

# Predicting the Influence of Land Development on Brown Hyena (*Parahyaena brunnea*) Movement and Activity

Ingrid Wiesel  
Brown Hyena Research Project, Lüderitz, Namibia

## INTRODUCTION

Brown hyenas are the only large carnivore along the southern Namibian coast where they forage mainly along beaches and at mainland Cape fur seal (*Arctocephalus pusillus pusillus*) colonies. The Restricted Diamond Area (Sperrgebiet) has been declared a National Park, but within the proposed park's management and development plan, the coastal area is defined as a Managed Resource Protected Area (IUCN category 6), allowing the use of the natural resources in this area. This study aims to assess the impact of development on brown hyena movement and activity to develop effective mitigation strategies for Environmental Management Programmes. Baseline data from undisturbed areas and monitoring of brown hyenas from pre to post development phases in a pocket beach mining area are used to review disturbance and conflict related issues.

## METHODS

Six brown hyenas were fitted with GPS collars. Five collars were dropped off for data retrieval. Remote data download was possible for one collar.

GPS data was analysed as follows:

- The distance between consecutive GPS locations was calculated.
- Home ranges were calculated with the Home Range extension for ArcView 3.3 using a random set of 1/3 of the recorded GPS locations to ensure independence of data.
- The daily number of locations for different distances from the coast was calculated for days without missing data.

## RESULTS

### A) Distance Moved

Table 1: Distance moved by six GPS collared coastal brown hyenas.

		Animal ID					
		LHb26m	BBHb9m	VRBb2m	LHb210RC	VRBb1m	VRBb3m
Daily Distance (km)	Mean	22.25	26.11	19.88	21.24	15.46	15.29
	Max	35.52	70.88	42.74	45.93	48.37	46.31
	Min	6.25	0.94	0.66	5.59	0.37	1.17
	SD	7.24	14.32	12.13	10.02	9.36	8.07

