis latrans*, Eastern Coyote, *Odocoileus virginianus*, White-tailed Deer, abundance, hunting, predation, overabundance, low numbers.

## Introduction

The white-tailed deer (*Odocoileus virginianus*) is the number one game animal in North America but is currently abundant or over-abundant in much of the eastern United States (Latham et al. 2005, Warren 1997). In fact, many scientists believe that the abundance of deer is a threat to the health of the East's forests (Waller and Alverson 1997). Thus, many states have liberalized doe/antlerless deer hunting and have increased season lengths and bag limits in an attempt to combat high deer densities and reduced hunter numbers (Warren 1997, Brown et al. 2000; MDFW 2009).

Having grown up in the 1980s and early 1990s in the town, I realized that there always has been a relative paucity of deer. I extensively hiked, ran, and mountain biked areas and rarely observed deer as a kid. In addition, my father, who went to work at 5 AM, also rarely observed deer despite looking for them. However, in many places that we visited when I was a kid, we would commonly observe deer using these simple methods of getting up at dawn and driving to areas that might have deer (e.g., fields) and exercising in nearby conservation areas. Three potential reasons for this lack of deer abundance in the town are: (1) over-development which lasted much of my childhood and possibly (at least temporarily) pushed deer out of given areas (i.e., woods converted to neighborhoods) and deer haven't subsequently recolonized those areas; (2) a very liberal deer hunting season where most hunters receive permits to kill antlerless deer and relatively high number of local hunters; and (3) the arrival of a predator, eastern coyotes (*Canis latrans x lycaon*), to the area which has largely had an unknown influence on the deer population. In this paper, I seek to summarize my past 16 years of deer observations and reported sightings. I provide an objective assessment of deer population dynamics in my home town, and provide recommendations for future deer management.

## Methods

### *Background*

I grew up in the town of Barnstable, graduating from Barnstable High School in 1993. I ran track and cross-country in high school and college (University of Massachusetts Amherst) and repeatedly traversed most of the town's wooded / conservation areas during that time. This provided me with great familiarity with many of the wild species living within my home town. I also took Dr. Peter Auger's Ecology class in high school and spent extensive amounts of time on Sandy Neck Beach where he was conducting a long-term study of deer populations. I produced an Honor's Thesis at UMass on deer, eastern coyotes, and red foxes (*Vulpes vulpes*) inhabiting the Sandy Neck area (Way 1996). Coincidentally, eastern coyotes did not begin to appear in the town of Barnstable in any appreciable numbers (i.e., a reproducing population) until right around the time I graduated from high school and began college. After obtaining a B.S. at UMass, I began graduate school in 1997 at the University of Connecticut Storrs (Way 2000) where I obtained an M.S. in 2000. I have been studying the behavior and ecology of eastern coyotes ever since (Way et al. 2002, Way et al. 2004, Way 2007, Way and Eatough 2008). This eastern coyote research has occurred throughout the town and at all

hours of the day (and night), enabling me to get extensive experience and familiarity with the area, including its other wild denizens, such as white-tailed deer.

### *Deer Research*

I sought to seek rough population numbers/trends of deer through direct sightings and tracking (on dirt, sand, and snow) over the past 16 years and through informal interviews (50-100 per year) with the general public and civic employees of the town. From 1995 – 2009 I have written 19 field notebooks on my research activities and findings. Most of these notes detail my eastern coyote study subjects, but I did consistently document any deer sightings, tracks, or other sign during the course of my research. I also frequently came into contact with residents of the town and they often shared their eastern coyote sightings with me (coyotes occur throughout the town, including the most urban portions). During these informal conversations (> 50 a year), I often asked the people about other wildlife that they have observed, and always asked them about any deer that they may have seen. I was always amazed at how few deer people had generally noted, so I frequently jotted these conversations into my field notes. The past decade plus has enabled me to obtain a good picture of deer abundance (or lack thereof) through my 500+ informal interviews, and through personal experience of extensive tracking of radio-collared eastern coyotes and documenting sightings of other wildlife (i.e., besides coyotes) such as deer and red fox. I produced a map of recorded sightings based on my own findings as well as through the informal interviews (Figure 1).

