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## Italian Journal of Zoology

Publication details, including instructions for authors and subscription information:  
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Published online: 06 Dec 2007.

To cite this article: P. Gaubert, F. Jiguet, P. Bayle & F. M. Angelici (2008) Has the common genet (*Genetta genetta*) spread into south-eastern France and Italy?, *Italian Journal of Zoology*, 75:1, 43-57, DOI: [10.1080/11250000701691812](https://doi.org/10.1080/11250000701691812)

To link to this article: <http://dx.doi.org/10.1080/11250000701691812>

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## Has the common genet (*Genetta genetta*) spread into south-eastern France and Italy?

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### Abstract

The common genet (*Genetta genetta*) is a small carnivoran that was probably introduced from Maghreb into south-western Europe. We reassessed its easternmost European distribution from 110—mostly new—data collected in south-eastern France and Italy, and tested for potential habitat selection, to finally re-evaluate the role of the Rhône as a geographic barrier against eastward migrations. The species was more frequent in river valleys, wetlands and low-mountainous areas (south-eastern France), but also occurred in high-mountainous zones at the French–Italian border. Our results evidenced a significant increase of records (13-fold the number of occurrences previously known) and an apparent absence of habitat selection by the common genet, suggesting a recent, natural spread from the right bank of the Rhône through a zone of ~30 km with artificial bridges. We finally provide a synthetic, re-assessed distribution map of the common genet in France and Italy, combining 4317 occurrences from French national databases and the 110 records collected herein.

**Keywords:** Europe, non-native species, Carnivora, Viverridae, *Genetta genetta*, range expansion

### Introduction

The common genet *Genetta genetta* (Linnaeus, 1758) (Carnivora, Viverridae) occupies various types of habitats in its native range, from savannah zones throughout sub-Saharan Africa to the forested areas of Maghreb (Delibes & Gaubert in press) and the coastal regions of the southern Arabian peninsula (Harrison & Bates 1991). It is supposed to have been introduced from Maghreb during historical times (Morales 1994) and to have successfully spread into south-western Europe since then. This small carnivoran is now established in Portugal, Spain (including the Balearic Islands) and, as its easternmost limit in Europe, France (Delibes 1999). The most recent, comprehensive review concerning the distribution of the common genet in France was published almost 20 years ago (Livet & Roeder 1987). The Loire and Rhône rivers have been traditionally considered as geographic barriers for the species (northward and eastward, respectively), thus restricting its range to the south-western part of the country (Trouessard

1884; Schauenberg 1966; Delibes 1999). However, for more than 100 years, numerous sightings have been reported outside this area, including cooler climatic regions such as northern and north-eastern France (Remy 1948; Livet & Roeder 1987; Léger et al. 1998; Vincent 2000), and even Switzerland, Germany and the Netherlands (Schauenberg 1966; Van Wijngaarden 1975; Léger et al. 1998); but the hypothesis of erratic or released specimens was always preferred (Schauenberg 1966; Léger et al. 1998; Vincent 2000), so that breeding populations have not been envisaged beyond the Loire and Rhône rivers.

Livet and Roeder (1987) anticipated that the Rhône might not constitute an impassable geographic barrier, the common genet being recorded in several French departments east of the river, notably in the region of Provence–Alpes–Côte d'Azur (PACA; south-eastern France). However, the records, detailed in Fayard et al. (1984), concerned only eight localities distributed over five departments from 1965 to 1983, which is very weak for

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considering a putative spread of the species in PACA (*contra* Vincent 2000) and even Italy, where *G. genetta* had only been mentioned twice in the literature (see Angelici 2003). Since the work of Livet and Roeder (1987), there have been a few, fragmented ‘grey literature’ publications concerning more recent records of the common genet in PACA (database of Conservatoire—Etudes des Ecosystèmes de Provence—Alpes du Sud [CEEP]; P.B., personal observation), without providing clear evidence for a natural establishment of the species in the area. The PACA region, with its Mediterranean climate, oak forests, dense shrub cover and rocky zones is likely to represent a favourable mosaic of habitats for the common genet (Virgós & Casanovas 1997; Virgós et al. 2001; Zuberogoitia et al. 2002), although the environmental parameters influencing its distribution in France remain poorly known.

The objectives of our study were (i) to reassess the distribution of the common genet in south-eastern France (PACA) and Italy through a comprehensive survey of records, and (ii) to test for potential habitat selection in PACA, in order to finally re-evaluate the role of the Rhône as a geographic barrier against eastward migrations.

## Materials and methods

The common genet is the only Viverridae species present in Europe. It is characterized by a very peculiar coat pattern (spotted body and annulated tail) and the use of specific sites for defecation (latrines), which make its misidentification with the other European species of mammals highly unlikely.

The validity of each new record for PACA and Italy was checked using the phenotypic (coat pattern) and/or track (latrines) descriptions provided by the data collectors (see Livet & Roeder 1987 for identification criteria).

We collected new data concerning the distribution of the common genet in PACA and Italy through two regional databases and the activation of a network of institutions, agencies and associations dealing with wildlife (Table I; see also Appendix I and Acknowledgements). The six administrative departments constituting the PACA region were targeted: Vaucluse (Vau), Var, Bouches-du-Rhône (BdR), Alpes-Maritimes (AIM), Alpes de Haute-Provence (AHP), and Hautes-Alpes (HA).

We built a synthetic map representing what was previously known of the species distribution in France and Italy through the compilation of 4317 records taken from four databases managed by the Service du Patrimoine Naturel [SPN] (Muséum National d’Histoire Naturelle [MNHN], Paris) (Table I). The two localities from Italy mentioned in the literature were also included (1967–68 and 1979; Baratti 1988). Given the heterogeneity of collection (through time and space) of such a dataset and its partial lack of information (e.g. missing collector names and dates of collection), this map was only used to provide a state of knowledge, including density of records, that would contribute to locating the geographic origin of migrants into PACA.

We assigned coordinates to all the localities using the Institut Géographique National (IGN) website ([http://www.ign.fr/affiche\\_rubrique.asp?rbr\\_id=](http://www.ign.fr/affiche_rubrique.asp?rbr_id=)

Table I. List of (i) organizations that provided records for reassessing the range of the species in south-eastern France (PACA) and Italy (Figure 1) and (ii) databases from which the synthetic distribution map of the common genet in France was built (Figure 3). See Acknowledgements for a detailed list of the contributors.

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### (i) Organizations (PACA and Italy)

- Office National de la Chasse et de la Faune Sauvage (ONCFS)
- Fédérations Départementales des Chasseurs (FDC)
- Office National des Forêts (ONF)
- Istituto Nazionale per la Fauna Selvatica (INFS)
- Natural history museums
- National parks
- Natural regional parks and Reserves
- Naturalist associations
- Wildlife recovery centres and research Stations

### (ii) Databases (France)

- Mammifères sauvages de France 1978–1984 (Société Française pour l’Etude et la Protection des Mammifères [SFPEM])
  - Enquête Carnivores 1983–1985 (Office National de la Chasse et de la Faune Sauvage)
  - Zones Naturelles d’Intérêt Ecologique Faunistique et Floristique [ZNIEFF], from 1982 (Ministère de l’Environnement et du Développement Durable)
  - Arrêtés de Protection de Biotopes [APB], from 1980
  - Mammifères (Conservatoire - Etudes des Ecosystèmes de Provence – Alpes du Sud [CEEP])
  - Réserves de Chasse, 1998–1999 (Muséum National d’Histoire Naturelle, Paris)
-

1745&lng\_id=FR) when the commune was taken as the reference point. We used collectors' information whenever coordinates were available for more accurate locations.

