

An inventory of the mosquitoes of Morocco. I. Genus *Anopheles* (Diptera: Culicidae)

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Abstract

This paper presents an updated inventory of the anopheline fauna of Morocco, which includes nine species. A literature summary, distribution, biting behaviour and disease relations are given for each species. *Anopheles labranchiae* is the only species that is known to play a significant role in the malaria transmission in Morocco.

Introduction

The mosquitoes of Morocco are divided between subfamilies Anophelinae (genus *Anopheles*) and Culicinae (seven genera) (Trari *et al.*, 2003). The species that occur in the country were treated previously by Gaud (1953), Guy (1959c), Himmi *et al.* (1995) and Brunhes *et al.*, (2000). This paper is the first in a series to provide an up-to-date inventory of the Moroccan mosquito fauna. The series is based on the bibliographic review of Trari *et al.* (2003). The objective of the series is to provide basic information of use for conducting studies and research on the mosquitoes of Morocco. Seven of the *Anopheles* species that occur in Morocco also occur in various areas of Europe, namely *An. algeriensis* Theobald, *An. claviger* (Meigen), *An. labranchiae* Falleroni, *An. marteri* Senevet & Prunelle, *An. cinereus* Theobald, *An. multicolor* Cambouliu and *An. sergentii* (Theobald) (Snow & Ramsdale, 2003). Thus, the information contained herein will augment what is known about these seven species.

Inventory of the species

The *Anopheles* of Morocco include nine species divided between subgenera *Anopheles* and *Cellia*. The species are listed by subgenus and species in alphabetical order. A synonymy and literature summary of previous usage is provided for each species, followed by its geographical distribution in Morocco (paragraph I). Distributions include records from the literature (paragraph IA) and, for some species, new collection records (paragraph IB) followed by codes (month/year/province/locality) that are explained in Appendix 1. The distributions of the species are illustrated on maps derived from Moroccan territory maps of 1/100000 (0.5° longitude x 0.5° latitude) (Aulagner & Thevenot, 1986). The following symbols are used on the maps to indicate when the distributional data became available (Trari *et al.*, 2003):

- data published before 1945,
- data collected between 1945 and 1965,
- data published between 1965 and 1980, and
- data collected after 1980.

Larval habitats (paragraph II), the biting behaviour of adult females (paragraph III) and disease relations (paragraph IV) are indicated for each species. Comments concerning the systematics, disease relations, ecology and/or geographical distribution of the species sometimes precedes the other information.

***Anopheles (Anopheles) algeriensis* Theobald, 1903 (Map 1)**

Synonym:

An. lukisi Christophers, 1916

Previous (synonymous) usage:

An. bifurcatus var. *algeriensis* auctorum (in Senevet, 1935; Guy, 1959c)

An. algeriensis var. *turkestani* Schingarev (in Senevet, 1958)

An. martinius Shingarev (in Senevet, 1958)

An. bifurcatus auctorum (in part) (in Senevet, 1958)

An. aitkeni auctorum (in Senevet, 1958)

An. fragilis of Searle *nec* Theobald (in Senevet, 1958)

IA. North of High Atlas (Gaud, 1957; Guy, 1959b,c), Middle Atlas (Bonjean, 1947; Bailly-Choumara, 1967a), eastern Morocco (Bonjean, 1947), Beni-Mellal (Guy, 1959b,c), Gharb (western Morocco) (Bailly-Choumara, 1973b; Trari & Himmi, 1987), Casablanca (Metge, 1986).

II. Generally, the larval habitats of *An. algeriensis* are stream margins encumbered by vegetation and exposed to sunlight. In mountainous regions, the habitats are shaded and the water is clear and cold.

III. This species is endophilic, but only slightly aggressive towards humans.

IV. Because *An. algeriensis* is scarce in Morocco, its role in malaria transmission is regarded as negligible.

***Anopheles (Anopheles) claviger* (Meigen, 1804) (Map 2)**

Synonyms:

An. villosus Robineau-Desvoidy, 1827

An. grisescens Stephens, 1828

An. turkestanii Shingarev, 1926

An. missiroli Del Vecchio, 1939

An. pollutus Torres Canamares, 1945

Previous (synonymous) usage:

An. antennatus Becker (in Senevet, 1935; Senevet, 1958; Guy, 1959c)

An. bifurcatus of Meigen (in Senevet, 1935; Senevet, 1958; Guy, 1959c)

An. claviger petragani form *sahelensis* of Guy (1959a)

An. claviger missiroli of Guy (1959a)¹

An. portugalensis of Figueredo (in Senevet, 1958)

IA. Kénitra (Vialatte, 1923), Rabat (Seguy, 1930; Gaud, 1948), Tounfit and Massou (Langeron, 1938), Anefgou and Tirghist (Langeron, 1938; Callot, 1940), Middle Atlas (Bongean, 1947; Gaud, 1947, 1948; Bailly-Choumara, 1967a), eastern Morocco (Bongean, 1947), Errachidia and Tadla (Gaud, 1948), Rif (Bailly-Choumara, 1967c), high Moulouya (Bailly-Choumara, 1967b), areas adjacent to the Sahara (Guy & Holstein, 1968), Casablanca (Metge, 1986).

II. Larvae of *An. claviger* prefer still or slightly moving water with vegetation. The temperature of the water may be as low as 5°C.

III. *Anopheles claviger* is exophilic in Morocco.

IV. The gonotrophic cycle of *An. claviger* is too long for it to be capable of transmitting malaria.

***Anopheles (Anopheles) labranchiae* Falleroni, 1926 (Map 3)**

Synonyms:

An. maculipennis perquasae Missiroli, 1935

An. maculipennis var. *sicaulti* Roubaud, 1935

Anopheles labranchiae is a member of the Holarctic *An. maculipennis* group. *Anopheles maculipennis* s.l. is the historical vector of malaria in Europe. In the early 1920s it was found to represent at least two species based on egg morphology (Falleroni, 1926; van Thiel, 1927). Current understanding of the composition of the *An. maculipennis* group in the Palaearctic Region stems from White (1978), who recognised nine species: *An. atroparvus* van Thiel, *An. beklemishevi* Stegnii & Kabanova, *An. labranchiae*, *An. maculipennis* Meigen, *An. martinius* Shingarev, *An. melanoon* Hackett (with its variety *subalpinus* Hackett & Lewis), *An. messeae* Falleroni, *An. sacharovi* Favre and *An. sicaulti* Roubaud. Field and laboratory investigations, utilising integrated morphological, enzyme electrophoresis, crossing-mating and chromosome studies later revealed that *An. sicaulti* was conspecific with *An. labranchiae*, and it was synonymized with that species by de Zulueta *et al.* (1983). Ribiero *et al.* (1988) treated *An. subalpinus* as a separate species, but it was recently shown to be conspecific

¹ Guy (1959a) also recognized an aberrant form ('subspecies') of *An. claviger*, but did not give it a Latin name.

