

Observations on the movements and home ranges of Hartmann's Mountain Zebras and Oryx in the Greater Sossusvlei-Namib Landscape

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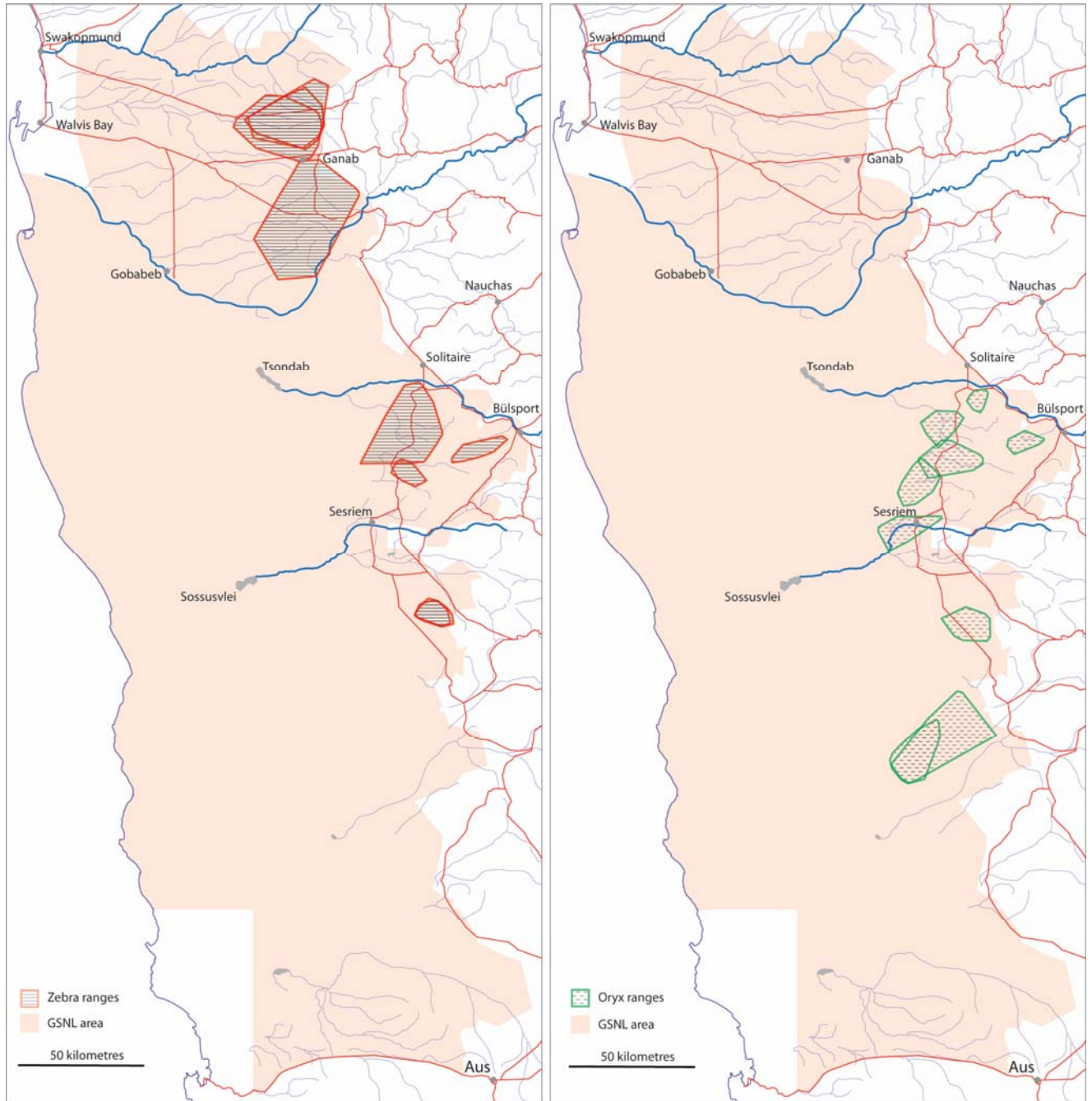


Figure 1. Major features in the Greater Sossusvlei-Namib Landscape and the areas covered by 9 zebra (left) and 9 oryx (right) fitted with GPS tracking devices.

This document provides a summary of information on the movements and locations of 9 Hartmann's mountain zebra and 9 oryx in the Greater Sossusvlei-Namib Landscape (GSNL). Each animal was fitted with a GPS tracking device on the 22nd or 23rd of November 2013. The locations of the animals were then recorded every 5 hours. This provided over one thousand locations for each animal during the 7 months from November 2013 to the 26th of June 2014, the date chosen as a cut-off for this review. Each animal is identified by its transmitter code number: from 1092 to 1100 for the 9 zebras, and from 1101 to 1109 for the 9 oryx.

Tables 1 and 2 provide information on the size of each animal's home range, calculated as a Minimum Convex Polygon (MCP). A better measure of areas used is provided by polygons which reflect intensity of use, here reported as areas enclosing 90% of the density of activity. The two Tables also report the average distance travelled per day by each animal.

The home ranges and 90% location density areas of zebra in the relatively flat landscape in the northern Ganab area of the GSNL were several times larger than those of zebra further south which spent much of their time in hilly country (Table 1 and Figure 3). While zebra 1095 in the Tsondab–Naukluft area also used a relatively large range, much of its activity was in the hilly areas in its range (see Figure 1095).

Table 1. Summary information for nine Hartmann's mountain zebras

Transmitter number	Sex	Area	Home range (hectares)	90% location density (hectares)	Average distance travelled per day (km)
1092	Female	<i>Ganab</i>	130,975	58,473	10.74
1093	Female	<i>Ganab</i>	50,547	28,082	10.93
1094	Male	<i>Tsondab – Naukluft</i>	11,925	1,821	3.94
1095	Male	<i>Tsondab – Naukluft</i>	69,058	8,053	7.58
1096	Male	<i>Namib Rand Nature Reserve – Chowagas</i>	11,208	4,562	5.75
1097	Male	<i>Ganab</i>	68,045	22,499	10.59
1098	Male	<i>Ganab</i>	58,948	14,733	9.24
1099	Female	<i>Tsondab – Naukluft</i>	9,011	1,757	5.68
1100	Female	<i>Namib Rand Nature Reserve – Chowagas</i>	10,599	2,324	5.23

The largest oryx home ranges and areas of intense activity were west of the escarpment (Table 2 and Figure 4). Areas of 90% intensity of activity ranged between 2,901 and 19,147 square kilometres. All nine oryx are females.

Table 2. Summary information for nine oryx

Transmitter number	Sex	Area	Home range (hectares)	90% location density (hectares)	Average distance travelled per day (km)
1101	Female	<i>Tsondab – Naukluft</i>	8,335	3,493	2.47
1102	Female	<i>Tsondab – Naukluft</i>	26,637	15,488	5.35
1103	Female	<i>Tsondab – Naukluft</i>	15,568	3,114	6.15
1104	Female	<i>Sesriem-Sossusvlei – Elim</i>	20,046	6,382	5.05
1105	Female	<i>Sesriem-Sossusvlei – Elim</i>	20,026	6,569	5.85
1106	Female	<i>Sesriem-Sossusvlei – Elim</i>	5,419	2,901	5.21
1107	Female	<i>Namib Rand Nature Reserve – Chowagas</i>	19,877	7,033	6.45
1108	Female	<i>Namib Rand Nature Reserve – Chowagas</i>	31,848	7,936	6.03
1109	Female	<i>Namib Rand Nature Reserve – Chowagas</i>	75,051	19,147	6.41

Preliminary analyses of home ranges and distances walked each day by both zebra and oryx did not reveal any obvious seasonal or monthly changes. However, distances walked changed during the day (Figure 2). Both species walked further in the morning and early evening than at other times, but oryx walked less in the evening than in the mornings.

The greatest distance covered by a zebra in a 5-hour interval was 25.6 kilometres. On 45 other occasions, zebras walked more than 10 kilometres in 5 hours. Among the oryx, 11.7 kilometres was the greatest distance covered in 5 hours, and only on two other occasions did oryx walk more than 10 kilometres in a 5-hour period.

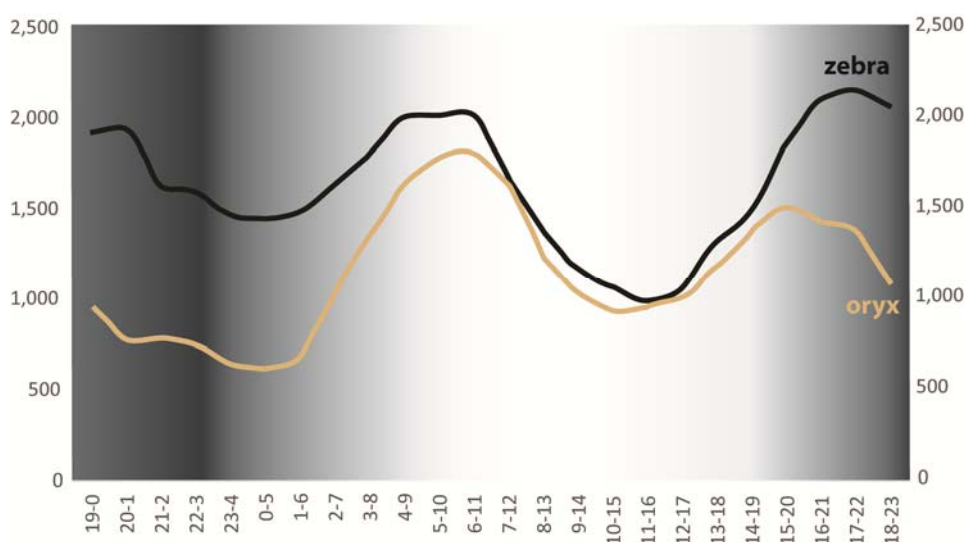


Figure 2. Average distances (in metres) walked per 5-hour period during the day by zebra (top) and oryx (bottom). Each 5-hour period is labelled on the x axis using the hour the period began and the hour it ended. The first period on the right stretches between 19h00 and 0h00 (midnight).

Significant associations between GPS locations and known water points were not apparent, suggesting that the animals did not spend much time at those water points.

Many of the maps of locations of individuals (Figures 1092 to 1109) reveal marked shifts in the areas in which animals were active. Comments on certain of the movements are offered in the captions to these maps.

Accurate information on the positions of fences which may impede movements are not presently available for the whole GSNL area. However, one example of such a barrier limiting movements by 3 zebra is provided in Figure 5. This fence separates private farm land to the east from the Namib-Naukluft National Park to the west.

The principal aim of fitting the GPS trackers has been to document the distributions and movements of zebra and oryx, and to understand how their ranges and movements relate to land uses, rainfall, vegetation, fences and other barriers. To achieve these goals it will be important to collect GPS data for as many animals and for as long as is possible. However, the lifespan of the GPS trackers is partly dependent on the frequency with which locations are recorded. This is now every 5 hours which is probably unnecessarily frequent for present purposes. Consideration should therefore be given to increasing the interval to 12 hours.

It is also recommended that GPS trackers be fitted as soon as possible to springbok in the same area. This will allow comparisons to be made between the three species, as well as maximising the benefits of any field or other data collected in support of the analyses of the GPS locations. Data collected on rainfall, land use, vegetation condition and the effects of fences, for example, can then be analysed simultaneously in relation to the movements and ranges of three species, rather than only zebra and oryx.

The analyses done so far and the results presented here are of a preliminary nature. Much more work is required, both of an analytical nature and to assemble data on the presence of fences, rainfall, vegetation types and condition, and land uses. Efforts are also required to engage students in this work. These can comprise of students at a variety of levels, some doing small, simple field studies to collect and verify primary data while others can do sophisticated analyses of relationships between the GPS data and environmental variables, perhaps using their work for post graduate studies.