We finally built a map using a UTM 10 × 10 km grid that combined the information from both the newly collected data from PACA+Italy and the synthetic map (country scale) to provide a standardized projection of the species' reassessed distribution at the European scale (see Araujo et al. 2005).

We looked for temporal trends in the number of records of common genets in PACA and Italy through log-linear models, where the units were the number of records per decade partitioned in seven different areas (the six French administrative departments of PACA, plus Italy). We used five 'decades', as follows: 1956–69, 1970–79, 1980–89, 1990–99, 2000–2005. We estimated the temporal trend by fitting the model with an additive effect of site (qualitative variable) and time (quantitative variable) assuming a Poisson distribution of the number of observations and using a log link function. We also tested for possible among year variations added to a linear trend through the addition of time as a qualitative variable to the previous model.

We tested for potential habitat selection of the common genet in PACA in order to assess whether the species was a habitat specialist or generalist in its easternmost invasive range. Variables related to land cover features within PACA were obtained using the geographical information system package ArcView 3.2 (ESRI, Redlands, CA) and Corine Land Cover (<http://www.ifen.fr/donIndic/Donnees/corine/presentation.htm>). The latter is a national geo-referenced database figuring the main habitats as contiguous polygons classified in 44 different land cover categories. In PACA, we imprinted a buffer (radius=5 km) around each genet sighting (removing repeated records), and then superimposed all the buffers on the land cover database to calculate proportions and average polygon sizes (for the 44 land cover categories) they included. These estimates were further compared to similar values obtained for the whole region by considering land cover categories that represented at least 1% of the buffer land covers (=18 land cover classes).

## Results

Altogether, we collected 104 records of *G. genetta* in PACA from 1956 to 2004 (Appendix I; Figure 1), of which 10 were extracted from 'grey' literature (Cheylan & Bergier 1979; Guérin & Orsini 1984; Parc National des Ecrins 1994; Dhermain 1998;

Dhermain & Durand 2000; Dhermain et al. 2003a, 2003b). The greatest numbers of records were found in BdR and Var (48 and 20, respectively; Figures 1 and 2). We found  $\geq 5$  records in each of the other French departments and Italy. The common genet was mostly present in the Mediterranean area ( $\chi^2=16.4$ ,  $df=1$ ,  $P=0.0001$ ), but was also recorded in the Alpine area (HA1, AIM, Italy). A part of the points of occurrence followed low altitude and topographically flat zones, including river valleys (Rhône, Durance, Verdon) and wetlands (Camargue delta). Two of the areas where the common genet was sighted most frequently were along the Durance, at the zone of confluence with the Verdon (North-East BdR–South-West AHP), and the Camargue (Rhône delta, South-West BdR). Low-mountainous zones yielded numerous sightings of common genets, including the massif de la Sainte-Baume (East BdR–West Var), and, to a lesser extent, the massif de la Sainte-Victoire (North-East BdR). Those distributional 'hotspots' have produced regular sightings of common genets since the early 1980s (Figure 1), whereas no census activities targeted on the species has taken place. Other records from BdR and Var concerned the easternmost part of the low-mountainous massif des Alpilles (North-West) and Comps-sur-Artuby (North-East), respectively. Northernmost records in Vau were located in the Rhône plain (Caderousse; North-West) and in the surroundings of Mont Ventoux (North). The common genet was sighted northerly in AHP, following the valleys of the Durance (Sisteron and Melve) and Bléone (Le Brusquet). In HA1, its presence was noticed in southern Laragnais (South-West) and within the massif du Pelvoux (Centre-North), in a high-mountainous zone (e.g. Vallouise: 1163 m). In AIM, the common genet was found in the northern valley of the Var river and its confluents (including the Vésubie). Six records (1990–2001) came from the commune of Sospel (East). Two mentions were from the high-mountainous zone of Péone and Valberg (North-West). The species appeared to be absent from the low-mountainous massif des Maures (Var) and massif de l'Estérel (Var-AIM). Four unpublished records from 1988 to 2004 were found for Italy. All came from the north-western, high-mountainous part of the country (Figure 1). Records were scattered between the Piedmont (Alta Val di Susa, Val d'Ala, Alto Canavese) and the Vallée d'Aoste (Valpelline, La Thuile) regions.

The first mentions of common genets (1956–1969) showed no structured geographic pattern across PACA and Italy (Figure 1). They were located in areas where, most of the time, they would

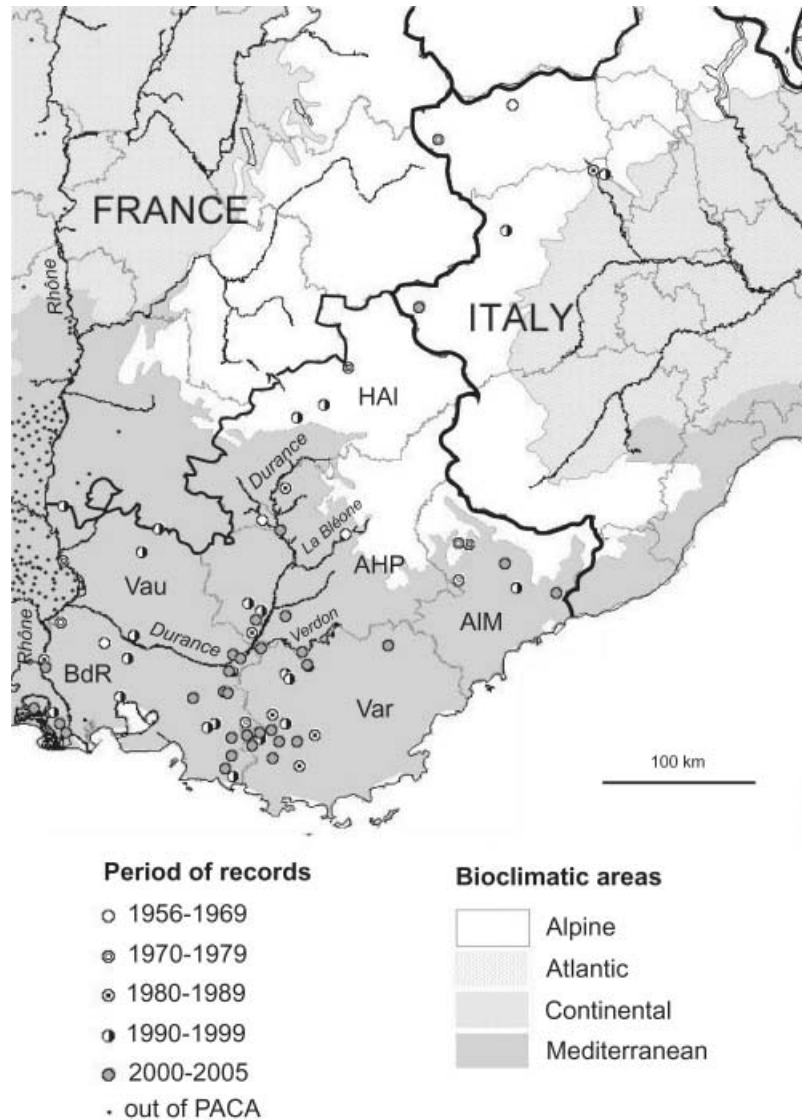


Figure 1. Re-assessed distribution map of the common genet (*Genetta genetta*) in Provence-Alpes-Côte d'Azur (PACA), south-eastern France, and Italy. The main rivers are indicated. Departments of PACA are named as follows: Vau (Vaucluse), BdR (Bouches-du-Rhône), Var, AIM (Alpes-Maritimes), Alpes de Haute-Provence (AHP), HAI (Hautes-Alpes).

not be recorded during later decades. BdR and Var were the only two departments that showed a regular increase of mentions across decades (from the 1980s in the case of Var; Figure 2), mainly through three hotspots with frequent sightings, notably in 2000–2005, including the Camargue delta, the massif de la Sainte-Baume, and the massif de la Sainte-Victoire (plus the neighbouring Durance valley). There was no apparent geographic continuum between these hotspots and neighbouring areas that had historical, high density records, at PACA's north-western boundary (Gard and Ardèche). Log-linear models applied to decadal number of records in PACA and Italy indicated a significant linear increase over the seven geographic partitions during the five decades ( $F=10.35$ ,  $df=1,27$ ,  $P=0.004$ ), with no

between-year significant variations beyond that linear trend ( $F=0.55$ ,  $df=3,24$ ,  $P=0.65$ ).