with *An. melanoon* (Linton *et al.*, 2002b). More recently, Sedaghat *et al.* (2003b) recognized a new species of the group, *An. persiensis* Linton, Sedaghat & Harbach, in Iran. White (1978) suggested that *An. lewisi* Ludlow may be synonymous with *An. messeae* or *An. beklemishevi*, but this nominal form is still regarded as a valid species because its identity has not been resolved. Consequently, ten species of the *An. maculipennis* group are currently formally recognized in the Palaearctic Region, namely *An. atroparvus*, *An. beklemishevi*, *An. labranchiae*, *An. lewisi*, *An. maculipennis*, *An. martinus*, *An. melanoon*, *An. messeae*, *An. persiensis*, and *An. sacharovi*. These species are notoriously difficult to distinguish morphologically in the adult and larval stages and, despite differential chromosome and isoenzyme differences, egg morphology remains the golden standard by which the species are routinely identified. As a result of recent molecular genetic studies, DNA assays and/or sequence data are available for identifying six members of the group, including *An. atroparvus*, *An. labranchiae*, *An. maculipennis*, *An. melanoon*, *An. messeae*, *An. persiensis* and *An. sacharovi* (Marinucci *et al.*, 1999; Proft *et al.*, 1999; Linton *et al.*, 2002a,b, 2003; Sedaghat *et al.*, 2003a,b). It should be noted that in Morocco morphology is the only criterion presently used for the identification of mosquitoes. For this reason, it is fortunate that *An. labranchiae* is the only member of the group present in the country.

IA. Salé (d'Anfreville, 1916), El Jadida (Delanoe, 1917), Tangier (Charrier, 1924), Middle Atlas (Seguy, 1930), Gharb (Sicault *et al.*, 1935; Bongean, 1947, Trari & Himmi, 1987; Himmi, 1991; Trari, 1991), Rabat (Roubaud, 1935), Anti Atlas (Langeron, 1938; Callot, 1940), southern zone of Marrakech (Ristorcelli, 1946a,b), Fom Zguid and Tagoumit (Gaud, 1953; Gaud *et al.*, 1949), Septentrional Atlantic Littoral: from Tangier to El Jadida (Gaud, 1953), Kénitra (Guy, 1963; Himmi *et al.*, 2004), north of the high Atlas, Souk larba, Settât, Chemaïa, Safi, Meknès, Fès, Azrou, Berkane, Oujda, Tangier, Rabat, Tétouan, Oued Zem, Kelaa of Sraghna and Debdou (Guy, 1963), Ouarzazate (Guy & Holstein, 1968), Rif (Bailly-Choumara, 1967c; de Zulueta *et al.*, 1983), Middle Atlas (Bailly-Choumara, 1967a), valley of Moulouya (Bailly-Choumara, 1967b), Larache (Bailly-Choumara, 1968, 1970, 1972a,b, 1973a,b; Trari *et al.*, 2004), Tétouan, Sidi Yahia of Gharb, Marrakech and Berkane (Bailly-Choumara, 1970, 1973b), Mamora (Ibn Jilali, 1984), Casablanca (Metge, 1986), Taounate, Khémisset, Larache, Settât, Kénitra, Taza, El Kelaa Desraghna, Ouarzazate, Khouribga, Chefchaouen, Béni Mellal, Tanger, Asilah, Salé, Sidi Kacem and Oujda (Trari, 1991).

IB. Al Hoceima (AHKT1099; AHAJ0600; AHAB0600); Azilal (AZTN0900); El Jadida (EJAS0800), Kénitra (KTMK0298; KTDB0298; KTLK0298; KTMG0598), Khémisset (KMRM0501; KMAA0501; KMKH0501); Khénifra (KNAS0700); Khouribga (KGOM0498; KGOF0799; KGTO0700; KG OZ0700; KGOA0501; KGOZ0501), Larache (LABE0599; LAEH0599; LALA0599; LALA0302; LAEG0599), Rabat (RTBO0398), Sidi Kacem (SKGH0297; SKBK0598; SKBD0403; SKTG0403; SKTR0403), Tanger (TGGZ0401), Taounate (TNTI0498; TNAL0699; TNTI0699; TNSA0699) and Tétouan (TEOL0798; TEBZ0599; TESM0599; TEBH0599; TEBZ0803).

II. The larval habitats of *An. labranchiae* are varied. They include stagnant temporary or permanent water (daya and merja), edges of wadis, wells, channels, basins, puddles, etc. This species generally prefers habitats exposed to sunlight with water that is fresh or slightly brackish, containing *Ranunculus* and *Potamogeton*.

III. *Anopheles labranchiae* is mainly endophilic in Morocco. It is generally active in the early morning. It is apparently anthropophilic and zoophilic as it is found in both human and animal dwellings.

IV. *Anopheles labranchiae* is the principal vector of malaria in Morocco.

Anopheles (Anopheles) marteri Senevet & Prunelle, 1927 (Map 4)

Anopheles marteri is a rare mountainous species in Morocco, where it occurs at the southern limit of its distribution.

IA. El Hajeb, Tizin' test, Tillouguit and Khénifra (Gaud, 1945b), high and Middle Atlas (Bonjean, 1947), Rif (Bailly-Choumara, 1967c), valley of Moulouya (Bailly-Choumara, 1967b), Taza (Benmansour *et al.*, 1972) Taounate (Trari, 1991).

II. Larvae of this species are found along the banks of mountain streams and cascades devoid of vegetation in steep shaded ravines.

III. *Anopheles. marteri* does not enter houses and very seldom bites humans.

IV. Because of its weak anthropophily, *An. marteri* is not studied and of no interest to epidemiologists.

***Anopheles (Anopheles) ziemanni* Grünberg, 1902 (Map 5)**

Previous (synonymous) usage:

An. mauritanus of Daruty de Grandpre (in Guy, 1959c; Senevet, 1958)

An. paludis var. *similis* Theobald (in Senevet, 1935; Senevet, 1958; Guy, 1959c)

An. mauritanus coustani of Christophers (in Senevet, 1958)

An. mauritanus de Grandpre & de Charmoy (in Senevet, 1935)

IA. Middle Atlas (Senevet, 1935), plain of south and north of the Occidental Atlas (Gaud *et al.*, 1949, 1950), Marrakech (Guy, 1958; Bailly-Choumara, 1970), Rabat (Guy, 1967), Oujda (Guy, 1967), El Haouz and Tadla (Benmansour *et al.*, 1972).

II. *Anopheles ziemanni* has been found in the grassy margins of large ponds. One site was rich in filamentous algae, and the water was cold and fresh.

III. The biology of *An. ziemanni* is poorly known. Some authors have considered it to be a domestic and anthropophilic species whereas others claim it is zoophilic and exophilic.

IV. *Anopheles ziemanni* does not play a role in malaria transmission in Morocco but in certain other countries it is known to transmit filariasis.

***Anopheles (Cellia) cinereus* Theobald, 1901 (Map 6)**

This species is widespread in Morocco but is more common in mountainous areas.

