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# Studies on the weed flora of cultivated land in Egypt. 4. Mediterranean and tropical elements[1]

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## RÉSUMÉ

La distribution de quelques synanthropophytes méditerranéens et tropicaux de la flore égyptienne est discutée. Des cartes indiquent les types de répartition de ces deux groupes ainsi que la distribution actuelle de cinq anthropophytes méditerranéens particuliers. Plusieurs espèces méditerranéennes représentées en Egypte depuis la préhistoire sont de mauvaises herbes résistant à l'hiver qui jouent un rôle important dans les groupements d'adventice contemporains de l'Egypte et des oasis du désert libyen. Les anthropophytes tropicaux, probablement introduits et naturalisés récemment en Egypte sont limités au bassin du Nil où ils sont des adventices typiques des cultures estivales.

## SUMMARY

The distribution of some Mediterranean and tropical synanthropophytes in the Egyptian flora is discussed. By means of maps, the local distributional patterns of the two mentioned groups are shown as well as the contemporary distribution of five selected Mediterranean synanthropophytes. Several Mediterranean species, occurring in Egypt since prehistorical times, are winter weeds playing a significant part in recent weed communities also in the Oases of the Libyan Desert. The tropical synanthropophytes, probably of recent introduction and naturalization in Egypt, are confined to the Nile Basin where they are characteristic weeds in the fields of summer crops.

## ZUSAMMENFASSUNG

Der Autor diskutiert die Verbreitung einiger mediterraner und tropischer Synanthropophyten der ägyptischen Flora. Mittels Verbreitungskarten beider Gruppen werden sowohl die ursprünglichen als auch die heutigen Areale von 5 ausgewählten, mediterranen Synanthropophyten dargestellt und verglichen. Verschiedene mediterrane Arten, in Aegypten schon aus prähistorischer Zeit bekannt, sind winterharte Kräuter, die, wie auch in den Oasen der libyschen Wüste, ein bedeutendes Element der heutigen Unkrautgesellschaften darstellen. Die tropischen Synanthropophyten sind sicherlich in Aegypten kürzlich eingebürgerte Introduktionen. Ihr Vorkommen ist auf das Nil-Becken beschränkt, wo sie als charakteristische Begleitpflanzen von Sommerkulturen auftreten.


[1] Cf. El Hadidi & Kosinová (1971), Imam & Kosinová (1972), Kosinová (1974).

## Introduction

The flora of Egypt comprises more than 2000 taxa, about 400 species of which belong to the group of synanthropic plants. The numerically strongest families are Graminae (20%), Compositae (11%) and Leguminosae (10%).

The present day composition of the flora is the result of long lasting complex interactions between nature and man. In Egypt, where the human influence dates from the most ancient times, a comprehensive description of the synanthropic flora and vegetation is a difficult task. The main part of the cultivated land has not been sufficiently surveyed as yet. Only the rain-fed agricultural land confined to the Mediterranean coast became an object of the ecological studies of Tadros & Atta (1958). There are, however, separate contributions dealing with the weed flora and vegetation in Egypt to which reference will be made. Those are partly surveyed in the first paper of this series (El Hadidi & Kosinová, 1971).

The present paper includes several distributional dot maps, every dot representing an area of 30 km in diameter around the actual locality where the taxon in question was collected or recorded. The maps represent a selection of Mediterranean and tropical species in Egypt. They show all the localities which have been found on herbarium labels (material present up to June, 1971) of the Herbarium of the Botany Department, Cairo University (CAI) and partly of the Herbarium Section of the Agricultural Museum, Dokki (CAIM). The author's field records from 1967 and 1971 as well as literature reports and unpublished data provided by M. N. El Hadidi, S. Ghabbour and M. Imam were also included. All the herbarium specimens examined were revised from a taxonomical point of view. The taxonomical nomenclature and the phytogeographical subdivision of Egypt follow in general those of the "Students' Flora of Egypt" (Täckholm & al., 1956).