Thirty-one records of common genets were accompanied by information about habitat, evidencing a mosaic of potential habitat types occupied by the species in PACA and Italy: riparian forest (5 records), wetlands (1), broadleaf—including oak—forest (3), mixed broadleaf × coniferous forest (2), coniferous forest (2), scrubland ('garrigue') (4), rocky zones (4), mountainous zones (2), agricultural area (2), and urbanized area (4). We found no difference in proportions of habitats in the PACA region as a whole and around records of common genets (5 km buffer) for the 18 land cover classes that represented  $\geq 1\%$  of the total buffer area (Wilcoxon rank-sum test:  $W=326$ ,  $n=18$ ,

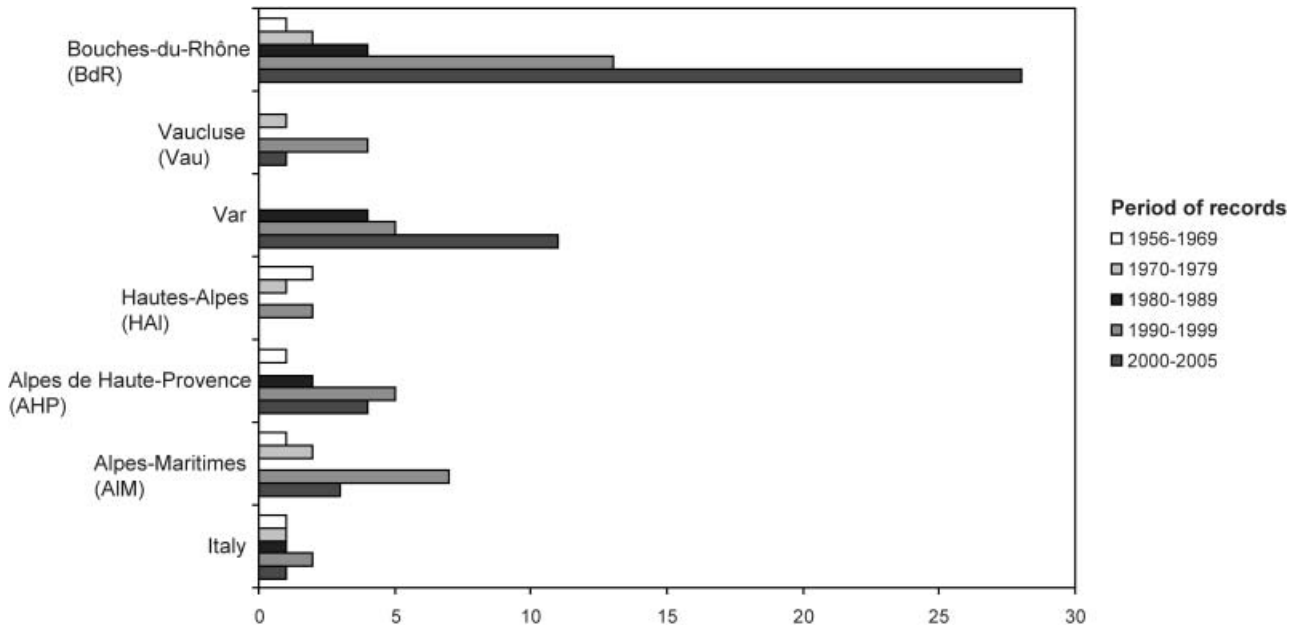


Figure 2. Distribution of records of the common genet (*Genetta genetta*) in PACA and Italy according to periods of time.

$P=0.839$ ). Habitat patches were slightly smaller within buffers around sightings, compared to all habitat patches in the region (average 145 vs. 170 ha; paired  $t$ -test:  $t=-6.02$ ,  $df=18$ ,  $P<0.001$ ), although this could be partly due to larger habitat polygons being systematically cut by buffer limits.

The compilation of the four national databases indicated the presence of the common genet in 58 French departments (Figure 3). The species occupied all the bioclimatic regions available, from the Atlantic (largest distribution) to the Mediterranean, continental and alpine areas. The traditional range of the species (i.e. South of the Loire and West of the Rhône) was recovered, with the highest density of records in south-western and western France. We identified 21 departments showing records north and east of the Loire, among which four of them had  $>10$  sightings (northernmost limit ca.  $49^{\circ}$  N; Figure 3). The other mentions were patchily distributed from north-western (ca.  $4^{\circ}$  W) to north-eastern France (ca.  $7^{\circ}$  E). East of the Rhône, but not included in PACA, were four sightings in Drôme (bordering Vau and AHP). In total, only eight records from PACA (national databases) and two records from Italy (Baratti 1988) were recovered.

## Discussion

### *A recent, natural spread into south-eastern France and Italy?*

We obtained a total of 104 records of common genets in PACA, representing a 13-fold increase of

the number of occurrences published in Fayard et al. (1984). This result raises two alternative hypotheses: (1) the presence of the species had been overlooked, at least from the published resources available, or (2) the common genet has genuinely increased its range. Mentions of *G. genetta* in PACA in the course of the 19th and 20th centuries are difficult to use because they remain scarce and contradictory (Hughes 1928; Guérin & Orsini 1984). The poor quality of the historical record prompted Guérin and Orsini (1984) to interpret new sightings of the species in Var as a relict population derived from a few introduced specimens. However, the significant increase of records in PACA and Italy, and the apparent absence of habitat selection by the common genet, fit with a scenario expected under invasion of a new range by a non-specialist and/or populations at disequilibrium with their environment (Guisan & Thuiller 2005). The fact that there was a positive correlation between the number of records and the number of collectors (data not shown) is not in contradiction with a genuine spread of the common genet in its south-easternmost European range. Indeed, observation pressure can be considered stable across decades, since no specific census targeted on the species has been undertaken in the study region, and very few collectors had more than one record per decade.