Synonym:

An. jehafi Patton, 1905

Previous (synonymous) usage:

Pyretophorus myzomyiafacies Theobald (in Senevet, 1935; Senevet, 1958; Guy, 1959c)

An. italicus Raffaella (in Senevet, 1958; Guy, 1959c)

An. rifemus Baeza Cuellar (in Senevet, 1958; Guy, 1959c)

An. turkhudi of Gaud (in Guy, 1959d)

An. cinereus hispaniola (of Ramsdale, 1998)

An. pictus of MacDonald (in Senevet, 1958)

IA. Valleys of Atlas (Segury, 1930), Souk Larba of Gharb (Sicault *et al.*, 1935), Souk Larba of Zemmour (Senevet, 1935), Anefgou, Tighist, Valley of Sidi Yahia Ouyoussef in the north of the Massif of Masker, Tighermine, Louggouargh and Massou (Langeron, 1938), northern Morocco (Viamonte & Ramirez, 1945, 1946), Marrakech (Ristorcelli, 1946a,b; Gaud, 1945a; Gaud & Duthu, 1954), Tansikht, valley of Sous, Moulouya, high Atlas, Anti-Atlas, Meridional Rif (Gaud, 1945a; Gaud *et al.*, 1949, 1950; Gaud (1953), Taounate (Guy, 1962), Hamada of Draa, Midelt (Guy, 1963), Rabat, Oujda, Tafilalet (Guy, 1967), Ait Melloul, Ouled Teima, Taroudant, Tiznit, Goulmine, Bou Izakarn, eastern borders of Jbel Bani, Vallée of Low Drâa, Tafraout (Bailly-Choumara, 1965), Rocade of Drâa, Atlantic south, Anti Atlas (Bailly-Choumara, 1966), Rif (Bailly-Choumara, 1967c), Middle Atlas (Bailly-Choumara, 1967a), valley of Moulouya (Bailly-Choumara, 1967b), Marrakech (Bailly-Choumara, 1970, 1973b), Oujda, Settât, Al Hoceima, Ouarzazate, Khénifra, Guelmim, Chefchaouen, Taounate, Khouribga, Figuig, Larache, Taza, El Kelaa Desraghna, Ben Slimane and Nador (Trari, 1991).

IB. Al Hoceima (AHKT1099; AHAJ0600), Béni Mellal (BMAO0900; BMCH0900), Khénifra (KNAJ0700), Taounate (TNSM1099), Khouribga (KGSM0498; KGML500, KGOF0700; KGSM0700; KGBK1000; KGTA1000) and Sidi Kacem (SKCO0297; SKTO0297; SKMJ0297).

II. Larval habitats of *An. cinereus* are varied. This species, however, has a predilection for slightly moving water and, in particular, for small flood pools in the beds of rivers. In general, preferred habitats are not very deep and are largely exposed to sunlight. *Anopheles cinereus* can tolerate high salinity. This species can also tolerate extreme temperatures. It has been found under ice and also in hot areas of Morocco.

III. *Anopheles cinereus* is slightly anthropophilic.

IV. Because of its weak anthropophily, *An. cinereus* is considered a negligible vector of malaria in Morocco.

***Anopheles (Cellia) dthali* Patton, 1905 (Map 7)**

Synonym:

An. wardi Leeson & Theodor, 1948

Previous (synonymous) usage:

An. rhodesiensis Theobald (in Senevet, 1958)

IA. Aoufous, Meski, Erfoud, Agdz, Zagora, Tagounit, Tamsruth (Sacca, 1960), Zagora and south of the high Atlas (at edge of Hamada of Draa) (Guy, 1963), Marrakech and Tafilalet (Guy, 1967), valley of Moulouya (Guy & Holstein, 1968), Tiznit and eastern borders of Jbel Bani (Bailly-Choumara, 1965), by-pass of Draa and Anti Atlas (Bailly-Choumara, 1966), valley of Moulouya (Bailly-Choumara, 1967b), Fom Zguid (Bailly-Choumara, 1970, 1973b).

II. The larval habitats of *An. dthali* are rather variable. This species has been found in residual pools of wadis, inundated depressions, rock holes, marshes with *Juncaceae* and thermal sources.

III. *Anopheles dthali* is an exophilic species that occasionally bites humans.

IV. *Anopheles dthali* was suspected of playing a role in malaria transmission in the south of the Moroccan Atlas Mountains. However, because it is weakly anthropophilic, it could only play a secondary role in transmission.

***Anopheles (Cellia) multicolor* Cambouliu, 1902 (Map 8)**

Synonyms:

An. impunctus Dönitz, 1902

Pyretophorus chaudoyei Theobald, 1903

Pyretophorus nigrifasciatus Theobald, 1907

Previous (synonymous) usage:

Pyretophorus chaudoyei Theobald (in Senevet, 1958; Guy, 1959c)

An. nigrifasciatus Theobald (in Senevet, 1958)

An. cleopatrae Willocks (in Senevet, 1958)

An. turkhudi of Bahr, 1918 (in Senevet, 1958)

IA. Marrakech (Messerlin & Treillard, 1938), Rif (Viamonte & Ramirez, 1945), Sahara (Guy, 1963), south of Atlas, plain located between Marrakech and the Atlantic from Tangier along the length of the Mediterranean (Guy & Holstein, 1968), Goulmine, Jbel Bani, valley of low Draa and Tantan (Bailly-Choumara, 1965), Rocade of Draa (Bailly-Choumara, 1966), valley of Moulouya (Bailly-Choumara, 1967b), Fom Zguid (Bailly-Choumara, 1970, 1973b), Casablanca (Metge, 1986)

II. Larvae of *An. multicolor* seem to prefer saline water. Although they occurs in habitats where salinity exceeds that of saltwater marshes, it has never been found in seawater habitats. Sunlit habitats are not essential for this species.

III. Some authors claim that *An. multicolor* enters houses and will bite humans whereas others claim that it is an exophilic species.

IV. *An. multicolor*, along with *An. sergentii*, may take part in malaria transmission in the south of Morocco, but its involvement remains to be proven.

Anopheles (Cellia) sergentii (Theobald, 1907) (Map 9)

Previous (synonymous) usage:

Pyrethophorus sergentii Theobald (in Senevet, 1935; Guy, 1959c)

An. culicifacies Giles (Edwards, 1912 and Alcock, 1913 in Senevet, 1935; Gough, 1914 and Langeron, 1921 in Senevet, 1958; Guy, 1959c)

Morocco is the northernmost limit of the distribution of *An. sergentii*.

IA. Tamelelt (Messerlin & Treillard, 1938), Targhist (Langeron, 1938), Wadi Draa (Gaud, 1947), Zoumi, Middle Atlas (Gaud *et al.*, 1949, 1950), Marrakech (Guy *et al.*, 1958), north of the high Atlas, south of Casablanca and Rif (Guy, 1961, 1962, 1963, 1967; Bailly-Choumara, 1967a) Tiznit, Goulmine, Bou Izakarn, Jbel Bani, Tantan and Tafraout (Bailly-Choumara, 1965c), Rocade of Drâa, Anti - Atlas (Bailly-Choumara, 1966), Middle Atlas (Bailly - Choumara, 1967a), valley of Moulouya (Bailly-Choumara, 1967b), Berkane, Marrakech (Bailly-Choumara, 1970, 1973b), Casablanca (Metge, 1986), Larache, Al Hoceima, Taounate et Ouarzazate (Trari, 1991).

IB. Al Hoceima (AHKT1099) and Taounate (TNSMZ1099, TNSMA1099).

II. Larvae of *An. sergentii* are found in the pools of wadis, marshes rich in vegetation supplied by permanent sources, dayas and merjas, rice plantations and irrigation channels. Larvae occur in stagnant water or slightly moving fresh to strongly brackish water.