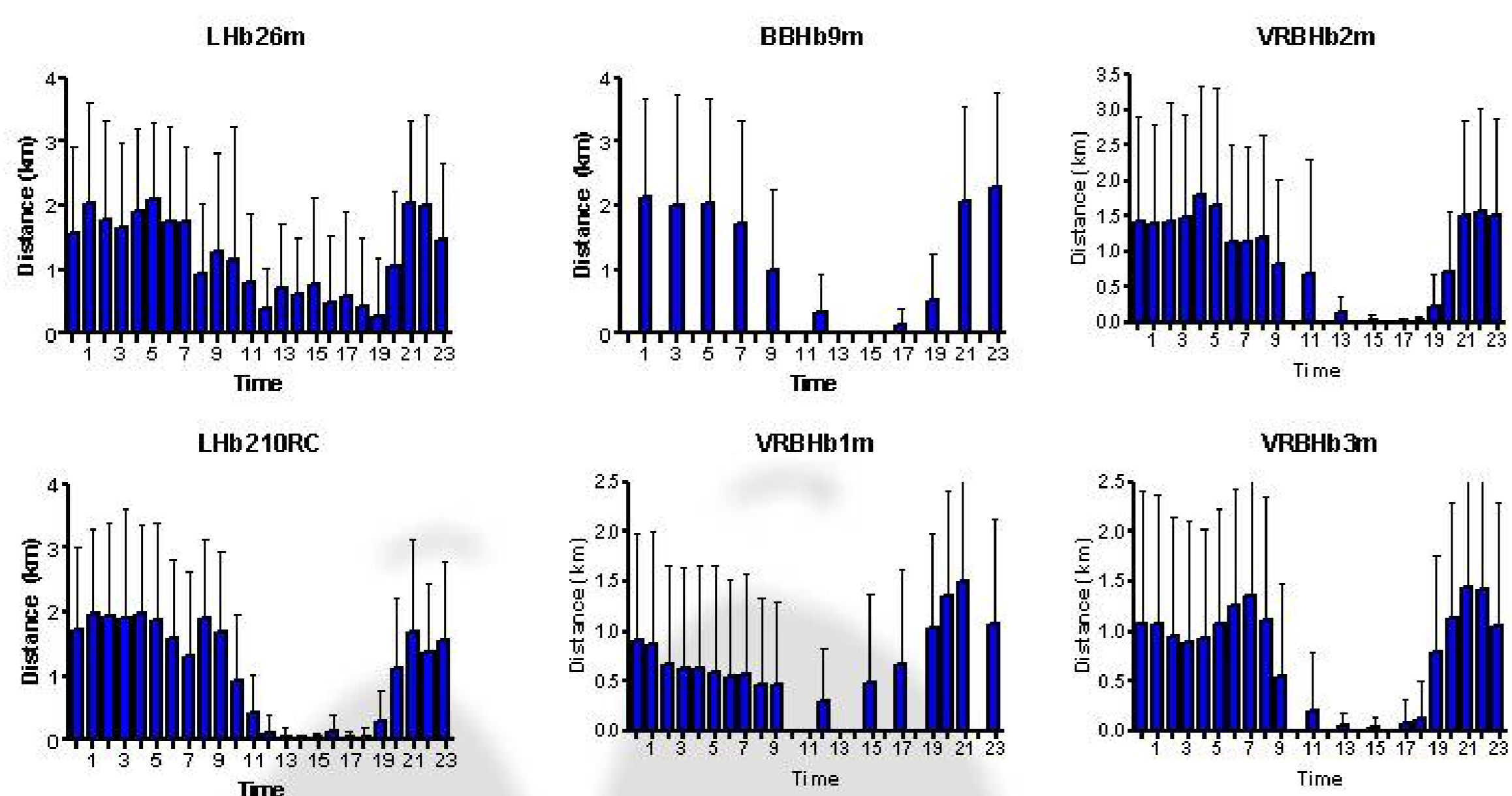


Figure 1: Distance travelled during different times of the day (Mean ± SD).

### B) Home Ranges

Table 2: Minimum Convex Polygon (MCP) and Adaptive Kernel Volume home range estimates.

Animal ID	Home Range Size (km <sup>2</sup> )			
	MCP	90%	80%	70%
LHb26m	620	590	360	250
BBHb9m	410	380	250	150
VRBb2m	1380	1600	1020	660
LHb210RC	140	100	40	20
VRBb1m	1000	940	510	300
VRBb3m	220	100	10	10