## Historical notes

In Egypt agriculture began some seven to eight thousand years ago. According to radiocarbon datings (Butzer, 1959) the oldest agricultural settlements known are situated in Northern Egypt (Nile Valley, 5000 BC; Faiyum Oasis, 6500 BC). There is only scarce information on the original natural vegetation of the Nile Valley and Delta. There Butzer (o.c.) assumes the existence of a kind of gallery forests along the river banks, low scrubs with shrub and grass vegetation in the seasonally inundated alluvial flats, and limited swamp areas with marsh vegetation, during predynastic and early historical times. The natural vegetation of the floodplains was gradually changed and diminished in its extent. Finally some species dominating this original vegetation have completely disappeared, i.e. *Papyrus cyperus, Mimusops schimperi, Ceratonia siliqua,* and are replaced by the artificial stands of cultivated crops and their weed companions. *Papyrus cyperus* was recently recorded from Wadi Natroun (El Hadidi, 1971). Together with *Nymphaea lotus,* this species may serve as an example of anthropofugous relicts in Egypt.

Our present knowledge of ancient, spontaneous as well as cultivated, plants is mostly based on findings from prehistorical and historical settlements. In Egypt the most important sources of information are the plant-remains from ancient tombs. About 50 weeds have been recorded by Täckholm (1940, 1950 [in Lauer & al.], 1961) and Greiss (1957). They are listed chronologically in Table 1. Today some of these species are characteristic to the segetal communities of irrigated fields. Many of them are common weeds of winter crops fields *(Avena fatua, Beta vulgaris, Cynodon dactylon, Lolium perenne, Malva parviflora, Medicago hispida, Melilotus indicus, Rumex dentatus, Trifolium resupinatum, Trigonella hamosa).* A few species are found as summer crop companions *(Echinochloa colonum, E. crus-galli).* Mostly they represent pluriregional species (sens. Eig, 1931 and Zohary, 1950) occurring either in the vast boreal areas of Europe and America or in the tropics of the Old World. A few of them belong to the Mediterranean element *(Lathyrus marmoratus, Scorpiurus muricata, Vicia lutea, Raphanus raphanistrum, Melilotus siculus)* or to the Saharo-Sindian element *(Desmostachya bipinnata, Balanites aegyptiaca, Solanum incanum).* Most of the species listed in Table 1 are commonly distributed all over the Mediterranean region today.

## Mediterranean and tropical elements

Table 2 indicates that an important part of the present-day synanthropic flora of Egypt has a Mediterranean origin or distribution. It might be expected that the Mediterranean species would occur mainly close to the Mediterranean coast, belonging to the Coastal (Mediterranean) subtype of the Extra-Riverain type of distribution (Kosinová, 1972). However, our data show that the Mediterranean or sub-Mediterranean species sensu Eig (1931) penetrate more or less into all cultivated lands of the Egyptian Territory (cf. fig. 1). But in spite of their relatively deep inland penetration, which will be discussed in the next paragraph, they occur more frequently, however, in the Mediterranean area, the Nile Delta, and the Faiyum Oasis. Their range corresponds to the two climatic belts, viz. the Mediterranean coastal belt and Middle Egypt according to Hurst (Kassas, 1955).

Outside the above mentioned areas, the Mediterranean species occur in the Oases of the Libyan Desert and in the Nile Valley. Their presence in the Oases is quite remarkable. *Thesium humile, Silene nocturna, Melilotus sulcatus* and *Convolvulus siculus* play an important part in segetal plant communities of winter crops in the Kharga and Dakhla Oases (Chrtek & Kosinová, 1968; El Hadidi & Kosinová, 1971). On the contrary, the frequency of the Mediterranean species in the Nile Valley, especially in its southern part (the third climatic belt according to Hurst – Upper Egypt), is relatively low. There are only a few species extending further south. Some of them have been observed or collected at Luxor and Kom Ombo, and in the Aswan area (*Scorpiurus muricata,* [cf. fig. 2], *Euphorbia arguta,* [cf. fig. 3]) or even in Egyptian Nubia *(Emex spinosus, Medicago ciliaris). Emex spinosus* (cf. fig. 4) was found many times in Egyptian Nubia (Boulos, 1966) but not in Sudanese Nubia (Ahti & al., 1973; Ghabbour, 1972) and only once in Sudan (Erkowit,