III. The behaviour of *An. sergentii* differs appreciably in the north and south of the country. Populations may be exophilic or endophilic, anthropophilic or zoophilic.

IV. It is often said that *An. sergentii* plays the same role in malaria transmission in the south of Morocco that *An. labranchiae* plays in the north. But whether this is true or not remains to be proven since the species is sympatric with *An. labranchiae* in the south.

Summary

This paper presents a summary of the *Anopheles* fauna of Morocco, which currently includes nine species. It should be noted that two species previously recorded in Morocco, *An. hyrcanus* and *An. gambiae*, are doubtful records (Trari *et al.*, 2003).

The ecology of the larval stages and the biology of the adults make it possible to distinguish some species in different areas. Currently, only *An. labranchiae* seems to play a significant role in malaria transmission in Morocco. The involvement of other species remains to be proven. But the changing world climate, the expansion of animal production, the movements of populations and domestic animals and other factors, could result in the introduction of other vector species into the country.

This inventory and the geographical distributions of the species are not definitive because they are partially based on old literature records. Furthermore, there seems to be a tendency for tropical species to move northward and for Mediterranean species to move southward from their historical geographical limits. Comprehensive surveys in the seldom-prospected regions and border areas of Morocco could result in the discovery of other species that are known to occur in neighbouring countries. In fact, because malaria is only in the north, several areas, particularly in the south, remain unexplored. It is thus possible that other species occur in Morocco.

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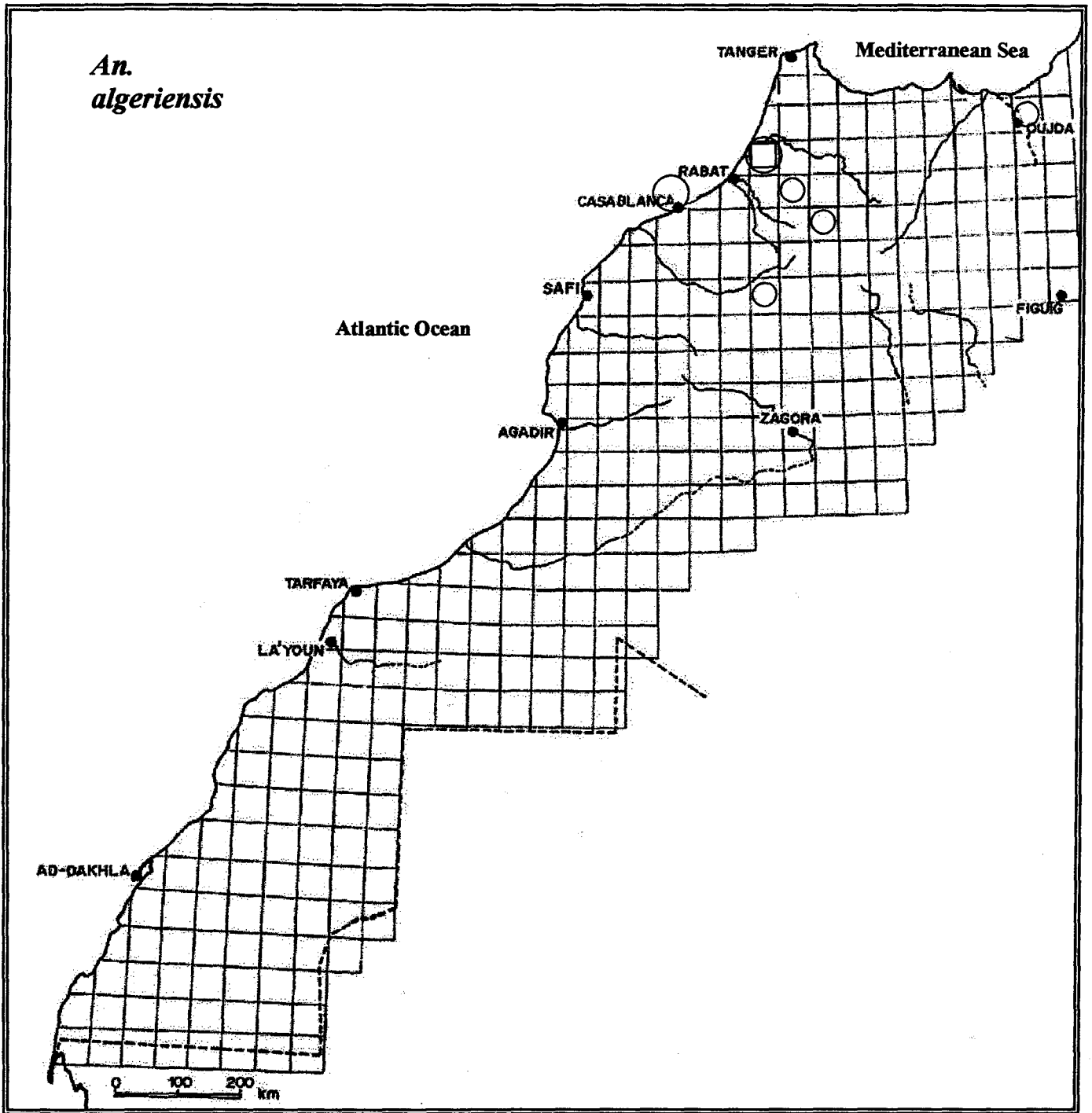
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Appendix 1. New collection records for *Anopheles* in Morocco.