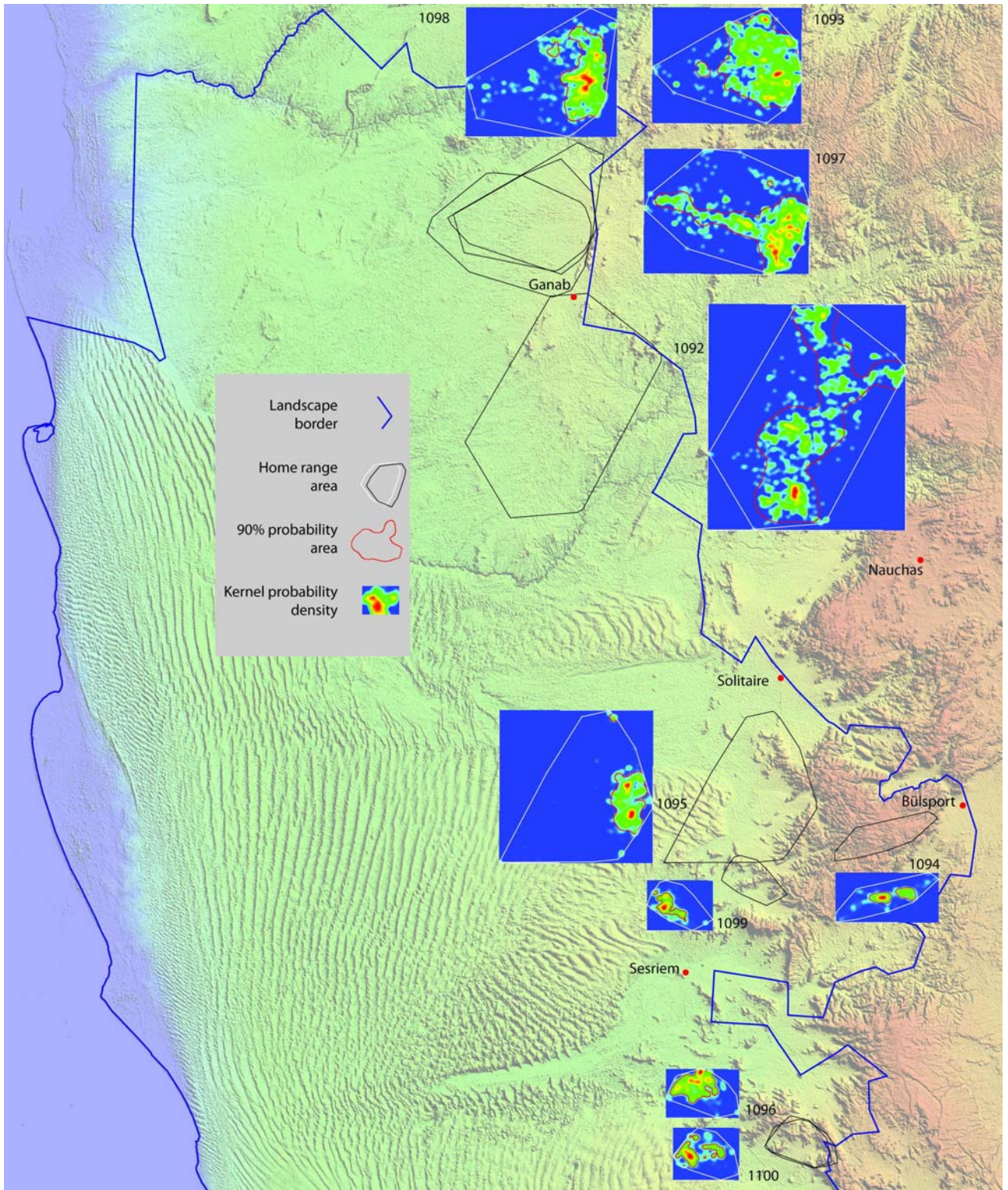


Figure 3. Home ranges, areas in which 90% of activity were concentrated and kernel densities for the 9 zebra in the GSNL. Areas with the highest kernel densities are red, grading to blue with the lowest densities. The background map shows the borders of the GSNL and hill-shaded topography.

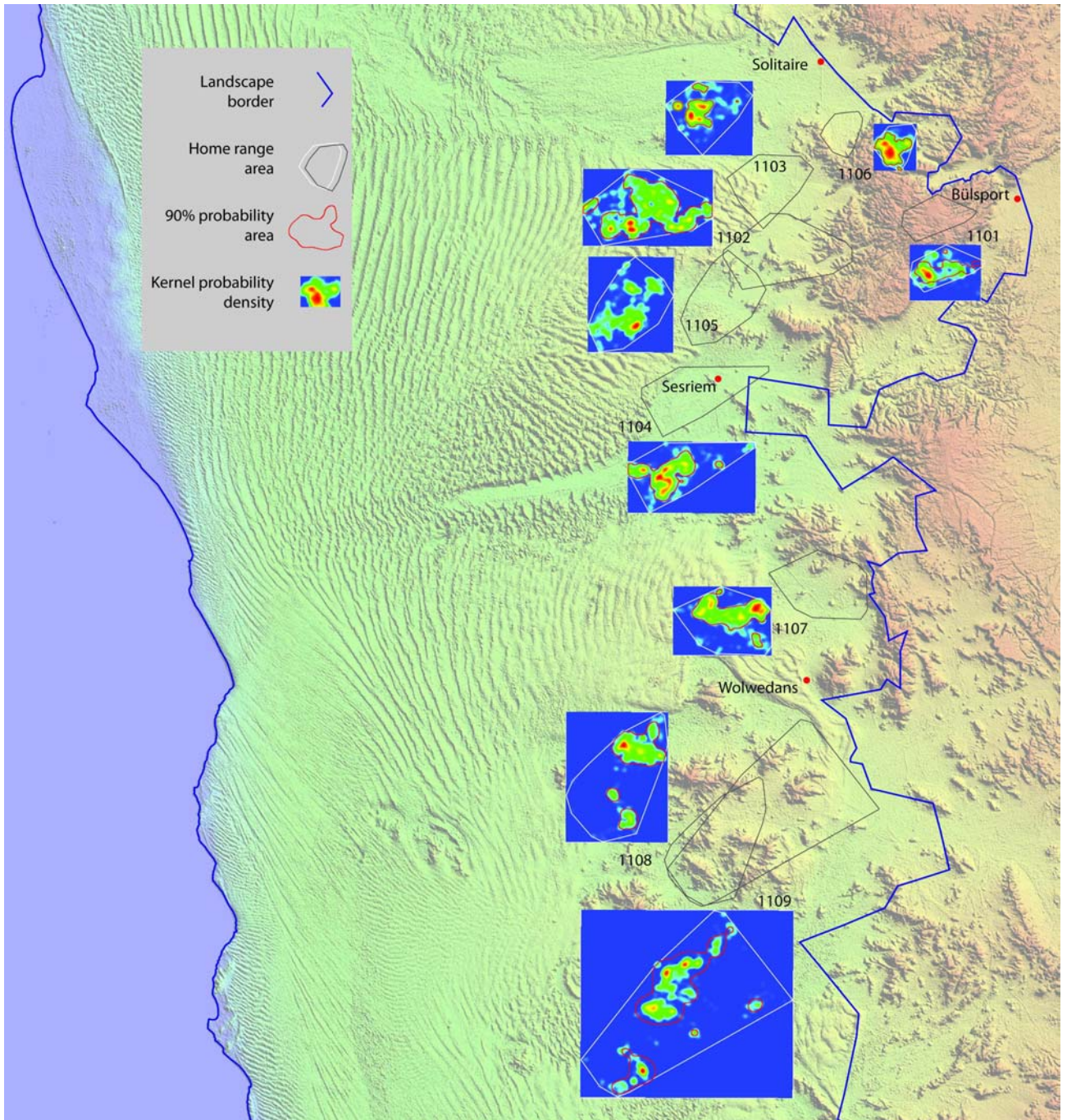


Figure 4. Home ranges, areas in which 90% of activity were concentrated and kernel densities for the 9 oryx in the GSNL. Areas with the highest kernel densities are red, grading to blue with the lowest densities. The background map shows the borders of the GSNL and hill-shaded topography.

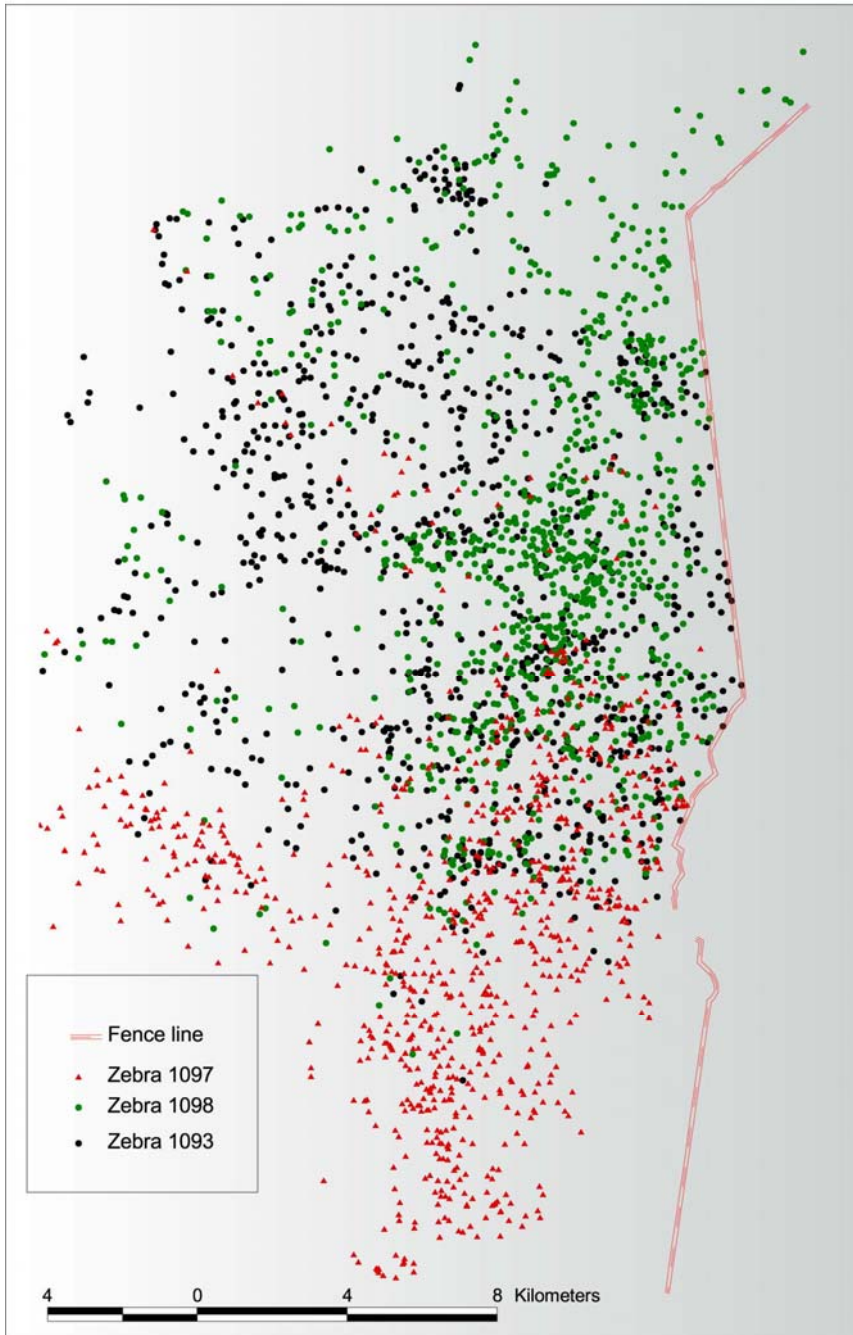


Figure 5. Locations of 3 zebra (1093, 1098 and 1097) showing how their ranges were limited by the fence bordering the Namib-Naukluft National Park. The apparent 'break' in the fence is where the border of the Park runs through rugged hills.

MAPS OF INDIVIDUAL ZEBRAS

The following 9 maps show the ranges and locations of each of the zebras. The dots representing each location are separately coloured for each month.