For purposes of this paper, I estimate deer abundance and distribution in the town of Barnstable (Figure 1) as rough / course estimates and indicate over 10 deer per square mile ( $\text{mi}^2$ ) as high density (which is actually a fairly low high density in the many studies found in Warren 1997), 5-10 deer per  $\text{mi}^2$  as moderately abundant, and low deer numbers of < 3-4 deer per  $\text{mi}^2$ . It should be noted that the Massachusetts Division of Fisheries and Wildlife (MDFW 2009) apparently strives to maintain deer at a low density range of 6-8 deer per square mile, which is considerably less than in most parts of deer range where about 20 deer per  $\text{mi}^2$  is an ecologically acceptable number, but where deer often occur in much higher numbers (e.g., Warren 1997, Riley et al. 2003). In high abundance areas of my study area, deer were frequently observed, and tracks and sign (i.e., rubs and scrapes) were prevalent in the area. In moderately abundant areas, deer were inconsistently observed, but sign was consistently found in the area. These areas were also locations where hunters frequently killed deer during the fall hunting season, which seemed to produce great fluctuations in deer numbers from year to year (e.g., one year I would consistently observe deer in nearby fields and the next year I rarely would). In low number areas, I observed deer or saw their tracks infrequently and the general public only rarely reported observing deer near where they lived. Intuitively, in areas where deer were rare or absent, deer were very infrequently reported. Often old-timers living on the Cape would respond by saying “I haven’t seen a deer in this area in over 20 years,” indicating that deer had previously lived there (e.g., in Hyannisport).

## Results

Figure 1 indicates that deer were only abundant (H = high density, consisting of 10 + deer per mi<sup>2</sup>) in about 5% of the town of Barnstable, in moderate abundance (~5-10 deer per mi<sup>2</sup>) in about 30% of the town, in low numbers (< 3-4 deer per mi<sup>2</sup>) in about 25% of the town and were rare or absent in approximately 40% of the town. Notable trends indicate that most deer (i.e., moderate abundance) are located north of Route 6, which encompasses approximately 33% of the town of Barnstable, along with deer south of Route 6 in the West Barnstable Conservation Area (WBCA), Cotuit Watershed (CW; between River Road, Route 28 and Newtown Road) and Hyannis Woods (HW) north of the Hyannis Airport. Subsequently, deer were notably rare or absent in most of the southern 50% of the town with the exception of Cotuit and the edge of Hyannis, where deer were in low numbers (there is a watershed at the Hyannis/Yarmouth line and deer often leave the woods and may be sighted at the edge of town).

Specifically, deer are often sighted in Cummaquid/Barnstable Village/Barnstable north of Route 6, which is a low density residential area with many open spaces between house lots. In addition, there are considerable areas of dense/impenetrable woods here and minimal human hunting due to the lack of public conservation areas where hunting is allowed. West Barnstable has more open space and thus more human hunting, but with a moderate deer density nonetheless (Figure 1). Sandy Neck Beach is the only place where deer densities are high, and this is because hunting is highly regulated. From 1988-1998 there was no deer hunting allowed and densities grew (to likely over 20 deer per mi<sup>2</sup>; Way 1996 and J. Way and P. Auger, unpublished data). However, hunting resumed in 1998 with 12-14 deer killed on the beach and subsequently in either 2000-2001 or 2001-2002 there was a back-to-back year of hunting including one year where 12 were allowed to be killed one year (13-14 were actually taken) and a quota of 20 deer were allocated the next year with 17 actually killed. Records became better maintained when Chief Ranger Nina Coleman took over the position after those back-to-back hunts and she has generally allowed hunting of 12 deer every other year on the beach, maintaining a moderately high deer abundance out on the Neck (although in late 2007 only 5 deer out of a quota of 12 were killed in 2 weeks of effort indicating that deer are not as abundant on the beach as in the late 1990s).

