

# SAHELO-SAHARAN INTEREST GROUP WILDLIFE SURVEYS

Part 4: Ahaggar Mountains, Algeria  
(March 2005)



OFFICE DU PARC NATIONAL  
DE L'AHAGGAR

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Ministerie van de  
Vlaamse Gemeenschap  
afdeling Natuur



Smithsonian  
National Zoological Park



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Front cover: [Clockwise from top] Oued near Tendjedj mountains; Cheetah tracks; setting a camera trap; photographing cheetah scat; dorcas gazelle. Parc National de l’Ahaggar, Algeria, 2005.

Report preparation, Tim Wachter.

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The Sahelo-Saharan Interest Group (SSIG) is a network of individuals and organisations committed to conserving wildlife and habitat in the Sahelian grasslands and Sahara desert of Africa. The information in this report reflects the observations and interpretations of the listed authors only.

## SPONSORS AND CONTRIBUTORS

Office du Parc National de l'Ahaggar (O.P.N.A.)  
The Saint Louis Zoological Park  
Ministerie van de Vlaamse Gemeenschap afdeling Natuur  
Cheetah Conservation Fund (C.C.F.)  
The Smithsonian Institution  
The Zoological Society of London (ZSL)

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SSIG/OPNA Ahaggar Survey Team, March 2005.

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## SUMMARY

- This report summarises results of a gazelle and cheetah survey of the Ahaggar National Park, conducted 7<sup>th</sup>-23<sup>rd</sup> March 2005. The survey team comprised staff of the Office du Parc National de l'Ahaggar (OPNA), the Agence Nationale pour la Conservation de la Nature (ANN), and the Université de Béjaïa in Algeria, with Sahelo-Saharan Interest Group (SSIG) members from Nature Division, Ministry of the Flemish Community (Belgium), Cheetah Conservation Fund (CCF, Namibia) and Zoological Society of London (ZSL, UK).
- The objective was to conduct a wildlife reconnaissance survey of little visited areas to the north and east of the Ahaggar massif within Parc National de l'Ahaggar, focusing simultaneously on distribution and relative abundance of cheetah and their prey base, particularly gazelles. The survey used standardised methods developed by SSIG and provided training for Algerian team members in methods and equipment.
- Rainfall on the first day resulted in good tracking and observation conditions throughout. The principle habitats visited were mountain wadis and gravel plains with granite boulders and outcrops. Routes were constrained to run along the drainage lines for most of the time; Acacia and/or Tamarix were present at >70% of sectors covered; smaller shrubs, herbs and grasses were mainly dry, but responding to recent rainfall through the course of the survey. Surface water was comparatively widespread.
- A total of 15 species of mammal were seen or detected by tracks and signs. Dorcas gazelles were detected on 90% of 0.5<sup>o</sup> grid squares visited (263 seen in 102 groups). No cheetahs were seen, but fresh evidence of their presence was found in 70% of grid squares and on 10% of 5km sectors visited. One barbary sheep was seen, and they were also detected in 70% of grid squares. Livestock were recorded throughout the range, with camels and small stock less widespread, but in combination were more numerous than gazelles. Both feral and tame donkeys were also detected throughout. Encounter rate indices for all these species are supplied.
- Annexes carry details of animal nomenclature, a summary of available Algerian cheetah records, details of predator scat collected for identification and analysis at CCF and ZSL; camera trapping results (dogs, hares and Rüppell's fox), bird and other records.
- Human activity was focused in eastern and western parts of the survey route, with direct evidence of hunting for gazelle and barbary sheep in the east. Local people mentioned that they considered cheetah a problem to camels, but not so much to small stock which are protected by herding and guard dogs.
- The report concludes that there is good evidence that the Ahaggar continues to support an internationally important population of cheetahs. No estimates of population size can be made on present data, but the survey demonstrated an area of occupancy approximating at least 10,000km<sup>2</sup>. Information from other parts of Algeria suggests that cheetahs are found over a much wider area. Although the gazelle prey base was encountered at only moderate rates compared to more southerly dorcas populations, they are consistently distributed and with barbary sheep, hares, and feral donkeys are likely to provide an adequate prey base besides livestock.
- Equipment (laptop computer, binoculars), several books and photographs useful for promotion of wildlife conservation and public relations were donated to OPNA by the Nature Division, Ministry of Flemish Community Belgium; while St. Louis Zoo/SSIG donated a TM550 camera trap unit.
- It is recommended *inter alia* that SCF/SSIG and CCF complete Memoranda of Understanding with the Ministry of Culture, Algiers to facilitate further support through survey, research and National Park staff training; that OPNA prioritises more detailed studies of cheetah and their prey base in collaboration with other Algerian and international partners, and that a new survey of cheetahs and prey base in Tassili National Park be undertaken.

## 1. INTRODUCTION AND BACKGROUND

The Sahelo-Saharan Interest Group (SSIG) is a network of experts and institutions committed to the conservation of aridlands wildlife and the implementation of the Djerba Action Plan (Beudels-Jamar, Devilliers *et al.* 1999). In support of the Djerba Action Plan SSIG has been active in updating current information about the actual status of Saharan wildlife (Montfort, Newby *et al.* 2004, Newby, Wachter *et al.* 2004, Wachter, Newby *et al.* 2005). This report summarises results of the fourth extensive field reconnaissance co-ordinated by SSIG, to the Parc National de l'Ahaggar, Algeria, in March 2005.

The Ahaggar survey resulted from collaboration between Algerian and international conservation colleagues under the SSIG initiative, and represents the first formal activity by SSIG within Algeria. Discussions are in process to formalise contacts between SSIG and Algerian institutions via MoUs.

### 1.1 AHAGGAR NATIONAL PARK

The Ahaggar National Park represents a very large protected area (ca. 450,000km<sup>2</sup>) in the mountainous zone of central south-eastern Algeria (Fig. 1.1). Management of the park falls under the remit of the Ministry of Culture (Ministère de la Culture) in Algiers. The park employs ca. 500 staff, with a local headquarters at Tamanrasset, associated with an excellent public museum describing the natural history and cultures of the Ahaggar. In addition there are some 46 ranger posts (Postes de contrôle) distributed through the area.

Climate and topography of the central Ahaggar highland area supports relatively increased densities and variety of forage for livestock compared to surrounding areas. In the passed camel census data have indicated 10-fold higher numbers in the Ahaggar compared to neighboring Tassili (Badi 2004). Like other parts of the Sahara, livestock numbers were severely reduced during prolonged droughts through the 1960s and 1970s. At the time of this survey, locust swarms had affected the region. We noted evidence of locust passage (wings) and it is possible that leaf biomass in the survey area had been reduced. Local informants mentioned the perception that while locusts create temporary problems through removal of livestock forage, locust swarm years are also associated with very good years for livestock pasture in the longer term.

The park attracts a desert tourism industry operating through tour companies, hotels and campsites based primarily in Tamanrasset, with regular air services from Algiers and Europe to Tamanrasset airport. Principle attractions include the desert landscape and mountains, Tuareg culture and notably the abundant rock engravings and rock art. Desert wildlife does not appear to have played a major role in this industry to date, though dorcas gazelles doubtless play a role in enriching the landscape. In general information and wildlife surveys in the area have been limited in modern times (Kowalski & Rzebik-Kowalska 1991, De Smet 1989 & *pers. obs.*).

As a result there is need for new surveys to improve understanding of biodiversity resources in the region. Like many other areas of the Sahara, the large flagship antelopes of the Ahaggar, notably addax and dama gazelle, are believed to have become extinct in the last 30-40 years (Kowalski & Rzebik-Kowalska 1991). But internationally important species such as dorcas gazelle, barbary sheep and particularly the elusive Saharan cheetah are still present, and although seldom seen, are attracting renewed interest (Hamdine *et al.* 2003).

The current report summarises the results of a reconnaissance survey designed to provide preliminary information on the relative importance of wildlife populations in the Ahaggar National Park, using standardised methods developed in earlier SSIG and ONCFS surveys (Lamarque and Stahl 2002; Monfort *et al.* 2004; Newby, *et al.* 2004; Wachter, Newby, Monfort *et al.* 2004; Wachter, Newby, Houston *et al.* 2004; Lamarque 2005).

## **1.2 MISSION CONTEXT AND OBJECTIVES**

Following preliminary discussions between Koen De Smet (Head of Nature Division, Ministry of Flemish Community, Belgium) and the Ministère de la Culture in Algiers, the SSIG mission took place in the context of a formal invitation from the Director de l'Office du Parc National de l'Ahaggar to SSIG team members.

Before the mission, an introductory meeting was held on 6<sup>th</sup> March at Tamanrasset between the SSIG survey team and the Director of O.P.N.A., Mr. Farid Ighilahriz. Following the meeting presentations were given to the Director and O.P.N.A. staff at Tamanrasset by Koen De Smet, Laurie Marker and Tim Wachter, giving an overview of the SSIG and its goals, the activities and objectives of the Cheetah Conservation Fund (C.C.F.) and a résumé of survey methods employed in previous SSIG surveys in Chad and Niger.

### **Other contacts in Algeria**

In addition to two vehicles supplied for the survey by OPNA, a third vehicle was hired from Mr. Abdallah Sahki of Timidoua Travel, Tamanrasset. Mr. Sahki also provided valuable information on passed cheetah observations in the Ahaggar region (see Hamdine *et al.* 2003).

Co-incidentally the survey team also met up with Mr. Reginald Pauwels, CEO & General Manager, WWF-Belgium, and we discussed our mission with him.

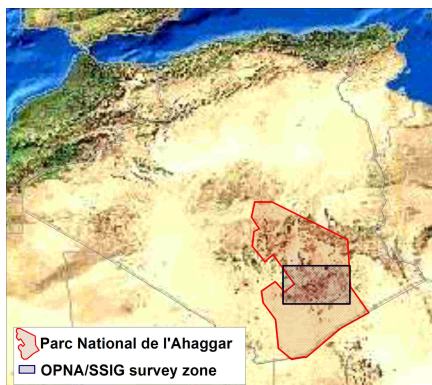
### **Main objectives of the mission**

1. To carry out a general wildlife reconnaissance of the central and eastern parts of the Parc National de l'Ahaggar.
2. To focus on obtaining simultaneous observations on distribution and relative abundance of cheetah in relation to the distribution and relative abundance of their potential prey base, particularly dorcas gazelle.
3. To follow reconnaissance methods developed in earlier SSIG missions to the Sahelo-Saharan region and develop indices of relative abundance and distribution, so far as the reconnaissance routing allowed.
4. To introduce all Algerian team members to survey techniques in use, with specific training in use of the OPNA GPS (including use of automatic track function and navigation features for field survey management), use of Trailmaster Camera traps (TM35-1 with TM 1500 active monitor and TM 550 passive monitor), & Leica LRF 1200 rangefinder. Additional, in the field instruction and practice in use of Mapsource software to download and store GPS data, and transfer of GPS data to Excel spreadsheet formats was also undertaken.

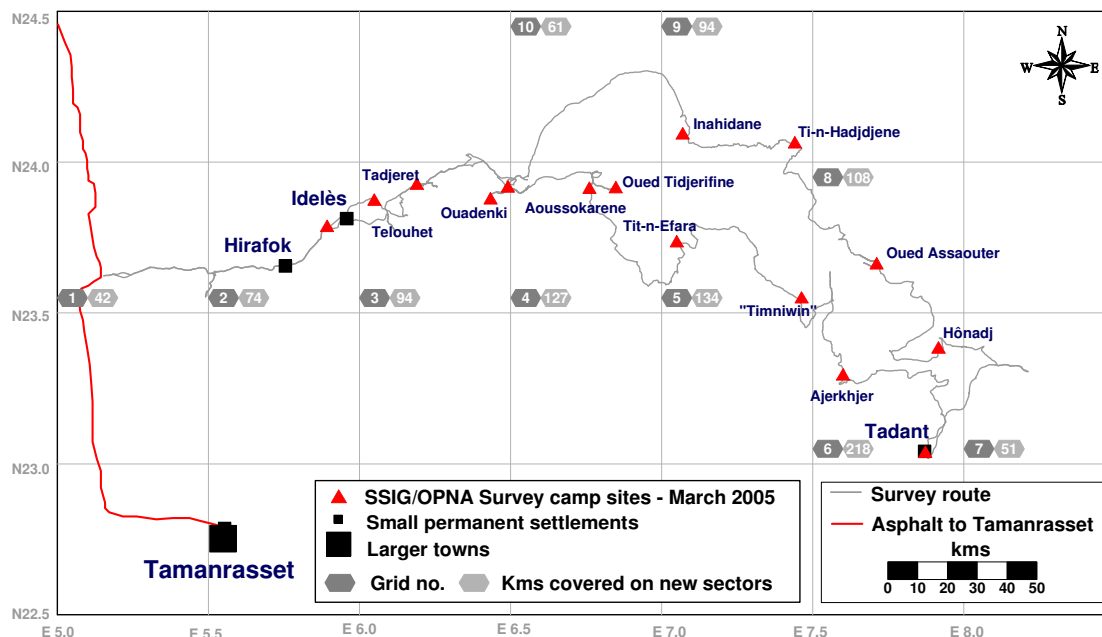


**1.3 ITINERARY:** The location and route followed by the survey is summarised in Fig. 1.1.

- 05/03/2005: SSIG/ANN/UB team members meet Algiers, fly to Tamanrasset pm.
- 06/03/2005: Arrive Tamanrasset 04:30hrs.
  - 11:30 Meeting with Director, OPNA, OPNA headquarters, Tamanrasset.
  - 13:30 Presentations by SSIG to OPNA staff pm. Discussions; tour of OPNA Museum.
- 07/03/2005: Vehicles prepared for departure, flash floods; delayed at Tamanrasset extra night.
- 08/03/2005: Final shopping and depart for Idelès; sleep in Oued Telouhet.
- 09/03/2005: Telouhet to Ouadenki
- 10/03/2005: Ouadenki to Oued Tidjerifine (LM departs by vehicle to Tamanrasset).
- 11/03/2005: Oued Tidjerifine to Aoussokarene (third vehicle rejoins from Tamanrasset).
- 12/03/2005: Aoussokarene to Tit-n-Efara
- 13/03/2005: Tit-n-Efara to "Timniwin"
- 14/03/2005: "Timniwin" to Ajerkhjer
- 15/03/2005: Ajerkhjer to Tadant
- 16/03/2005: Tadant to Hônadj
- 17/03/2005: Hônadj to Oued Assaouter
- 18/03/2005: Oued Assaouter to Ti-n-Hadjdjene
- 19/03/2005: Ti-n-Hadjdjene to Inahidane
- 20/03/2005: Inahidane to Ouadenki
- 21/03/2005: Ouadenki to Tadjeret
- 22/03/2005: Tadjeret to Idelès
- 23/03/2005: Idelès to Tamanrasset; Meeting & field report to OPNA; donation of books, photographs, binoculars, laptop computer from Nature Division, Flemish Ministry; camera trap & Mapsource software from SSIG..
- 24/03/2005: Fly Tamanrasset Algiers. SSIG/ANN/UB team disperse.



**Fig. 1.1** Parc National de l'Ahaggar and location of SSIG/OPNA survey zone in south-eastern Algeria (left) and details of survey zone, route and camp site locations, in relation to half degree grid squares (below), March 2005.



## 2. METHODS

In preparation it was envisaged that this survey would comprise primarily a reconnaissance of areas known to be important to cheetah based on previous field experience of participants (KDS, FB, AB-B, AF in 2003) and published records of cheetah observations in Algeria (Kowalski & RzebiK-Kowalska 1991, Hamdine *et al.* 2003). It was also planned that systematic transects would be followed in less mountainous habitats at the edge of the erg systems of the border areas between Ahaggar National Park and the neighboring Tassili National Park.