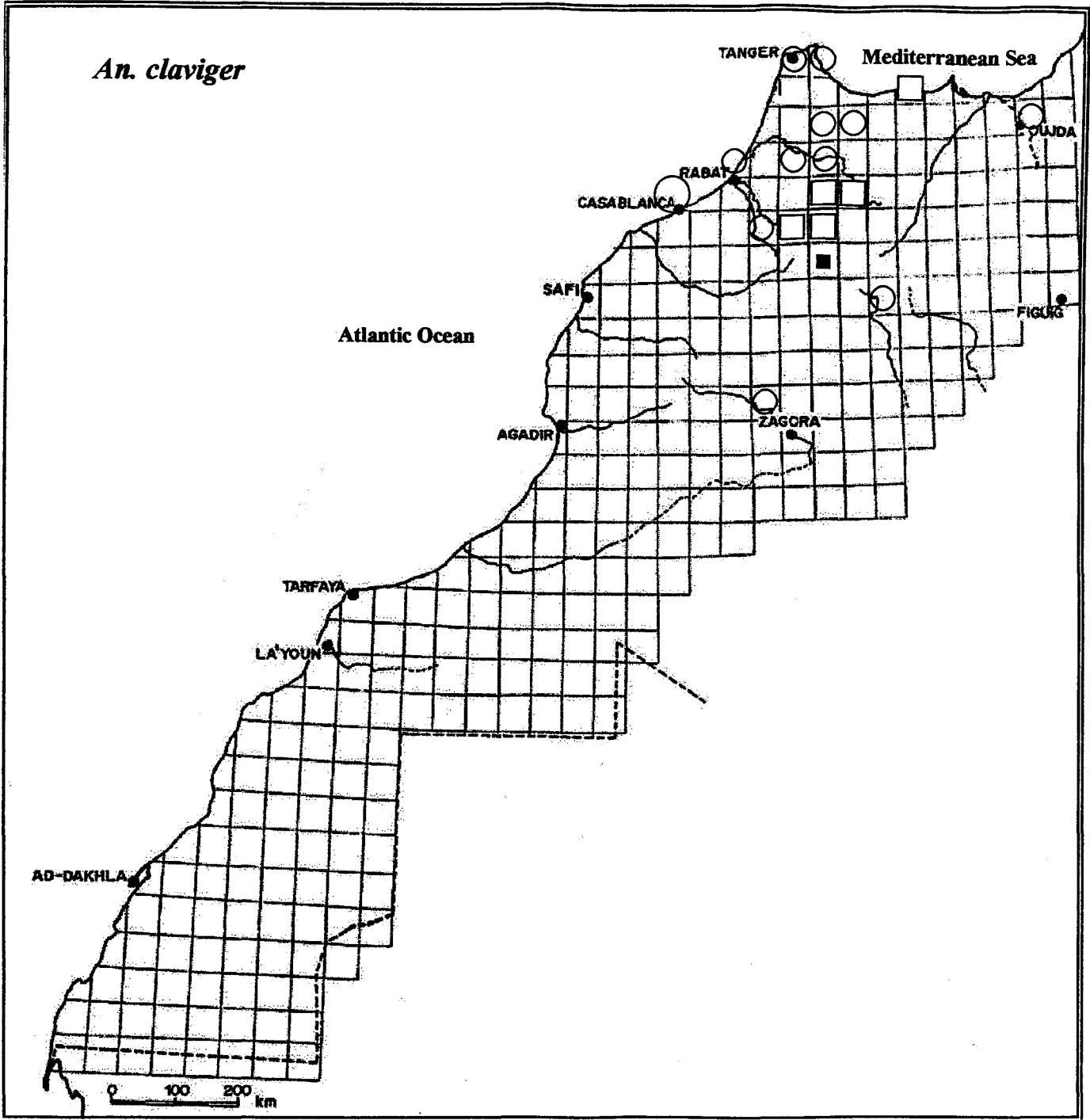
AHKT1099	Al Hoceima Province, Ketama, October 1999
AHAJ0600	Al Hoceima Province, Azib Jrou, June 2000
AHAB0600	Al Hoceima Province, Azib Bouflou, June 2000
AZATN900	Azilal Province, Adouz, September 2000
BMTG0900	Béni Mellal Province, Taghzirt, September 2000
BMAG0900	Béni Mellal Province, Aghbala, September 2000
EJAS0800	El Jadida Province, Aarabat Sidi Abdelaziz, August 2000
KTMK0298	Kénitra Province, Moukaouama, February 1998
KTDB0298	Kénitra Province, Dar Belamri, February 1998
KTLK0298	Kénitra Province, Laksibia, February 1998
KTMG0598	Kénitra Province, Mgadid, May 1998
KMRM0501	Khémisset Province, Rommani, May 2001
KMAA0501	Khémisset Province, Aît Abderrahmane, May 2001
KMKH0501	Khémisset Province, Khouarine, May 2001
KNOAS700	Khénifra Province, Aît Shak, July 2000
KNMR0700	Khénifra Province, Mrirt, July 2000
KGOM0498	Khouribga Province, Oulad Messoud, April 1998
KGSM0498	Khouribga Province, Smaala, April 1998
KGOF0799	Khouribga Province, Ouled Fennane, July 1999
KGOF0500	Khouribga Province, Ouled Fennane, May 2000
KGTO0700	Khouribga Province, Karma, July 2000
KGOZ0700	Khouribga Province, Oulad Zguida, July 2000
KGML0700	Khouribga Province, Mlalih, July 2000
KGBK1000	Khouribga Province, Béni Khlef, October 2000
KGTA1000	Khouribga Province, Tachrafte, October 2000
KGOZ0501	Khouribga Province, Ouled Zguida, May 2001
KGOA0501	Khouribga Province, Oulad Abbou, May 2001
KGSM0700	Khouribga Province, Smaala, July 2000
LABE0599	Larache Province, Beggara, May 1999
LAEH0599	Larache Province, El Haouata, May 1999
LAEG0599	Larache Province, El Garaâ, May 1999
LALA0599	Larache Province, Laouamra, May 1999
LALA0302	Larache Province, laouamra, March 2002
RTBO0398	Rabat Province, Bouregreg, urban lodging, March 1998
SKCO0297	Sidi Kacem Province, Cité ouvrière, February, 1997
SKGH0297	Sidi Kacem Province, Ghouiba, February 1997
SKTO0297	Sidi Kacem Province, Touissa, February 1997
SKBK0598	Sidi Kacem Province, Bakchouch, May 1998
SKBD0403	Sidi Kacem Province, Bdour, April 2003
SKTG0403	Sidi Kacem Province, Tgagaa, April 2003
SKTR0403	Sidi Kacem Province, Trabna, April 2003
TGGZ401	Tanger Province, Gzenaya, April 2001
TNTI0498	Taounate Province, Tissa, April 1998
TNAL0699	Taounate Province, Aïn laayoune, June 1999
TNTI0699	Taounate Province, Tissa, June 1999
TNSA0699	Taounate Province, Sidi Ahmed, June 1999
TNSM01099	Taounate Province, Sidi Mokhfi, October 1999
TEOL0798	Tétouan Province, Oued Laou, July 1998
TEBZ0599	Tétouan Province, Bouzaghla, May 1999
TESM0599	Tétouan Province, Smir, May 1999
TEBH0599	Tétouan Province, Béni Hasssan, May 1999
TEBZ0803	Tétouan Province, Bouzaghla, August 2003