We suggest, following the intuition of Livet and Roeder (1987), that all the records collected in our study represent individuals originating from a natural spread across the Rhône. First of all, the

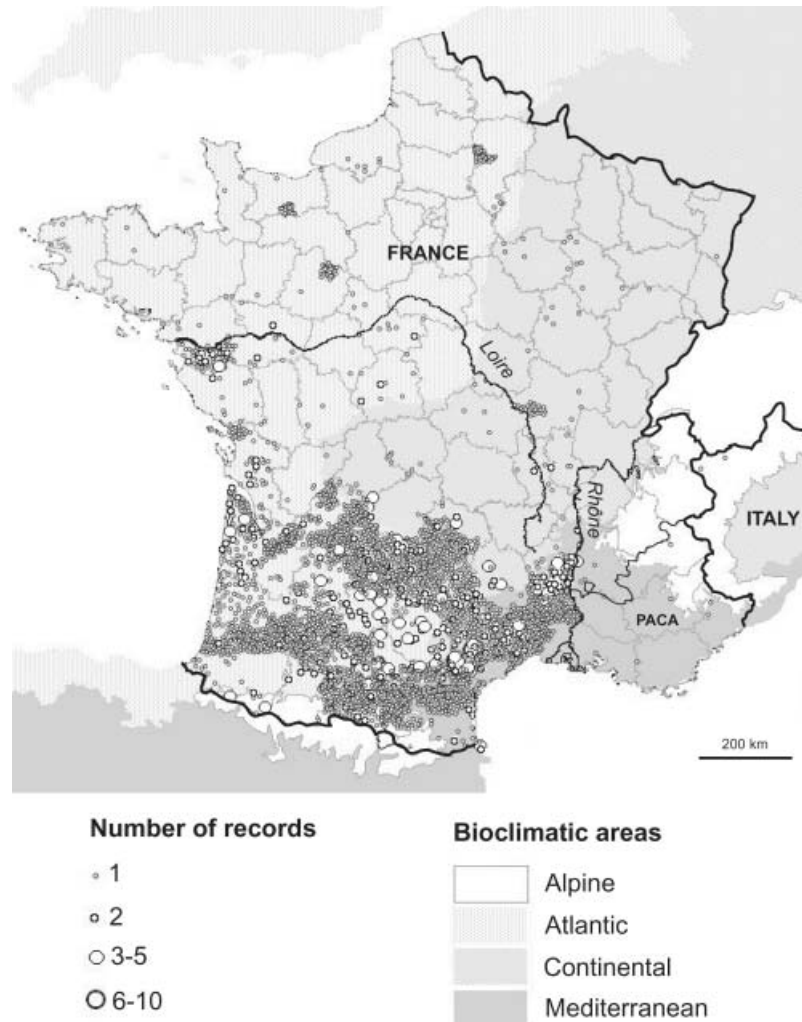


Figure 3. Synthetic distribution map of the common genet (*Genetta genetta*) based on four national databases (France) and literature sources (Italy), showing record density and the low number of records in PACA before this study. The Loire and Rhône rivers are indicated as 'traditional' geographical boundaries to the species range.

hypothesis of released or escaped specimens does not appear plausible nowadays. Indeed, it probably holds its root from references to French colonists moving back to France with *G. genetta* as pet after the independence of Algeria in 1962 (see Léger et al. 1998; Vincent 2000). However, it is hardly conceivable that common genets from Maghreb are now illegally kept in captivity by private owners. Second, and more substantially, the density of records of common genets in Gard and Ardèche (along PACA's north-western boundary) and in the Camargue delta (Figure 3) strongly argues for the existence of healthy populations at range periphery, from which presaturation dispersal (Swenson et al. 1998) may have been possible. However, our interpretations remain limited by (1) the nature of our records (random data collection), which does not allow us to correlate abundance to frequency,

and (2) the absence of knowledge on the population dynamics of the common genet.

Dispersal routes for the species towards south-eastern France and Italy are difficult to trace back, all the more because it is probable that, despite our efforts, we may have obtained an incomplete picture of its distribution across PACA. However, the hydrographical and road networks (Manufacture Française des Pneumatiques Michelin 2003) suggest that a zone of ~30 km between Arles and Avignon along the Rhône river might constitute the passage that allowed the common genet to spread into PACA. Indeed, from the estuary of the Grand Rhône, the first two bridges crossing the Rhône are located in Arles, where two records of common genets (Trinquetaille) were mentioned in 1981 (Appendix I). Two other bridges are found in the area between Beaucaire and Tarascon, of which one



is situated outside the urban zone (road D20). The last bridge before Avignon is in the surroundings of Aramon, linking roads D2 and D35 across a natural landscape. Given the ability of common genets to occupy, at least temporarily, urbanized areas (Admasu et al. 2004; this study), the crossing of the Rhône may have taken place through bridges both within and near the above-mentioned cities. Other rivers of PACA (e.g. Durance, Verdon) do not represent geographical obstacles to dispersal given that their widths and currents are far less important than those of Rhône due to the activity of several dams.

The distribution of *G. genetta* in Italy showed no interpretable spatial or temporal structure (Figures 1 and 2), and there was no apparent geographical connection with France. Although Palomares and Delibes (1988) suggested a potential for long-distance dispersals (one male covered  $\sim 50 \text{ km}^2$  during a period of  $\sim 4$  months in southern Spain), it remains impossible to assess whether the distributional gaps observed with Italian sightings (also true for northern, north-eastern and eastern France) represent genuine dispersal patterns or incomplete occurrence sampling. The Italian records showed that the common genet could be found in high mountainous areas (also sighted in Parc Naturel Régional du Queyras, HA1, France; M. Blanchet, personal observation). However, points of occurrence from a given area do not necessarily constitute a valid indicator of habitat suitability. In our case, and similarly to Spain (Virgós et al. 2001), the general distribution of occurrences in France suggests instead that high elevations do not represent ecological conditions favourable to the species.

#### *The utility of four national databases in assessing distribution patterns*

Our reassessment of the range of the common genet in France resulted in a different distribution map (Figure 3) to those previously published (Schauenberg 1966; Fayard et al. 1984; Livet & Roeder 1987; Delibes 1999). Interestingly, the compilation from four national databases did not yield an extended range compared to previous works, but rather (1) confirmed that the species was well-represented in western and south-western France, and (2) highlighted new areas but at the same time failed to recover some departments from which they were mentioned (see Livet & Roeder 1987). One explanation for such discrepancies is that some of these national databases, once produced, were never updated. For instance, 'Mammifères sauvages de France' (1978–1984) did

not integrate the data available in Livet and Roeder (1987), although it was the same coordinator and publisher in both productions (Société Française d'Etude et de Protection des Mammifères). Another explanation is that the regular inclusion of literature sources into such databases was not envisaged, so that knowledge on distribution was not updated. For instance, numerous publications have provided comprehensive surveys of the common genet at departmental or regional scales, but have never been integrated to the building process of these databases (Remy 1948; Rode 1948; Niort 1951; De la Comble 1963; Léger 1998, 1999; Léger et al. 1998; Destre 2000; Vincent 2000; Tessier & Paillat 2001).

Our map might also reflect a usual bias inherent to large-scale distribution censuses, e.g. the unbalanced response of administrative areas to coordinated surveys and collecting bias due to geographic artefacts (Graham et al. 2004). For instance, departments with a moderate number of records like Tarn, Tarn-et-Garonne and Lot-et-Garonne were surrounded by departments with high densities of sightings (south-western France; Figure 3); this may be diagnostic of biases in response levels among administrative areas. In the case of Lozère (centre-southern France), a recent publication clearly showed the underestimation of common genet records from the databases we used (Destre 2000). Also detrimental to the comparative analysis of the species range over time are the differences of 'quality' characterizing the published maps, some based on rough abundance representations (Schauenberg 1966; Livet & Roeder 1987), and others based on points of occurrence but using different grid levels (Fayard et al. 1984; Delibes 1999); some of these maps also excluded records considered as too infrequent (Livet & Roeder 1987; Delibes 1999). We thus provide here a standardized, re-assessed distribution map of the common genet through a UTM  $10 \times 10 \text{ km}$  grid, combining occurrence data sets obtained from both SPN-managed databases and our own investigations in PACA and Italy, which may be used for future comparative analyses at the European scale (Figure 4).