In the event it was agreed with the Director of OPNA that the survey would take place entirely within the Ahaggar National Park. This resulted in a survey route primarily restricted within the gravelly and rock-sided wadi systems draining the north-eastern flanks of the central Ahaggar massif, under the guidance of the OPNA Agents de Conservation. As a consequence no transect surveys could be conducted. The OPNA guides had primary control over the choice of route taken and the survey remained a reconnaissance throughout.

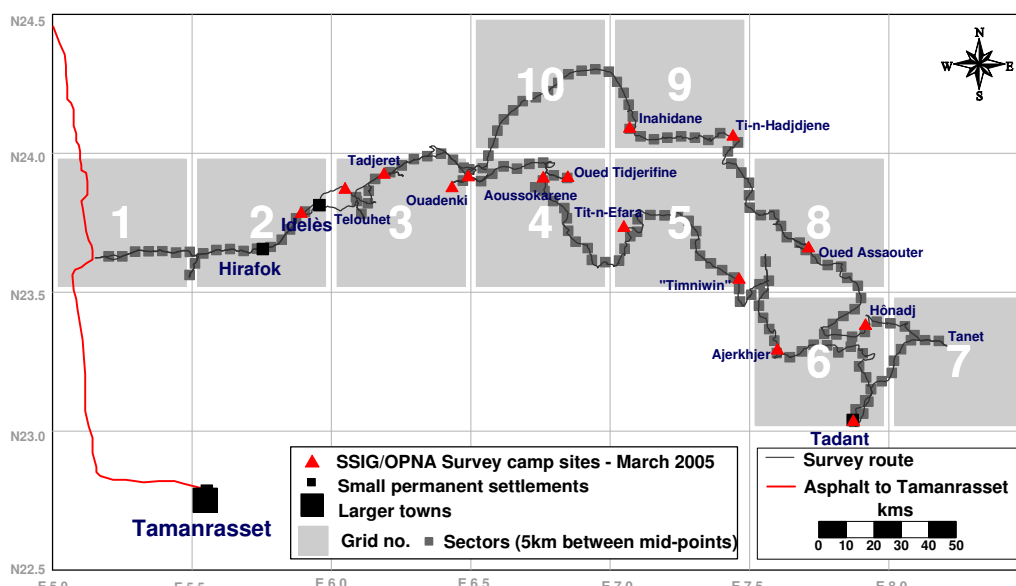
### 2.1 RECONNAISSANCE METHOD

#### 2.1.1 Record management

Since it was not practical to use a formal sample frame on this survey, attention was focused on maintaining a detailed record of search effort by setting automatic track functions of the GPS to logging location at 1 minute intervals and maintaining GPS operation throughout active survey periods.

Although the route was inevitably affected by irregular and unpredictable meanders, it was divided into approximately equal sectors by marking fixed waypoints separated at 5km intervals (line of sight) throughout. The survey route resulted in 158 unique sector units, distributed continuously along the line of travel. On occasions where the route doubled-back over previously travelled ground (notably towards the end of the survey), observations of animals were noted, but not included in the assessment of encounter rates. Thus each sector represents observations counted once on entering new territory. The total distance covered on the sectors summed to 1003kms (out of some 1360 travelled off asphalt), corresponding to a mean of 6.3kms per sector.

At each sector point a note was taken of habitat type, and vegetation (visually estimated cover and growth condition by growth form), creating a record of presence/absence and greenness by location. Between sector points all observations of features such as water availability, wildlife



**Fig. 2.1** Location of all 158 '5km' sectors and number references for half degree grid squares visited, SSIG/OPNA survey, Ahaggar National Park, March 2005.

and livestock sightings (including tracks and signs for presence/absence) , and human activity were recorded as waypoints. On occasions where significant local exploration was conducted on foot, the start and end points were indicated by waypoint records as well as switching the GPS on and off to create separate track sections.

Subsequent editing of track files & waypoint records allowed construction of a master file, coding all observations to indicate in which half degree grid square they fell, which survey sector they fell on, and if they were made from the vehicle or on foot. Distribution of survey sectors and half degree square identification labels are shown in Fig. 2.1. Note that the need to search for cheetah evidence (scat, tracks and scratch marks) meant that routine stops along the vehicle route were made at opportunistically selected trees. This activity has been scored as part of the vehicle based schedule unless specifically occurring along a major walking section.

Meteorological records were maintained in the field using a Kestrel 4000 hand held weather station, saving temperature, relative humidity, dew point and wind speed at 06:00, 09:00, 12:00, 15:00 and 18:00 each day.

At wildlife and livestock observations total numbers (estimated for large livestock herds), GPS location at observation point, distance from perpendicular to vehicle course (measured with infra-red rangefinder when possible for closer gazelles, otherwise estimated) were recorded.

### **2.1.2 Vehicle management**

In the field the three vehicles travelled one behind the other. The objective was to maintain a spacing of ca. 30-60m between vehicles, with all vehicles remaining in site of each other at all times to facilitate communication and minimise confusion in creating a single primary record of survey observations.

One vehicle was crewed by two O.P.N.A. guides and necessarily travelled in the lead over much of the route. Although the team remained in contact and communication most of the time, this was not always achieved despite repeated discussion on the topic. A second vehicle acted as an observation and record keeping vehicle, with TJW maintaining a primary record via GPS management, voice tape records and daily data downloads to notebook and laptop computer. The third vehicle acted as a supporting observation vehicle, with all observations of gazelles or cheetah sign made by this team cross-checked to the primary record by signal or discussion. In addition team members travelling in the third vehicle were able to practice developing GPS navigation and recording skills for use in the field following practical demonstrations and informal teaching sessions conducted at camp sites.

## **2.2 TRAINING**

Opportunity was taken to demonstrate all aspects of equipment and methods to team members. Through the survey all scientific team members took part in GPS track set-up and waypoint navigation operations, GPS data download to lap-top computer (with introductory sessions on waypoint editing in Mapsource and export to Excel); use of infra-red range-finder (Leica 1200 LRF); and use of two models (active and passive) of Trailmaster camera trap.

## **2.3 EQUIPMENT**

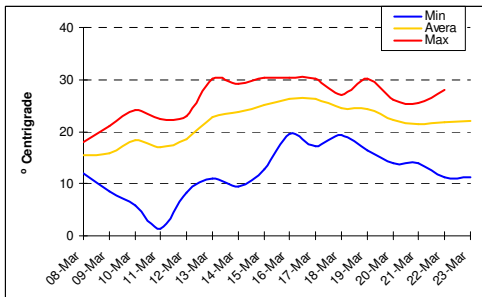
At the end of the survey, in further support of efforts by OPNA to extend wildlife research and conservation activity, the Nature Division, Ministry of the Flemish Community (Belgium), was able to donate a laptop computer and two sets of binoculars to OPNA headquarters. The same source also donated several books about Saharan wildlife, a set of large photographic images of Saharan wildlife, suitable for promotional use and public relations to the OPNA library. The Trailmaster TM 550 passive camera trap system used on the survey was also donated to OPNA, with GPS software and download cable, funded by St. Louis Zoo and SSIG.

### 3. WEATHER AND OBSERVATION CONDITIONS

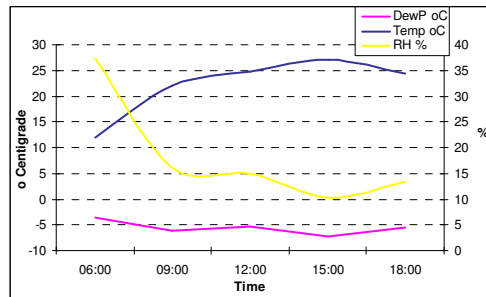
**Rainshowers** were falling at Tamanrasset on 6<sup>th</sup> and 7<sup>th</sup> March, sufficient to fill wadis and disrupt desert travel. A total of 18mm at Tamanrasset and 28mm at Djanet was recorded in the first week of March 2005 (FAO Desert Locust Bulletin No. 318). Although this meant departure from Tamanrasset was delayed by 24 hrs., rainfall also created good conditions for preserving and ageing clearly defined animal tracks on fine alluvial silts. No further rain fell following departure from Tamanrasset on 8<sup>th</sup> March.

The first week of the survey took place in clear weather with blue skies. Marginally increased winds led to hazier skies in the second half of the survey, but daylight visibility was good throughout.

**Temperature and humidity:** Daily temperature ranged from near freezing (1.3°C) at night in higher altitudes early in the survey, to a maximum of 30.4°C. Relative humidity fell from an early morning peak to remain below 5% through most days, while dew point remained below zero at all times (Figs. 3.1-3.2).

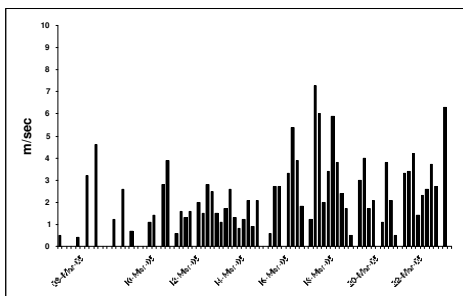


**Fig.3.1** Daily temperature range SSIG/OPNA survey, Ahaggar, March 2005.

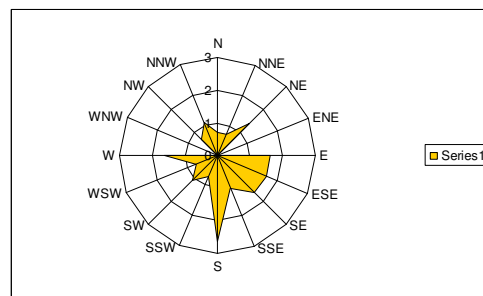


**Fig.3.2** Average temperature, Relative Humidity and dewpoint, SSIG/OPNA survey Ahaggar, March 2005.

**Wind:** Daily windspeed measurements indicated light winds through the first part of the survey, with a slight increase in the latter half (Fig. 3.3), associated with hazier skies, but no significant impact on visibility. A minor local dust storm was encountered where drying alluvial dust was lifted by a squall on the evening of the 18<sup>th</sup> March. Wind directions were predominantly southerly or south-easterly, but variable, with local measurements perhaps affected by the topography of the surrounding hills (Fig. 3.4).



**Fig.3.3** Daily windspeed measurements, SSIG/OPNA survey, Ahaggar, March 2005.



**Fig.3.4** Frequency distribution of wind directions, SSIG/OPNA survey, Ahaggar, March 2005.

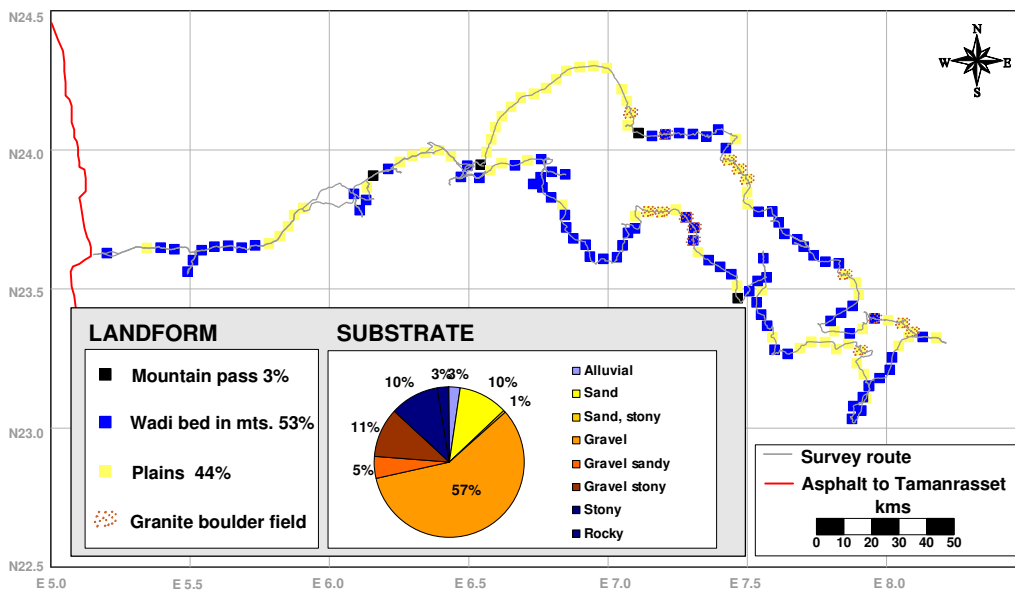
#### 4. HABITAT AND VEGETATION

The survey covered the northern and eastern flanks of the uplifted volcanic Ahaggar mountain massif. In consequence the habitats visited were dominated by steeply defined rocky mountains and hills. Travel routes were thus extensively restricted to flat bedded gravelly drainage lines of variable width, which in general coincided with the distribution of perennial vegetation. More open plains were crossed in the central and far eastern sectors of the survey, in most cases featuring a scatter of large wind eroded granitic boulders and kopjes. The northern most sector of the survey (grid square 10) was characterised primarily by a very wide undulating gravel plain, with high steep volcanic mountains visible in the distance, but devoid of significant vegetation.

Habitat type and vegetation were scored visually at each of the 158 sector points.

##### 4.1 Landform and Substrate:

The distribution of mountain wadis, boulder strewn and open plains is shown below (Fig. 4.1). The substrates were dominated by gravels throughout. While gravels offered an indifferent surface for track detection, local areas of recent water flow created some small, smooth silty surfaces with excellent properties for preserving animal tracks. The frequency of substrates shown here reflects the dominant surface at each sector point. In practice a variety of substrates existed within most sectors.



**Fig. 4.1** Distribution of primary landform and frequency of dominant substrate at sector recording points; SSIG/OPNA survey of Ahaggar, March 2005.

The principle observation is that the majority of the survey took place on gravelly substrates in mountain habitats, with more open areas frequently featuring extensive boulder fields. No time was spent in sand dunes, with sandy substrates confined to a minority of wadi beds.

## 4.2 VEGETATION

Being in the central Sahara the survey area is relatively sparsely vegetated. But water availability mediated by the sharp topography and in some areas the impervious qualities of granitic rock formations allows significant stands of trees and perennial vegetation, which are frequently distributed linearly along drainage patterns and surfaces. Of necessity the vehicle route followed these vegetated lines for much of the time.

The survey team did not attempt a systematic inventory of plant species, but the following notes on some dominant species seen are supplied, with plant species identification based on personal knowledge of team members supported by newly available photographic guides (Sahki & Sahki 2004).

### 4.2.1 Shrubs, herbs and grasses.

Many drainage lines featured prominent growth of the robust dwarf shrub *Zilla spinosa*, recorded present at 66% of sector points, mainly at 5-10% cover (estimated within the zone of plant growth), often flowering but with stems only partially green. Other prominent shrubs and herbs included *Artemisia* species (*judaiica* & *campestris*) at 32% of sector points, with less prominent *Deverra scoparia* and *Fagonia* spp. Species with known potential as food and moisture resources for gazelles, such as *Citrullus colocynthis* and *Cistanche phelypaea* were observed on a limited number of occasions .



Grass observations were limited to recording presence and status of tussock forming perennials *Panicum turgidum*, (30% of sites, primarily at 1% estimated cover or less, maximum 25% at one location) and *Stipagrostis pungens* (9% of sites, also at low cover). Tussock growth stage was scored flowering to fully green in 21% of sectors, and greater than 90% dry in 40% of sectors. The effect of rainfall in greening the vegetation in local patches through the period of the survey was clearly observed comparing grass tussock greenness e.g. at Tadjeret on the 9<sup>th</sup> March and again on 22<sup>nd</sup> March.