South of Route 6 there are a couple of “hotspots” of deer activity including the Hyannis Woods (HW), a state-owned ‘wildlife management area’ north of the actual airport. HW definitely has a moderate deer abundance level as I often see tracks in the area when tracking coyotes. However, it also has human hunting which keeps deer numbers low. The West Barnstable Conservation Area and Cotuit Woods Watershed hold the most potential for deer to colonize the southern portion of the town of Barnstable (Figure 2). However, these two areas also have the highest amount of human hunting in the town (Barnstable Department of Natural Resources, Russ Keyes and Keith Williams, personal communication). As a general trend, through my conversations with outdoor folks, especially hunters, deer numbers in both areas build up for roughly 3-5 years then large numbers (e.g., 6-8) are removed by gang hunters in localized areas of those wooded areas. Gang hunting involves large numbers of hunters (10-20) surrounding a particular

patch of woods and driving deer along deer trails to waiting hunters. These types of hunts are renowned for removing all ages and sexes of deer (“if it is brown, it is down”) and it just takes luck (or lack thereof for the deer) for hunters to come across deer bedded in groups in one of those patches. It is highly likely that this single activity (i.e., gang hunting), as opposed to hunting in general (e.g., bow hunting, still hunting), is why deer numbers remain low or absent in over 50% of the town. I have had extensive conversations with many local hunters who agree with this assessment. It is likely that deer recolonization of the southern half of Barnstable (see Figure 2), although adequate deer habitat remains, will take a long-time (tens of years) given current hunting regulations.

Additionally, eastern coyotes are prevalent throughout the town, but currently have an unknown influence on deer population dynamics. I have tracked them for years and have produced many publications on the species (e.g., Way et al. 2002, 2004; Way 2007) but have not observed many deer/coyote confrontations (partially because of the lack of deer that I see). However, deer often do show up in coyote scat especially in areas where deer are moderately abundant like in the WBCA (J. Way, unpublished data) and there is little doubt that deer (especially fawns) are preyed on by coyotes, at least to a moderate extent. Without question, a radio-collaring and monitoring effort of deer in the town, along with continued research on coyotes, would help clarify the extent of coyote predation.

## **Discussion**

The town of Barnstable’s relatively small deer population is unique because deer are exceedingly abundant throughout just about all of the eastern United States including Massachusetts (MDFW 2009; a quick google.com search of “overabundant deer in Massachusetts” produces a page of articles). The very liberal deer hunting season (MDFW 2009) for sure, and possibly eastern coyote predation, has suppressed deer population growth in areas where they currently live (Figure 1) in the town of Barnstable and this has likely prevented deer from recolonizing areas where they are rare or absent (Figure 2). Research indicates that female deer disperse at low rates from their natal ranges (Nelson and Mech 1992, Nelson 1993). Furthermore, the low densities of deer in Barnstable might even further delay this dispersal as young females can find suitable habitat within their natal ranges. In fact, McNulty et al. (1997) noted that localized population management (i.e., removing most deer from a 1.4 km<sup>2</sup> area) was effective at preventing philopatric deer from recolonizing adjacent areas.

Currently the MDFW gives doe/antlerless permits to most (87%; 850 of 975) applicants on Cape Cod (MDFW 2008a). In fact, if deer average 6 per mi<sup>2</sup> on Cape Cod (see MDFW 2009: 20-21), and there is a theoretical 50/50 sex ratio (i.e., 3 does per mi<sup>2</sup>), then MDFW issues 2.15 antlerless tags per mi<sup>2</sup>, almost the same number of tags as there are females estimated to be in the population. Population harvests/kills on the Cape have remained low (195 deer killed on 396 mi<sup>2</sup>, or 0.49 deer per mi<sup>2</sup>), which is 3 times lower than the overall average in the state of Massachusetts (11576 deer killed per 7840 land mi<sup>2</sup>, or 1.48 deer per mi<sup>2</sup>), as reported in 2007 (MDFW 2008b). No doubt this is because

there simply are not many deer on Cape Cod, especially in the town of Barnstable, and hunting pressure keeps their numbers artificially low, which prevents dispersal to areas where they are rare or absent (Figure 2; Nelson and Mech 1992).

Additional surveys and research should be conducted, both on deer abundance and distribution, as well as coyote-deer interactions. It is unlikely that coyotes play a large role in deer abundance in most areas of their range because coyotes rarely prey on significant numbers of them (especially in very high deer density areas), and deer and coyotes are abundant throughout much of their sympatric range in North America (Parker 1995, Warren 1997). However, coyotes might figure significantly in low deer numbers in Barnstable because of the combined low numbers of deer in the town, and the high human hunting pressure, which likely keeps the deer population suppressed. Research in northeastern North America has determined coyotes to be a significant cause of mortality for white-tailed deer (Ballard et al. 1999, Patterson and Messier 2000, 2001). However, there have been no published studies of predator-prey interactions in urbanized areas especially in southern New England. Studying these interactions could better elucidate how coyotes in varied settings, ranging from urbanized to rural, influence prey dynamics.