#### **Conclusion**

Our reassessment of the distribution of the common genet in south-eastern France and Italy suggested a previously undetected, natural spread, and evidenced that the Rhône no longer constitutes a geographic barrier to the eastward migration of the species. This result, together with an apparent absence of habitat specificity, confirms the successful, on-going, invasion of the common genet within

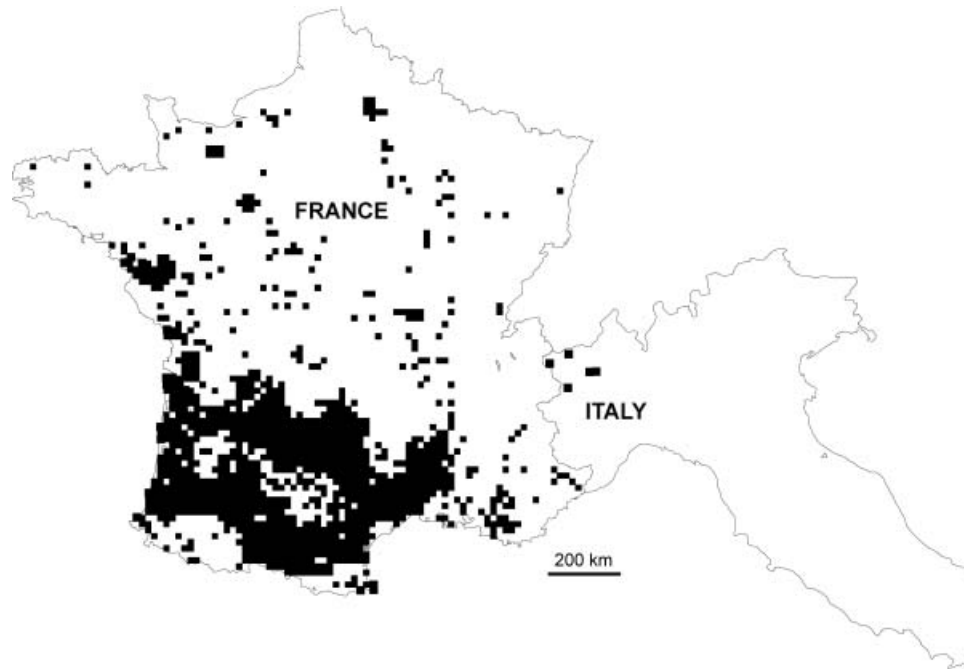


Figure 4. Re-assessed distribution map of the common genet (*Genetta genetta*) in France and Italy, combining data from Figures 1 and 3, using a  $10 \times 10$  UTM grid projection.

the south-western European ecological and trophic space. Given that prey and predator assemblages in Italy are similar to their French counterparts (although the grey wolf *Canis lupus* is more widespread; Boitani et al. 2003), favourable environmental conditions may be available for a further south-eastward spread of the species into Europe.

### Acknowledgements

We wish to thank the following people for having contributed to data collection on the distribution of the common genet in PACA and Italy: J. Barret (ONF, BdR), Y. Bielle and B. Lequette (P.N. du Mercantour, AIM), M. Blanchet (P.N.R. du Queyras, HAI), D. Chavis (P.N.R. du Verdon, AHP), G. Coste (FDC, BdR), E. Crégut (Muséum Requiens, Avignon, Vau), P. Daumas and S. Koest (Centre de Gestion de la Fonction Publique Territoriale 04, AHP), G. Farny (P.N. des Ecrins, HAI), M. Gallardo (P.N.R. du Luberon, AHP), P-F. Galvin (FDC, HAI), G. and N. Gaubert (Manosque, AHP), O. Gerriet and A. Villers (In-Natura, AIM), A. Guegant-Malaussa (Réserve Naturelle Volontaire du Domaine des Courmettes, AIM), P. Legendre (FDC, Var), O. Hameau (Villars, Vau), F. Léger (ONCFS, Gerstheim, France), E. Lux (Settore Tutela faunistica, Agricoltura, Montagna e Parchi, Verbania Fondotoce, Italy), G. Olioso (Grignan, France), A.

Olivier (Réserve Naturelle Volontaire de la Tour du Valat, BdR), J-P. Olivier (DIREN PACA, BdR), P. Orsini (Muséum d'Histoire Naturelle de Toulon et du Var), M. Pâques (Réserve Naturelle Volontaire de Saint-Honorat, AIM), L. Picco (Servizio Tutela della Fauna e della Flora, Torino, Italy), S. Pichard (Muséum d'Histoire Naturelle de Marseille, BdR), P. Tartary (Conservatoire Etudes des Écosystèmes de Provence / Alpes du Sud, Var), S. Urrio (Centre de sauvegarde de la faune sauvage, P.N.R. du Luberon, AHP). P.G. is thankful to P. Haffner, A. Grange-Lalaoui, J. Comolet-Tirman, J. Moret, L. Deharveng (MNHN), and F. Moutou (SFPEM) for having provided access to the national databases used in this study. We are grateful to M. Papeş, P.J. Taylor and P. Haffner for having significantly improved the early version of the manuscript. P.G. thanks G. Gaubert for computer support.

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Appendix I. Detailed list of the records of common genets in PACA and Italy used in this study. Columns 'LOCALITY' from 1 to 3 represent the exact point of occurrence, communes or councils, and departments (France) or regions (Italy), respectively. 'X-' and 'Y Lamb II ét' are latitudinal and longitudinal coordinates expressed in 'Lambert II étendu'.

TYPE OF OBSERVATION	DATE	COLLECTOR	SOURCE	LOCALITY 1	LOCALITY 2 (Commune or Council)	LOCALITY 3	COUNTRY	CODE OF COMMUNE	X LAMB II ét	Y LAMB II ét	HABITAT
Dead specimen	1/25/65	P. Orsini	SPN, Inventaire « Mammifères sauvages de France » - CEEP, « Mammals » data base	Le Brusquet	Le Brusquet	Alpes de Haute-Provence	France	04036	917882	1914598	
Sighting	12/29/84	J-P. Cantera	CEEP, « Mammals » data base	NW Sainte-Tulle	Sainte-Tulle	Alpes de Haute-Provence	France	04197	876642	1870875	
Sighting	7/23/88	Grs – FL 30	CEEP, « Mammals » data base	Between Melve and Claret, D 134 road	Melve	Alpes de Haute-Provence	France	04118	891385	1934949	
Sighting	8/15/93	S. Uriot	Centre de sauvegarde de la faune sauvage du PNR du Luberon	La Garde	Volx	Alpes de Haute-Provence	France	04245	880445	1880708	Rocks
Sighting	8/15/94	S. Uriot & V. Pelletier	Centre de sauvegarde de la faune sauvage du PNR du Luberon	La Garde	Volx	Alpes de Haute-Provence	France	04245	880445	1880708	
Latrines	8/16/94	S. Uriot & V. Pelletier	Centre de sauvegarde de la faune sauvage du PNR du Luberon	La Garde	Volx	Alpes de Haute-Provence	France	04245	880445	1880708	Rock face facing Volx
–	12/29/97	–	SPN, « Arrêtés Préfectoraux de Biotopes »	Eastern Luberon	Volx – Villeneuve – Oppedette	Alpes de Haute-Provence	France	04142 – 04242 – 04245	874882	1884074	Rocks, scree-covered slope and sand
Latrines	2/1/98	B. Lecard	CEEP, « Mammals » data base	Basses-Gorges du Verdon	Quinson	Alpes de Haute-Provence	France	04,158	898789	1862628	
Latrines	4/2/00	J-P. Dauphin	CEEP, « Mammals » data base	Sainte-Maxime	Quinson	Alpes de Haute-Provence	France	04,158	898789	1862628	
Sighting	1/1/01	F. Légér	ONCFS Alsace	Vallée du Jabron	Peipin	Alpes de Haute-Provence	France	04209	888766	1916504	
Sighting	5/27/01	P. Gaubert	Muséum National d'Histoire Naturelle, Paris	Manosque, road to Apt, after crossroad to Pierrevert	Manosque	Alpes de Haute-Provence	France	04112	878029	1876584	Urbanized area (block of villas)
Dead specimen	6/1/01	F. Légér	ONCFS Alsace	Plateau de Valensole	Valensole	Alpes de Haute-Provence	France	04230	891333	1878131	
Dead specimen	1/1/67	J. Besson (via P. Orsini)	SPN, Inventaire « Mammifères sauvages de France » - CEEP, « Mammals » data base	Puget-Theniers	Puget-Theniers	Alpes-Maritimes	France	06099	967896	1893969	
Dead specimen	1/1/70	J. Besson (via P. Orsini)	CEEP, « Mammals » data base	Valberg	Peone	Alpes-Maritimes	France	06094	968138	1910504	
Dead specimen	1/1/70	–	SPN, Inventaire « Mammifères sauvages de France »	Beuil	Beuil	Alpes-Maritimes	France	06016	972561	1909856	
Latrines	1/1/93	J-M. Cévasco (via Y. Bielle)	PN du Mercantour	near Saint-Vincent	Sospel	Alpes-Maritimes	France	06136	1011034	1888418	
Dead specimen	12/24/99	F. Guigo	PN du Mercantour (via Y. Bielle), data base	Le Clot, D 2565 road, Saint-Jean-la-Rivière	Utelle	Alpes-Maritimes	France	06151	993708	1890763	
Dead specimen	12/19/01	J-M. Cévasco (via Y. Bielle)	PN du Mercantour	road to Berrins	Sospel	Alpes-Maritimes	France	06136	1011034	1888418	