| | |
|---|---|
| Neolitic period | *Arundo donax* L. |
| | *Cyperus esculentus* L. |
| | *Desmostachya bipinnata* (L.) Stapf |
| | *Lathyrus sativus* L. |
| | *Phragmites communis* (L.) Trin. |
| | *Vicia sativa* L. |
| Predynastic period | *Echinochloa colonum* (L.) Link |
| | *Lolium temulentum* L. |
| (Badarian age) | *Cyperus alopecuroides* Rottb. |
| Dynastic period | |
| 1st Dynasty | *Ceruana pratensis* Forssk. |
| | *Juncus arabicus* (Asch. & Buch.) Adamson |
| | *Medicago hispida* Gaertn. |
| 3rd Dynasty | *Anthemis pseudocotula* Boiss. |
| | *Balanites aegyptiaca* (L.) Del. |
| | *Beta vulgaris* L. subsp. *maritima* (L.) Thell. |
| | *Lathyrus aphaca* L. |
| | *Lathyrus hirsutus* L. |
| | *Lathyrus marmoratus* Boiss. & Bl. |
| | *Phalaris paradoxa* L. subsp. *praemorsa* (Lam. & DC.) Coss. & Dr. |
| | *Rumex dentatus* L. |
| | *Scorpiurus muricata* L. |
| | *Trigonella hamosa* L. |
| | *Vicia lutea* L. |
| | *Vicia narbonensis* L. |
| 6th Dynasty | *Imperata cylindrica* (L.) Beauv. |
| 12th Dynasty | *Leersia hexandra* Sw. |
| | *Melilotus indicus* (L.) All. |
| | *Raphanus raphanistrum* L. |
| | *Raphanus sativus* L. |
| 18th Dynasty | *Juncus acutus* L. |
| 19th Dynasty | *Phalaris minor* Retz. |
| 21st Dynasty | *Agrostis stolonifera* L. |
| | *Bromus japonicus* Thunb. |
| | *Hordeum marinum* Huds. |
| | *Lolium perenne* L. |
| | *Ranunculus asiaticus* L. |
| | *Trifolium medium* L. |
| | *Trifolium resupinatum* L. |
| Coptic period | *Echinochloa crus-galli* (L.) Beauv. |
| | *Heleochloa schoenoides* (L.) Host |
| | *Malva parviflora* L. |
| | *Melilotus siculus* (Turra) Vitm. |
| | *Sinapis arvensis* L. |
| | *Solanum incanum* L. |
| Other synanthropophytes reported without dating: | |
| | *Avena fatua* L. |
| | *Citrullus vulgaris* Schrad. |
| | *Cynodon dactylon* (L.) Pers. |
| | *Cyperus rotundus* L. |
| | *Cyperus schimperianus* Steud. |
| | *Eragrostis aegyptiaca* (Willd.) Del. |
| | *Koeleria phleoides* (Vill.) Pers. |
| | *Saccharum spontaneum* L. var. *aegyptiacum* (Willd.) Hack |
| | *Setaria verticillata* (L.) Beauv. |

Table 1. — Records of synanthropic plants from the Egyptian excavations (according to Täckholm, 1940; 1950; 1961, and Greiss, 1957).