I am confident that the distribution map (Figure 1) is accurate, given the long-term nature of this research (i.e., 15 years), my intimate familiarity with the area, and my detailed conversations with many town residents. While I am not certain of exact deer densities (for which reason this paper was not sent for peer review to a journal), as deer numbers fluctuate over time, especially with human hunting or lack thereof, I am reasonably certain that the map is accurate over the entire town and within appropriate abundance indices. For instance, it would be very difficult for there to be many deer (if any) in the Craigville/Hyannisport area, given lack of sign observed there, as well as a nearly universal response from landowners in that portion of the town never having observed deer there. However, the fact that I often see deer or sign from West Barnstable to Cummaquid is a sign that a moderately abundant population exists in the northern third of the town.

In Massachusetts, 1.3% of the population ( $n = 64,000$ )  $\geq 16$  years old participates within their state in resident hunting, while 1.5 million people (or 30.9% of the population; 23.3 times the number of hunters; Chi-square test =  $1.3 \times 10^6$ ,  $df = 1$ ,  $P < 0.00001$ ) watches wildlife and contributes \$469.3 million to the economy, compared to \$58.5 million in hunting (U. S. Department of the Interior et al. 2001). Thus, in many areas, wildlife watching is an order of magnitude more important in terms of both participation and revenue (Caudill 2001). It would behoove wildlife managers to allow deer populations to recover in the town of Barnstable to satisfy the interest of all users of wildlife, including many hunters who have indicated they would like to observe more deer while they engage in their activities.

Therefore, to satisfy all users of wildlife, including hunters, wildlife watchers, scientists, and animal welfare interests, I recommend that the town of Barnstable/state of Massachusetts not issue antlerless deer tags within the town limits for a minimum of 5-10 years to allow deer numbers to recover in these heavily hunted areas, and to allow them

to colonize areas (from core habitats) where they are currently rare or absent. This is justified ecologically as deer populations need to be at a density of  $> 20$  per  $\text{mi}^2$  (8 per  $\text{km}^2$ ) before they would have a negative affect on the environment (Riley et al. 2003). Certainly, based on lack of sightings and reports of deer, the town of Barnstable does not have deer densities approaching that threshold (Figure 1).

### **Management Recommendations**

1. Do not issue doe/antlerless tags in the town of Barnstable for at least 5-10 years in order to allow deer numbers to recover and recolonize areas where they are currently rare or absent.
2. Control the numbers of hunters allowed to hunt in a given area. This control action has been implemented successfully on Sandy Neck Beach and could be done in other wooded areas (e.g., CW or WBCA) if the state/town does not accept reducing antlerless tags specifically within the town of Barnstable.
3. Prohibiting “gang/group” hunting which will help deer numbers recovery locally (or rather, will be less likely to wipe out deer numbers locally).
4. Require deer killed in the town of Barnstable to be checked in at a specific location so information can be recorded on the kill (e.g., location killed). Currently deer can be taken to any check station, including other towns, making it hard to even know how many deer are killed in the town, except for the regulated every other year (on average) Sandy Neck deer hunt.
5. Recommend funding for a companion deer – coyote research study to help reveal the effects of eastern coyotes on this clearly moderate to low density deer herd.

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Figure 1. White-tailed deer abundance indices throughout the town of Barnstable where high abundance (H) is likely 10+ deer per mi<sup>2</sup>, moderate abundance (M) is 5-10 deer per mi<sup>2</sup>, low numbers (M) is 3-4 deer per mi<sup>2</sup>, and Rare or Absent (A/R) means that deer are rarely or never seen in the general area.