## Appendix I. (Continued.)

TYPE OF OBSERVATION	DATE	COLLECTOR	SOURCE	LOCALITY 1	LOCALITY 2 (Commune or Council)	LOCALITY 3	COUNTRY	CODE OF COMMUNE	X LAMB II ét	Y LAMB II ét	HABITAT
Dead specimen	11/23/04	P. Fontanilles & T. Corbet	PN du Mercantour (via Y. Bielle), data base	D 2205, viaduc de Bancairon (Moyenne Tinée)	Clans	Alpes-Maritimes	France	06042	988544	1901561	
Sighting	6/17/05	J-M. Cévasco (via Y. Bielle)	PN du Mercantour	near Mont-Grazian	Sospel	Alpes-Maritimes	France	06136	1011034	1888418	
Sighting	6/24/05	J-M. Cévasco (via Y. Bielle)	PN du Mercantour	near Le Calvaire	Sospel	Alpes-Maritimes	France	06136	1011034	1888418	Urbanized area: chicken run
Sighting	1990–2000	J-M. Cévasco (via Y. Bielle)	PN du Mercantour	D 2566 road, between Sospel and Moulinet, near Sainte-Sabine	Sospel	Alpes-Maritimes	France	06136	1011034	1888418	
Latrines	1990–2000	J-M. Cévasco (via Y. Bielle)	PN du Mercantour	Baou de la Nicya	Sospel	Alpes-Maritimes	France	06136	1011034	1888418	
Sighting	1999–2000	G. Millischer	PN du Mercantour (via Y. Bielle), data base	D 2565 road, Saint-Jean-la-Rivière	Utelle	Alpes-Maritimes	France	06151	993709	1890763	
Latrines	Fall 1997	A. Liborio	PN du Mercantour (via Y. Bielle), data base	Near Cime de Castel Vieil	Roquebillière	Alpes-Maritimes	France	06103	998729	1823150	Rocky zone, under an abandoned canal
Dead specimen	2/27/67	P. Orsini	CEEP, « Mammals » data base	Eygalières	Eygalières	Bouches-du-Rhône	France	13034	810863	1866404	
Sighting	6/4/78	—	Cheyilan & Bergier (1979)	Mas de Gouine	Arles	Bouches-du-Rhône	France	13004	791952	1875520	Ricefields, bocages and Tamaris trees
Sighting	12/12/81	F. Rensch	Tour du Valat (via A. Olivier)	Trinquetaille (papetterie)	Arles	Bouches-du-Rhône	France	13004	784143	1858970	
Sighting	12/13/81	Rensch (in Log TdV)	CEEP, « Mammals » data base	Trinquetaille, D 570 road	Arles	Bouches-du-Rhône	France	13004	784143	1858970	
Dead specimen	1/1/87	Audibert (ONC)	CEEP, « Mammals » data base	Jouques	Jouques	Bouches-du-Rhône	France	13048	867853	1854019	
Dead specimen	1/1/87	Audibert (ONC)	CEEP, « Mammals » data base	Trets	Trets	Bouches-du-Rhône	France	13110	873390	1830812	
Sighting	11/1/90	J-C. Tempier	CEEP, « Mammals » data base	La Glacière, D 45a road	Auriol	Bouches-du-Rhône	France	13007	867398	1824167	
Latrines	5/10/91	G. Cheylan	CEEP, « Mammals » data base	Roquerousse	Lamanon	Bouches-du-Rhône	France	13049	821596	1859342	
Latrines	3/22/92	G. Cheylan & O. Iborra	CEEP, « Mammals » data base	La Sambre	Saint-Chamas	Bouches-du-Rhône	France	13092	818176	1842492	
Dead specimen	3/24/95	E. Vialet	CEEP, « Mammals » data base	Domaine de La Palissade, D 36 road	Arles	Bouches-du-Rhône	France	13004	785059	1855492	
Dead specimen	3/25/95	E. Vialet & P. Chavelon (in Log TdV)	CEEP, « Mammals » data base	Domaine de la Palissade	Arles	Bouches-du-Rhône	France	13004	785059	1855492	
Sighting	8/10/95	C. Tourenq (in Log TdV)	Tour du Valat (via A. Olivier)	La Tour-du-Valat	Arles	Bouches-du-Rhône	France	13004	788620	1835784	Near garages
Sighting	1/25/96	R. Fradin (in Log TdV)	CEEP, « Mammals » data base	Mas de Grand-Badon	Arles	Bouches-du-Rhône	France	13004	791486	1830304	
Dead specimen	1/1/98	G. Hemery (in Log TdV)	CEEP, « Mammals » data base	Salin-de-Giraud	Arles	Bouches-du-Rhône	France	13004	794030	1826674	