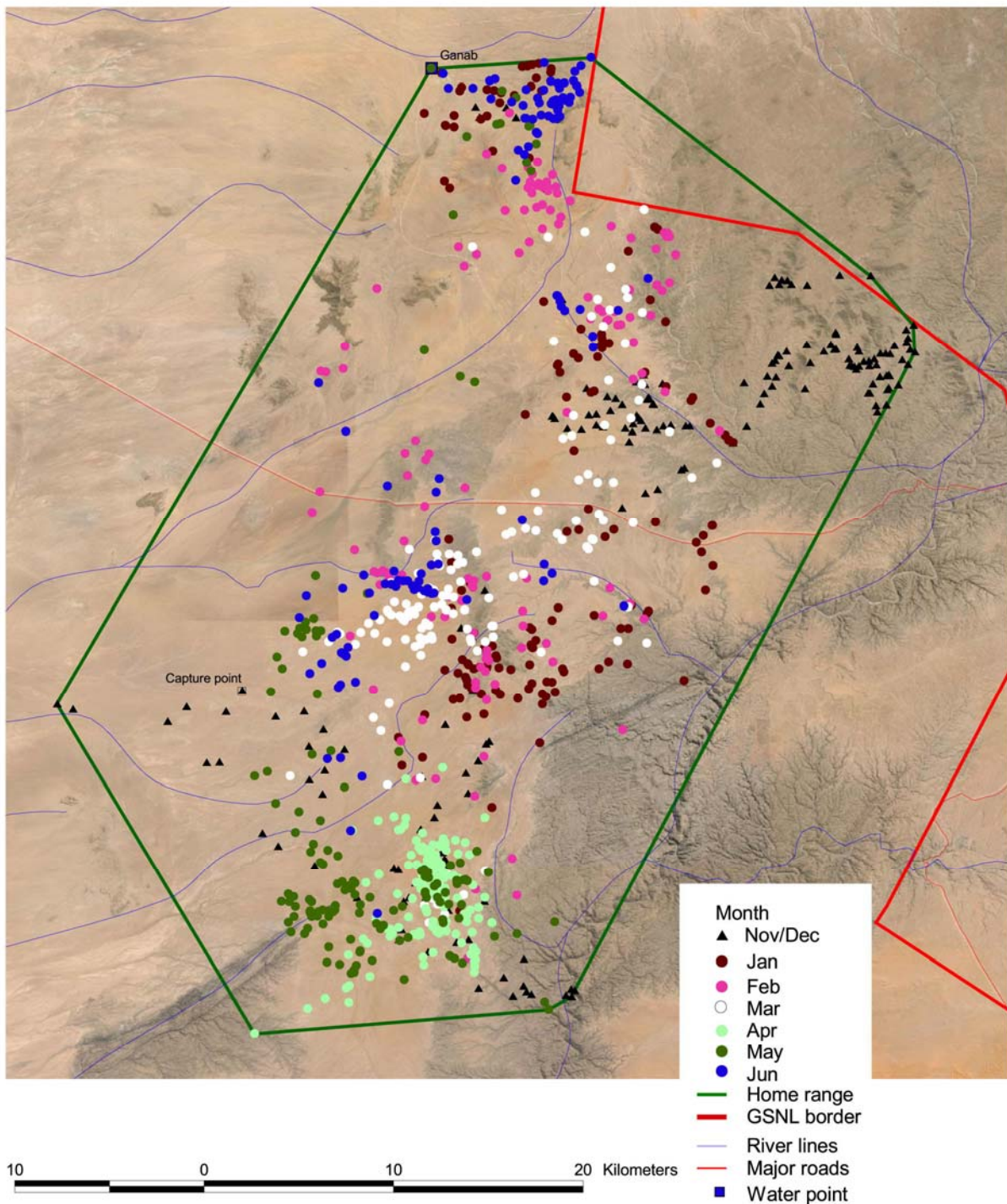


Figure 1092. Locations of zebra 1092, a female which had the largest home range (130,975 hectares) of all the animals. Much of April and May was spent in the south, while the central areas of its range were favoured in February and March.

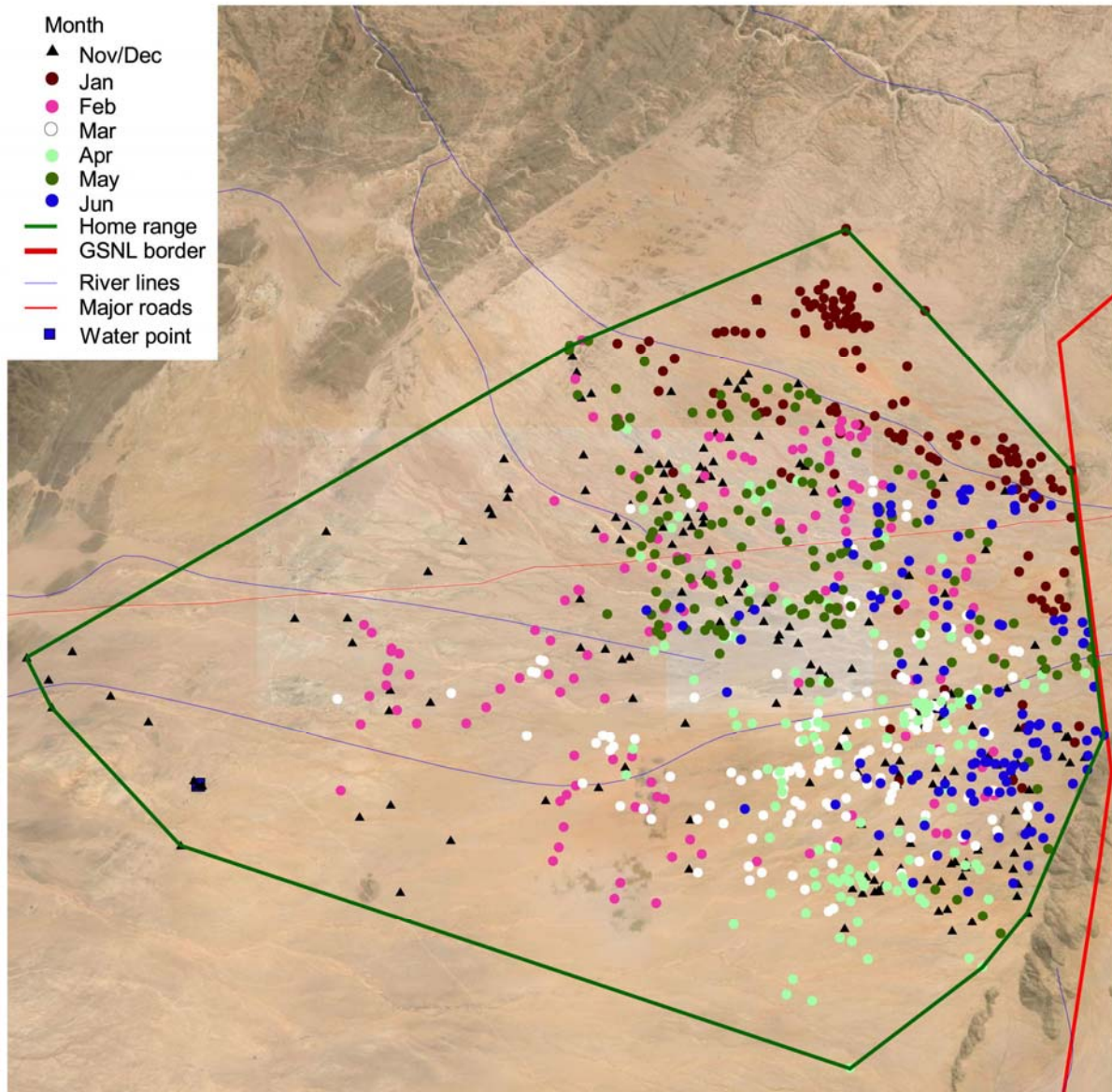


Figure 1093. Locations of zebra 1093, one of the animals prevented from moving east by the fenced border of the Namib Naukluft National Park. Its activity was concentrated in the north during January, but wider ranging during other months.

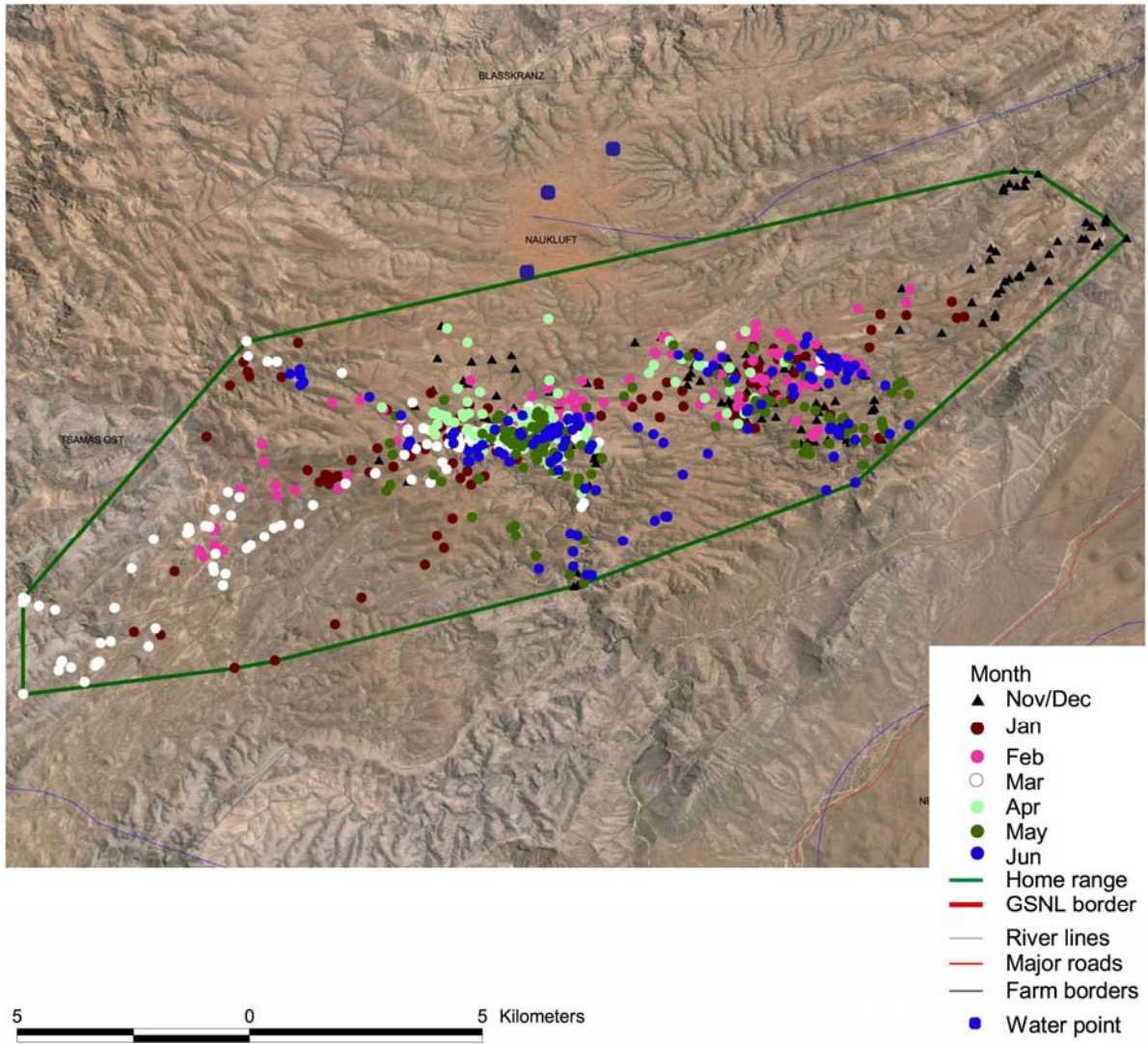


Figure 1094. Locations of zebra 1094 which spent all of its time in the Naukluft Mountains to the west of Bülsport. It apparently did not visit any of three nearby water points. The animal had one of the smallest home ranges (11,925 hectares) and areas of intense activity (1,821 hectares) among all the zebras.