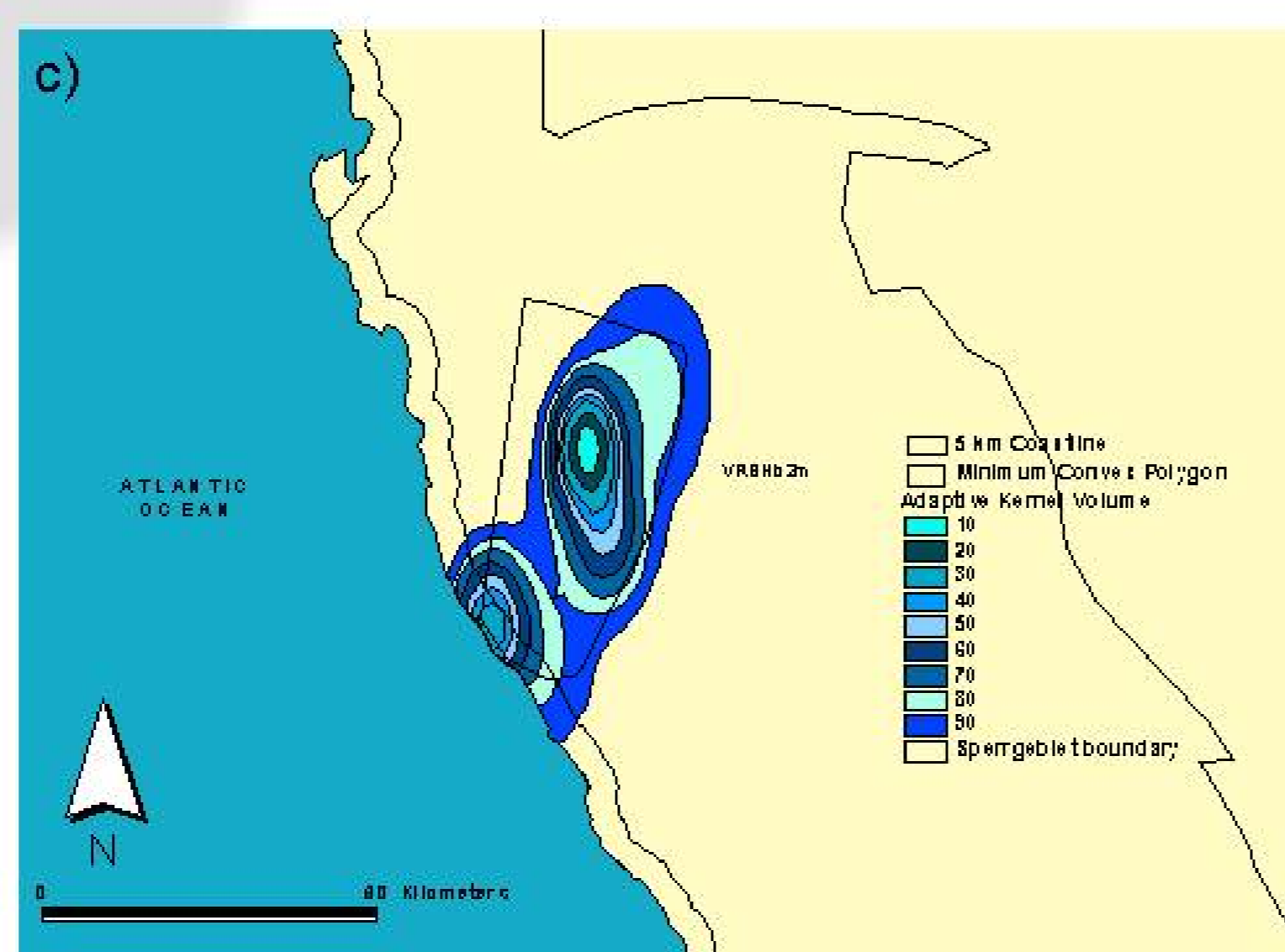
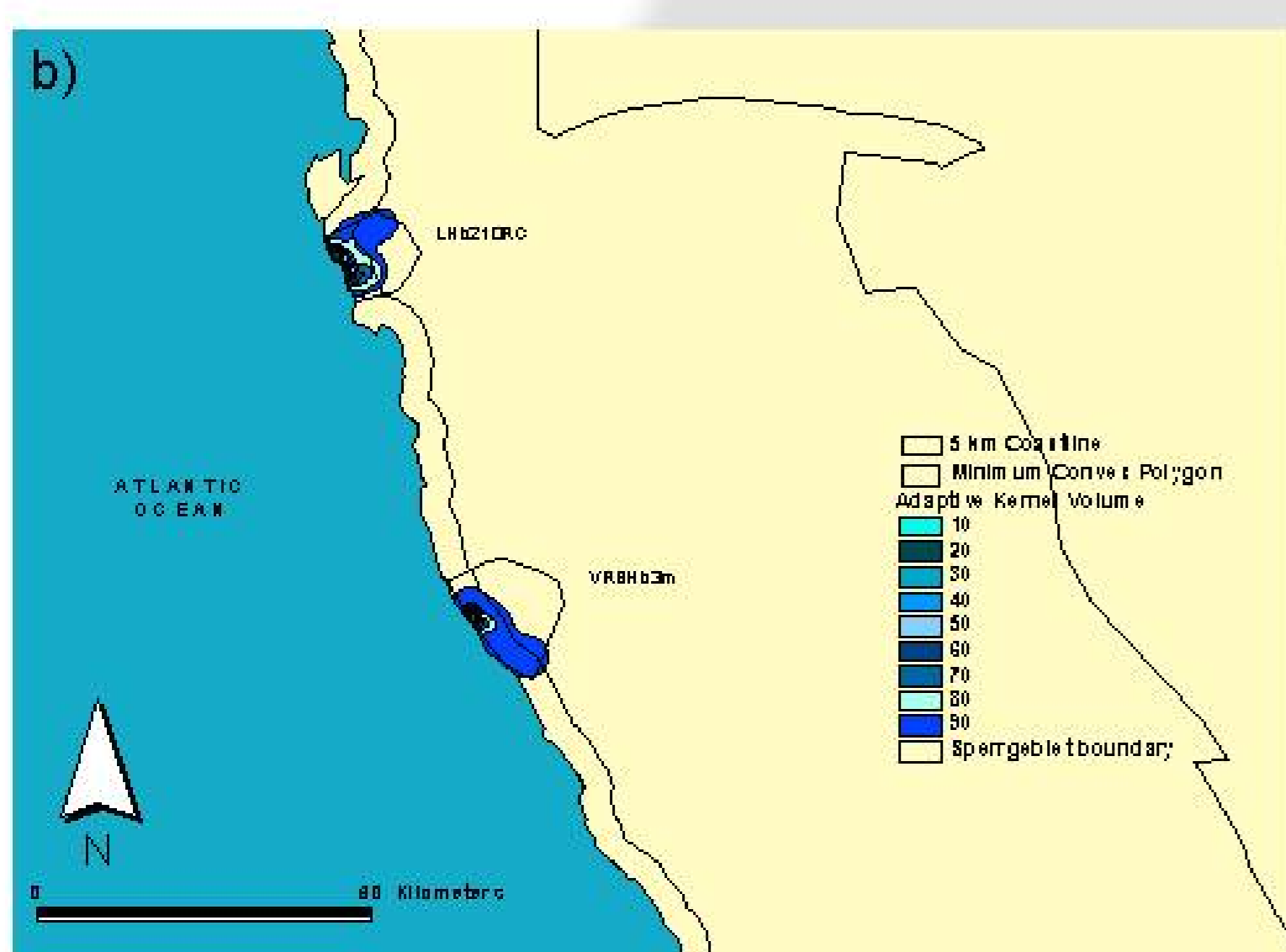