Larger shrubs were recorded comparatively infrequently but were typically greener than the herbaceous layer (shrubs scored present at 13% of sector points, cover estimated at 1% or less on >75% of those locations, but flowering or green on 51% of sector points). Most frequently recorded species were *Leptadenia pyrotechnica* and *Calligonum polygonoides* subsp. *comosum* (in sandy wadis), with more occasional patches of *Atriplex halimus*, isolated *Calotropis procera* and *Rhus tripartita*.

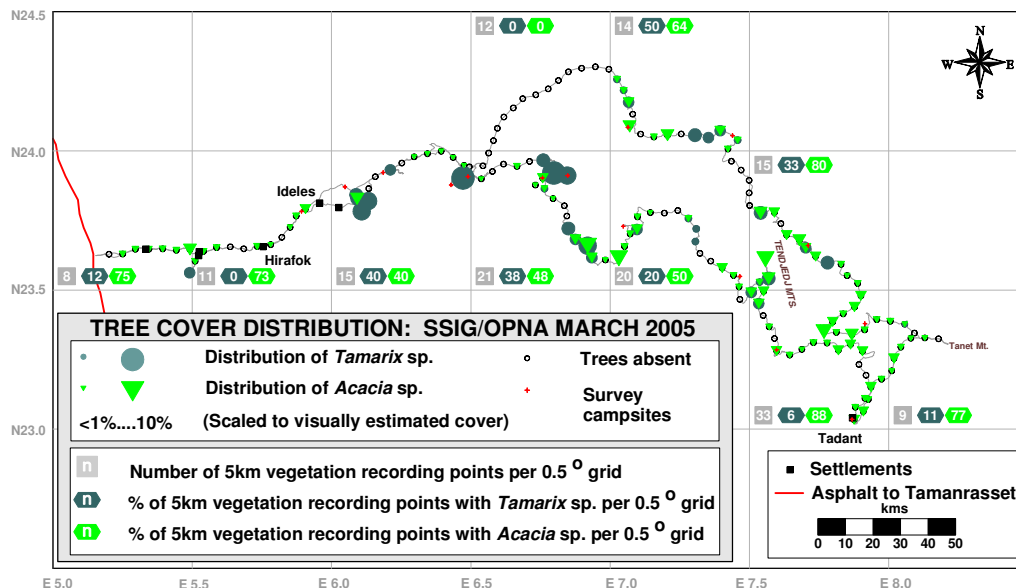
### 4.2.2 Trees

Trees were scored present at 72% of all sector recording points. *Acacia* sp. and *Tamarix* sp. dominate and were routinely inspected for sign of cheetah activity (see below).

*Acacia tortilis* subsp. *raddiana* was the most frequent *Acacia* with *A. ehrenbergiana*, also regularly recorded, notably on the western flanks of Tendjedj. Together *Acacia* trees were most frequently scored at less than 1% cover, and fully green at less than half the locations (43%). Small stands of three or four *Faidherbia albida* were encountered on 8 occasions, though none coincided with sector recording points.

*Tamarix aphylla* (predominantly) with some *T. gallica*, were scored present at 21% of sector sites contributing greater than 1% cover at 41% of those sites and fully green in most places (82% of records). *Tamarix* were primarily found at higher altitudes growing in clusters along main drainage lines. *Tamarix* are notable for creating substantial shady thickets with numerous thick low branches and near horizontal trunks, forming raised mounds of sandy soil, several

metres high in some places. Such places provide excellent cover, marking and vantage points for cheetah. The distribution of *Acacia* sp. and *Tamarix* sp. tree cover at survey route sector points is mapped in Fig. 4.2. Other tree species recorded at low frequency include *Balanites aegyptiaca*, seen in small clusters along the edges of some incised wadis, and comparatively small numbers of *Maerua crassifolia*.

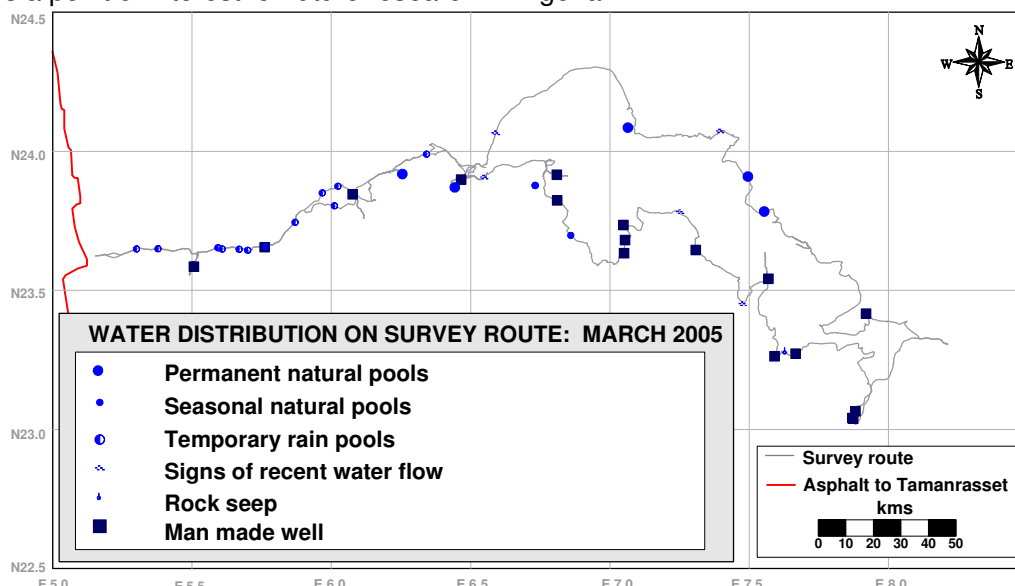


**Fig. 4.2** Distribution of dominant tree species (mainly *Tamarix aphylla* and *Acacia tortilis* subsp. *raddiana*) on 5km sectors; SSIG/OPNA survey of Ahaggar National Park, March 2005.

### 4.3 WATER AVAILABILITY

The survey took place following a spell of unusually heavy rainfall for the area, with 18mm and 28mm recorded at Tamanrasset and Djanet respectively during the first week of March (FAO Desert Locust Bulletin No. 318). As a result fresh temporary rain pools were encountered regularly in the first days of the survey.

Permanent and semi-permanent natural water points were recorded on 8 occasions, distributed through 5 of the 10 half degree grid squares visited. A total of 17 wells were noted, distributed in 6 grid squares, including some established in remote locations to support livestock managers. This distribution shows how water-dependent feral donkeys can exist widely through the area (see Section 6). The degree to which Ahaggar cheetahs do or do not make use of free-standing water is a point of interest for future research in Algeria.



**Fig. 4.3** Distribution of natural and artificial water on OPNA/SSIG survey route, Ahaggar National Park, March 2005.

## 5. WILDLIFE OBSERVATIONS

The results of the survey are summarised as simple presence/absence of species detected compared to a mammal species list assembled from the published record (Table 5.1).

More detailed information on the distribution of target species is also presented, where possible using indices of relative abundance (sightings of individuals per km, or presence/absence detection rate by survey sector in each half degree grid square) to maximise information content. Because the reconnaissance survey was organised into sectors distributed continuously along the route, these units cannot be treated as necessarily representative of the whole survey area, but the data could be compared with information collected in the same way along the same routes in future.

### 5.1 Mammal Species list

A general species list of 37 species (including the 3 largest, recently extirpated) known from the survey zone and surrounding area was compiled from the published record by grouping records from all the 32 one degree squares comprising the polygon between south-west to north-east corner points N20 E4 and N28 E8 (Kowalski & Rzebik-Kowalska 1991, De Smet 1989 & *pers. comm.*). Information on 17 mammal species was collected, including one bat potentially new to Ahaggar (see below), and two of the extinct antelopes.

Detailed information on both the region's extant ungulates, dorcas gazelle and barbary sheep, is presented below. All information collected from local people on the status of extinct species (dama gazelle, addax), reinforced the view that there are currently none known in Ahaggar. Notably, regret about this was expressed by local inhabitants on several occasions.

Information about cheetahs (*amayas* in Tamahaq) in the area was collected by discussion with local people, confirmation and photography of cheetah tracks made since the rains of 6<sup>th</sup> & 7<sup>th</sup> March 2005 in at least three, and possibly 4-5 places, and observation of large predator scats deposited on tree branches between 1-2.5 m off the ground in several areas supporting extensive *Tamarix* or large *Acacia t. raddiana*. Details are supplied below.

Throughout the survey, both in our own observations and in discussion with local people, attention was given to the possibility that leopards (*damessa* in Tamahaq) might also be present. Although no leopard records exist for Ahaggar, many features of the rocky and steep mountainous habitat superficially resembles habitat used by desert-adapted leopards e.g. of the Arabian peninsula. Field guide images of both leopard and cheetah (and other predators) were regularly reviewed and discussed with local respondents. Although only a minority recognised leopard images under these conditions, those that did know of them concurred that they are found further south, outside Algeria, and we did not detect any evidence of leopards in the Ahaggar on this survey.

Wild cat tracks were recorded on 5 occasions, with a larger, unidentified felid track, suggestive of e.g. caracal, also noted at two places. Caracal have been reported in the Ahaggar (Badi 2004), but further confirmation would be useful.

Golden jackals were found to be widespread throughout on the basis of track records, though none were seen. Fox tracks appeared mostly attributable to Rüppell's fox and this species was confirmed by camera trap images at 7 different sites. It is noted also that domestic dogs were seen on nine occasions, including photographs at two different camera trap sites. Herding dogs are commonly kept with small stock, in part as defence against cheetah. Dog tracks were recorded on a further nine occasions. A tendency to ascribe dog tracks to cheetah by some guides was noted early in the survey, and time was spent discussing this, reviewing literature sources on the topic (Dragesco-Joffé 1993, Stuart & Stuart 2000) and ensuring that all team members were fully aware of details of cheetah print identification.



Hares were flushed on three occasions while walking and photographed at 5 camera trap sites. Tracks and dung pellets of hares were extremely widespread, although not always recorded when seen. Nevertheless hares were detected in all 0.5<sup>o</sup> grid squares crossed.

A single Gundi was observed active on a low cliff face at 15:45 hrs. on 22<sup>nd</sup> March. Other small mammal observations were restricted to setting 10-15 traps on 6 nights for 115 trap nights. One *Gerbillus* sp. was collected which on preliminary interpretation of whole body measurements may be *G. tarabuli* subject to confirmation of details (L. Granjon *pers. comm.*). In addition 12 owl pellets from *Bubo ascalaphus* were collected from 3 grids and mammal material from within them is being analysed by Dr. Kock, Frankfurt, Germany. A dead bat found entire at the edge of a permanent pool appears to be a potential addition to the species list for Ahaggar National Park, though is still under examination (A. Lefevre *pers. comm.*).

**Table 5.1** Mammal species list for the Ahaggar region, Algeria (based on Kowalski & Rzebik-Kowalska 1991, De Smet 1989 & *pers. comm.*) with presence/absence information collected during the SSIG/OPNA survey, March 2005. (Owl pellet analysis to be conducted & not included). See Annex I for a summary of English, French and Tamahaq names.

| SPECIES LIST:                   | Notes: SSIG/OPNA Survey<br>March 2005   | 0.5° Grid No. (see Fig. 2.1)<br>(live animals or physical<br>remains in bold ) |
|---------------------------------|---|--|
| <i>Paraechinus aethiopicus</i>  | Live specimen caught by children at Idelès; skin and spines found near Ti-n-Hadjjene.                         | <b>2,9</b>   |
| <i>Rhinopoma hardwickei</i>     | n/o   |  |
| <i>Taphozous nudiventris</i>    | n/o   |  |
| <i>Rhinolophus clivosus</i>     | n/o   |  |
| <i>Pipistrellus deserti</i>     | Collected over water, Tit-n-Efara, 8-9 <sup>th</sup> Feb. 2003. Similar bats seen there this survey.          | 5  |
| <i>Pipistrellus kuhlii</i>      | n/o   |  |
| <i>Tadarida aegyptiaca</i>      | n/o   |  |
| [ <i>Eptesicus</i> sp.]         | Specimen collected dead at water hole. Provisional identification (unconfirmed) would be new to Ahaggar.      | <b>9</b>   |
| <i>Canis aureus</i>             | Tracks and scats only.  | 1,3,4,5,6,8,9  |
| <i>Fennecus zerda</i>           | No firm identifications.  |  |
| <i>Vulpes rueppellii</i>        | Camera trap images at 7 sites; tracks.  | <b>3,4, 5,6,8,9,10</b>   |
| <i>Hyaena hyaena</i>            | n/o   |  |
| <i>Acinonyx jubatus</i>         | Tracks, kills and scats.  | 1,3,4,5,7,8,9  |
| <i>Felis sylvestris lybica</i>  | Tracks.   | 4,5,9  |
| [ <i>Caracal caraca</i> ]       | [Possible tracks of a medium felid at two locations – identity not certain – photos]                          | 4,9  |
| <i>Procavia capensis</i>        | n/o   |  |
| <i>Ammotragus lervia</i>        | 1 seen, tracks and dung.  | 3,4,5,6,7,8  |
| <i>Addax nasomaculatus</i>      | Local reports confirmed no recent sightings.  |  |
| <i>Oryx dammah</i>              | No observations or reports.   |  |
| <i>Gazella dama</i>             | Local reports confirmed no recent sightings.  |  |
| <i>Gazella dorcas</i>           | 263 counted.  | <b>1,3,4,5,6,7,8,9,10</b>  |
| <i>Gerbillus campestris</i>     | n/o   |  |
| <i>Gerbillus garamantis</i>     | n/o   |  |
| <i>Gerbillus gerbillus</i>      | n/o   |  |
| <i>Gerbillus henleyi</i>        | n/o   |  |
| <i>Gerbillus nanus</i>          | n/o   |  |
| <i>Gerbillus pyramidum</i>      | n/o   |  |
| <i>Gerbillus tarabuli</i>       | 1 <i>Gerbillus cf. tarabuli</i> trapped.  | <b>5</b>   |
| <i>Meriones crassus</i>         | 1 unidentified <i>Meriones</i> sp. seen.  | <b>6</b>   |
| <i>Meriones libycus</i>         | n/o   |  |
| <i>Pachyuromys duprasi</i>      | n/o   |  |
| <i>Psammomys obesus</i>         | n/o   |  |
| <i>Acomys cahirinus seurati</i> | n/o   |  |
| [ <i>Eliomys/Graphiurus</i> ]   | Unidentified Dormice previously seen in <i>Ficus</i> sp.; no specimens to date. (De Smet <i>pers. obs.</i> ). |  |
| <i>Jaculus jaculus</i>          | Tracks seen.  | 5  |
| <i>Massoutiera mzabi</i>        | 1 seen.   | <b>3</b>   |
| <i>Lepus capensis</i>           | 3 seen, photos at 5 camera traps; tracks and signs very common.   | <b>1,2,3,4,5,6,7,8,9,10</b>  |

n/o = No observations on this survey

## 5.2 DORCAS GAZELLE *Gazella dorcas* (Linnaeus, 1758)

*Tamahaq - Ahenked*

Over the entire survey dorcas gazelles were encountered 102 times for a total of 263 individuals counted. Some of these records were made in the course of doubling back over previously covered parts of the route. Flight distances were very variable, but were comparatively low in some remote parts of central regions of the survey route (Fig. 5.1).