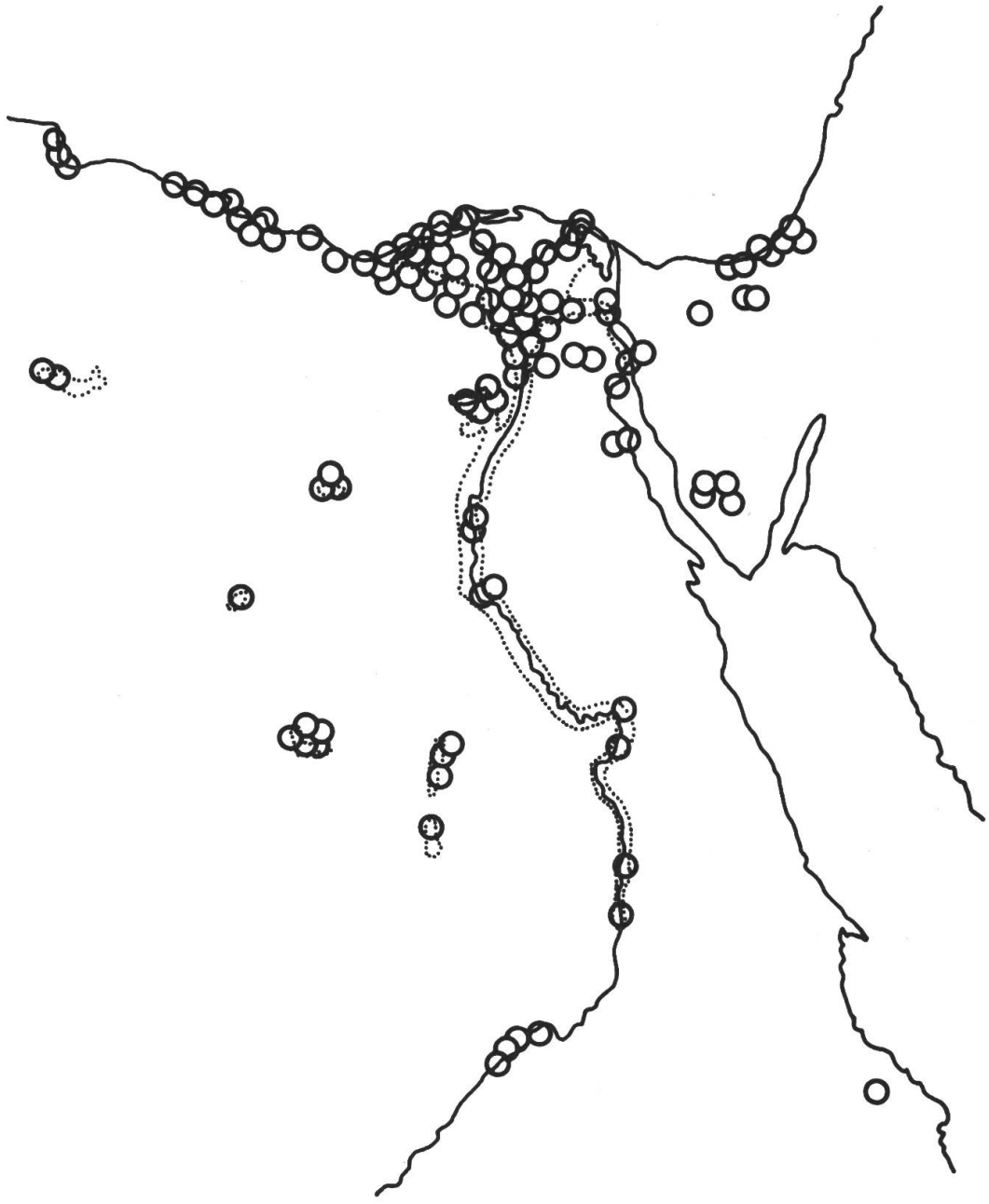

Fig. 1. – Distributional pattern of Mediterranean synanthropophytes in Egypt based on the local patterns of 14 selected species: *Convolvulus althaeoides, C. siculus, Cutandia dichotoma, Emex spinosus, Erodium laciniatum* s.l., *Euphorbia arguta, Lolium multiflorum, Medicago ciliaris, Melilotus siculus, M. sulcatus, Scorpiurus muricata, Silene nocturna, S. rubella* and *Thesium humile.*