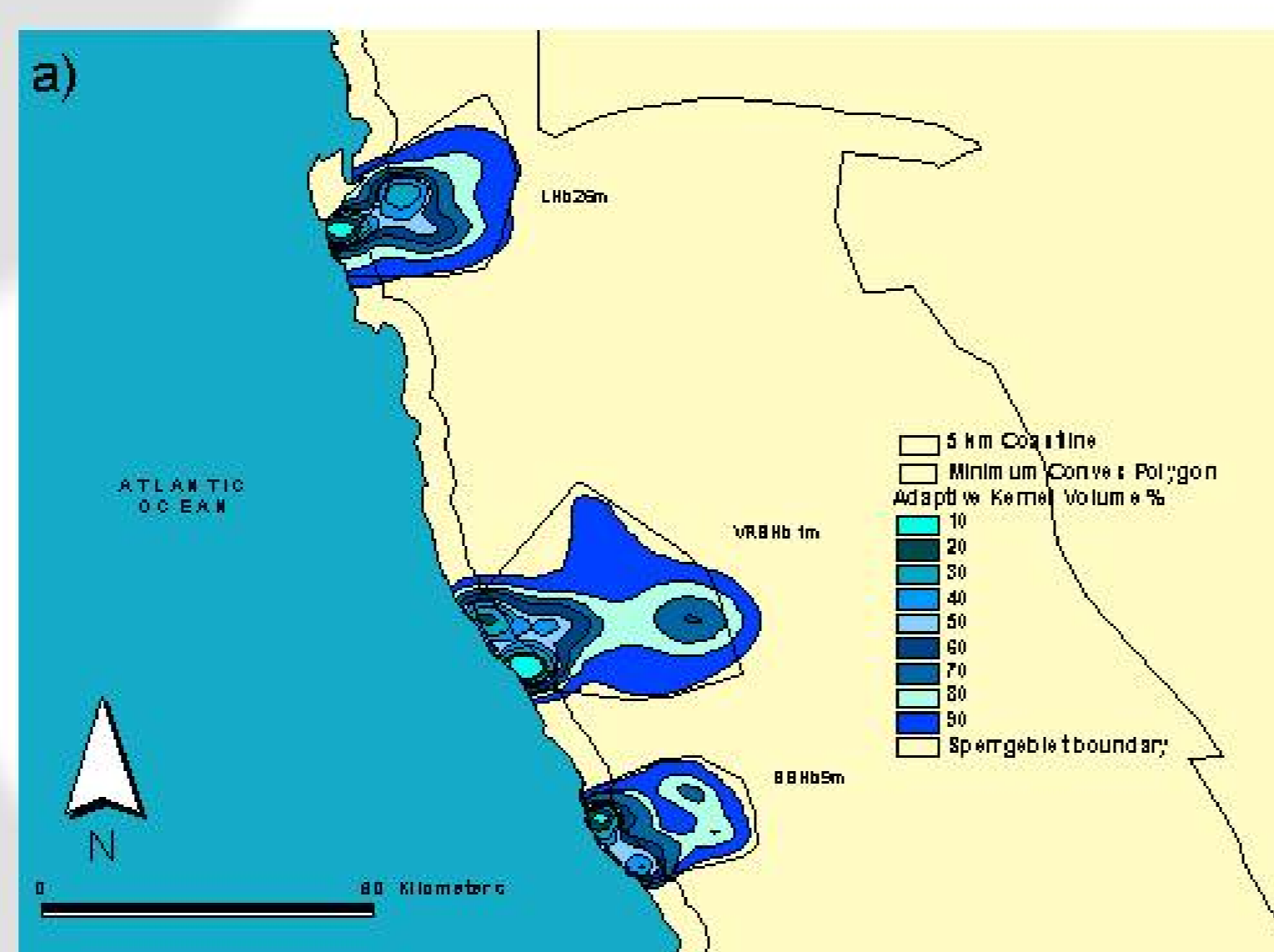