### 5.2.1 Dorcas Encounter Rate index:

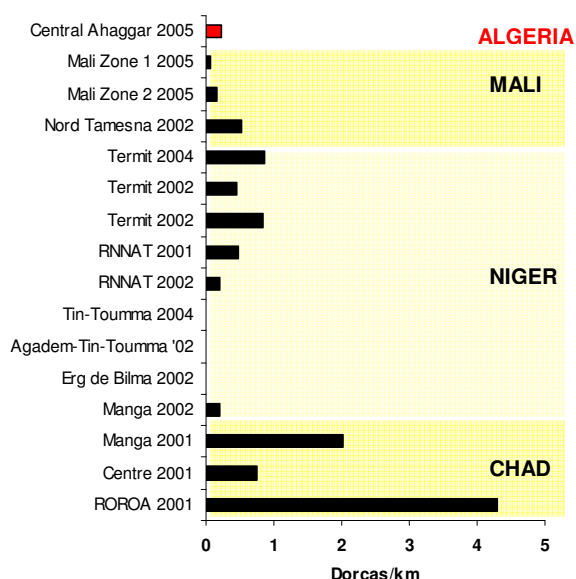
To standardise observations as far as possible and make them comparable with previous SSIG surveys, only the subset of 90 groups (234 individuals) seen on the 158 unique new sectors (sectors averaged 6.35 kms in length, with centre points mostly 5km apart by line of site) have been used to derive indices of sighting frequency (dorcas /km). The overall index of encounter rate for all 158 sectors is summarised in Table 5.2. The encounter rate index is compared with data collected in approximately similar ways (though in widely differing seasons and habitats) in Fig. 5.2. Group size frequency distribution shows that most groups comprised one or two individuals (Fig. 5.3).

**Table 5.2** Summary observations of dorcas gazelles; SSIG/OPNA survey of Ahaggar, March 2005.

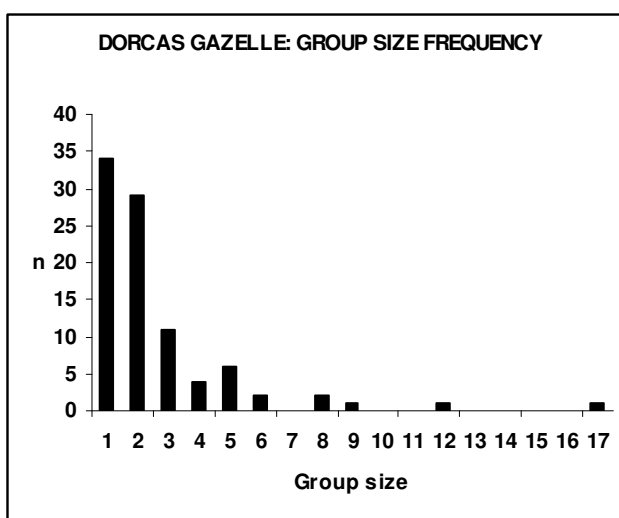
|         |                                       |            |
|---------|---------------------------------------|------------|
| Data    | N sectors                             | 158        |
|         | N 0.5° grids                          | 10         |
|         | Total Groups                          | 90         |
|         | Total individuals                     | 234        |
| Indices | % sectors seen                        | 33.9       |
|         | % sectors detected                    | 122/158=77 |
|         | % grids detected                      | 9/10=90    |
|         | Mean number of groups seen per sector | 0.57       |
|         | Mean group size                       | 2.6        |
|         | Dorcas/km                             | 0.23       |



**Fig. 5.1** Young dorcas gazelle photographed from the vehicle at 55m, Ajerkhjer, western flank of Tondjedj Mountains, SSIG/OPNA survey of Ahaggar National Park, March 2005.



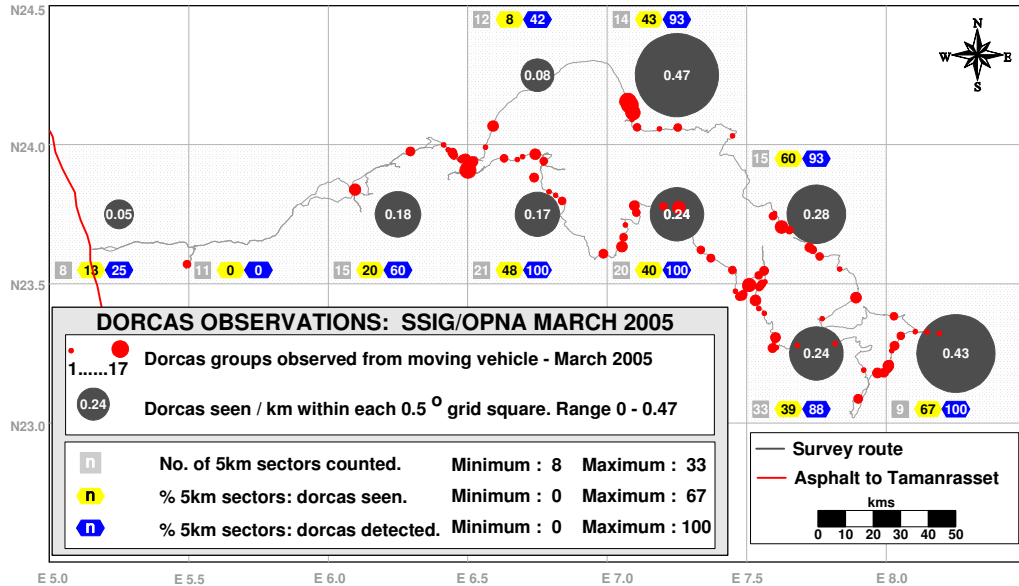
**Fig. 5.2** Comparison of dorcas encounter rates (dorcas seen/km) across all habitats surveyed by SSIG since 2001.



**Fig. 5.3** Group size frequency distribution, dorcas gazelles; SSIG/OPNA survey of central Ahaggar National Park, March 2005.

### 5.2.2 Dorcas distribution:

The distribution of all dorcas sightings is summarised in Fig. 5.4, showing that dorcas were encountered widely, but at marginally higher rates in the eastern sectors of the survey, where detection rates rose to 100% of 5km sectors about 150km in from the asphalt.



**Fig. 5.4** Distribution of all exact locations of dorcas gazelle *Gazella dorcas* sightings, with encounter rate and detection rate data / 0.5° square also displayed. OPNA/SSIG survey of Ahaggar National Park, March 2005.

**5.3 BARBARY SHEEP *Ammotragus lervia* (Pallas, 1777)**  
*Tamahaq - Oudad*

Barbary sheep are believed to be distributed throughout the mountains of Ahaggar (Kowalski & Rzebik-Kowalska 1991). SSIG is not aware of any recent published data on their relative status or population trends in this area. Rapid reconnaissance is of limited use to assess their status, since they minimise contact with people by spending most of the daylight hours on inaccessible uplands and hilltops. In addition the tracks and signs can frequently be confused with small stock herds, though may be distinguished with reasonable confidence in some contexts (e.g. smaller groups of largish footprints in more isolated areas, tending to cross wadis rather than travelling along them) and the footprint of some adult males is much larger than most goats.

**5.3.1 Barbary sheep encounter rate**

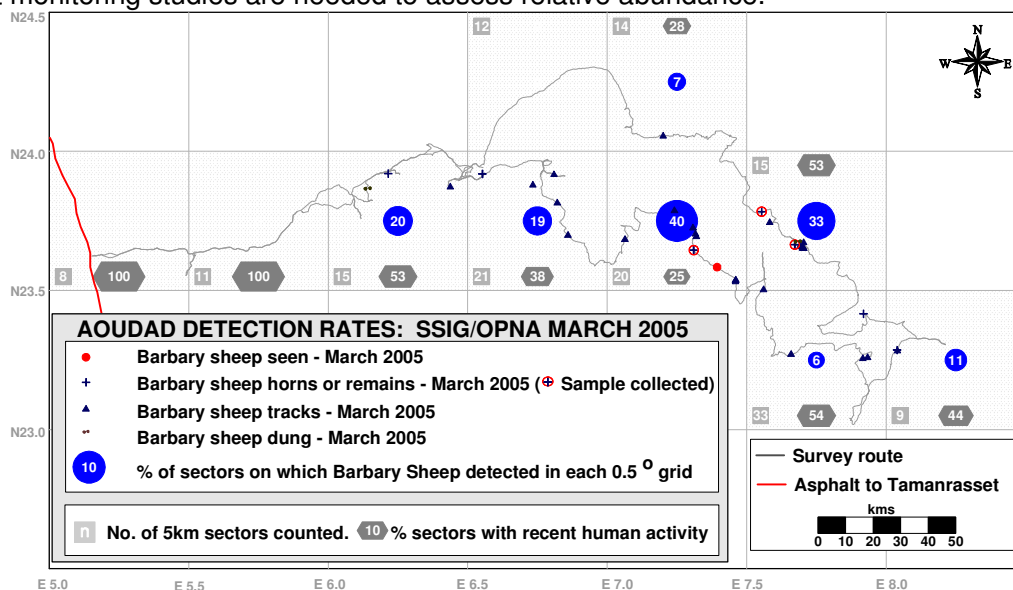
A single adult male Barbary sheep was encountered crossing a gravel wadi between rocky hills in front of the lead vehicle on 13<sup>th</sup> March at 16:47hrs. This individual fled directly to the nearby foothills and was not seen again. Barbary sheep remains, mostly old horns were found on 7 occasions, including parts from a recently butchered specimen found near a hunting camp with recently killed dorcas remains on the eastern side of the Tendjedj Mts. and a horn with indications of cooking at Tadjeret.

**Table 5.3** Barbary sheep observations and detection rates, SSIG/OPNA survey of Ahaggar, March 2005.

|                        |             |
|------------------------|-------------|
| N sectors              | 158         |
| N 0.5° grids           | 10          |
| Total Groups           | 1           |
| Total individuals      | 1           |
| % sectors seen         | 1/158       |
| % sectors detected     | 24/158=15.2 |
| % grids seen/ detected | 7/10=70     |
| Barbary sheep / km     | 0.001       |

**5.3.2 Barbary sheep distribution**

Although only seen once, conservatively interpreted signs of Barbary sheep presence were detected on 15% of all sectors crossed and in 70% of all half degree squares visited (Fig. 5.5). These observations suggest that the species is still well distributed, but longer term standard effort monitoring studies are needed to assess relative abundance.



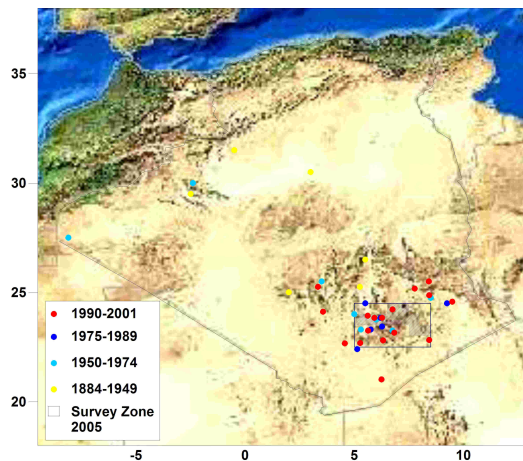
**Fig. 5.5** Distribution of all Barbary sheep *Ammotragus lervia* information, including encounter rate indices by half degree square. SSIG/OPNA survey of Ahaggar National Park, March 2005.

## 5.4 CHEETAH *Acinonyx jubatus* (Schreber, 1776) *Tamahaq - Amayas*

The presence of cheetah in the Ahaggar mountains was a major focus of the survey. Within Algeria, cheetah are protected (Décret n° 83-509 du 20 Août 1983 – National list of Protected species, Algeria) and information about their status and distribution has recently been updated with publication of results from a survey jointly supported by Agence Nationale pour la Conservation de la Nature (ANN) and IUCN (Anon. 2001, Hamdine *et al.* 2003).

### 5.4.1 Historical records of cheetah in Algeria

Historical records of Algerian cheetah, combining both sample specimens and field observations, have been compiled by Kowalski & Rzebik-Kowalksa (1991) who published 18 records scattered fairly evenly through the decades from 1884 to 1981. D. Seddiki recorded three observations in 1989 & 1990 (Seddiki 1990), while the ANN/IUCN study collated 25 further records of cheetah in Algeria from between 1974 to 2000, with a particular focus on reports of encounters collected through the 1990s (Anon. 2001, Hamdine *et al.* 2003). The combined distribution of the published records prior to 2001 is summarised in Annex II; locations are shown in relation to the SSIG/OPNA survey area in Fig. 5.6.



**Fig. 5.6** Distribution of published records of cheetah observations in Algeria, 1884-2000, in relation to SSIG/OPNA survey zone (shaded), March 2005 (after Kowalski & Rzebik-Kowalska 1991, & Hamdine *et al.* 2003 – see Annex II.)

### 5.4.2 Cheetah records assembled on this survey

**Local Knowledge:** During the current survey several of the OPNA guides had personal experience of observing cheetah, known in Tamahaq as '*Amayas*'. In addition the majority of local people encountered in the area also had first hand experience with cheetahs, and several mentioned seeing fresh cheetah tracks in recent days.

At the site of a cheetah kill a relative of the owner of the young camel involved told us in discussion that in his view cheetahs in the area typically live in groups of 3-4, ranging between several wadi systems and feed on barbary sheep, gazelle, camels and hares and sometimes goats. He commented that cheetahs only come to a kill once, and that they might kill, but not eat, jackals. He also reported that the camel had been killed at night. Other informants also mentioned that Ahaggar cheetahs can and do hunt at night.

We also collected information from the owner of Timidoua tour company in Tamanrasset, Mr. Abdallah Sahki, who has taken a keen interest in the cheetah of the Ahaggar National Park. In



**Fig. 5.7** Cheetah pelts collected since 1999 from dead cheetahs reported in the Ahaggar National Park. Tamanrasset, March 2005.

particular three skins from cheetahs whose deaths were reported by members of the local communities have been collected. These skins were seen and photographed by one of us (LM), and small samples were collected for genetic analysis (Fig. 5.7).

**OPNA Records:** OPNA have actively contributed to recent records of cheetah in Algeria (see Annex II). At OPNA headquarters, Tamanrasset, the SSIG team were shown video of a sub-adult cheetah, apparently in fine health with a full set of sharp teeth, captured by local people in the Tefedest area, (to the immediate north of the SSIG survey zone) in April 2004 (Fig. 5.8). OPNA staff documented this with photographs and video footage before organising the release of the animal near its capture point.



**Fig. 5.8** Young cheetah captured by local people in Tefedest area, Ahaggar National Park, April 2004. Photographed and filmed by staff of OPNA before release near point of capture. *Photo – OPNA.*

#### 5.4.3 Cheetah encounter rate – March 2005

**Sightings:** No cheetahs were seen during the current survey.

**Tracks:** Cheetah tracks formed since the rain of 7<sup>th</sup> March were identified with certainty at 3 locations, each separated by more than 30kms (Fig. 5.10, 5.11 & 5.13). Probable tracks of cheetah were identified at 2 other locations. One of the ‘probable’ sets of cheetah tracks was likely to have been formed in the 24hrs prior to observation. All other track sets were less than 14 days old as indicated by the rainfall of 7<sup>th</sup> March.

**Cheetah kills:** On returning to the area of Tadjeret towards the end of the survey, members of the local community alerted the survey team to news of a camel killed by cheetahs two evenings previously. We were able to visit the site and confirm the carcass of a young animal, around 4-6mths old, with a typical bite mark on the upper neck, and presence of cheetah tracks among numerous dog tracks at the site (Fig. 5.11).

Other observations included three tails of cape hare together under tamarix in association with probable cheetah scat and tracks (17<sup>th</sup> March N23.6 E7.8); old remains of an adult female gazelle were noted in association with one set of recent cheetah tracks reported above; and an assembly of gazelle, donkey and camel remains were found on a tamarix mound near possible cheetah scat north of Ouadenki (20<sup>th</sup> March N23.9 E6.55).



gazelle were noted in association with one set of recent cheetah tracks reported above; and an assembly of gazelle, donkey and camel remains were found on a tamarix mound near possible cheetah scat north of Ouadenki (20<sup>th</sup> March N23.9 E6.55).