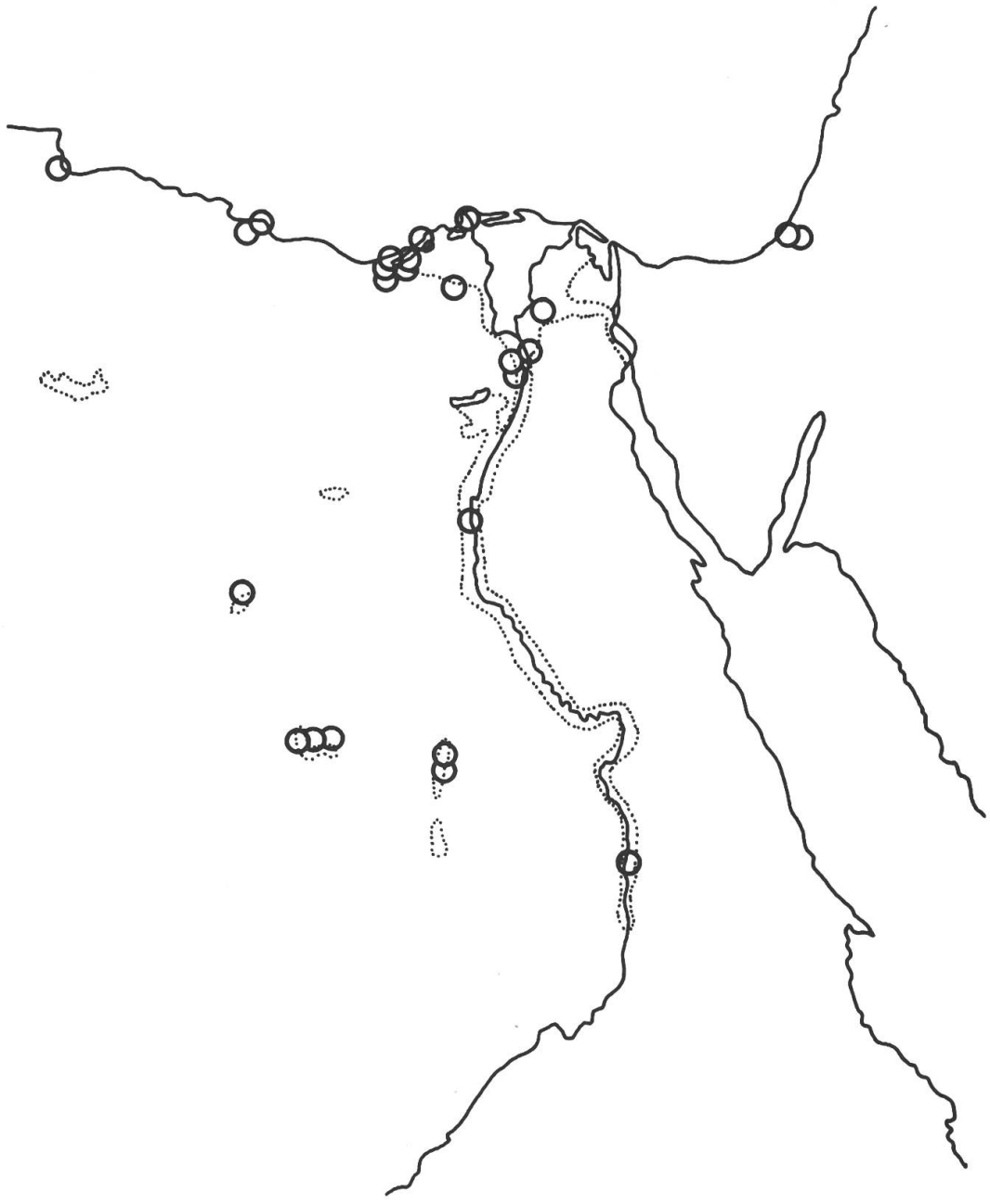

Fig. 2. – Local distribution of *Scorpiurus muricata.*

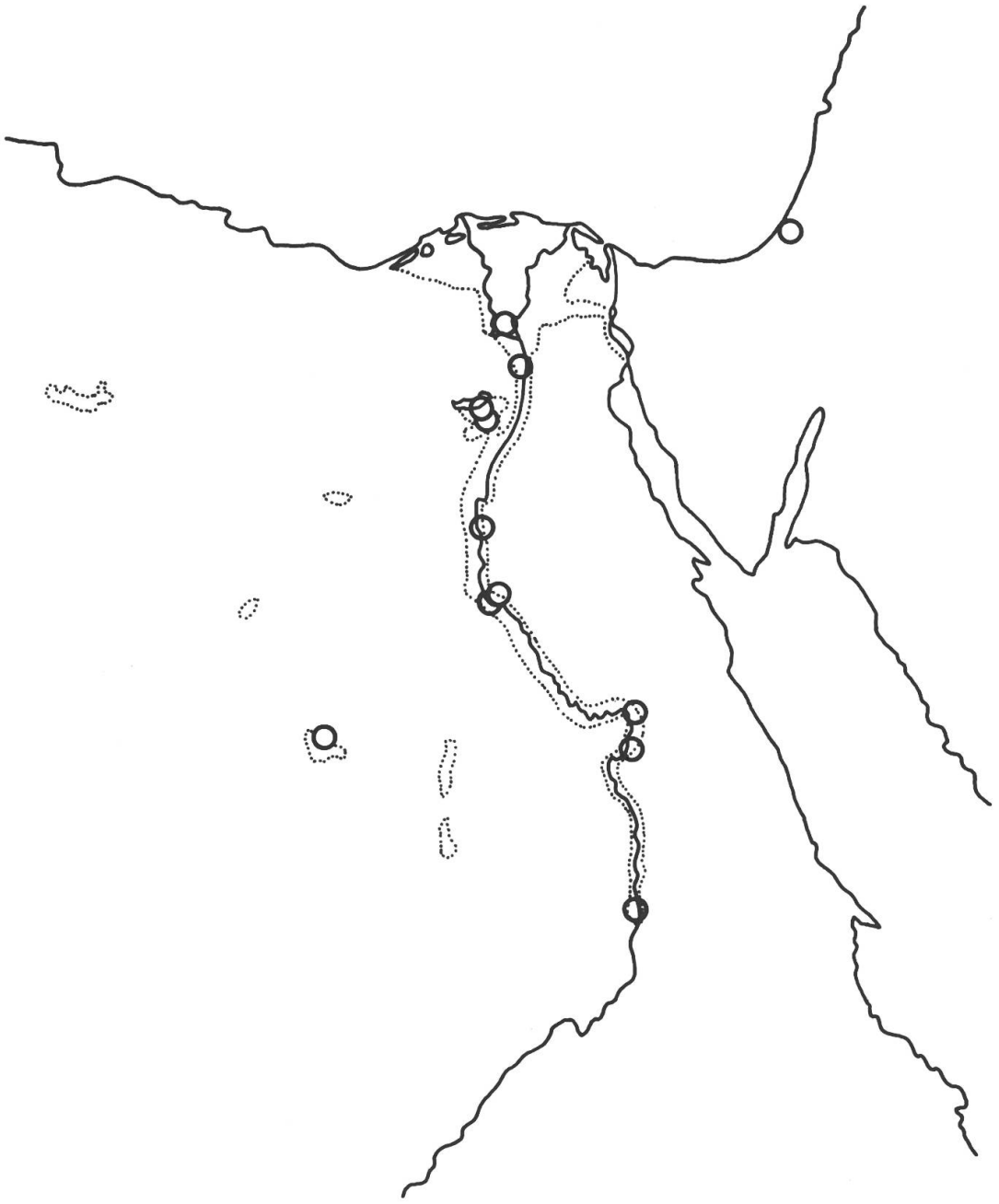

Fig. 3. – Local distribution of *Euphorbia arguta.*

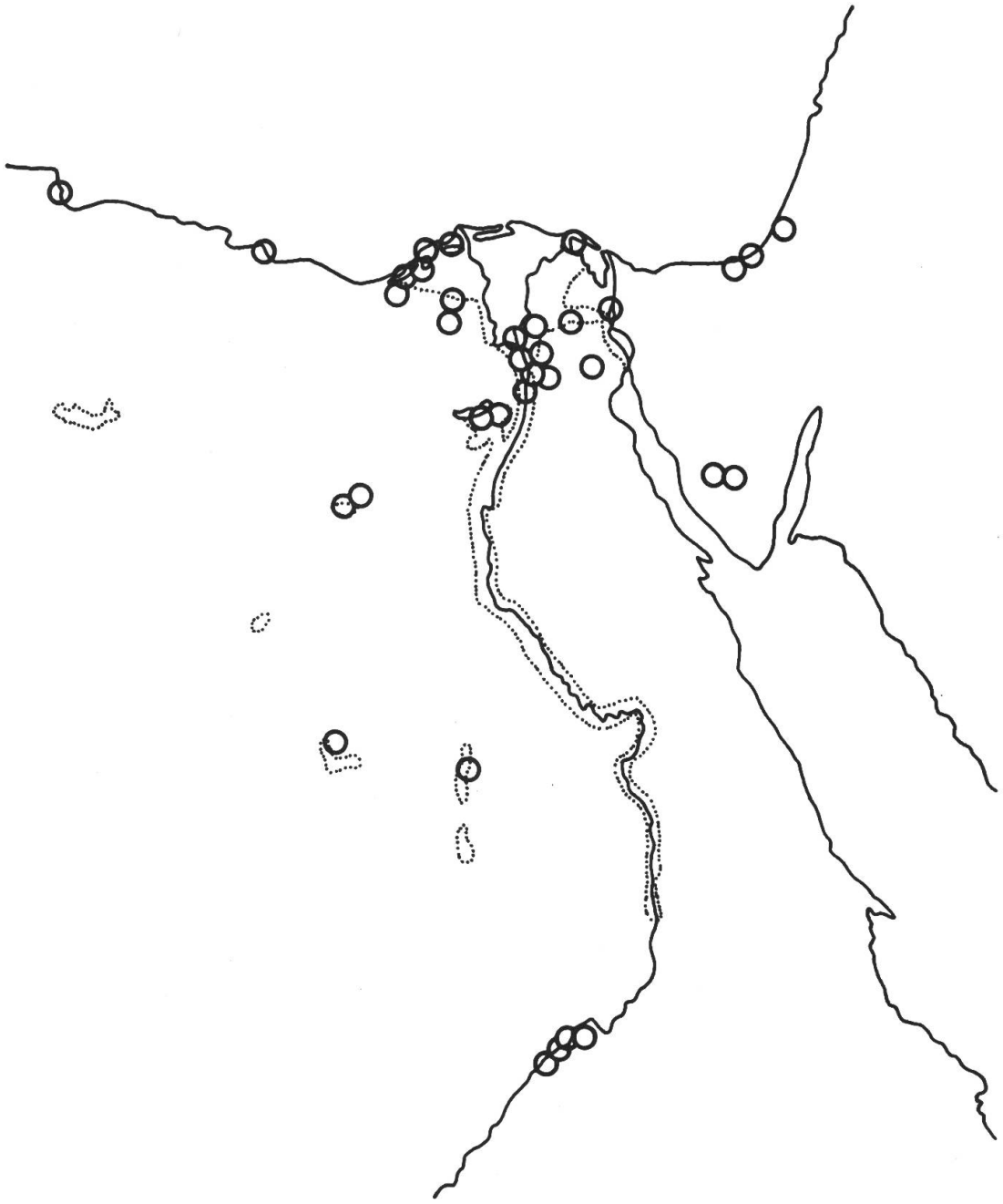

Fig. 4. – Local distribution of *Emex spinosus*.

cf. Drar, 1970). This species has been introduced, however, into East Africa (Graham, 1958) and it is listed among common weeds there (Ivens, 1967). *Medicago ciliaris*, commonly spread in Lower Egypt, has been collected in Egyptian Nubia (cf. Boulos, 1966). *Erigeron crispus* (cf. fig. 5) and *Ambrosia maritima* (cf. fig. 6) are common and locally even abundant in Upper Egypt, Egyptian Nubia and Sudanese Nubia (Ahti, o.c.; Ghabbour, o.c.; Boulos, 1966, 1967; El Hadidi & Ghabbour, 1968). Both species are also known from Sudan, the former from Merowe and Bahr el Ghazal (Drar, o.c.), the latter from Northern and Central Sudan (Andrews, 1956).

With the above mentioned exceptions none of the Mediterranean synanthropophytes studied by the author has been listed among weeds in Sudan (cf. Drar, o.c.; Ghabbour, o.c.; Richards, 1950; Andrews, 1954; Jonglei Investigation Team, 1954) or in East Africa (Ivens, o.c.).

As demonstrated above, the synanthropic species extend far beyond the limits of the supposed influence of Mediterranean climate. The localities recorded in the Nile Valley represent the most southern extension of the range of the Mediterranean element[1] in North-East Africa.