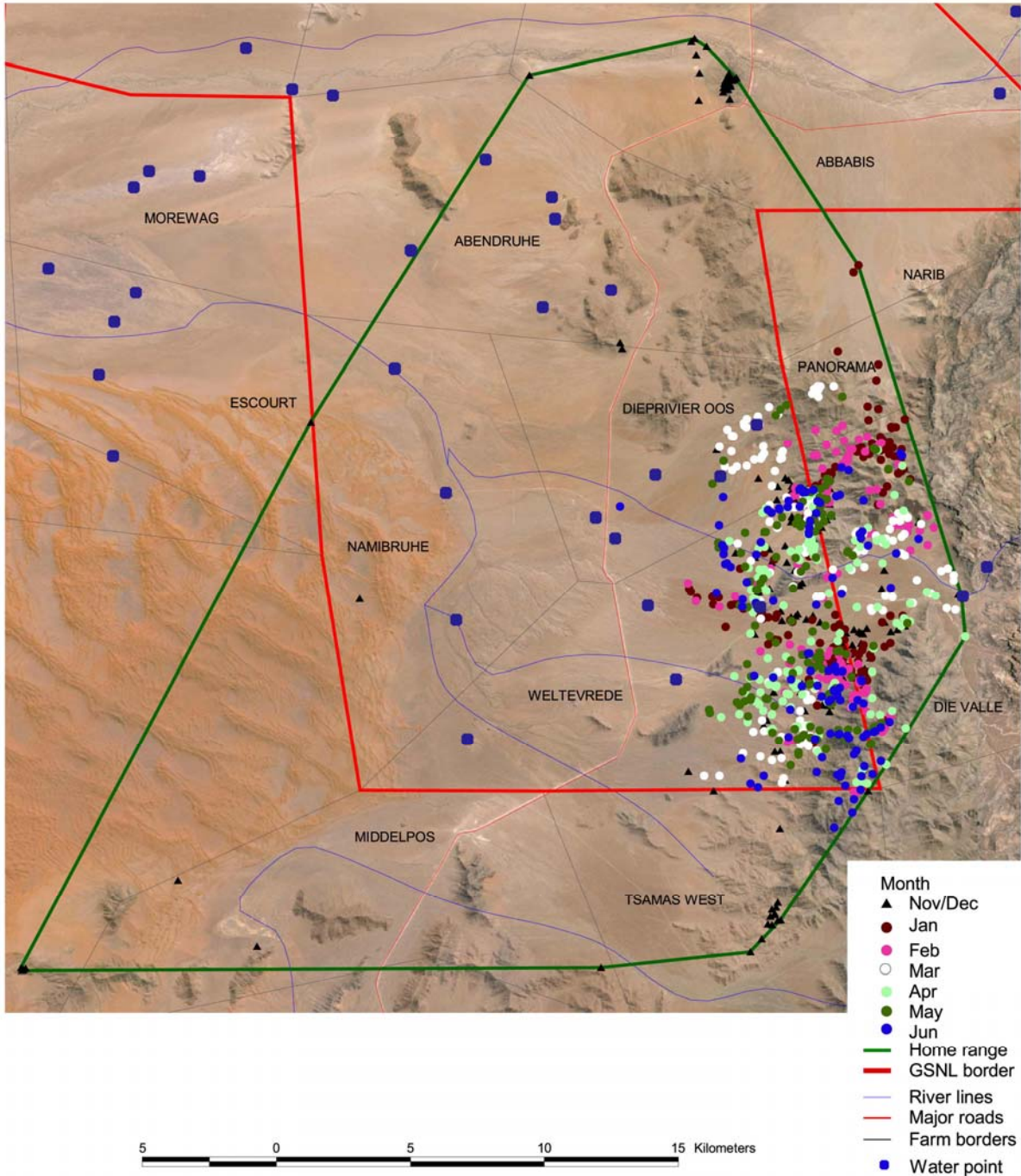


Figure 1095. Zebra 1095 spent the entire period between January and June 2014 in the adjacent plains and foothills of the Naukluft Mountains, but had previously ranged far to the west and north in November and early December 2013. On the 9th of December, this zebra walked at least 25.6 kilometres between 13h30 and 18h30. At a minimum, its walking speed averaged about 5 kilometres/hour.

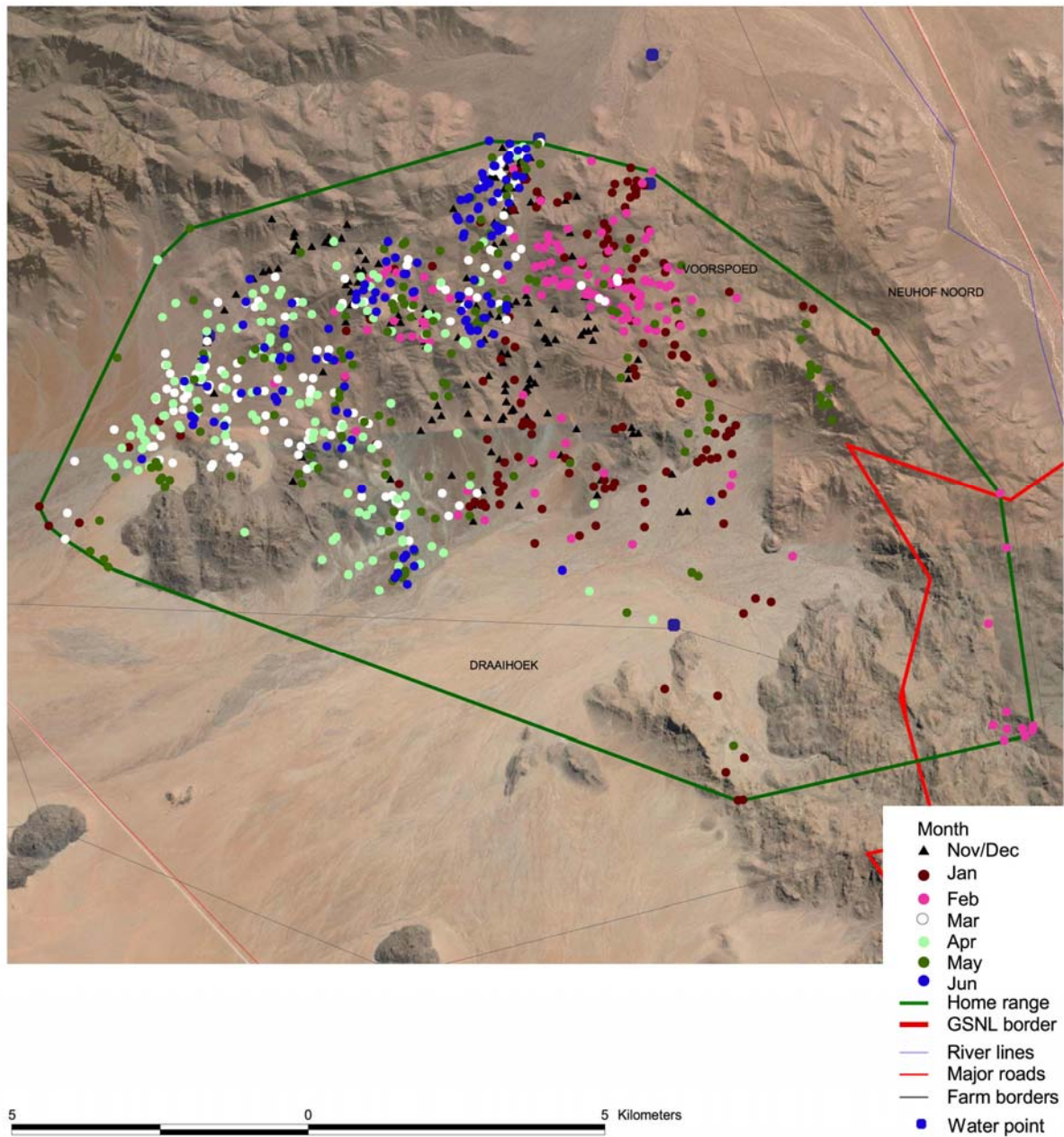


Figure 1096. This male zebra and 1100 (a female) occupied the same small area of hills in the north-east of the NamibRand Nature Reserve. Both animals focussed their activity in the hills since relatively few locations were recorded in the plains below the hills.

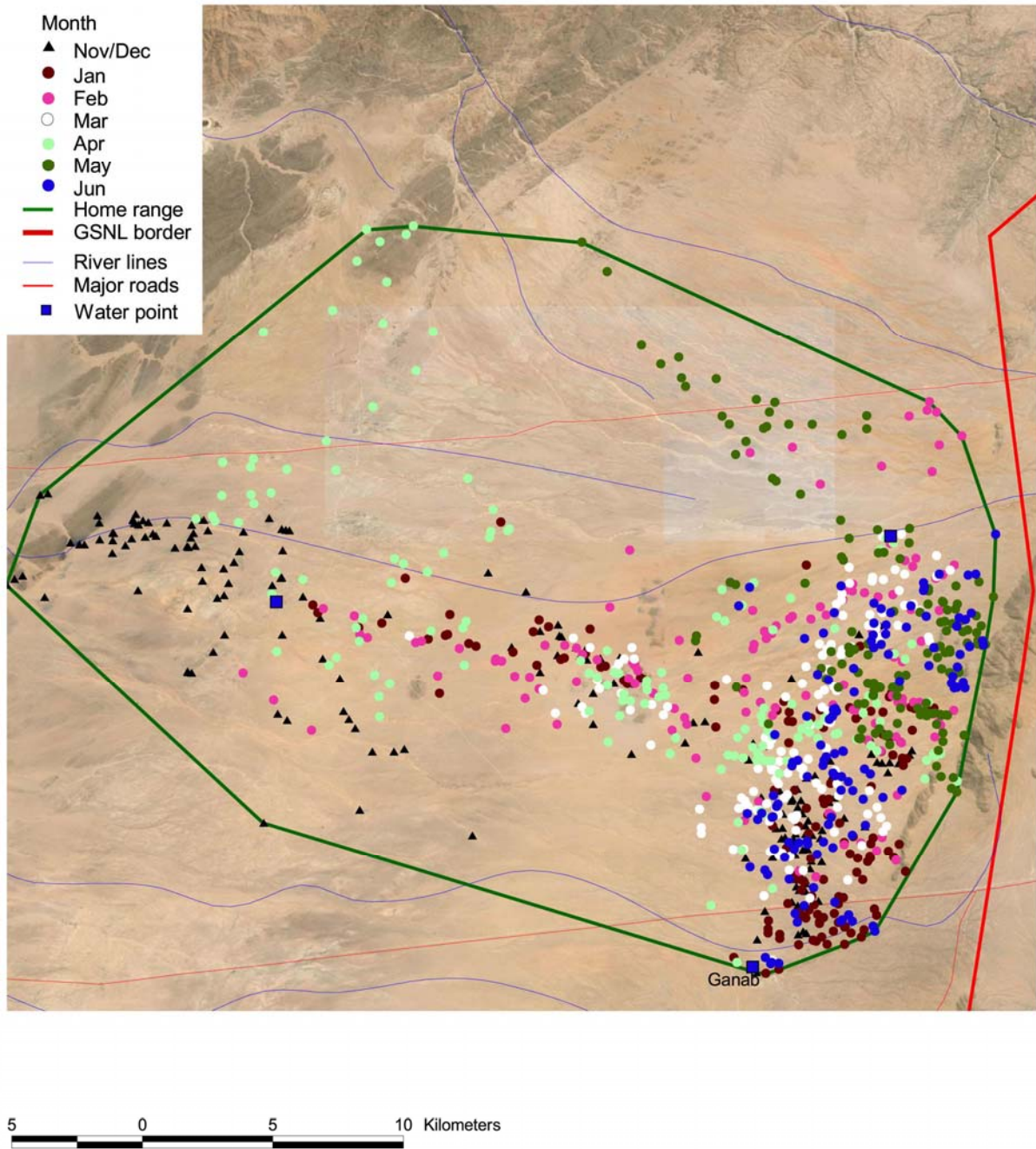


Figure 1097. Zebra 1097 is a male in the Ganab area which had its movements east impeded by the fence along the eastern border of the Namib-Naukluft Park. It occupied a similar area to that used by zebras 1093 and 1098 (see Figures 3 and 5).