**Fig. 5.9** Cheetah habitat near Ti-n-Hadjjene, where recent cheetah tracks (near Tamarix in foreground; see Fig 5.10), plus scats and an old dorcas carcass (Tamarix in centre-right background) were found, 19<sup>th</sup> March 2005.

**Cheetah scats:** Larger *Tamarix* and *Acacia* trees, selected subjectively on basis of location, size and branch structure, were inspected at regular intervals throughout the survey to detect evidence of cheetah scat marking on larger horizontal or sloping trunks and branches. A total of 238 trees were inspected, Table 6.4.

**Table 5.4** Summary of results from inspecting selected trees for presence or absence of predator scat sign, SSIG/OPNA survey of Ahaggar, March 2005.

|                    | Predator Scat present | [Subset with possible Cheetah scat present]* | No scat present | Total |
|--------------------|-----------------------|--|-----------------|-------|
| <i>Acacia</i> sp.  | 24                    | [12]   | 104             | 128   |
| <i>Tamarix</i> sp. | 15                    | [5]  | 40              | 55    |
| Other              | 0                     | [0]  | 3               | 3     |
| Unrecorded         | 6                     | [2]  | 46              | 52    |
| Total              | 45                    | [19]   | 193             | 238   |

(\* as assessed in the field, subject to verification by scat analysis.)

Predator scat was found in association with 45 trees (Fig. 5.12). In the field 19 of these were considered large enough or high enough to have been possible cheetah scats. There is little indication of a difference in success rates in detecting cheetah scat between the two principle tree types investigated. A summary of scat samples collected on the survey is given in Annex III.

**Table 5.5** Encounter rate indices for cheetah (signs only). SSIG/OPNA survey of Ahaggar, March 2005.

|                      |             |
|----------------------|-------------|
| N sectors            | 158         |
| N 0.5° grids         | 10          |
| Total groups         | 0           |
| % sectors seen       | 0           |
| % sectors detected   | 16/158 = 10 |
| % grids detected     | 7/10 = 70   |
| Mean groups / sector |             |
| Mean group size      |             |
| Cheetah seen / km    | 0           |



**Fig. 5.10** Cheetah tracks near Ti-n-Hadjjene (front foot L8.6cm W7.0cm, left) and Inahidane (front foot L7.6cm W6.2cm, right); SSIG/OPNA survey of Ahaggar National Park, March 2005.





**Fig. 5.11** Cheetah kill at Tadjeret, reported by local people. Cheetah tracks at this site (inset) were still present and distinguished among numerous tracks of scavenging dogs. The bite mark on the neck, and opening of the carcass at the rear were also typical signs of cheetah. SSIG/OPNA survey of Ahaggar National Park. March 2005.



**Fig 5.12** Mature trees, mainly *Acacia raddiana* (Tadjeret above and left) or *Tamarix aphylla* (below and right) were routinely checked for presence of cheetah-like predator scat (recognised by a combination of size, and presence of animal hair or blood). Samples were collected for verification and analysis of prey items, see Annex II.

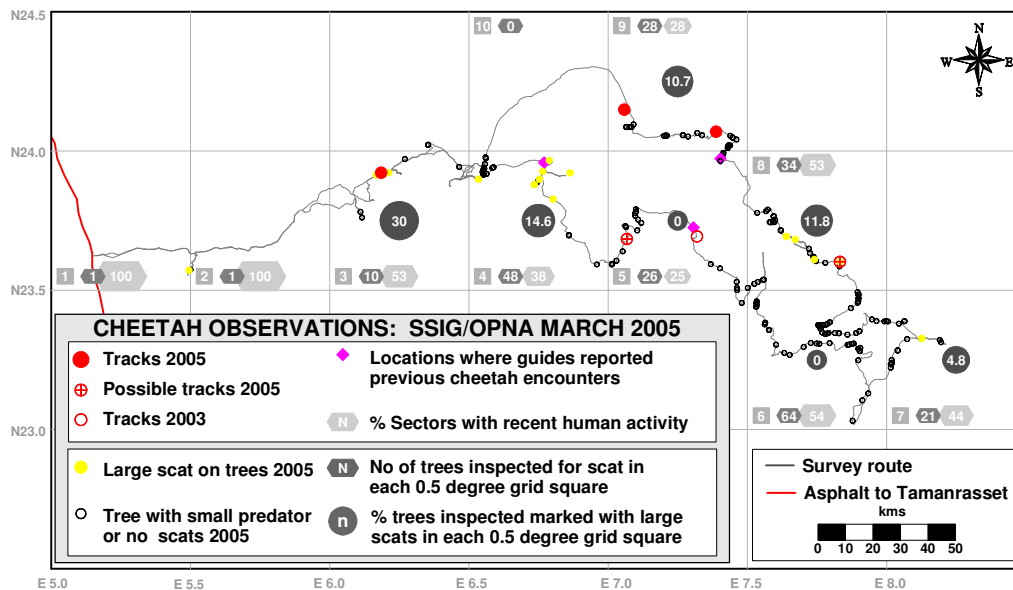


Scat samples have been divided into two and sent to the Cheetah Conservation Fund, Namibia, and ZSL Institute of Zoology, UK, for analysis. At CCF mammal hair in the scats will be separated from the samples and identified. Cheetahs, like other cats, commonly ingest their own body hair as a result of grooming, so faecal samples containing cheetah hair are likely to have been produced by cheetahs. This will confirm what proportion of samples are actually cheetah scat. Hair from prey items should also be detected. At ZSL results of the work at CCF will be used to select cheetah samples and attempt to extract cheetah DNA following protocols developed for cheetah scat samples collected in Tanzania. If DNA amplification is successful an objective will be to compare Ahaggar cheetahs with cheetahs from other parts of the world.

#### 5.4.4 CHEETAH DISTRIBUTION – March 2005

Although no cheetahs were seen, combined observations of all cheetah signs (tracks, kills, scat tree markings) indicate the survey detected cheetah activity on around 10% of the 5km sectors crossed and in 70% of the half degree squares crossed, Table 5.5. These data remain subject to confirmation of scat identity by hair structure analysis, and perhaps genetic analysis, among collected scat samples. Without scats, the survey detected cheetah on 50% of grids.

The summary distribution of cheetah tracks and signs, including scat trees, is shown in Fig. 5.13, indicating that cheetahs are widely but thinly distributed through the majority of the area surveyed. A reference table showing all cheetah records published by Seddiki (1990), Kowalski & Rzebik-Kowalska (1991) and Hamdine *et al.* (2003), with additional records of cheetah observations in Ahaggar collated by this survey, is supplied in Annex II.



**Fig. 5.13** Distribution of cheetah *Acinonyx jubatus* signs and detection frequencies. SSIG/OPNA reconnaissance survey, Ahaggar National Park, March 2005.

## 5.5 CAMERA TRAPPING

Trailmaster Camera traps fitted with two receiver types, an active TM1500 and a passive TM 550, were taken on the survey and both deployed every night. Team members were trained in use of both camera trap types. Because traps were only put up for one night at each location, they were usually baited with sardines to maximise probability of obtaining images of small predators.

Photographs of Rüppell's fox *Vulpes rueppellii*, Cape hare *Lepus capensis*, domestic dogs *Canis familiaris* and a probable Barn Owl *Tyto alba* were obtained. Details of camera trapping locations and results are summarised in Annex IV. Distribution data from camera trapping has been incorporated with other survey observations in the presence absence summary for the survey (Table 5.1).

At the end of the survey the TM 550 passive camera trap system with a TM35-1 camera was donated to OPNA from St. Louis/SSIG funds. It is planned that OPNA and University of Béjaïa staff will be able to use this equipment to obtain photographs of cheetah from the Ahaggar area by setting it out without bait for prolonged periods at key sites of cheetah activity, determined by survey results and further interaction with local informants.

## 5.6 BIRDS, REPTILES AND INVERTEBRATES

Throughout the survey notes on birds and reptiles were made. More than 50 bird species were recorded. Details with location to half degree grid square are supplied in Annex V. Information from a limited number of reptile observations is presented in Appendix VI. Spiders and close relatives were collected opportunistically by KDS and have been submitted to Dr. R Bosmans, a Belgian specialist, for identification. A summary of provisional results is tabulated in Annex VII.

## 6. LIVESTOCK

Livestock keeping in the survey area is a predominant activity in >90% of families. Camel ownership in particular is considered a mark of wealth and prestige (Badi 2004). Local camels "*amis n'Ahaggar*" and goats "*teghsi n'Ahaggar*" are adapted to the cool rocky mountains (Badi 2004). Camels are allowed to forage un-hobbled and untended, sometimes spending long periods away from people or their owners. They are monitored from campsites near key water points. In addition traditional marks on neck and upper legs indicate ownership, and sightings are reported through customary exchange of news over an extensive social network among the nomads.

Goats, used for meat and milk production, are kept under closer control at nomad settlements, being herded by women throughout the day, foraging mainly close to the camps. Sheep make up a small proportion of the herds, being a local sahelian race (*Demman*) and less well adapted to Ahaggar conditions. They provide additional quality meat, milk and skins.

Many small stock herds are accompanied by guard dogs (*aberhoh*) habituated to staying with the group where they largely fend for themselves and help defend against predators. Some nomads also maintain greyhound-like dogs (*oska*) which receive more direct care and feeding, and are used to hunt gazelle and barbary sheep (Lhote 1984).

Donkeys are widespread but of comparatively low priority to the nomad economy. Most are feral, referred to as *ahouilil*. Individuals are occasionally recaptured for transport as need or work demands.

**Table 6.1** Indices of abundance for livestock observations, SSIG/OPNA survey, Ahaggar National Park, March 2005.

|                                       | Dog        | Camels      | Donkeys   | Small stock |
|---------------------------------------|------------|-------------|-----------|-------------|
| N sectors                             | 158        | 158         | 158       | 158         |
| N 0.5° grids                          | 10         | 10          | 10        | 10          |
| Total Groups                          | 9          | 39          | 15        | 14          |
| Total individuals                     | 10         | 254         | 49        | 909         |
| % sectors seen                        | 11/158=7   | 30/158=19   | 10/158 =6 | 9/158=6     |
| % sectors detected                    | 12/158=7.6 | 81/158=51.3 | 45/158=28 | 26/158=16   |
| % grids seen/ detected                | 5/10=50    | 9/10=90     | 9/10=90   | 6/10=60     |
| Mean number of groups seen per sector | 0.06       | 0.27        | 0.09      | 0.09        |
| Mean group size                       | 1.1        | 6.5         | 3.3       | 65          |
| Encounter rate index                  | 0.01       | 0.25        | 0.05      | 0.91        |

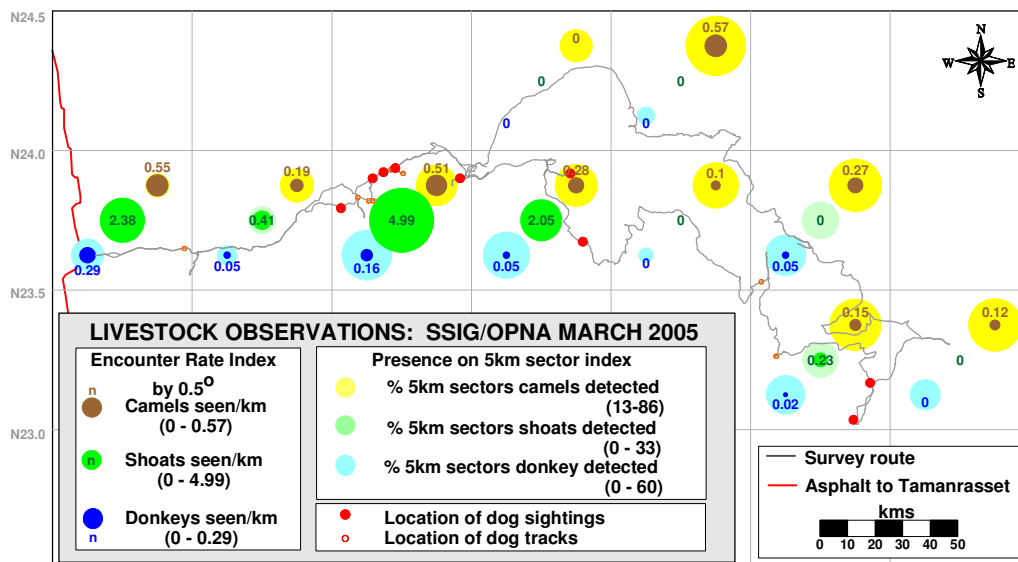
### 6.1 Livestock encounter rates.

A summary of indices for livestock observation rates is given in Table 6.1. Domestic animals are shown to be generally widespread and detected on a high proportion of grid squares. Goats and sheep formed the numerically most abundant livestock observed, though camels and donkeys were more widespread, reflecting the fact that most are living independent of people.

### 6.2 Livestock Distribution

The distribution of livestock observation is summarised in Fig. 6.1, showing camels, donkeys and livestock observation rate indices (individuals/km and % sectors detected) by half degree grid square.

Locations where individual dogs were seen are also shown.



**Fig. 6.1** Distribution of small stock, donkeys and camels shown as encounter rate indices and detection rate indices by half degree square. SSIG/OPNA survey of Ahaggar National Park, March 2005.

Most of the small stock herds were recorded in the western part of the survey area, while donkey records were also associated with the mountainous western and central areas. Camels were widely distributed throughout and seen at high rates in east and west.

## 7. HUMAN ACTIVITY

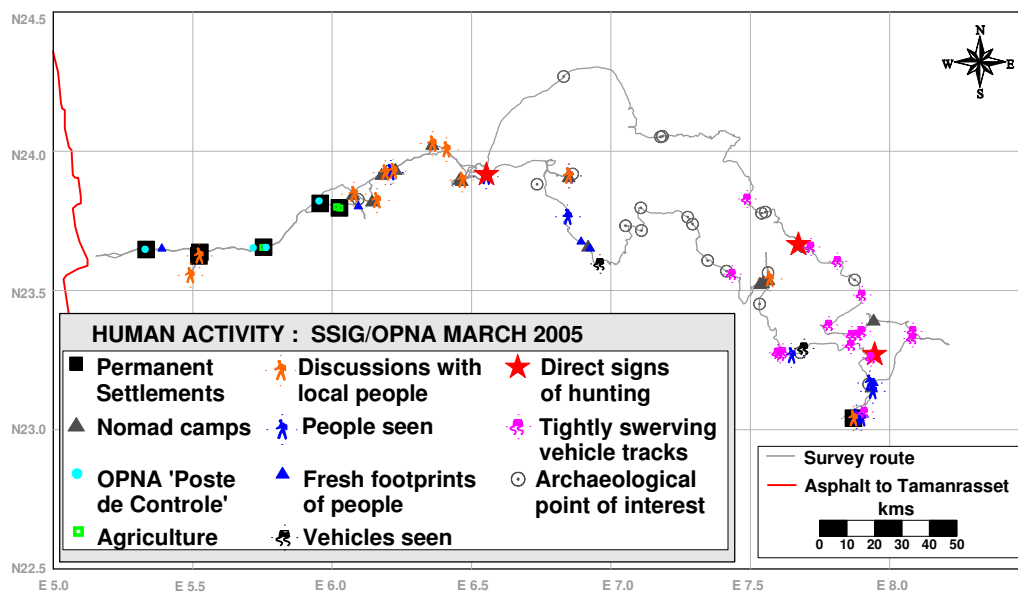
The distribution of human activity encountered along the off-road sectors of the survey is shown in Fig. 7.1.

Outside the permanent settlements at Hirafok, Idelès and Tadant, the dominant community activity in the study area was livestock keeping (camels and small stock with some donkeys) based in mobile nomad camps.