Map 1



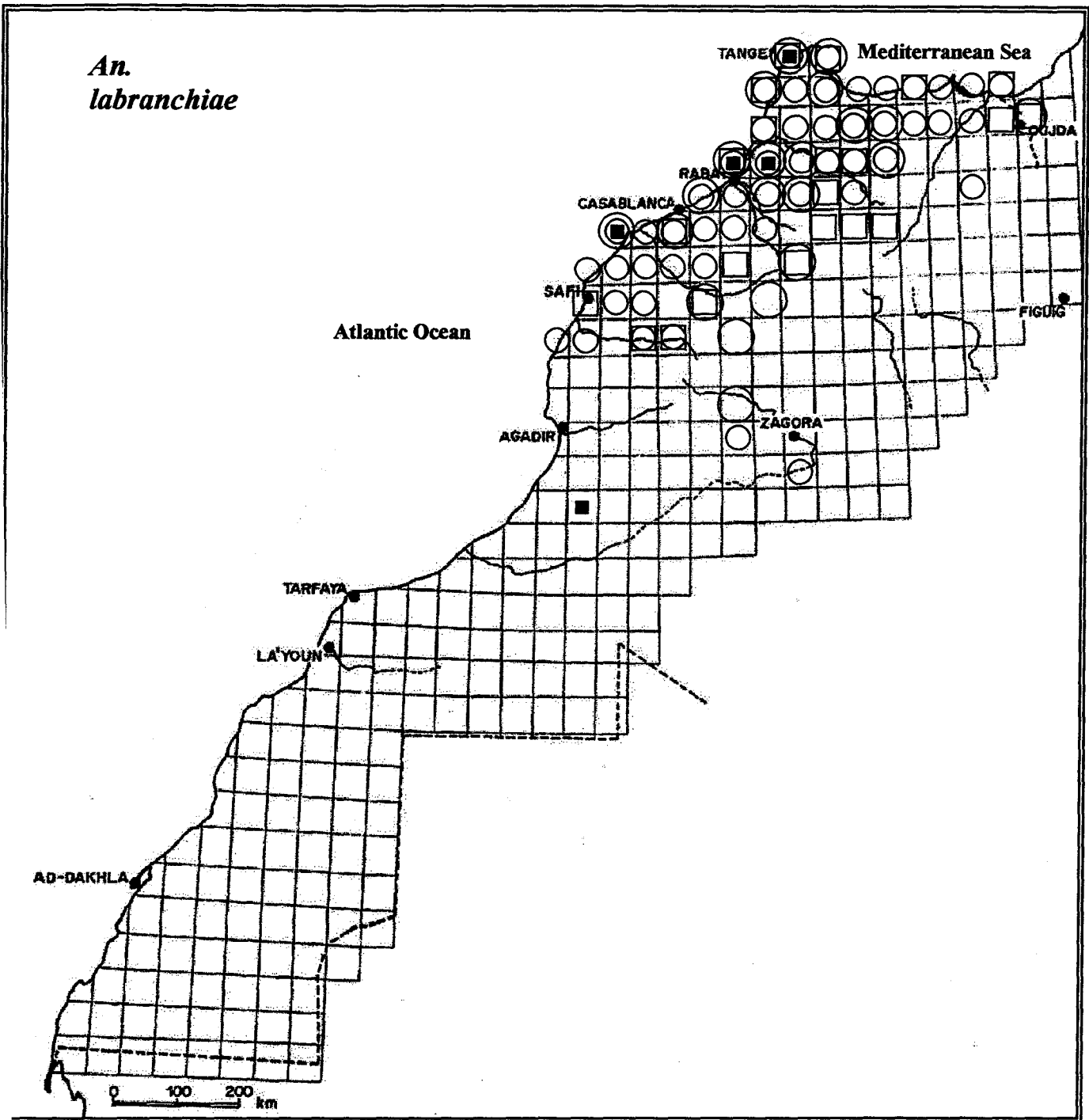
Map 2

An. claviger

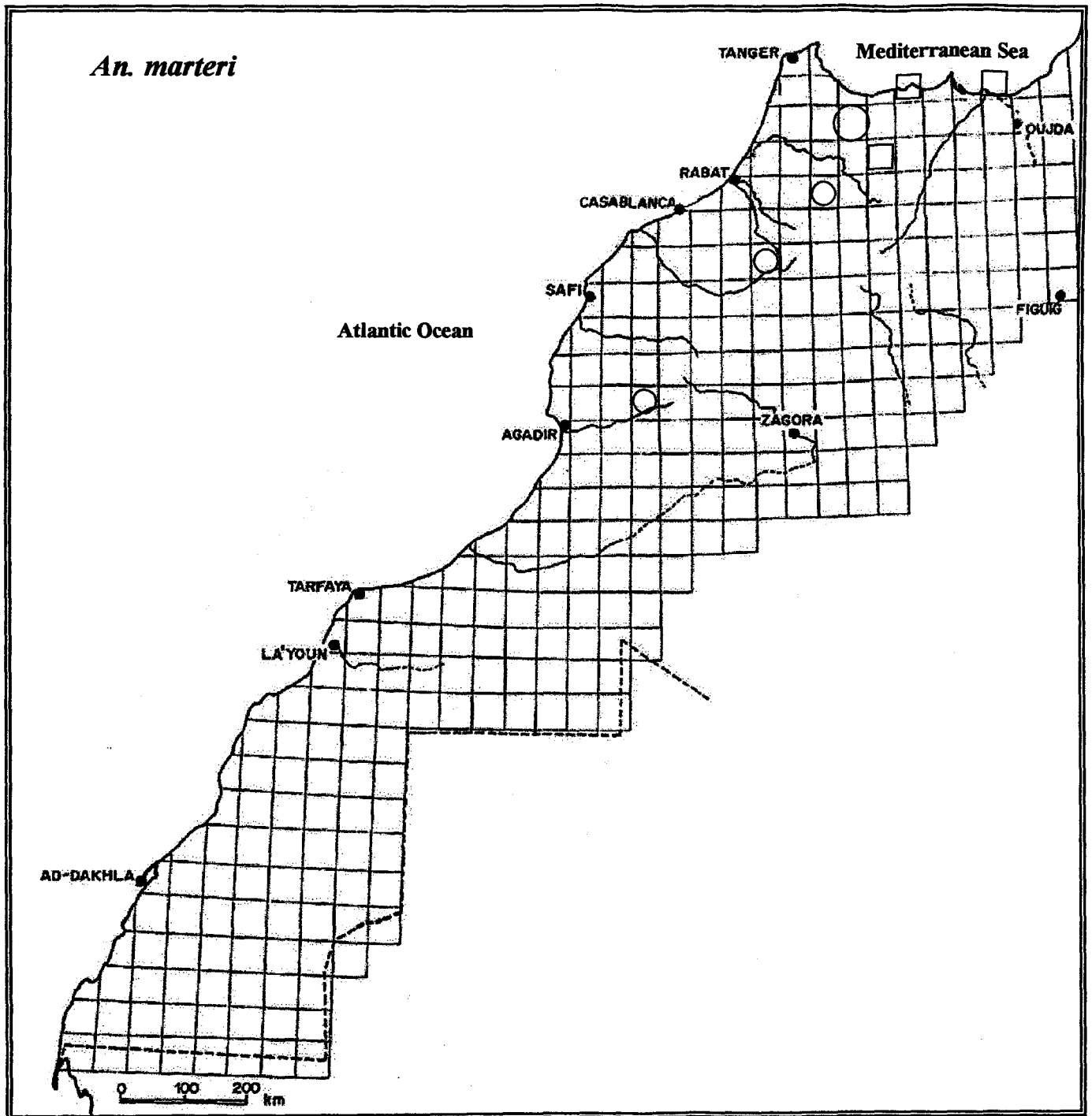


Map 3