Figure 2a-c: MCP and Adaptive Kernel Volume Contours of six GPS collared brown hyenas.



Figure 5: Pocket beach construction site at coast



Figure 6: Brown hyena fitted with GPS collar



Figure 7: Brown hyena foraging at seal colony



Figure 8: Truck nearly running over brown hyena



Figure 9: Road kill in mining area

### C) Use of Coastal Area

Table 3: Size and percentage of coastal area (coast to 5 km) of MCP home range.

	LHb26m	BBHb9m	VRBb2m	LHb210RC	VRBb1m	VRBb3m
km <sup>2</sup>	100	105	85	65	75	110
%	16	26	6	46	8	50

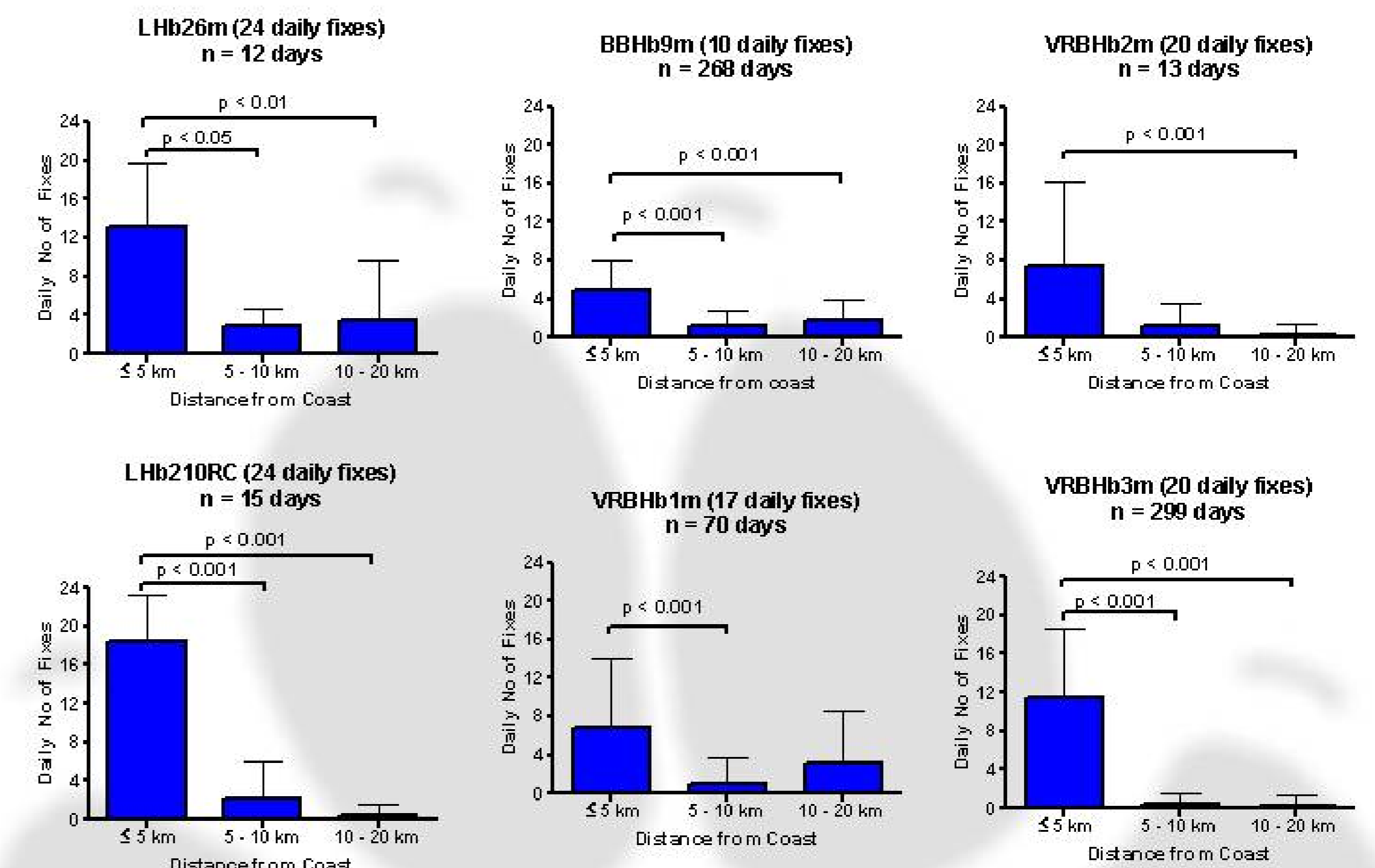


Figure 3: Daily number of GPS locations in areas with different distances from the coast (Mean ± SD).