The observations suggest a zone of more permanent impacts in the west (more settlements and camps), relatively reduced human activity in the central part of the survey and a higher proportion of more temporary impacts in the east (hunting activity). Two of the three locations where convincing cheetah tracks were located were associated with the apparently less disturbed central areas, although the third was close to several nomad camps.

Evidence of hunting activity included frequent observation of tire tracks indicating a vehicle swerving sharply as if following hares and other animals in a spotlight and detection of old expended shotgun shells (made in Burkina Faso). In a narrow mountain pass on the east side of the Tendjedj Mountain range two sets of vehicle tracks led to a campsite where fresh butchered remains of one adult barbary sheep and at least three dorcas gazelles were found.

Although not a target of this survey, a record of most locations where sites of archaeological interest were encountered was maintained to add to the records of the OPNA.



**Fig. 7.1** Distribution of human settlements, nomad camps and miscellaneous other activities ( including hunting evidence), SSIG/OPNA survey of Ahaggar National Park, March 2005. [See Annex VIII for GPS locations of archaeological sites].

### 7.1 Livestock & cheetahs

The question of predator impacts on the livestock economy was regularly discussed with nomads and our OPNA guides. The view was consistently expressed that cheetahs caused comparatively little problem with small stock, because small stock are normally accompanied by both herders and guard dogs while foraging. Much more concern is expressed about losses caused to camels. The case of a camel calf killed by a cheetah at Tadjeret during this survey is documented in detail above and we also noted that owners report cheetahs kill adult camels on occasion. In the past the traditional method used to manage cheetah harassment of livestock was to kill them after prolonged pursuit and tracking on foot. Hamdine *et al.* (2003) report 11 cheetahs killed between 1995-1998, though methods are not specified.

## CONCLUSIONS AND RECOMMENDATIONS

The SSIG/OPNA reconnaissance survey of the central zone of the Ahaggar National Park in southern Algeria has produced baseline information on the observation frequency of larger wildlife species, particularly dorcas gazelle and cheetah. In addition the survey has provided some preliminary information on the distribution of human land use activity in relation to wildlife distribution.

The results indicate that an internationally important population of desert adapted cheetah are still distributed widely through the Ahaggar National Park survey area. The daytime encounter rate with dorcas gazelles was moderate compared to that recorded by SSIG surveys of populations in more open fixed dune and Sahelian habitats further south, perhaps a result of the more rocky mountain habitats of the Ahaggar. But importantly dorcas were shown to be widespread and consistently distributed throughout the survey zone, with supporting populations of barbary sheep, cape hares and feral donkeys all providing a potentially significant prey base in this mountain desert environment.

The survey has also initiated training in field survey techniques for Algerian counterparts working in the Office du Parc National de l'Ahaggar, the Université de Béjaïa, and ANN, representing a partial cross-section of national conservation and wildlife research organisations. In discussion with the Director of OPNA, Farid Ighilahriz, it was noted that development of staff training opportunities is a high priority for OPNA, and that development of a memorandum of understanding between the SCF/SSIG and Ministry of Culture would provide a valuable formal mechanism to facilitate further SSIG/OPNA collaboration in training, survey and research on the wildlife of the Ahaggar.

### RECOMMENDATIONS:

In view of these findings it is recommended:

- 1) That (when fully constituted) SCF explore completion of an MoU with the Ministry of Culture, Algiers, for the purpose of providing a formal framework within which to conduct future collaboration on field conservation and monitoring work between staff of national parks managed by the Ministry of Culture (OPNA & neighboring Tassili National Park (OPNT)) and SCF/SSIG supported projects in Algeria.
- 2) We recommend that more detailed studies of cheetah and their prey base in central Ahaggar be pursued, with particular reference to study of cheetah-livestock interactions and development of improved monitoring techniques through scat tree recognition and camera trapping. Opportunities for additional training of OPNA staff at both management and Agent to Conservation level should be developed.
- 3) We recommend that continued collaborative surveys be used as a mechanism to facilitate training opportunities for National Park staff at all levels in wildlife monitoring methods while at the same time generating new information about wildlife status in Algeria. In particular a follow up training and reconnaissance survey of Tassili N'Ajjer is recommended, with the objective of extending the combined cheetah and prey base reconnaissance work, and extending the antelope survey into former addax habitats.
- 4) In future survey support in the northern steppic, montane and dune habitats will also be valuable, giving insight into the status of both dorcas and slender-horned gazelle populations, and opportunity to follow up recent verbal reports of cheetah (Fellous *pers.comm.* interview with local inhabitant) in this separate and distant habitat.
- 5) We recommend SSIG considers exploring opportunities to hold an annual meeting at the headquarters of the Ahaggar National Park at Tamanrasset.
- 6) We recommend that antelope reintroduction opportunities and methods in southern Algeria be a topic for special review at that meeting, noting the former widespread presence of addax and dama gazelles in the Ahaggar area in particular with attention to assisting OPNA and OPNT to develop effective public relations and promotional activities for such a project.

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## ANNEX I

Animal nomenclature in English, French and Tamahaq for species recorded in the Ahaggar National Park region.

### MAMMALS

| Latin                           | English              | French                     | Tamahaq               |
|---------------------------------|----------------------|----------------------------|-----------------------|
| <i>Paraechinus aethiopicus</i>  | Desert hedgehog      | Hérisson du désert         | Tiknissit, Teknissit  |
| <i>Chiroptera</i>               | Bat                  | Chauve souris              | Adeggal-n-teffuk,     |
| <i>Pipistrellus deserti</i>     | Desert pipistrelle   | Pipistrelle du désert      | Adeggal-n-teffuk,     |
| <i>Canis aureus</i>             | Golden jackal        | Chacal doré                | Ebeggi                |
| <i>Fennecus zerda</i>           | Fennec               | Fennec                     | Akhorhi               |
| <i>Vulpes rueppellii</i>        | Rüppell's fox        | Renard famélique           | Akhorhi               |
| <i>Hyaena hyaena</i>            | Striped hyaena       | Hyène rayée                | Eridel, Aghidel       |
| <i>Lycaon pictus</i>            | Hunting dog          | Lycaon                     | Tahenchit, Taghessit  |
| <i>Acinonyx jubatus</i>         | Cheetah              | Guépard                    | Amayas, Ahdel         |
| <i>Panthera pardus</i>          | Leopard              | Panthère                   | Damessa               |
| <i>Felis sylvestris libyca</i>  | African wild cat     | Chat ganté                 | Aghda, Taghda,        |
| <i>Procavia capensis</i>        | Rock hyrax           | Daman de rocher            | Akawka                |
| <i>Ammotragus lervia</i>        | Barbary sheep        | Mouflon à manchettes       | Oudad                 |
| <i>Addax nasomaculatus</i>      | Addax                | Addax                      | Amellal, Tamellalt    |
| <i>Oryx dammah</i>              | Scimitar-horned oryx | Oryx algazelle             | Izzem, Tizzemt, Ademi |
| <i>Gazella dama</i>             | Dama gazelle         | Gazelle dama               | Inir, Enir            |
| <i>Gazella dorcas</i>           | Dorcas gazelle       | Gazelle dorcas             | Ahenked               |
| <i>Gerbillus spp.</i>           | Gerbils              | Gerbilles                  | Akouti, Akoutei       |
| <i>Meriones spp.</i>            | Jirds                | Mérions                    | Akounder?             |
| <i>Psammomys obesus</i>         | Fat sand rat         | Rat des sables             | Akounder              |
| <i>Acomys cahirinus seurati</i> | Egyptian spiny mouse | Souris épineuse égyptienne | Tajejert              |
| <i>Jaculus jaculus</i>          | Lesser jerboa        | Petite Gerboise d'Egypte   | Eddawi                |
| <i>Massoutiera mzabi</i>        | Mzab gundi           | Goundi du Mzab             | Telout                |
| <i>Lepus capensis</i>           | Cape hare            | Lièvre du cap              | Timerwelt, Emerwel    |



## BIRDS

| Latin                            | English                      | French                  | Tamahaq                                |
|----------------------------------|------------------------------|-------------------------|--|
| <i>Ardea</i> spp.                | Heron                        | Héron                   | Irek                                   |
| <i>Egretta garzetta</i>          | Little Egret                 | Aigrette garzette       | Ibilbil                                |
| <i>Neophron percnopterus</i>     | Egyptian Vulture             | Vautour percnoptère     | Taghaldji, Taghaldjit                  |
| <i>Falco tinnunculus</i>         | Eurasian Kestrel             | Faucon crécerelle       | Aloullem                               |
| <i>Falco biarmicus</i>           | Lanner Falcon                | Faucon lanier           | Aloullem, Afokka                       |
| <i>Cursorius cursor</i>          | Cream-colored<br>Courser     | Courvite isabelle       | Seyellel-ibaraden                      |
| <i>Pterocles</i> spp.            | Sandgrouse                   | Ganga                   | Tbidert                                |
| <i>Pterocles coronatus</i>       | Crowned Sandgrouse           | Ganga couronné          | Tagdout                                |
| <i>Pterocles lichtensteinii</i>  | Lichtenstein's<br>Sandgrouse | Ganga de Lichtenstein   | Tagdout, Tintamat                      |
| <i>Columba livia</i>             | Rock Pigeon                  | Pigeon biset            | Tidebbirt                              |
| <i>Streptopelia turtur</i>       | Eurasian Turtle-Dove         | Tourterelle des bois    | Tinkarrou, Tadoureit                   |
| <i>Streptopelia senegalensis</i> | Laughing Dove                | Tourterelle maillée     | Tadjeredjert                           |
| <i>Bubo ascalaphus</i>           | Pharaoh Eagle-Owl            | Grand-duc du désert     | Bouhan, Bouihane                       |
| <i>Athene noctua</i>             | Little Owl                   | Chevêche d'Athéna       | Taouik                                 |
| <i>Upupa epops</i>               | Hoopoe                       | Huppe fasciée           | Gag-el-Kheir, Houd-houd,<br>Agag akbar |
| <i>Ammomanes</i> spp.            | Desert Larks                 | Ammomanes               | Touidira, Tabegnest, Chiway            |
| <i>Alaemon alaudipes</i>         | Greater Hoopoe-Lark          | Sirli du désert         | Ati-Ati                                |
| <i>Ptyonoprogne fuligula</i>     | Rock martin                  | Hirondelle isabelline   | Mestegh                                |
| <i>Hirundo rustica</i>           | Barn Swallow                 | Hirondelle rustique     | Mestegh                                |
| <i>Delichon urbica</i>           | House-Martin                 | Hirondelle de fenêtre   | Mestegh                                |
| <i>Sylvia</i> spp.               | Warblers                     | Fauvettes               | Sidden-izlen                           |
| <i>Oenanthe leucopyga</i>        | White-tailed Wheatear        | Traquet à tête blanche  | Moula-moula                            |
| <i>Turdoides fulvus</i>          | Fulvous Chatterer            | Cratélope fauve         | Etiyyeti, Tiou-tiou                    |
| <i>Lanius meridionalis</i>       | Southern Grey Shrike         | Pie-grièche méridionale | Srend, Srendi-boughellama              |
| <i>Corvus ruficollis</i>         | Brown-necked raven           | Corbeau brun            | Aghaledj, Arralit                      |
| <i>Emberiza striolata</i>        | House Bunting                | Bruant striolé          | Siboubou, Egdedaren<br>(plural name?)  |
| <i>Bucanetes githaginea</i>      | Trumpeter Finch              | Roselin githagine       | Tahrays                                |

## REPTILES

| Latin                             | English            | French           | Tamahaq      |
|-----------------------------------|--------------------|------------------|--------------|
| <i>Ptyodactylus hasselquistii</i> | Fan-footed Gecko   | Ptyodactyle      | Emezerega    |
| <i>Agama impalearis</i>           | Bibron's Agama     | Agame de Bibron  | Emeterter    |
| <i>Uromastyx</i> spp.             | Spiny tailed agama | Fouette queue    | Agezzaram    |
| <i>Scincus scincus</i>            | Sand fish          | Poisson de sable | Tahallemlwit |
| <i>Varanus griseus</i>            | Desert monitor     | Varan du désert  | Aghata       |
| <i>Cerastes cerastes</i>          | Horned viper       | Vipère à corne   | Tachelt      |

Sources for Tamahaq names follow Seddiki (1990), Badi (2004) and field notes of FB, AB-B and FA.

## ANNEX II

Algerian cheetah records used in this report by SSIG/OPNA survey: Lat/Long estimated from map plots where not available in original sources and given in decimal degrees.