The Nile region, especially the Nile Valley, is remarkable not only because of the diminishing occurrence of the Mediterranean synanthropophytes, but first of all because of the high concentration of tropical weeds. The latter, being confined to the alluvial deposits of the river, are almost exclusively distributed in the Nile Valley and Delta. Their present-day distributional pattern is shown in figure 7. Findings from the territory outside the Nile Basin represent localities of *Bergia aquatica, Corchorus olitorius, Lotus arabicus* and *Trigonella hamosa* in the Oases of Khagra and Dakhla. *Trigonella hamosa* was reported also from Wadi Natroun, Alexandria, Ismailia, and El Arish, *Lotus arabicus* from Ismailia, *Sida alba* and *Gynandropsis gynandra* from Alexandria. The relatively broad range of *Corchorus olitorus* (including the locality in the Siwa Oasis) is due to the fact that this species is cultivated as a common vegetable all over Egypt.

The tropical species belong to the Riverain type of distribution sensu Kosinová (1972) and mostly they represent dominant as well as constant species of the weed communities of summer crop in Egypt (El Hadidi & Kosinová, 1971).

While the Mediterranean synanthropophytes are well documented by many archaeological findings, the occurrence of tropical weeds in Egypt seems to be of recent date. Table 1 contains only two tropical weeds, viz. *Trigonella hamosa* and *Eragrostis aegyptiaca*, and a few pluriregional species extending either from the Mediterranean to the tropics *(Lathyrus aphaca, Rumex dentatus)* or, on the contrary, from the tropics to the Mediterranean area *(Echinochloa colonum, Cyperus alopecuroides)*. However, there is no archaeological evidence for the rest of the present-day coenologically significant tropical weeds. As far as their general distribution is concerned, *Gynandropsis gynandra* and *Corchorus olitorius* are tropical cosmopolites. On the other hand, *Euphorbia aegyptiaca* and *Sesbania sesban* are

[1] The indigenous Mediterranean species are commonly occurring only in a belt along the Mediterranean coast (Mediterranean coastal strip, Isthmic Desert, and Nile Delta). Their inland penetration seems exceptional, though some of them have been found occasionally south of this belt. The species *Poterium verrucosum, Lotus ornithopoides, Micromeria nervosa*, and *Inula viscosa* are reported from Southern Sinai; *Alkanna tinctoria, Hyoscyamus albus* from the northern part of the Arabian Desert; *Scolymus hispanicus* from the Oases, and *Paronychia argentea* even from Gebel Elba (Täckholm & al., 1956).