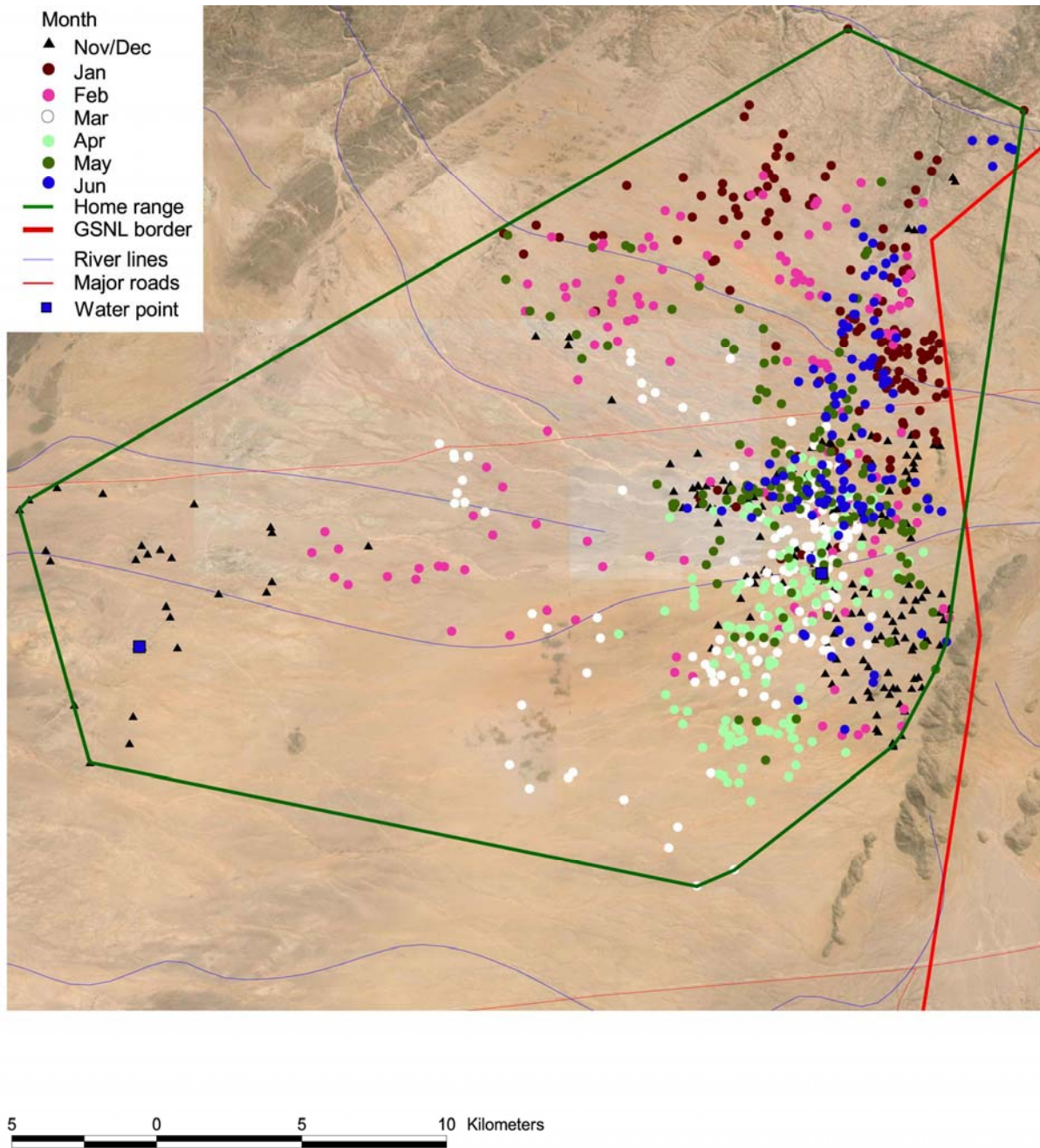


Figure 1098. This male and 1093 (female) and 1097 (male) concurrently spent time in November and December 2013 in the far west of their ranges. The movements of 1098 were restricted by the border fence of the Namib-Naukluft Park (see Figure 5).

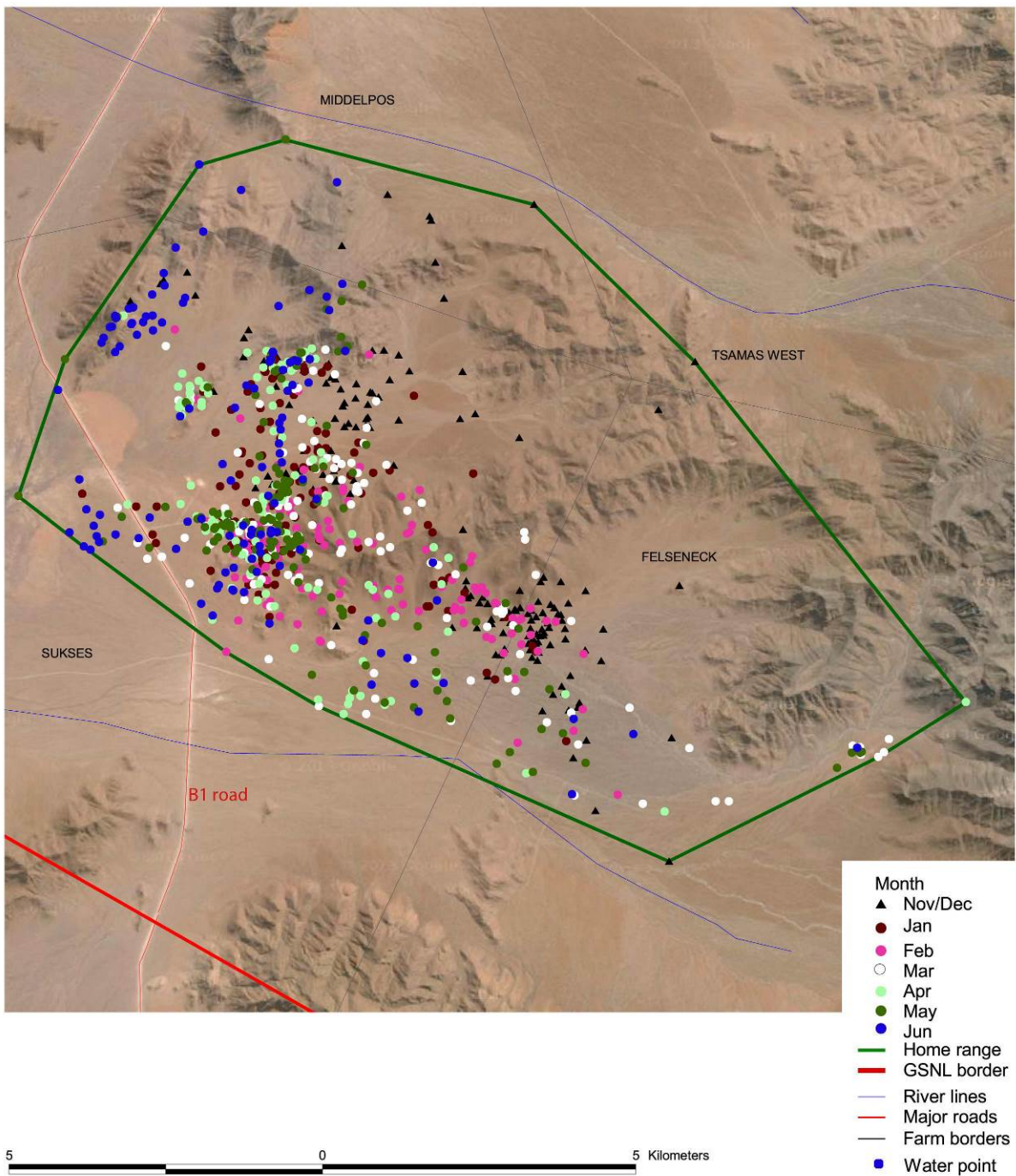


Figure 1099. This female had the smallest home range (9,011 hectares) and area of intense activity (1,757 hectares) of all the zebras. It occupied a range of low-lying hills to the east of the B1 road, which it occasionally crossed.

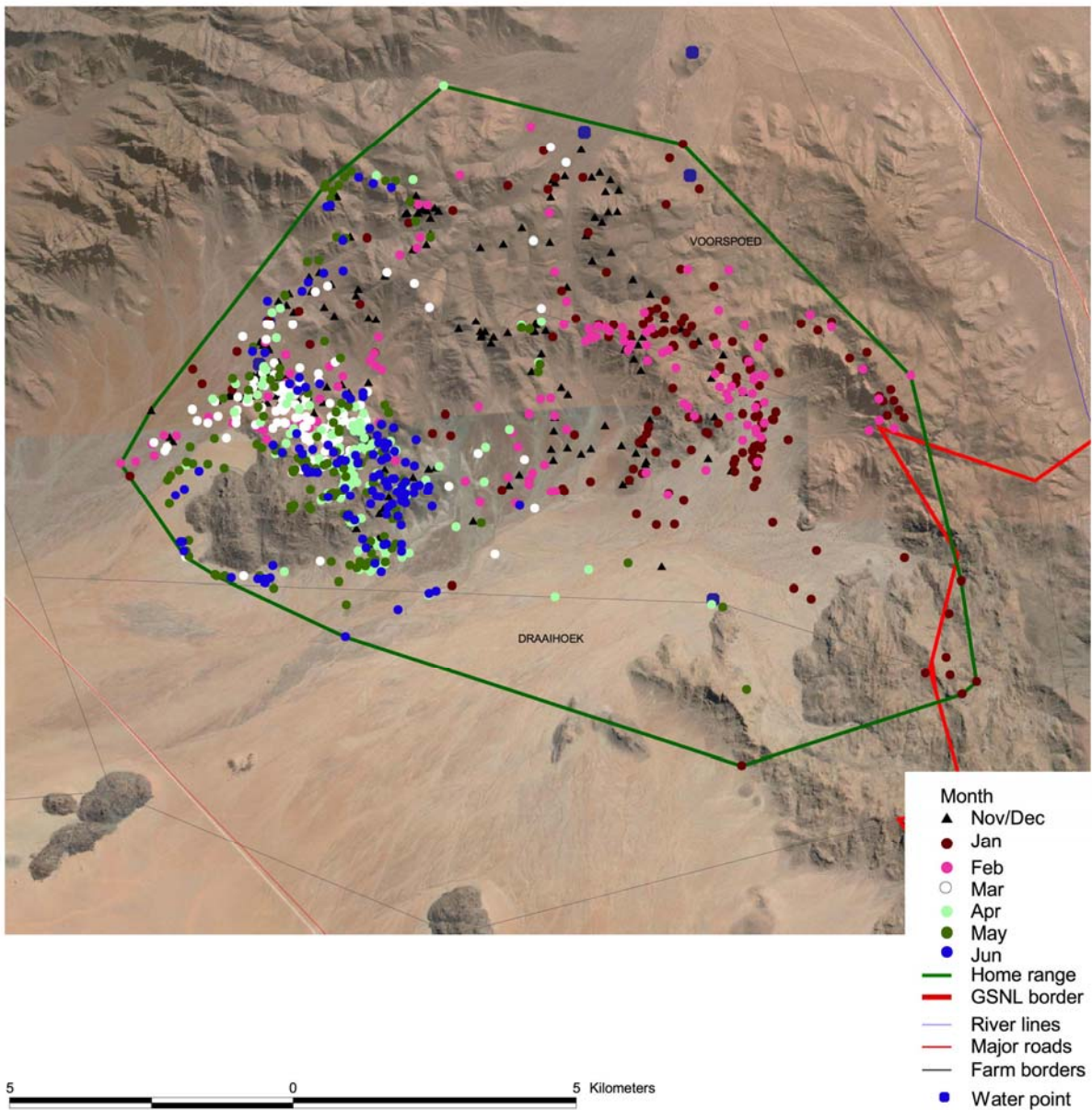


Figure 1100. This female and male 1096 occupied the same area of hills in the north-east of the NamibRand Nature Reserve. Both zebras ranged to the east in January and February, but spent the remaining time confined to the small area of hills in the west.