| North   | East    | Mt  | Year | Ob. Type            | Location and other notes   | Original Source        | Data Collated by:                |
|---------|---------|-----|------|---------------------|--|------------------------|----------------------------------|
| 25.0000 | 2.0000  |     | 1884 | Obs/report          | Adrar Ahnet  | Monod 1931             | Kowalski & Rzebiak-Kowalska 1991 |
| 30.5000 | 3.0000  |     | 1892 | Obs/report          |  |                        | "                                |
| 26.5000 | 5.5000  |     | 1914 | Obs/report          | Amguid   | Schweppenbourg 1917    | "                                |
| 31.5000 | -0.5000 |     |      | Specimen            | At least 5 killed between Ain Sefra and Figuig, one in Oued Namoud | Heim de Balsac 1928    | "                                |
|         |         |     | 1927 | Obs/report          | 1 Bousaâda   | Joleaud 1927           | "                                |
| 25.2500 | 5.2500  |     | 1939 | Specimen            | 1 Tefedest - Gareet el Djenoun                                     | Devilleers 1939        | "                                |
| 29.5000 | -2.5000 |     | 1943 | Obs/report          | Ougarta Mts & 12 near Figuig,                                      | Seurat 1943            | "                                |
| 23.3000 | 5.3000  |     | 1957 | Obs/report          | 2 Imadouzen  | Regnier 1960           | "                                |
| 23.1500 | 6.8333  |     | 1960 |                     | 4 Tin Tarabine   | Regnier 1960           | "                                |
| 24.0000 | 5.0000  |     | 1960 | Obs/report          | Adenek   | Regnier 1960           | "                                |
| 23.7500 | 6.0000  |     | 1960 | Obs/report          | 5 Telouhat 15km E of Idelès, attacking livestock 1958-1960         | Regnier 1960           | "                                |
| 25.5000 | 3.5000  |     | 1965 | Obs/report          | 1 Mouydir - Tadjemout  | Dupuy 1966             | "                                |
| 23.2500 | 6.7500  |     | 1966 | Specimen            | Tindouf  | Dupuy 1966             | "                                |
| 24.7500 | 8.5000  |     | 1966 | Obs/report          | Tassili  | Dupuy 1966             | "                                |
| 27.5000 | -8.1000 |     | 1967 | Obs/report          |  |                        | "                                |
| 24.2167 | 6.7500  |     | 1973 | Killed              | 2 Atakor   | Guide de Sahara 1980   | "                                |
| 30.0000 | -2.4000 |     | 1976 | Specimens           | 2 captured near Beni Abbas sent to Algiers zoo                     | De Smet 1989.          | "                                |
| 23.3000 | 5.7500  |     | 1981 | Specimen            | Hoggar   | De Smet 1989.          | "                                |
| 24.5000 | 9.2500  |     | 1981 | Obs/report          | Tassili  | Management: Tassili NP | "                                |
| 23.4333 | 6.2667  |     | 1974 | Killed              | 1 Tazrouk  | INRF                   | Hamdine <i>et al.</i> 2003       |
| 22.4000 | 5.1333  |     | 1981 | Tracks              | Hoggar   | De Smet 1989           | Hamdine <i>et al.</i> 2003       |
| 23.8333 | 6.2000  |     | 1984 | Killed              | 1 Oued Telouhet  | OPNA                   | Hamdine <i>et al.</i> 2003       |
| 24.5000 | 5.5000  | Dec | 1989 | Seen                | 3 Tefedest   | Seddiki 1990           | Hamdine <i>et al.</i> 2003       |
|         |         |     | 1989 | Tracks              | Abnizi – Oued Abezzou  | Seddiki 1990           | Seddiki 1990                     |
|         |         |     | 1990 | Seen                | 2 Oued Amghah  | Seddiki 1990           | Seddiki 1990                     |
|         |         | Feb | 1990 | Tracks/scats        | Oued Dehine  | Seddiki 1990           | Seddiki 1990                     |
| 24.5000 | 5.5000  | Oct | 1993 | Seen                | 1 Tefedest   | INRF                   | Hamdine <i>et al.</i> 2003       |
| 24.1167 | 3.5667  |     | 1995 | Killed              | 1 Ajerar   | INRF                   | "                                |
| 22.6667 | 4.5667  |     | 1996 | Killed              | 1 Tahalgha   |                        | "                                |
| 22.6667 | 4.5667  | Mar | 1997 | Killed              | 1 Tahalgha   |                        | "                                |
| 25.1667 | 7.7667  | Jul | 1997 | Seen                | 4 Oued enki  |                        | "                                |
| 25.1667 | 7.7667  | Jul | 1997 | Skin                | 2 Oued enki  | INRF                   | "                                |
| 24.2167 | 6.7500  | Aug | 1997 | Corpse              | 1 Atakor   |                        | "                                |
| 25.5000 | 8.4167  | Nov | 1997 | Scats               | Oued iherir  |                        | "                                |
| 22.8167 | 8.4333  | Mar | 1998 | Killed              | 4 Aghelsa  |                        | "                                |
| 23.9333 | 5.6167  | Mar | 1998 | Killed              | 1 Tohra  |                        | "                                |
| 23.2500 | 5.6333  | Apr | 1999 | Seen                | 1 Imadouzène   |                        | "                                |
| 23.8333 | 5.9167  | Aug | 1999 | Seen                | 2 Idelès   |                        | "                                |
| 23.1500 | 6.8333  | Oct | 1999 | Killed*             | 1 Tin Tarrabine  | Ecomusée - OPNA        | "                                |
| 25.2500 | 3.3333  | Dec | 1999 | Seen                | 2 Oued Ahtes   |                        | "                                |
| 22.6833 | 5.2667  | Sep | 2000 | Corpse in a well    | 1 Oued Toufedet  | Ecomusée - OPNA        | "                                |
| 23.8333 | 6.2667  | Oct | 2000 | Killed              | 1 Oued Telouhet†   | Ecomusée - OPNA        | "                                |
| 22.8000 | 6.3167  | Nov | 2000 | Seen                | 8 Oued Tanget  |                        | "                                |
| 24.8667 | 8.4333  |     | 1981 | Seen                | 1 Zaouatallaz  | OPNT                   | "                                |
| 21.0167 | 6.2500  | Nov | 1997 | Tracks              | Tagrina  |                        | "                                |
| 24.5667 | 9.4833  | Apr | 1998 | Killed              | 1 Djanet   | OPNT                   | "                                |
| 24.8667 | 8.4333  |     | 1998 | Skull               | 1 Zaouatallaz  | Ecomusée - OPNT        | "                                |
| 23.8800 | 6.0500  |     |      | Skin                | 1 Telouhet †   | Abdallah Sahki         | This survey                      |
| 22.5000 | 5.3300  |     |      | Skin                | 1 Amsel -  | Abdallah Sahki         | This survey (Fig.5.7)            |
| 25.0000 | 5.5000  |     |      | Skin                | 1 Tefedest   | Abdallah Sahki         | This survey (Fig. 5.7)           |
| 23.2000 | 5.5000  |     |      | Skin                | 1 Assouf Melen   | Abdallah Sahki         | This survey (Fig. 5.7)           |
| 23.6998 | 7.3171  | Feb | 2003 | Tracks              | Oued Tedjjet   | KDS, FB, AB-B, AF      | Survey 2003                      |
| 25.0000 | 6.2000  | Mar | 2004 | Live capture**      | 1 Tefedest   | OPNA                   | This survey (Fig. 5.8)           |
| 24.0678 | 7.3880  | Mar | 2005 | Tracks              | Ti-n-Hadjdjene   | This survey            | This survey (Fig 5.10)           |
| 24.1489 | 7.0581  | Mar | 2005 | Tracks              | Inahidane  | This survey            | This survey (Fig 5.10)           |
| 23.9222 | 6.1850  | Mar | 2005 | Tracks & camel kill | Tadjeret   | This survey            | This survey (Fig. 5.11)          |

\*Mounted specimen prepared. \*\* Released in situ by OPNA after filming. † Possible duplicate of report of same specimen.  
Note: Additional locations from this survey may be identified on completion of scat analysis projects.

### ANNEX III

Predator scat samples from SSIG/OPNA survey of Ahaggar National Park, Algeria, sent for identification and analysis to Cheetah Conservation Fund, Namibia, and Institute of Zoology, ZSL, United Kingdom.

|    | Sample No   | N        | E       | Gr. | Sec. | ZSL | CCF | Tree ID        | Ht. (cm.) | Pos.   | Note               |
|----|-------------|----------|---------|-----|------|-----|-----|----------------|-----------|--------|--------------------|
| 1  | 20050308/01 | 23.57118 | 5.495   | 1   | 9.5  | n   | n   | <i>Acacia</i>  | 100       | Branch | Sample with LM?    |
| 2  | 20050310/01 | 23.92199 | 6.86373 | 4   | 38.5 | y   | y   | <i>Tamarix</i> | 150       | Branch |                    |
| 3  | 20050310/02 | 23.92199 | 6.86373 | 4   | 38.5 | n   | y   | <i>Tamarix</i> | 150       | Branch |                    |
| 4  | 20050310/03 | 23.92199 | 6.86373 | 4   | 38.5 | n   | y   | <i>Tamarix</i> | 150       | Branch |                    |
| 5  | 20050310/04 | 23.92199 | 6.86373 | 4   | 38.5 | n   | y   | <i>Tamarix</i> | 150       | Branch |                    |
| 6  | 20050311/01 | 23.92648 | 6.76522 | 4   | 39.5 | y   | y   | <i>Tamarix</i> |           |        |                    |
| 7  | 20050311/02 | 23.92648 | 6.76522 | 4   | 39.5 | y   | y   | <i>Tamarix</i> |           |        |                    |
| 8  | 20050311/03 | 23.92648 | 6.76522 | 4   | 39.5 | y   | y   | <i>Tamarix</i> |           |        |                    |
| 9  | 20050311/04 | 23.89848 | 6.75337 | 4   | 39.5 | n   | y   | <i>Tamarix</i> |           |        |                    |
| 10 | 20050311/05 | 23.87944 | 6.73496 | 4   | 40.5 | n   | y   | <i>Tamarix</i> |           |        |                    |
| 11 | 20050311/06 | 23.89848 | 6.75337 | 4   | 39.5 | y   | y   | <i>Acacia</i>  | 170       | Trunk  | Scat tree          |
| 12 | 20050312/01 | 23.82774 | 6.80248 | 4   | 42   | y   | y   | <i>Acacia</i>  |           | Branch | Jackal ? (1)       |
| 13 | 20050313/02 | 23.5939  | 7.36891 | 5   | 62   | y   | y   | <i>Acacia</i>  |           |        |                    |
| 14 | 20050313/04 | 23.5939  | 7.36891 | 5   | 62   | y   | y   | <i>Acacia</i>  |           |        |                    |
| 15 | 20050315/01 | 23.24857 | 7.89879 | 6   | 84   | y   | y   | <i>Acacia</i>  | 15        | Bole   |                    |
| 16 | 20050315/02 | 23.24857 | 7.89879 | 6   | 84   | y   | y   | <i>Acacia</i>  | 0         | ground |                    |
| 17 | 20050315/03 | 23.24857 | 7.89879 | 6   | 84   | y   | y   | <i>Acacia</i>  | 0         | ground |                    |
| 18 | 20050316/0? | 23.32098 | 8.19134 | 7   | 99   | y   | y   | <i>Tamarix</i> |           | ground |                    |
| 19 | 20050316/0? | 23.32707 | 8.12663 | 7   | 98   | y   | y   | ?              |           |        |                    |
| 20 | 20050316/03 | 23.32707 | 8.12663 | 7   | 98   | y   | y   | ?              |           | ground | Not cheetah?       |
| 21 | 20050316/04 | 23.32098 | 8.19134 | 7   | 99   | y   | y   | <i>Tamarix</i> |           | ground | Dark               |
| 22 | 20050316/05 | 23.32098 | 8.19134 | 7   | 99   | y   | y   | <i>Tamarix</i> | 0         | ground | White              |
| 23 | 20050316/06 | 23.41611 | 7.91884 | 6   |      | y   | y   | Rock           | 0         | ground | Rocks near water   |
| 24 | 20050317/02 | 23.60202 | 7.83285 | 8   | 114  | y   | y   | <i>Tamarix</i> |           | Ground |                    |
| 25 | 20050317/03 | 23.60202 | 7.83285 | 8   | 114  | y   | y   | <i>Tamarix</i> |           | Branch |                    |
| 26 | 20050317/04 | 23.60202 | 7.83285 | 8   | 114  | y   | y   | <i>Tamarix</i> |           | ground |                    |
| 27 | 20050317/05 | 23.61029 | 7.74115 | 8   | 116  | y   | y   | <i>Acacia</i>  | 200       | Branch |                    |
| 28 | 20050317/06 | 23.61029 | 7.74115 | 8   | 116  | n   | y   | <i>Acacia</i>  | 200       | Branch |                    |
| 29 | 20050317/07 | 23.64922 | 7.72138 | 8   | 117  | y   | y   | <i>Acacia</i>  | 100       | Branch |                    |
| 30 | 20050317/08 | 23.64922 | 7.72138 | 8   | 117  | y   | y   | <i>Acacia</i>  | 100       | Branch |                    |
| 31 | 20050318/01 | 23.68259 | 7.67193 | 8   | 118  | n   | y   | <i>Tamarix</i> | 80        | Branch | Small sample       |
| 32 | 20050318/02 | 23.74512 | 7.58115 | 8   | 121  | y   | y   | ?              |           | cave   |                    |
| 33 | 20050318/07 | 23.74512 | 7.58115 | 8   | 121  | y   | y   | ?              |           | cave   |                    |
| 34 | 20050318/08 | 23.74512 | 7.58115 | 8   | 121  | n   | y   | ?              |           | cave   |                    |
| 35 | 20050318/11 | 23.77801 | 7.53555 | 8   | 122  | y   | y   | <i>Tamarix</i> | 80        | branch |                    |
| 36 | 20050318/12 | 24.04165 | 7.46094 | 9   | 129  | y   | y   | <i>Acacia</i>  | 180       | Branch |                    |
| 37 | 20050319/01 | 24.05488 | 7.43913 | 9   | 129  | y   | y   | <i>Tamarix</i> | 160       | Branch | Camera trap site   |
| 38 | 20050319/02 | 24.05488 | 7.43913 | 9   | 129  | y   | y   | <i>Tamarix</i> | 150       | Branch | Camera trap site   |
| 39 | 20050319/03 | 24.05488 | 7.43913 | 9   | 129  | y   | y   | <i>Tamarix</i> | 80        | Branch | Camera trap site   |
| 40 | 20050319/04 | 24.06938 | 7.38788 | 9   | 130  | y   | y   | <i>Tamarix</i> | 70        | Branch | Cheetah site       |
| 41 | 20050319/04 | 24.05688 | 7.33771 | 9   | 131  | y   | y   | <i>Tamarix</i> | 175       |        |                    |
| 42 | 20050319/05 | 24.06938 | 7.38788 | 9   | 130  | y   | y   | <i>Tamarix</i> | 60        | Branch | Cheetah site       |
| 43 | 20050319/06 | 24.06938 | 7.38788 | 9   | 130  | y   | y   | <i>Tamarix</i> |           |        | Cheetah site       |
| 44 | 20050319/07 | 24.06938 | 7.38788 | 9   | 130  | y   | y   | <i>Tamarix</i> | 80        | Branch | Cheetah site       |
| 45 | 20050319/08 | 24.06938 | 7.38788 | 9   | 130  | y   | y   | <i>Tamarix</i> | 30        | Branch | Cheetah site       |
| 46 | 20050320/01 | 24.14866 | 7.05658 | 9   | 139  | y   | y   | <i>Tamarix</i> | 0         | ground | Incl. hair & seeds |
| 47 | 20050321/03 | 23.89907 | 6.53476 | 4   | 31   | y   | y   | <i>Acacia</i>  | 0         | ground |                    |
| 48 | 20050322/01 | 23.92265 | 6.19694 | 3   | 24   | y   | y   | <i>Acacia</i>  | 0         | ground | 2 samples (2)      |

Gr.: Grid (See Fig. 2.1)

Sec.: Sector (Note sector numbers marked with a '.5' indicates collected while walking)

(1) Tuareg guide's suggestion

(2) Two samples of which 1 in tin and 1 in plastic – moist sample.

## ANNEX IV

Camera trapping results: SSIG/OPNA survey, Ahaggar National Park, March 2005.  
Two cameras were deployed each night, resulting in 400.53 hours of camera trapping time.  
Cameras performed reliably and four species (3 mammals 1 bird) were photographed.

| Location                | East    | North    | Bait                           | Start               | Finish              | Traps | Hours | Active TM 1500                   | Passive TM550                     |
|-------------------------|---------|----------|--------------------------------|---------------------|---------------------|-------|-------|----------------------------------|-----------------------------------|
| Telouhet                | 6.0484  | 23.87068 | Sardines                       | 08/03/2005<br>21:05 | 09/03/2005<br>07:05 | 2     | 20.00 | 0                                | 0                                 |
| Ouadenki                | 6.48961 | 23.90804 | Sardines                       | 09/03/2005<br>18:55 | 10/03/2005<br>08:38 | 2     | 27.43 | Rüppell's<br>fox x 9             | Hare x 1                          |
| Oued<br>"Tabayoqq-ine"* | 6.78887 | 23.96643 | Sardines                       | 10/03/2005<br>15:01 | 11/03/2005<br>11:01 | 2     | 40.00 | Rüppell's<br>fox x 2             | 0                                 |
| Aoussokarene            | 6.75707 | 23.90308 | Sardines                       | 11/03/2005<br>18:43 | 12/03/2005<br>07:16 | 2     | 25.10 | Rüppell's<br>fox x 1             | 0                                 |
| Tit-n-Efara             | 7.04705 | 23.72907 | Sardines                       | 12/03/2005<br>17:50 | 13/03/2005<br>06:48 | 2     | 25.93 | Hare x 1                         | Hare x 1                          |
| "Timniwin"              | 7.46559 | 23.54921 | Sardines                       | 13/03/2005<br>18:18 | 14/03/2005<br>07:41 | 2     | 26.77 | 0                                | 0                                 |
| Ajerkhjer               | 7.59737 | 23.28545 | Sardines                       | 14/03/2005<br>18:19 | 15/03/2005<br>07:45 | 2     | 26.87 | Rüppell's<br>fox x 4<br>Hare x 1 | 0                                 |
| Tadant                  | 7.86826 | 23.03536 | Sardines                       | 15/03/2005<br>18:23 | 16/03/2005<br>07:33 | 2     | 26.33 | Dog x 2                          | Hare x 1                          |
| Hônadj                  | 7.91423 | 23.37951 | Sardines                       | 16/03/2005<br>17:56 | 17/03/2005<br>07:34 | 2     | 27.27 | 0                                | 0                                 |
| Oued Assaouter          | 7.71037 | 23.66017 | Sardines                       | 17/03/2005<br>18:54 | 18/03/2005<br>07:54 | 2     | 26.00 | Rüppell's<br>fox x 1             | 0                                 |
| Ti-n<br>Hadjdjene★      | 7.43913 | 24.05488 | Sardines                       | 18/03/2005<br>18:33 | 19/03/2005<br>07:47 | 2     | 26.47 | Rüppell's<br>fox x 5             | Rüppell's<br>fox x 5              |
| Inahidane               | 7.06412 | 24.08487 | Sardines<br>& natural<br>water | 19/03/2005<br>18:21 | 20/03/2005<br>07:36 | 2     | 26.50 | 0                                | 0                                 |
| Ouadenki                | 6.42895 | 23.87796 | Sardines                       | 20/03/2005<br>20:20 | 21/03/2005<br>08:55 | 2     | 25.17 | Hare x 2                         | 0                                 |
| Tadjeret                | 6.18491 | 23.92249 | Camel<br>carcass<br>(cheetah)  | 21/03/2005<br>18:16 | 22/03/2005<br>07:57 | 2     | 27.37 | Dog x 11                         | Dog x 10:<br>Rüppell's<br>fox x 1 |
| Idelès                  | 5.8925  | 23.78265 | Sardines                       | 22/03/2005<br>19:46 | 23/03/2005<br>07:26 | 2     | 23.33 | 2 photos<br>lost                 | Barn Owl<br>x 1                   |

\* Both cameras covering a *Tamarix* bearing predator scat on the branches, and known for use by cheetahs to the OPNA Agents de Conservation, see upper fox photo below.