TYPE OF OBSERVATION	DATE	COLLECTOR	SOURCE	LOCALITY 1	LOCALITY 2 (Commune or Council)	LOCALITY 3	COUNTRY	CODE OF COMMUNE	X LAMB II ét	Y LAMB II ét	HABITAT
-	1/1/98	G. Coste (FDC 13)	SPN, Inventaire « Réserves de Chasse »	Le Devens Petit Roumagoua	Ceyreste	Bouches-du-Rhône	France	13023	868203	1807318	Garrigue of kermes oaks+few Alep pines; feet of valleys with Argeras scrubland
-	1/1/98	G. Coste (FDC 13)	SPN, Inventaire « Réserves de Chasse »	Notre-Dame des Anges	Mimet	Bouches-du-Rhône	France	13062	856475	1829089	Garrigue
Dead specimen	1/1/98	G. Hémerly	CEEP, « Mammals » data base	Gardens of Solvay, Salin-de-Giraud	Arles	Bouches-du-Rhône	France	13004	794030	1826674	
Sighting	9/28/98	J-Y. Mondain-Monval (in Log TdV)	CEEP, « Mammals » data base	Mas de Pontevès	Arles	Bouches-du-Rhône	France	13004	794300	1826678	
Dead specimen	1/15/00	A. Olivier	Tour du Valat (via A. Olivier)	Paulet, Salin-de-Giraud	Arles	Bouches-du-Rhône	France	13004	794030	1826674	
Latrines	8/17/00	P. Van Oye	CEEP, « Mammals » data base	Montagne des Ubacs	Jouques	Bouches-du-Rhône	France	13048	866592	1853937	Mountains, crest
Sighting	12/15/00	J-F. Pauc (via G. Hémerly)	Tour du Valat (via A. Olivier)	Salin-de-Giraud (quartier Barcarin)	Arles	Bouches-du-Rhône	France	13004	794030	1826674	
Sighting	12/24/00	G. Hémerly	Tour du Valat (via A. Olivier)	Salin-de-Giraud (quartier Barcarin)	Arles	Bouches-du-Rhône	France	13004	794030	1826674	
Capture	2/24/02	G. Coste (FDC 13)	ONCFS Alsace (via F. Léger)	Montagne de la Sainte-Victoire, N flank	Auriol	Bouches-du-Rhône	France	13007	867398	1824167	Old forest of green oaks, rocky ground
Latrines	4/10/02	M. Magner	CEEP, « Mammals » data base	Vallon du Délubre	Vauvenargues	Bouches-du-Rhône	France	13,111	864235	1844731	
Sighting	11/21/02	M. Cheylan, F. Poitevin & G. Llorente	Tour du Valat (via A. Olivier)	Between Notre-Dame d'Amour and Mas-Neuf du Vaccarès, D 37 road	Arles	Bouches-du-Rhône	France	13004	779792	1837490	
Sighting	1/1/03	M. Magnier	CEEP, « Mammals » data base / Dhermain et al. (2003a)	Montagne de la Sainte-Victoire, N flank	Auriol	Bouches-du-Rhône	France	13007	867398	1824167	
Sighting	2/1/03	J-C. Briffaut	Tour du Valat (via A. Olivier)	Le Vedeau, Japon bridge, D 36 road	Arles	Bouches-du-Rhône	France	13004	785059	1855492	
Latrines	5/7/03	D. Cohez, L. Willm & Y. Kayser	Tour du Valat (via A. Olivier)	Woods of Tourtoulon (in front of Mas de Tourtoulon)	Arles	Bouches-du-Rhône	France	13004	785059	1855492	
Dead specimen	5/29/03	N. Sadour (via A. Olivier)	Tour du Valat (Fondation Sanssouire)	Mas Neuf de Vaccarès	Arles	Bouches-du-Rhône	France	13004	779792	1837490	Reed marsh, rice- and wheatfields; few rows of willows and Provence canes
Latrines	9/20/03	J. Baret (ONF)	CEEP, « Mammals » data base	Notre-Dame de la Consolation	Jouques	Bouches-du-Rhône	France	13048	866264	1853545	
Latrines	1/1/04	J-C. Tempier	CEEP, « Mammals » data base	park of Saint-Pons	Gemenos	Bouches-du-Rhône	France	13,042	867378	1816014	
Latrines	1/1/04	J-C. Tempier	CEEP, « Mammals » data base	forest of Font-Blanche	Roquefort-la-Beudoule	Bouches-du-Rhône	France	13,085	864674	1810476	

Appendix I. (Continued.)

TYPE OF OBSERVATION	DATE	COLLECTOR	SOURCE	LOCALITY 1	LOCALITY 2 (Commune or Council)	LOCALITY 3	COUNTRY	CODE OF COMMUNE	X LAMB II ét	Y LAMB II ét	HABITAT
Latrines	1/1/04	J-C. Tempier	CEEP, « Mammals » data base	le Grand-Caunet	Roquefort-la- Bedoule	Bouches-du- Rhône	France	13,085	864674	1810476	
Capture	1/1/04	G. Coste (FDC 13)	FDC Bouches-du- Rhône	Saint-Paul-lès-Durance	Saint-Paul-lès- Durance	Bouches-du- Rhône	France	13099	871401	1859375	
Dead specimen	3/1/04	F. Légér	ONCFS Alsace	Vauvenargues	Vauvenargues	Bouches-du- Rhône	France	13111	865575	1844108	
Capture	3/1/04	F. Légér	ONCFS Alsace	Vauvenargues	Vauvenargues	Bouches-du- Rhône	France	13111	865575	1844108	
Capture	3/4/04	G. Coste (FDC 13)	FDC Bouches-du- Rhône	Plateau de l'Arbois	Aix-en- Provence	Bouches-du- Rhône	France	13001	850568	1841782	Border of stream
Capture	4/24/04	G. Hémerly & L. Mariage	Tour du Valat (via A. Olivier)	La Bèlugue	Arles	Bouches-du- Rhône	France	13004	785059	1855492	
Sighting	5/9/04	G. Paulus	Tour du Valat (via A. Olivier)	Mas du Grand Boisviel, 500 m S on D 35 road, near Plan du Bourg	Arles	Bouches-du- Rhône	France	13004	785059	1855492	
Latrines	5/23/04	A. Olivier & K. Lombardini	Tour du Valat (Fondation Sansouire)	Woods of Tourtoulon	Arles	Bouches-du- Rhône	France	13004	785059	1855492	
Latrines	6/6/04	E. Cosson	CEEP, « Mammals » data base	foot of Pic de Bertagne	Gemenos	Bouches-du- Rhône	France	13,042	867378	1816014	
Sighting	6/26/04	C. Moyon	CEEP, « Mammals » data base	Traconnade, D 561 road	Jouques	Bouches-du- Rhône	France	13048	866264	1853545	
Sighting	12/10/04	A. Olivier & K. Lombardini	Tour du Valat (Fondation Sansouire)	Salin-de-Badon, D 36b road	Arles	Bouches-du- Rhône	France	13004	785059	1855492	swamp area (fresh water, with tamar- isks and san- souires) with a house (mas RNC) plus a few ruins
Dead specimen	6/5/05	M. Thibault (via A. Olivier)	CEEP, « Mammals » data base	Notre-Dame d'Amour, CD 37 road	Saintes-Maries- de-la-Mer	Bouches-du- Rhône	France	13,096	769523	1829992	
Sighting	6/27/05	C. Pin (via A. Olivier)	CEEP, « Mammals » data base	Mas de Petit Badon	Arles	Bouches-du- Rhône	France	13,004	791486	1830304	
Sighting	1970–1979	–	Cheyland & Bergier (1979)	La Tour-du-Valat	Arles	Bouches-du- Rhône	France	13004	788620	1835784	
Sighting	1990–1995	G. Coste (FDC 13)	FDC Bouches-du- Rhône	Gréasques	Gréasques	Bouches-du- Rhône	France	13046	860226	1830352	
Capture	Spring 2003	via G. Hémerly	Tour du Valat (via A. Olivier)	« roubine de ceinture » of Salin-de-Giraud	Arles	Bouches-du- Rhône	France	13004	794030	1826674	
Sighting	1/1/56	–	Parc National des Ecrins (1994)	S Laragnais	Ribiers	Hautes-Alpes	France	05118	881374	1920721	Near river stream
Sighting	1/1/60	–	Parc National des Ecrins (1994)	S Laragnais	Ribiers	Hautes-Alpes	France	05118	881374	1920721	Near river stream
Sighting	9/30/93	H. Cortot	PN des Ecrins (via G. Farny), « faune » data base	Laye	Laye	Hautes-Alpes	France	05072	896273	1966615	Ripisylve (white alder, ash)
Sighting	12/20/97	J. Bonnet	PN des Ecrins (via G. Farny), « faune » data base	Saint-Jean-Saint- Nicolas	Saint-Jean-Saint- Nicolas	Hautes-Alpes	France	05145	908571	1972042	Broad-leaved for- est (beech)
Sighting	1972–1973	G. Cheylan	CEEP, « Mammals » data base	Vallouise	Vallouise	Hautes-Alpes	France	05175	919076	1988446	