MAPS OF INDIVIDUAL ORYX

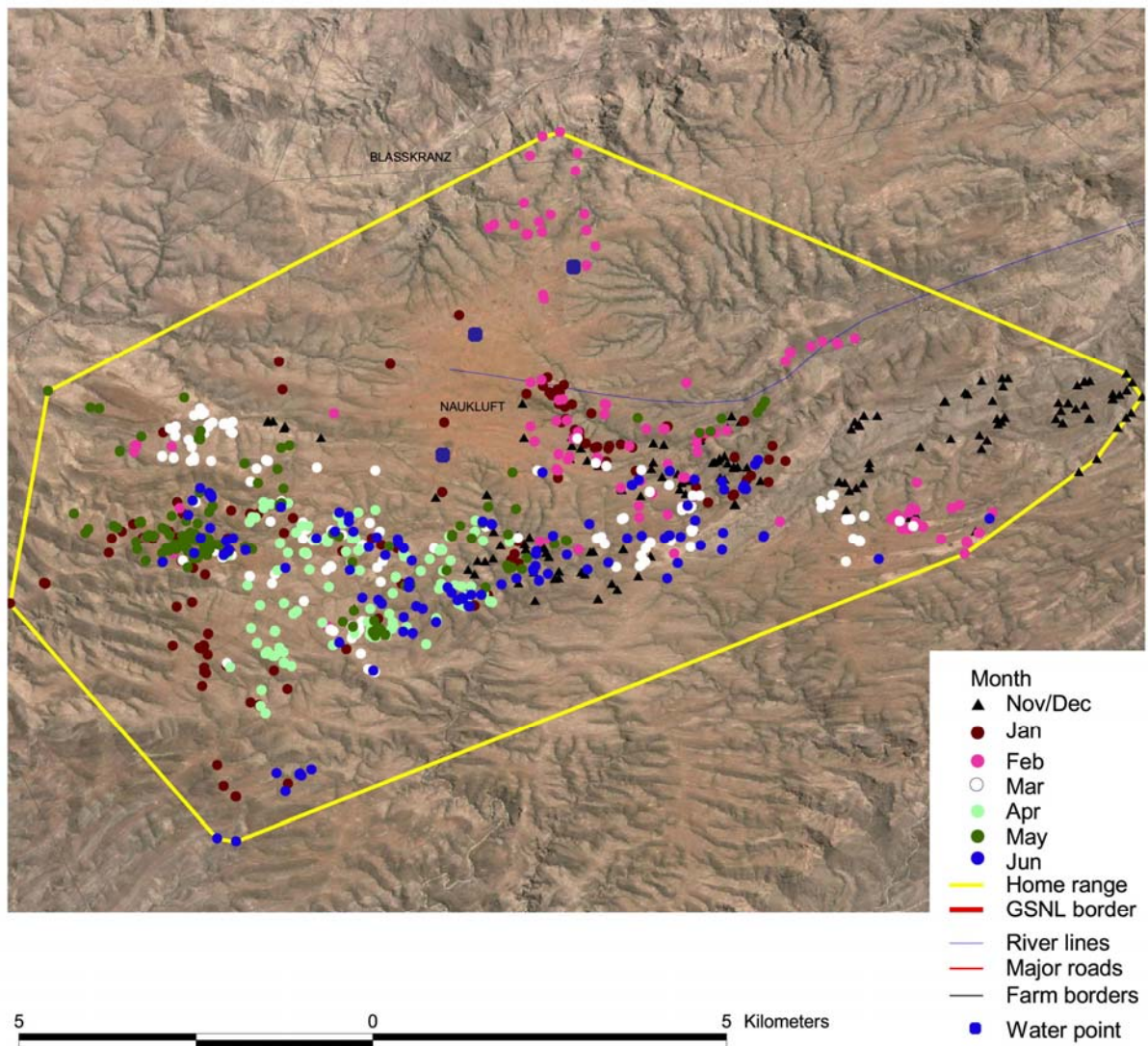


Figure 1101. This oryx was confined to a small area of hills in the Naukluft Mountains west of Bülsport. Its home range covered 8,335 hectares and much of it overlapped the area occupied by zebra 1094.

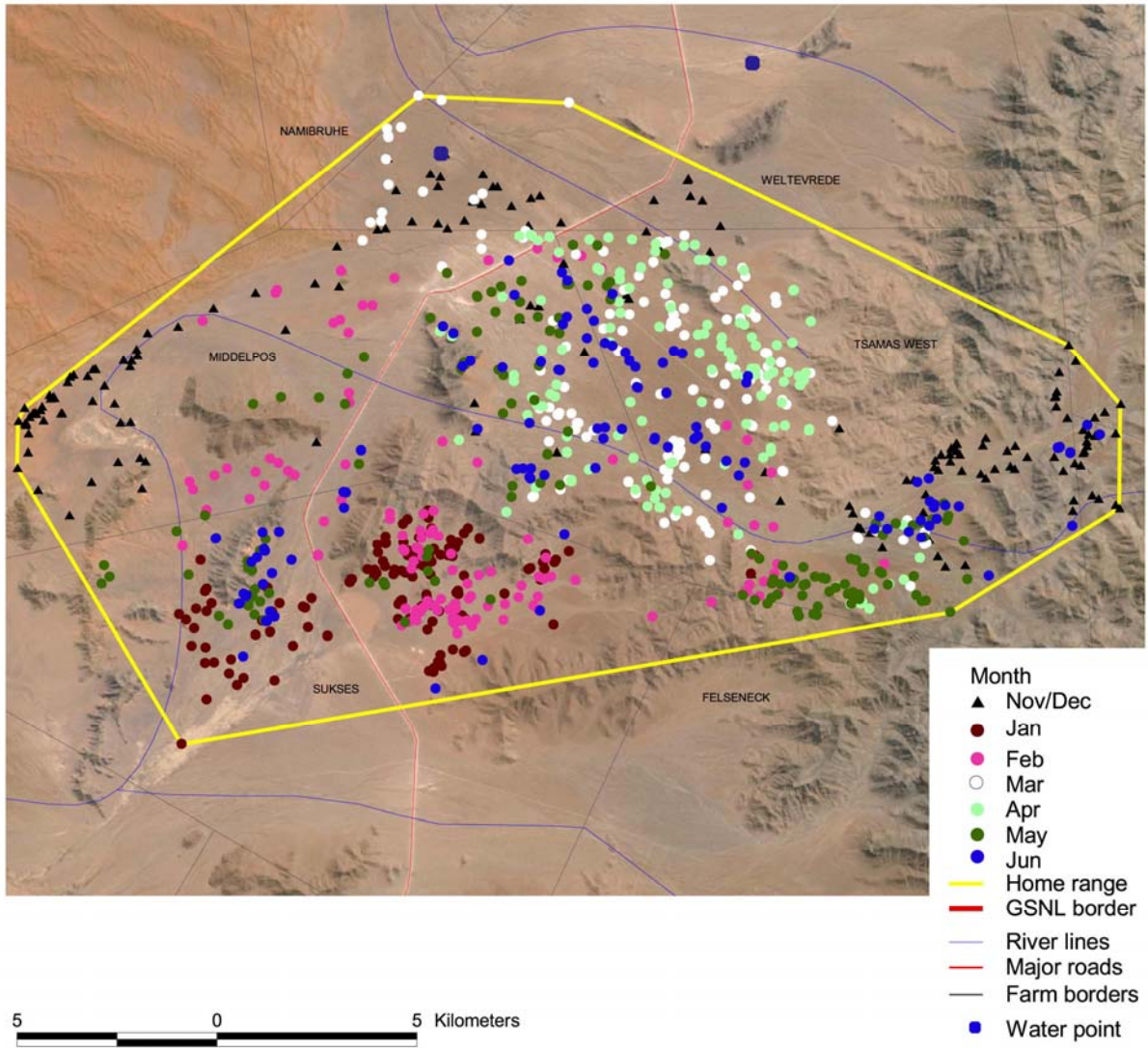


Figure 1102. Activity focussed in the south-west of the home range of this oryx during January and February, and in the central areas in March and April. The animal ranged more widely during the other months.

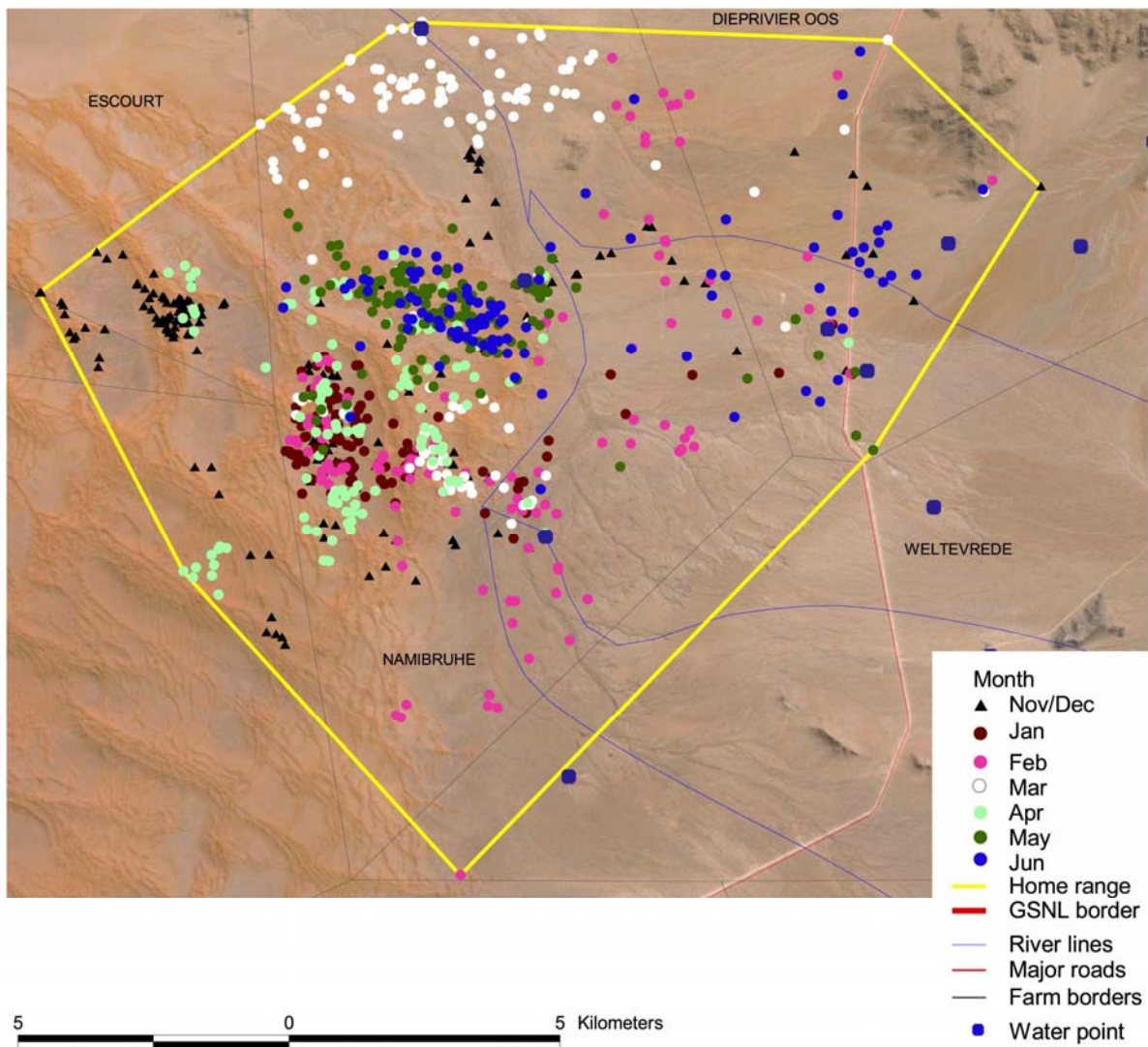


Figure 1103. The locations recorded for this oryx suggest that it often concentrated its activities in rather small, circumscribed areas, each of which appears as a cluster of dots in this map.