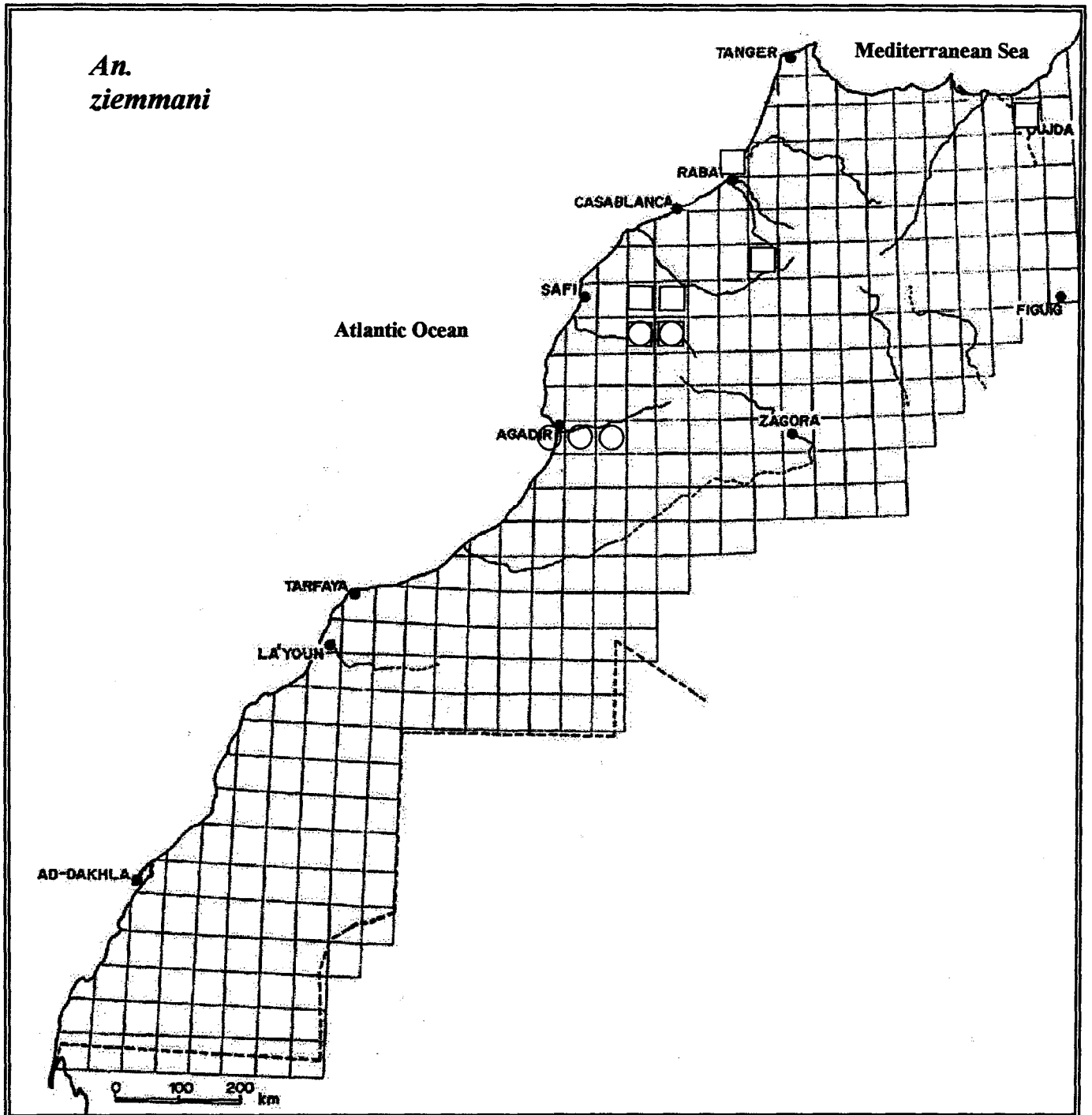
*An.
labranchiae*



Map 4

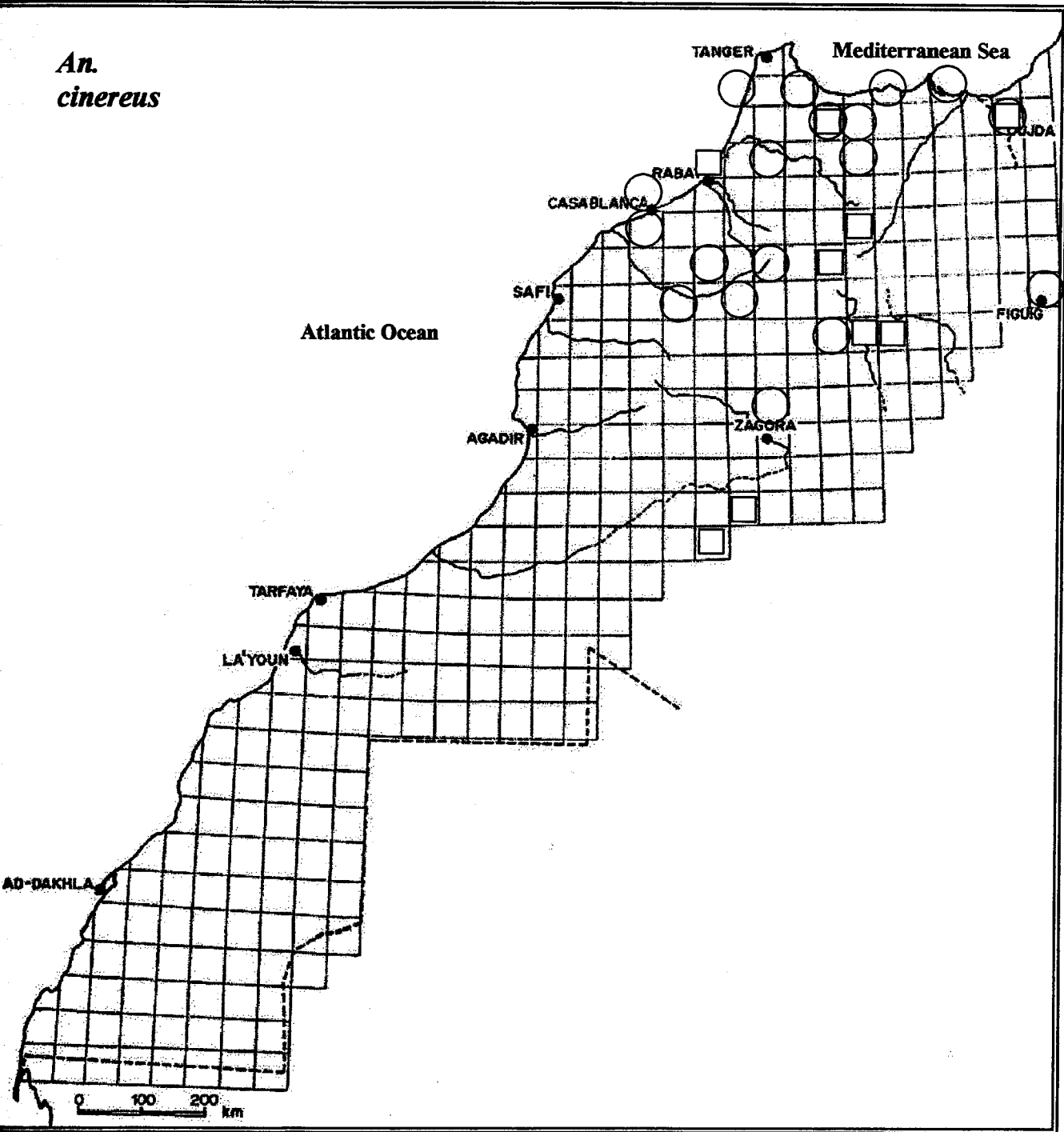


Map 5