Spread of the common genet in SE France and Italy

TYPE OF OBSERVATION	DATE	COLLECTOR	SOURCE	LOCALITY 1	LOCALITY 2 (Commune or Council)	LOCALITY 3	COUNTRY	CODE OF COMMUNE	X LAMB II ét	Y LAMB II ét	HABITAT
Latrines	12/1/83	–	SPN, Inventaire « Z.N.I.E.F.F. » / Guérin & Orsini (1984)	Mont Aurélien, crests	Saint-Maximin-la-Sainte-Baume	Var	France	83116	885683	1834305	Mountains
–	1/1/85	–	SPN, Inventaire « Z.N.I.E.F.F. »	Montagne de la Loube et Barre de Saint-Quinis	Besse-sur-Issole – Brignoles – Camps-la-Source – Celle – Forcalqueiret – Gareoult	Var	France	83018 – 83023 – 83030 – 83037 – 83059 – 83064	904240	1825508	Moor, scrubland, montane grass
–	1/1/88	P. Orsini (FL 24)	CEEP, « Mammals » data base	Belgentier	Belgentier	Var	France	83017	897667	1811590	
Latrines	4/1/89	A. Cormons	CEEP, « Mammals » data base	Source de l' Huveaune	Nans-les-Pins	Var	France	83087	879634	1824826	
Latrines	8/15/90	J-C. Tempier	CEEP, « Mammals » data base	Vallon du Pommier	Nans-les-Pins	Var	France	83087	880131	1823920	
Sighting	1/1/93	–	B.M.I. ONC	Between Varages and La Verdrière, D554 road	Varages – La Verdrière	Var	France	83145 – 83146	891372	1852757	
Sighting	1/1/93	BMI ONCFS	CEEP, « Mammals » data base	CD 554 road	Varages	Var	France	83,145	892895	1850692	
Dead specimen	5/26/96	A. Delcourt	CEEP, « Mammals » data base	Tourves, 3 km NE A8 highway	Tourves	Var	France	83140	891252	1830302	
Sighting	4/20/00	R. Paul	Muséum d'Histoire Naturelle de Toulon et du Var (via P. Orsini)	Signes, « quartier » Colle de Fède	Signes	Var	France	83127	885743	1815427	
Sighting	7/13/02	A. Joyeux & C. Bury	Muséum d'Histoire Naturelle de Toulon et du Var (via P. Orsini)	Jabron, CD 955 road	Comps-sur-Artuby	Var	France	83044	936549	1865392	
Sighting	10/15/03	G. Aumage	CEEP, « Mammals » data base / Dhermain et al. (2003b)	northern flank of Montagne de Sainte-Baume	Plan-d'Aups-Sainte-Baume	Var	France	83,093	876295	1820928	
Sighting+latrines	1/1/04	J-C. Tempier	CEEP, « Mammals » data base	northern flank of Montagne de Sainte-Baume	Plan-d'Aups-Sainte-Baume	Var	France	83093	876295	1820928	
Latrines	1/1/04	J-P. Dauphin	CEEP, « Mammals » data base	Basses-Gorges du Verdon	Montmeyan	Var	France	83,084	900958	1856555	
Sighting+latrines	1/1/04	J-C. Tempier	Muséum d'Histoire Naturelle de Toulon et du Var (via P. Orsini)	northern flank of Montagne de Sainte-Baume	Nans-les-Pins	Var	France	83087	879737	1826474	
Sighting+latrines	1/1/04	J-C. Tempier	Muséum d'Histoire Naturelle de Toulon et du Var (via P. Orsini)	northern flank of Montagne de Sainte-Baume	Saint-Zacharie	Var	France	83120	874169	1825604	
Dead specimen	3/2/04	D. Mathieu	ONCFS Var	Mazaugues	Mazaugues	Var	France	83076	888488	1822661	Hayloft
Dead specimen	11/21/04	M. Gatti	(via O. Hameau & G. Oliosio)	Roquebrussanne, D 5 road	Roquebrussanne	Var	France	83108	896291	1822387	
Sighting	1/15/05	P. Nouzelle	CEEP, « Mammals » data base	le Rabel	Vinon-sur-Verdon	Var	France	83,150	880299	1864304	
Dead specimen	4/12/05	J-C. Tempier	CEEP, « Mammals » data base	road (D1) between Rougiers and Nans	Rougiers	Var	France	83,110	885118	1827521	



Appendix I. (Continued.)

TYPE OF OBSERVATION	DATE	COLLECTOR	SOURCE	LOCALITY 1	LOCALITY 2 (Commune or Council)	LOCALITY 3	COUNTRY	CODE OF COMMUNE	X LAMB II ét	Y LAMB II ét	HABITAT
Latrines	1998–2004	J-P. Dauphin	Muséum d'Histoire Naturelle de Toulon et du Var (via P. Orsini)	Basses-Gorges du Verdon	Montmeyan	Var	France	83084	901412	1856021	
–	1/1/79	G. Cheylan	SPN, Inventaire « Mammifères sauvages de France » - CEEP, « Mammals » data base	Caderousse	Caderousse	Vaucluse	France	84027	793109	1902939	
Sighting	4/1/94	M. Geniez (via V. Rufrey)	CEEP, « Mammals » data base	Montagne de Bluye, D 40 road	Saint-Léger du Ventoux	Vaucluse	France	84110	835029	1916733	
Sighting	1/1/96	J-C. Gaudin (via V. Rufrey)	CEEP, « Mammals » data base	Combe d'Ansis	Bédoin	Vaucluse	France	84017	827732	1906575	
Latrines	1/1/00	P. Van Oye	CEEP, « Mammals » data base / Dhermain & Durand (2000)	Pont-Mirabeau	Mirabeau	Vaucluse	France	84,076	867837	1861475	
–	1995–1997	–	SPN, Inventaire « Réserves de Chasse »	Cheval Blanc	Cheval Blanc	Vaucluse	France	84038	824330	1869494	Mixed forests
–	1/1/94	J-C. Gaudin (ONC)	SPN, Inventaire « Réserves de Chasse »	Donzère – Mondragon	Bollène – Mondragon – La Garde-Adhemar – Saint-Paul-Trois-Châteaux	Vaucluse – Drôme	France	84019 – 84078 – 26138 – 26324	792871	1927296	Lagoon (30%) - deciduous forest (30%) - scrubland (40%)
Dead specimen	7/21/04	L. Picco	Servizio tutela della fauna e della flora, Torino	Lago Giorgan	Oulx	Alta Val di Susa, Piedmont region	Italy	10056	950163	2015282	Riparian vegetation and pastures
Capture	8/1/88	F.M. Angelici	FIZV, Roma	Sorroundings of Cesnola	Settimo Vittone	Alto Canavese, Piedmont region	Italy	10010	1027563	2075868	Mixed broadleaf forest
Capture	7/28/92	F.M. Angelici	FIZV, Roma	near S. Giacomo, between Nomaglio and Andrate	Andrate	Alto Canavese, Piedmont region	Italy	10010	1032888	2074385	Mixed broadleaf forest, pastures and coniferous forest ecotone
Sighting	9/1/79	–	Baratti (1988)	Pont Serrand	La Thuile	Aosta Valley Region	Italy	11016	958929	2090019	Larch forest ecotone
Sighting	10/1/95	F.M. Angelici	FIZV, Roma	Doubia Mt., foot of the mountain, near Martassina	Ala di Stura	Val d'Ala, Piedmont region	Italy	10070	988820	2049152	Coniferous forest with large clearings
Capture	Spring 1967 / 1968	–	Baratti (1988)	Vernosse	Oyace (20 km from Swiss border, 40 km from French border)	Valpelline, Aosta valley region	Italy	11010	991775	2105033	Coniferous forest

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