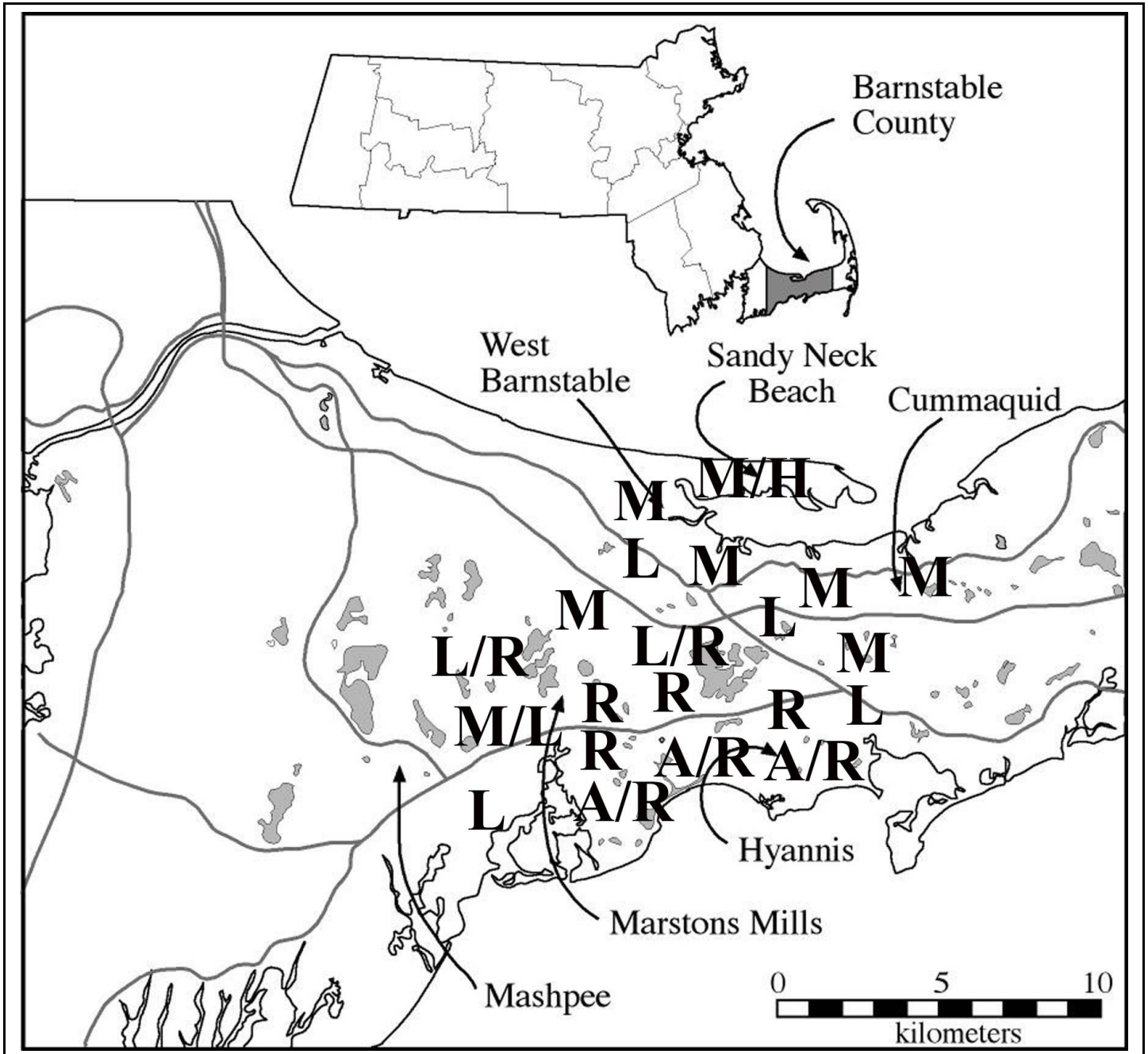


Figure 2. Possible routes for white-tailed deer to recolonize the southern portion of Barnstable, which will be facilitated through reducing or eliminating doe/antlerless tags for the foreseeable future (5-10 years). Solid arrows indicate dispersal from current areas of moderate abundance south of Route 6 (including WB = West Barnstable Conservation Area and CW = Cotuit Watershed). Dashed lines represent areas that will likely take longer for deer to colonize because of current distance from existing deer populations. Note: the “X” is urban Hyannis, which will likely restrict deer colonization and movements.