### D) Movement in Mining Area

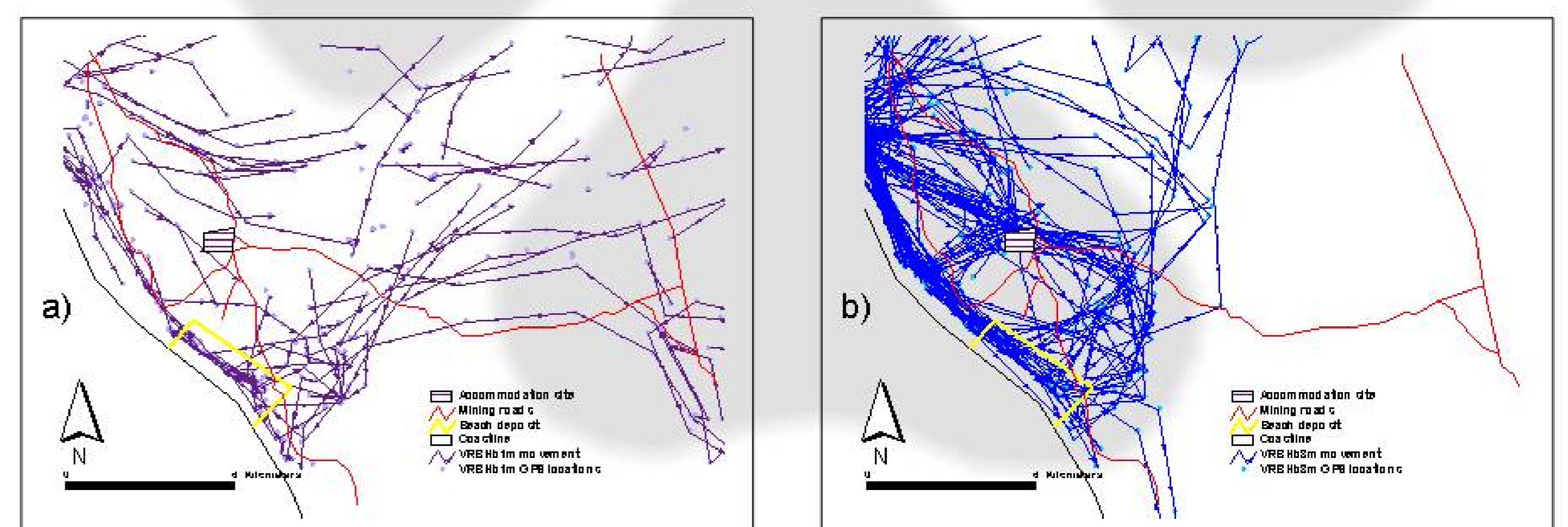


Figure 4: Movement of individual brown hyenas in the mining area (a) before and (b) after commencement of the construction activity.

## CONCLUSIONS

- Brown hyenas travel large distances mostly at night.
- Home ranges are large and individual brown hyenas spent up to 80% of their time in coastal areas.
- Coastal areas represent 6 to 50% of individual brown hyenas' home ranges.
- A significantly larger number of GPS locations is recorded in the coastal area than in areas further away from the coast.
- The majority of roads are in north to south direction.
- Hyenas travelled along the coast, but in west to east and vice versa direction in other parts of their home range.
- Activity at the development site was low before the start of the construction phase.
- Activity at the development site increased around the accommodation facility after the start of the constructions phase.

## CONSERVATION IMPLICATIONS

Land development in coastal areas of the Sperrgebiet can influence brown hyena activity and movement through

- Habitat fragmentation
- Direct mortality (e.g. road kills)
- Change of habitat use

Although mining takes place at beaches where brown hyenas frequently forage, the impact is regarded as low, due to the existence of mainland Cape fur seal colonies as a food source nearby.

Accidents with vehicles pose a real threat and the threat increases with

- Night-time mining activity and the associated vehicle traffic, when visibility is low
- Attraction of scavengers to accommodation sites with a denser network of roads and more traffic in the surrounding area
- movement of animals across roads rather than along roads

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