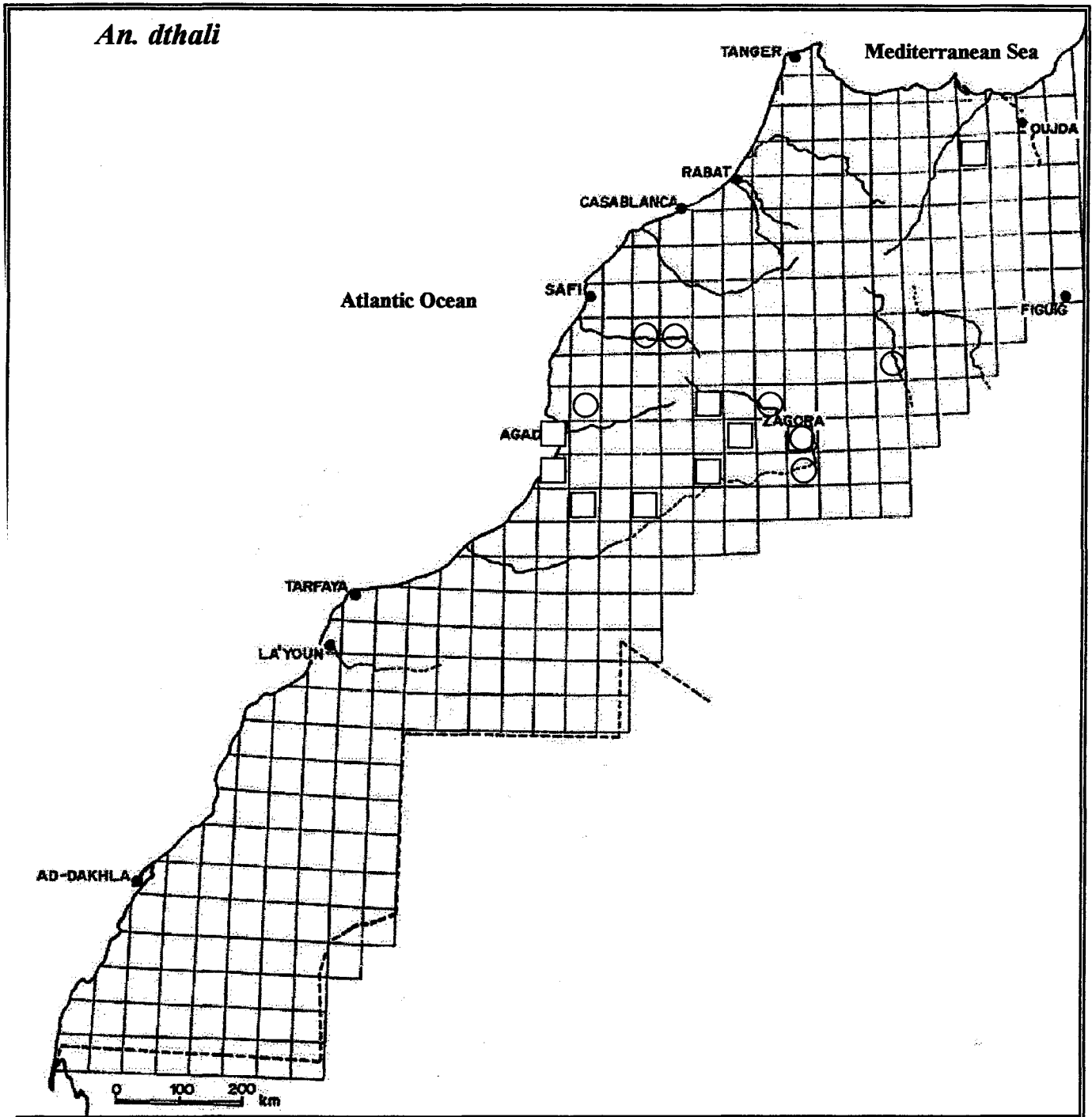


Map 6

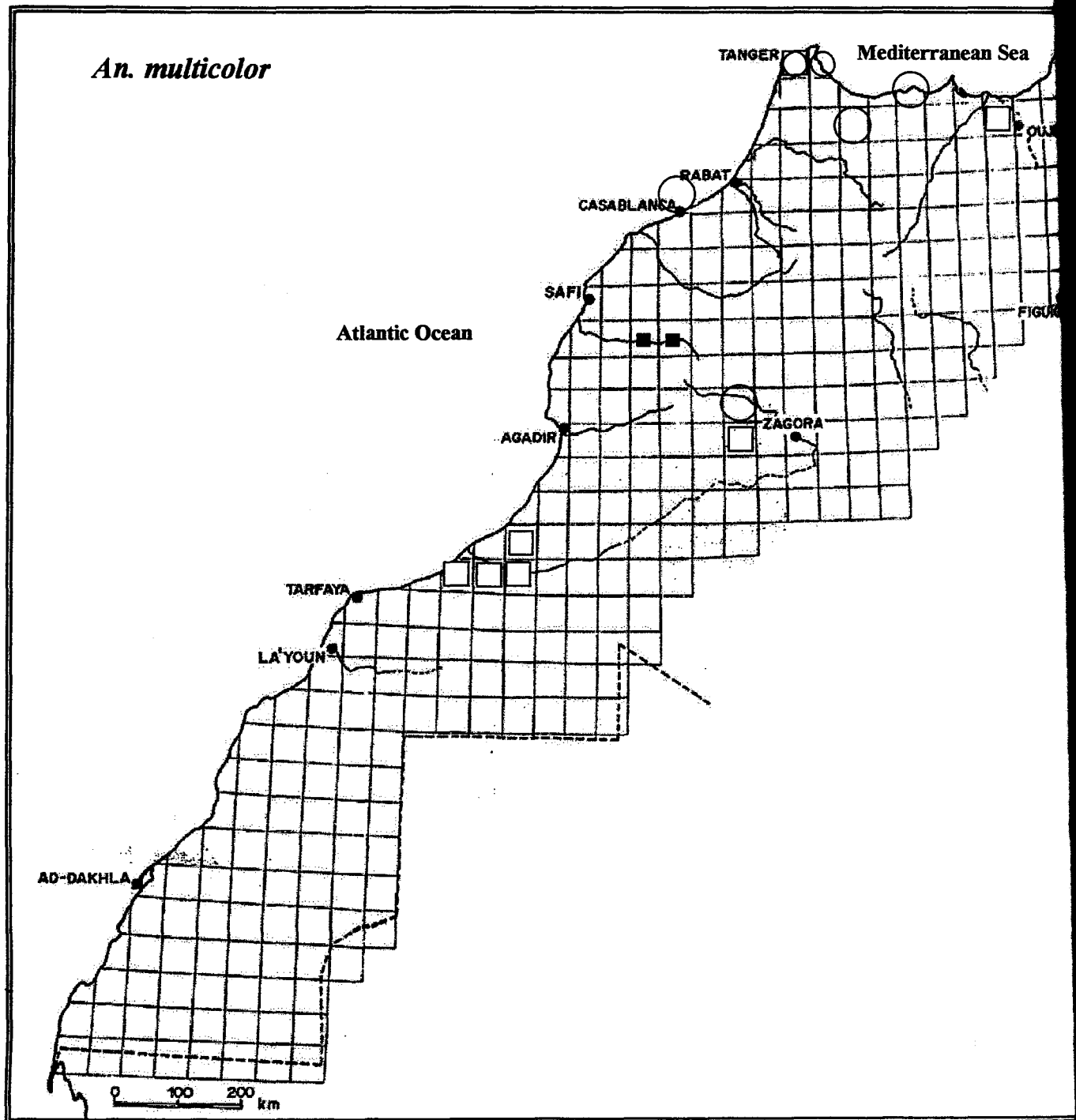
*An.
cinereus*



Map 7



Map 8



Map 9