★ TM1500 on scat tree , see lower fox photo below.



Mohamed Belghoul (OPNA) and Amina Fellous (ANN), setting a camera trap.



Amel Belbachir-Bazi and Farid Belbachir (University of Béjaïa), setting a camera trap.



Cape Hare (left); Rüppell's foxes at cheetah 'scat trees' (centre above and below) and dog (at cheetah kill, right). Photographed using Trailmaster camera traps. SSIG/OPNA survey of Ahaggar National Park, March 2005.

**ANNEX V:** Bird species recorded on SSIG/OPNA survey of Ahaggar, March 2005. Nomenclature follows Clements (2000, updated 2004).

| NAME                      | Species                          | Note  | 0.5° Grid<br>(see Fig. 2.1) |
|---------------------------|----------------------------------|---|-----------------------------|
| Heron                     | <i>Ardea</i> sp.                 | Tracks at water point   | 3                           |
| Little Egret              | <i>Egretta garzetta</i>          | 1 dead tangled in <i>Faidherbia albida</i> branches           | 4                           |
| Black Kite                | <i>Milvus migrans</i>            |   | 3                           |
| Egyptian Vulture          | <i>Neophron percnopterus</i>     | Single adults seen only                                       | 6,7                         |
| [Lappet-faced Vulture]    | <i>[Torgos tracheliotus]</i>     | Provisional identification from a found primary feather only. | 5                           |
| Western Marsh Harrier     | <i>Circus aeruginosus</i>        |   | 2                           |
| Pallid Harrier            | <i>Circus macrourus</i>          |   | 2,3,4,6                     |
| Long-legged Buzzard       | <i>Buteo rufinus</i>             |   | 3,4,9                       |
| Booted Eagle              | <i>Aquila pennatus</i>           | 1 soaring bird  | 3                           |
| Eurasian Kestrel          | <i>Falco tinnunus</i>            |   | 4,8                         |
| Lanner Falcon             | <i>Falco biarmicus</i>           |   | 3,6,10                      |
| Cream-colored Courser     | <i>Cursorius cursor</i>          |   | 8                           |
| Crowned Sandgrouse        | <i>Pterocles coronatus</i>       |   | 3,6,8,9                     |
| Lichtenstein's Sandgrouse | <i>Pterocles lichtensteinii</i>  |   | 4,5,6,8                     |
| Rock Pigeon               | <i>Columba livia</i>             |   | 3,5                         |
| Eurasian Turtle-Dove      | <i>Streptopelia turtur</i>       |   | 6,7,9                       |
| Laughing Dove             | <i>Streptopelia senegalensis</i> |   | 2,9                         |
| Barn Owl                  | <i>Tyto alba</i>                 | Camera trap picture   | 3                           |
| European Scops-Owl        | <i>Otus scops</i>                |   | 3                           |
| Pharaoh Eagle-Owl         | <i>Bubo ascalaphus</i>           | Pellets only  | 3,4,7                       |
| Little Owl                | <i>Athene noctua</i>             |   | 2,3,5,8                     |
| Swift (Common?)           | <i>Apus cf. apus</i>             |   | 3                           |
| European Bee-eater        | <i>Merops apiaster</i>           |   | 4                           |
| Hoopoe                    | <i>Upupa epops</i>               |   | 4,5,6,8,9                   |
| Desert Lark               | <i>Ammomanes deserti</i>         |   | 3                           |
| Greater Hoopoe-Lark       | <i>Alaemon alaudipes</i>         |   | 5                           |
| Lark (Crested?)           | <i>Galerida cf. cristata</i>     |   | 2                           |
| Rock Martin               | <i>Ptyonoprogne fuligula</i>     |   | 4,5,6,8,9                   |
| Barn Swallow              | <i>Hirundo rustica</i>           |   | 3,4,5,6,9,10                |
| Common House-Martin       | <i>Delichon urbica</i>           |   | 3                           |
| White Wagtail             | <i>Motacilla alba</i>            |   | 3,4                         |
| Yellow Wagtail            | <i>Motacilla flava</i>           |   | 2,5,6                       |
| Tawny Pipit               | <i>Anthus campestris</i>         |   | 7                           |
| Blue Rock-Thrush          | <i>Monticola solitarius</i>      | 1 ♀ and 1 ♂   | 6,8                         |
| Common Chiffchaff         | <i>Phylloscopus collybita</i>    | [ <i>Phylloscopus</i> sp. frequent]                           | 4                           |
| Western Bonelli's Warbler | <i>Phylloscopus bonelli</i>      |   | 3                           |
| African Desert Warbler    | <i>Sylvia deserti</i>            |   | 3,4,8                       |
| Western Orphean Warbler   | <i>Sylvia hortensis</i>          | Seen once   | 8                           |
| Subalpine Warbler         | <i>Sylvia cantillans</i>         | Frequent  | 3,4                         |
| Sardinian Warbler         | <i>Sylvia melanocephala</i>      | Frequent  | 3,4                         |
| Spectacled Warbler        | <i>Sylvia conspicillata</i>      | Several seen  | 3                           |
| Common Redstart           | <i>Phoenicurus phoenicurus</i>   |   | 4                           |
| White-tailed Wheatear     | <i>Oenanthe leucopyga</i>        | Frequent  | 1 to 10                     |
| Northern Wheatear         | <i>Oenanthe oenanthe</i>         |   | 1,4,8                       |
| Fulvous Chatterer         | <i>Turdoides fulvus</i>          |   | 2,4,5,6                     |
| Southern Grey Shrike      | <i>Lanius meridionalis</i>       |   | 3,5,6,8,9                   |
| Woodchat Shrike           | <i>Lanius senator</i>            |   | 3,5,8,9                     |
| Brown-necked Raven        | <i>Corvus ruficollis</i>         |   | 2,3,4,5,6,7,8               |
| House Bunting             | <i>Emberiza striolata</i>        |   | 3,6                         |
| Trumpeter Finch           | <i>Bucanetes githaginea</i>      |   | 4,5,6,8                     |

### Additional notes on bird observations.

Bird observations reported here are particularly affected by restrictions on use of binoculars, strongly reducing the accuracy and efficiency of bird recording in the field.

The record of Lappet-faced vulture *Torgos tracheliotus* is placed in square brackets to indicate that it is provisional, depending on the discovery of a single moulted primary feather at a water point. The feather has been collected, but its Identity still requires confirmation by direct comparison with museum material.

Additional desert lark types (*Ammomanes* sp.) were observed on several occasions but not identified to species. Similarly a number of additional observations of incompletely identified *Phylloscopus* warblers, mostly *P. collybita* but with possible *P. trochilus*, are not included in the table.

Other species whose presence was suggested by partial or incomplete observations, but not listed in the main table were, a possible Red-throated pipit *Anthus cervinus* seen on 12<sup>th</sup> March, a possible *Oedicnemus* sp. heard calling at a camp site on evening of 19th March. A *Sylvia* sp. was glimpsed very briefly and partially in tamarix, among *S. melanocephala* and *S. cantillans* on 23<sup>rd</sup> March, which was distinguished by strong uneven charcoal smudging on the lower flanks. No identification was made, but superficial resemblance to Cyprus Warbler *S. melanothorax* (not previously recorded closer than southern Libya) was noted. This may be a species to bear in mind as a possible rarity in the Ahaggar area.

At Tamanrasset an Olivaceous warbler *Hippolais cf. pallida*. and Whitethroat *Sylvia communis* were noted singing on 7<sup>th</sup> March.

### ANNEX VI

Reptile species recorded on SSIG/OPNA survey of Ahaggar, March 2005. Nomenclature based on Bons and Geniez (1996). Photographs of reptiles were sent to Drs. U. Joger in Germany, and J. Viglione and P. Geniez in France, who provided the following provisional identifications, based on inspection of the photographs only.

| Species                                     | Note   | 0.5° Grid |
|---|--|-----------|
| <i>Tarentola ephippiata hoggarensis</i> [1] |  | 9         |
| <i>Stenodactylus petrii</i>                 |  | 8         |
| <i>Tropicolotes tripolitanus</i>            |  | 8         |
| <i>Tropicolotes steudneri</i> [2]           |  | 8         |
| <i>Agama impalearis</i> [3]                 | Male   | 2,5,6,7,9 |
| <i>Agama</i> sp.                            | Sub adult  | 5         |
| <i>Uromastix cf. geyri</i> [4]              |  | 3,5,6     |
| <i>Cf. Acanthodactylus</i> spp. [5]         |  | 3,4,5     |
| <i>Latastia longicaudata</i> [6]            | A Sahelian species, first recorded in Ahaggar by KDS in 2003, and seen again on this survey. | 4         |
| Unidentified Scincidae                      |  | 5         |
| <i>Psammophis shokari</i>                   |  | 5         |



## ANNEX VII

Arachnoids collected by KDS, primarily at camp sites and lunch stops, and sent to Dr. R. Bosmans in Belgium, who has provided the following provisional identifications.

| Family      | Genus               | Sp.  | Date       | Lat/Long               | Location                          | 0.5°<br>Grid | m | f | Collector | Habitat              |
|-------------|---------------------|------|------------|------------------------|-----------------------------------|--------------|---|---|-----------|----------------------|
| Gnaphosidae | <i>Haplodrassus</i> | n.i. | 13/03/2005 | N23.73227<br>E07.04986 | Tit-n-Efara                       | 5            |   | 1 | KDS       | Oued with<br>Acacia  |
| Gnaphosidae | <i>Nomisia</i>      | n.i. | 13/03/2005 | N23.54556<br>E07.46279 | "Djebel Toufrik",<br>Oued Tedjjet | 5            |   | 1 | "         | Oued with<br>Tamarix |
| Solifugidae |                     | n.i. | 15/03/2005 | N23.26089<br>E07.94022 | Tadant                            | 6            |   |   | "         | Oued with<br>Tamarix |
| Gnaphosidae |                     | n.i. | 16/03/2005 | N23.30643<br>E08.21267 | Tanet                             | 7            |   | 1 | "         | Oued with<br>Acacia  |
| Gnaphosidae |                     | n.i. | 17/03/2005 | N23.65835<br>E07.71142 | Oued Adjou                        | 8            | 1 | 1 | "         | Oued with<br>Tamarix |
| Gnaphosidae | <i>Leptodrassus</i> | n.i. | 20/03/2005 | N24.08907<br>E07.06948 | Telleghteba                       | 9            | 1 |   | "         | Oued with<br>Acacia  |
| Gnaphosidae | <i>Zelotes</i>      | n.i. | 21/03/2005 | N23.87435<br>E06.43319 | Ouadenki                          | 3            |   | 1 | "         | Oued with<br>Tamarix |
| Hersiliidae | <i>Hersilia</i>     | n.i. | 21/03/2005 | N23.87435<br>E06.43319 | Ouadenki                          | 3            |   | 1 | "         | Oued with<br>Tamarix |
| Gnaphosidae |                     | n.i. | 22/03/2005 | N23.9229<br>E06.18963  | Tadjeret                          | 3            |   | 1 | "         | Oued with<br>Tamarix |
| Gnaphosidae | <i>Nomisia</i>      | n.i. | 23/03/2005 | N23.78265<br>E05.89250 | Idelès                            | 2            |   | 1 | "         | Oued with<br>Acacia  |

Note: n.i. indicates not identified.

## ANNEX VIII

Locations in Fig. 7.1 where some of the archaeological features seen were noted.

| WPT | DATE      | Local<br>Time | N        | E       | Grid |  |
|-----|-----------|---------------|----------|---------|------|--|
| 140 | 09-Mar-05 | 12:31         | 23.92968 | 6.20569 | 3    | Stone settlement                                 |
| 263 | 10-Mar-05 | 18:02         | 23.91858 | 6.863   | 4    | Stone circles on hill top                        |
| 321 | 11-Mar-05 | 14:57         | 23.88152 | 6.73533 | 4    | Tumuli   |
| 113 | 12-Mar-05 | 16:43         | 23.7325  | 7.05269 | 5    | Tumuli   |
| 134 | 13-Mar-05 | 08:57         | 23.71546 | 7.10983 | 5    | Stone circle                                     |
| 164 | 13-Mar-05 | 09:49         | 23.79682 | 7.10751 | 5    | Tumulus  |
| 184 | 13-Mar-05 | 10:44         | 23.76349 | 7.27564 | 5    | Tumulus  |
| 192 | 13-Mar-05 | 10:55         | 23.73846 | 7.29295 | 5    | Rock engraving of Zebu; photo 107                |
| 245 | 13-Mar-05 | 15:58         | 23.60766 | 7.34706 | 5    | Tumulus  |
| 265 | 13-Mar-05 | 17:04         | 23.56949 | 7.41481 | 5    | 'Sombrero'                                       |
| 365 | 14-Mar-05 | 10:49         | 23.56399 | 7.56367 | 8    | Tumulus  |
| 409 | 14-Mar-05 | 15:47         | 23.45162 | 7.53339 | 6    | Tumulus  |
| 511 | 15-Mar-05 | 10:03         | 23.277   | 7.67897 | 6    | 'Sombrero'                                       |
| 612 | 15-Mar-05 | 15:42         | 23.1637  | 7.92457 | 6    | Stone oval                                       |
| 641 | 15-Mar-05 | 16:32         | 23.04033 | 7.87552 | 6    | Observation point of Tadant Archaeology          |
| 113 | 17-Mar-05 | 11:33         | 23.53794 | 7.87463 | 8    | Stone circles - ?recent                          |
| 187 | 17-Mar-05 | 16:12         | 23.65638 | 7.69058 | 8    | 2 Tumuli   |
| 293 | 18-Mar-05 | 12:04         | 23.7816  | 7.55411 | 8    | Two stone circle buildings at entrance to Guelta |
| 301 | 18-Mar-05 | 15:18         | 23.77737 | 7.54057 | 8    | Stone building                                   |
| 439 | 19-Mar-05 | 14:50         | 24.05355 | 7.18479 | 9    | Tumulus  |
| 441 | 19-Mar-05 | 14:52         | 24.05159 | 7.17773 | 9    | Tumulus  |
| 547 | 20-Mar-05 | 14:34         | 24.26835 | 6.83063 | 10   | 'Sombrero's' to NW                               |
| 749 | 22-Mar-05 | 17:04         | 23.82773 | 6.09362 | 3    | Tumulus  |