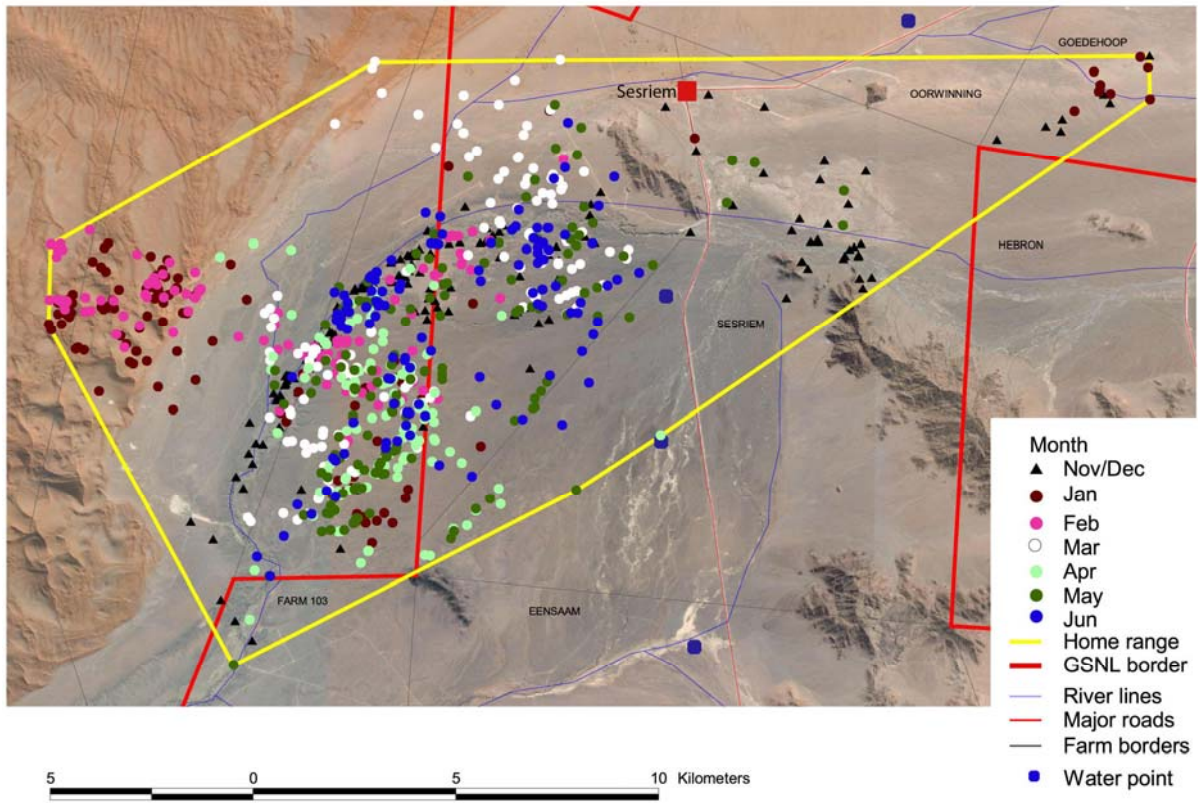


Figure 1104. Most of the area occupied by this oryx lies south and west of Sesriem. The only time that the animal was active in the dunes to the west was in January and February. It remained on the gravel plains during all the other months.

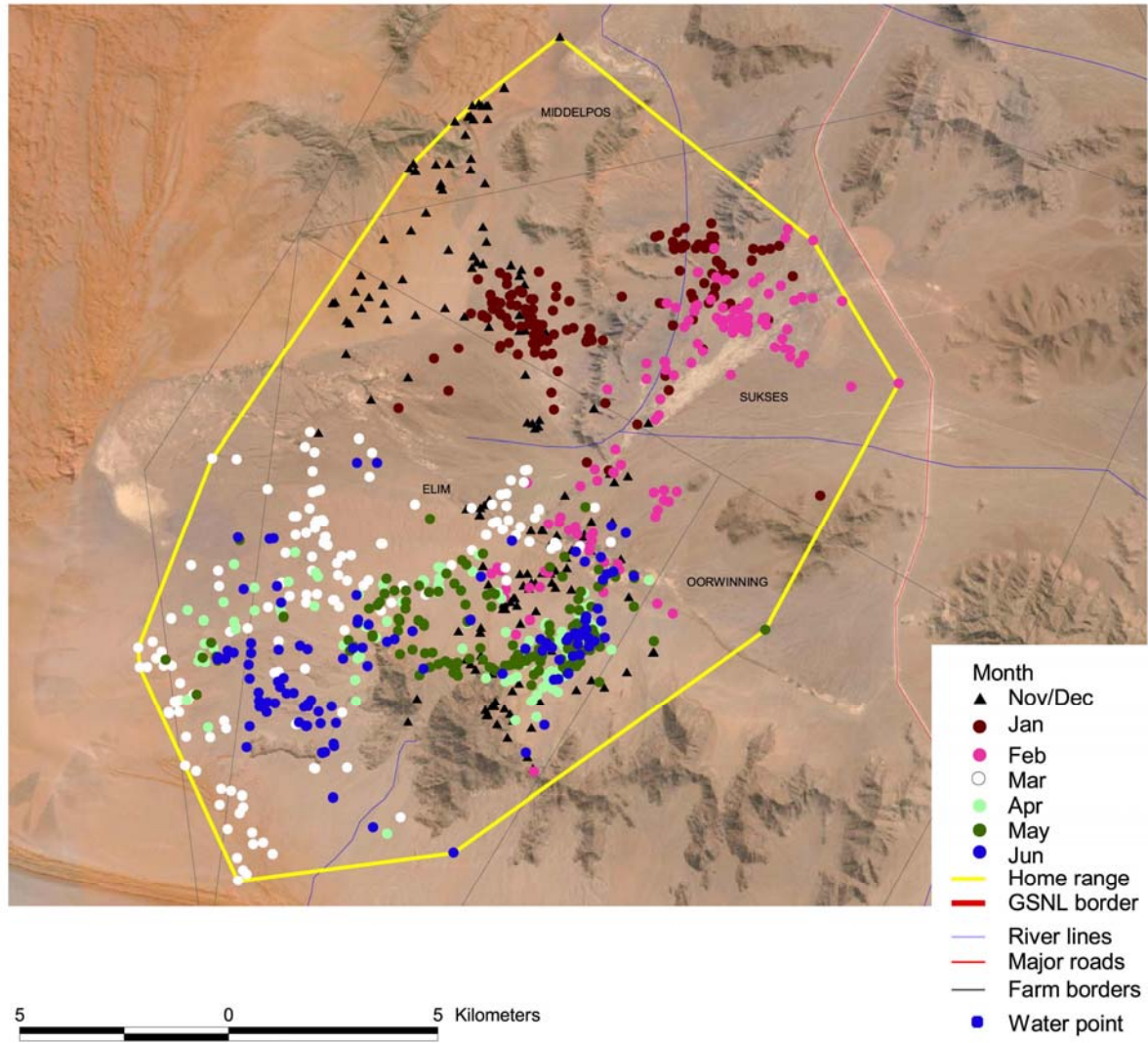


Figure 1105. The months of December, January, February and May were all spent in rather discrete areas, whereas movements during other months were more wide ranging. The animal's home range lies north of Sesriem.

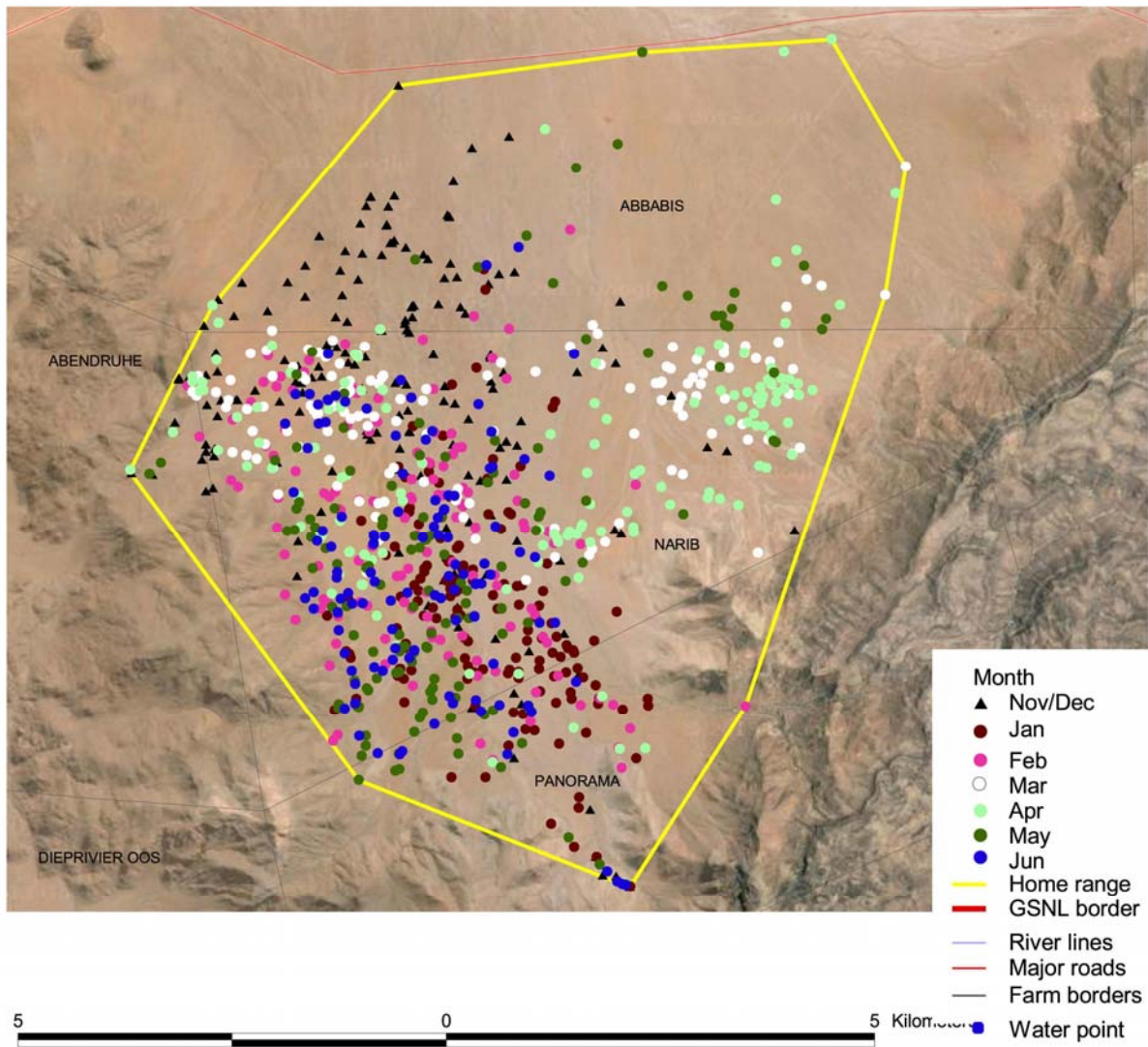


Figure 1106. Covering just 5,419 hectares, this home range was the smallest of all the oryx and zebra. Indeed, the home range was many times smaller than those of most other oryx. The map shows how this animal largely confined its activities to the gravel plains, seldom venturing into the surrounding hills.

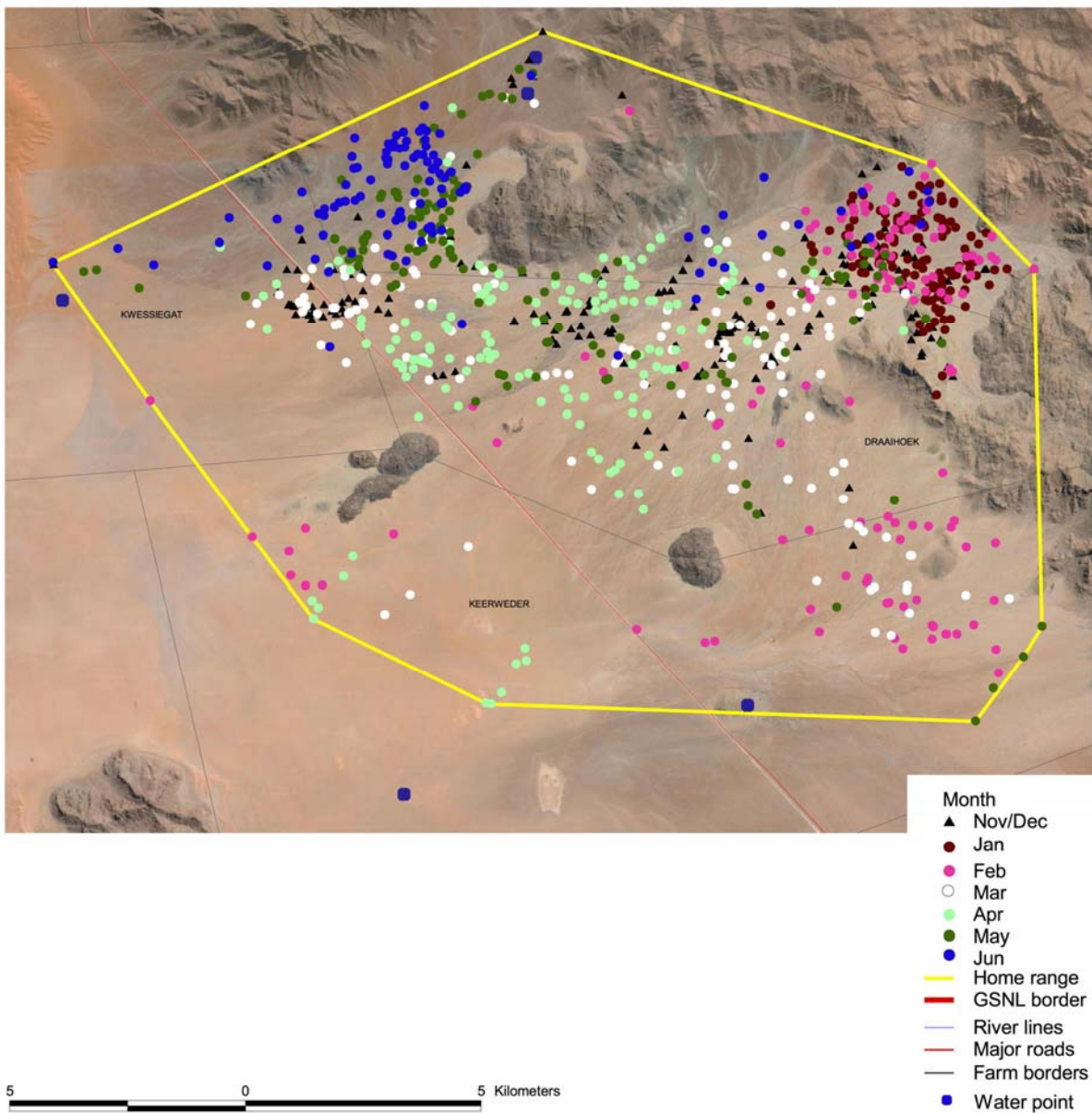


Figure 1107. Much of May and June was spent in the northern area of the home range, which covered 19,877 hectares. However, much of this range was seldom used or visited, and the area which covered 90% of the density of activity amounted to only 7,033 hectares which is about one-third of the overall home range.

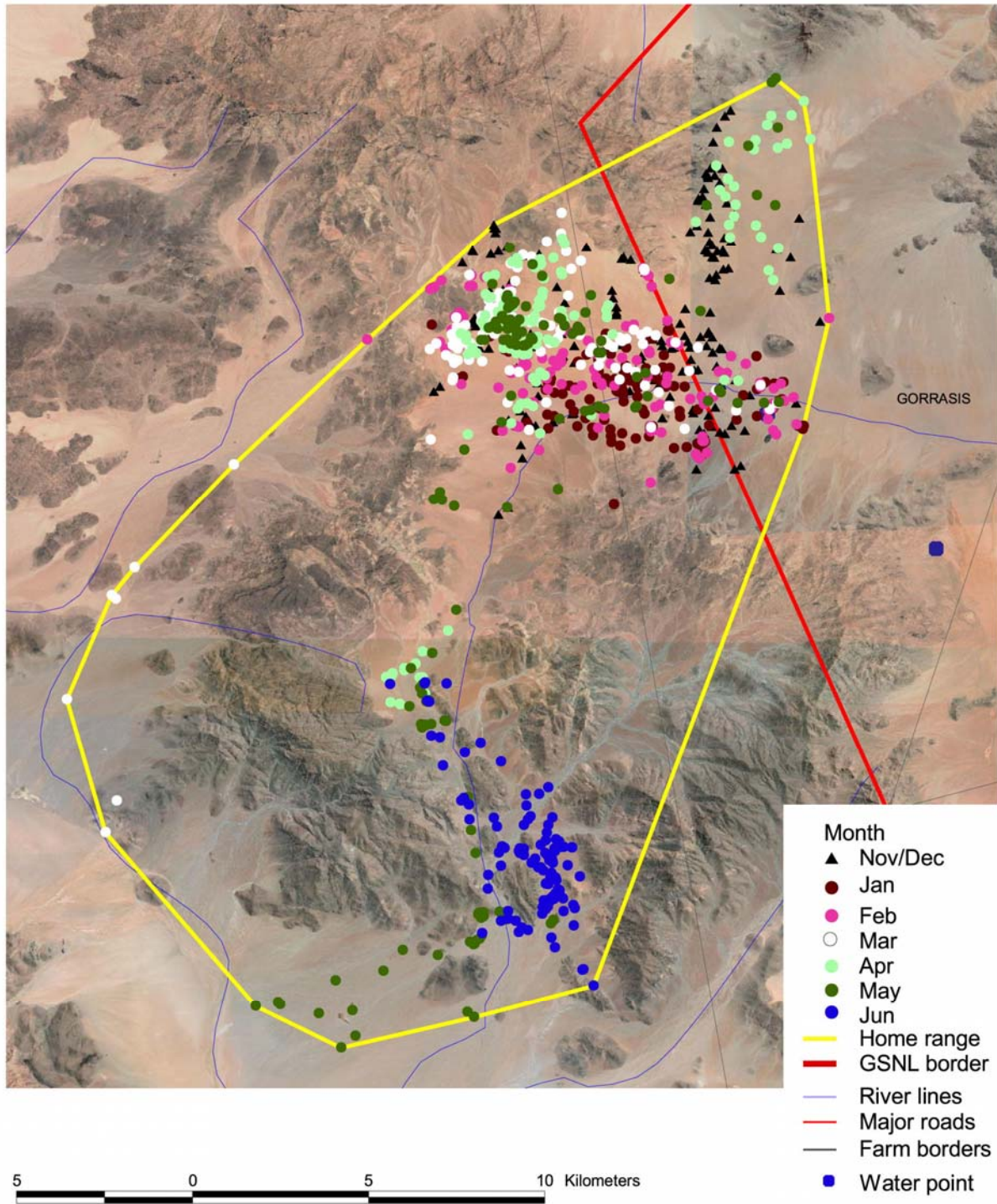


Figure 1108. The home range of this oryx entirely overlapped that of 1109, and these two oryx had the largest home ranges, respectively 31,848 hectares and 75,051 hectares. Over two days in May (the 24th and 25th), this animal walked far to the west of its normal areas of activity.

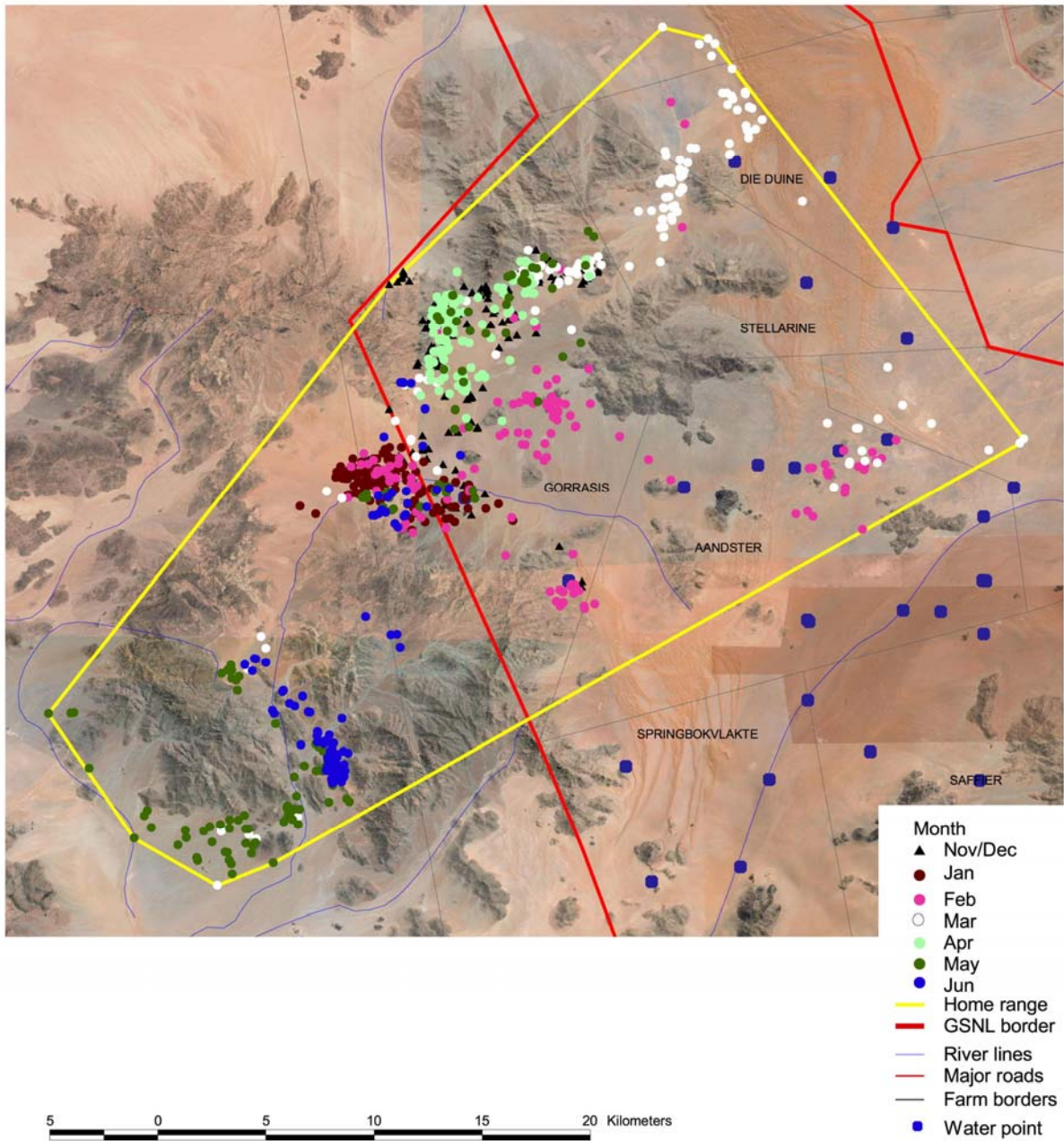


Figure 1109. The home range of 1109 was several times larger than most other oryx and more than double the size of 1108, which had the next largest home range (Table 2). Most of 1109's activities were focussed in discrete areas of gravel plains, and it often spent several weeks in one area before moving on to another.

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