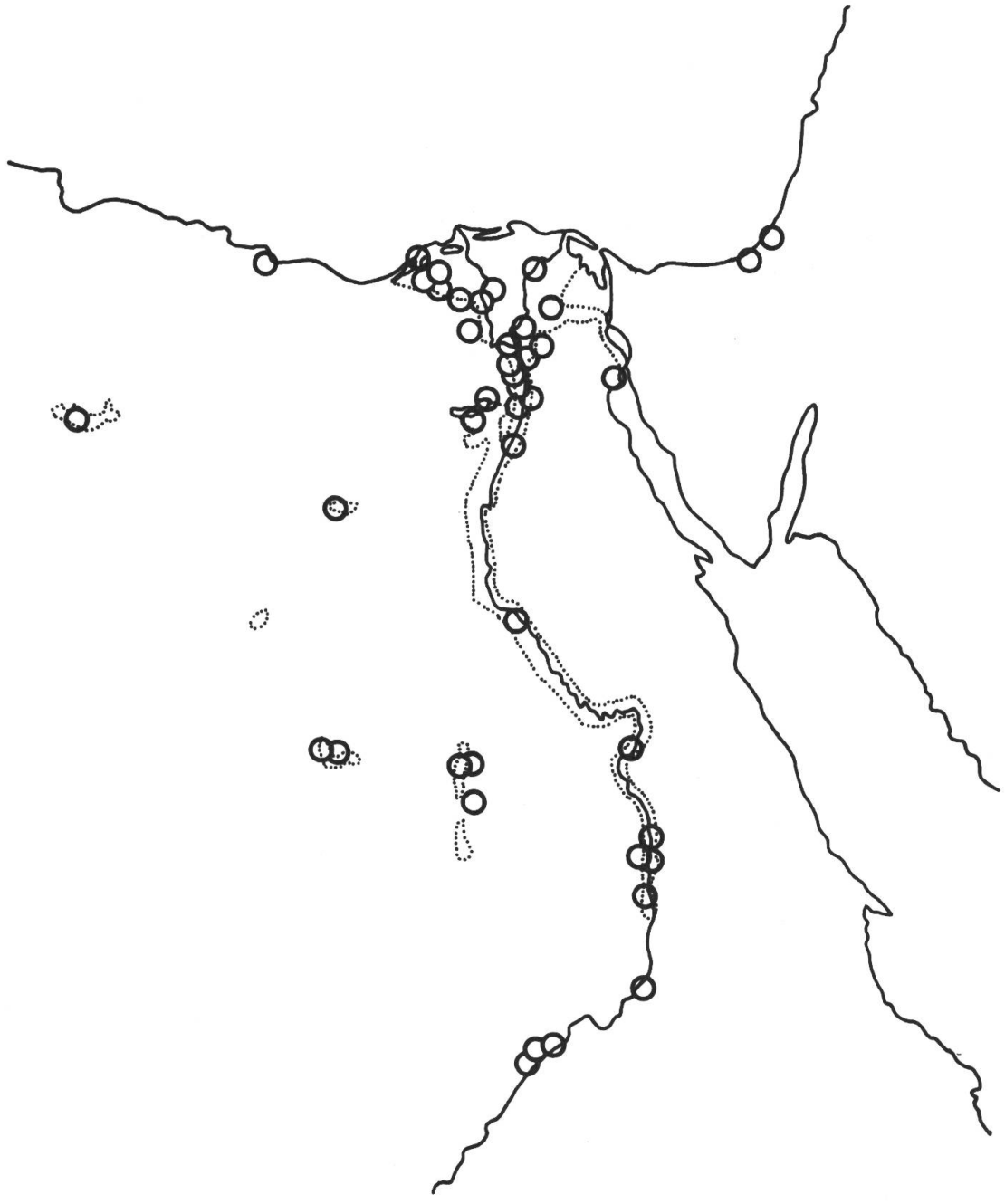

Fig. 5. – Local distribution of *Erigeron crispus*.

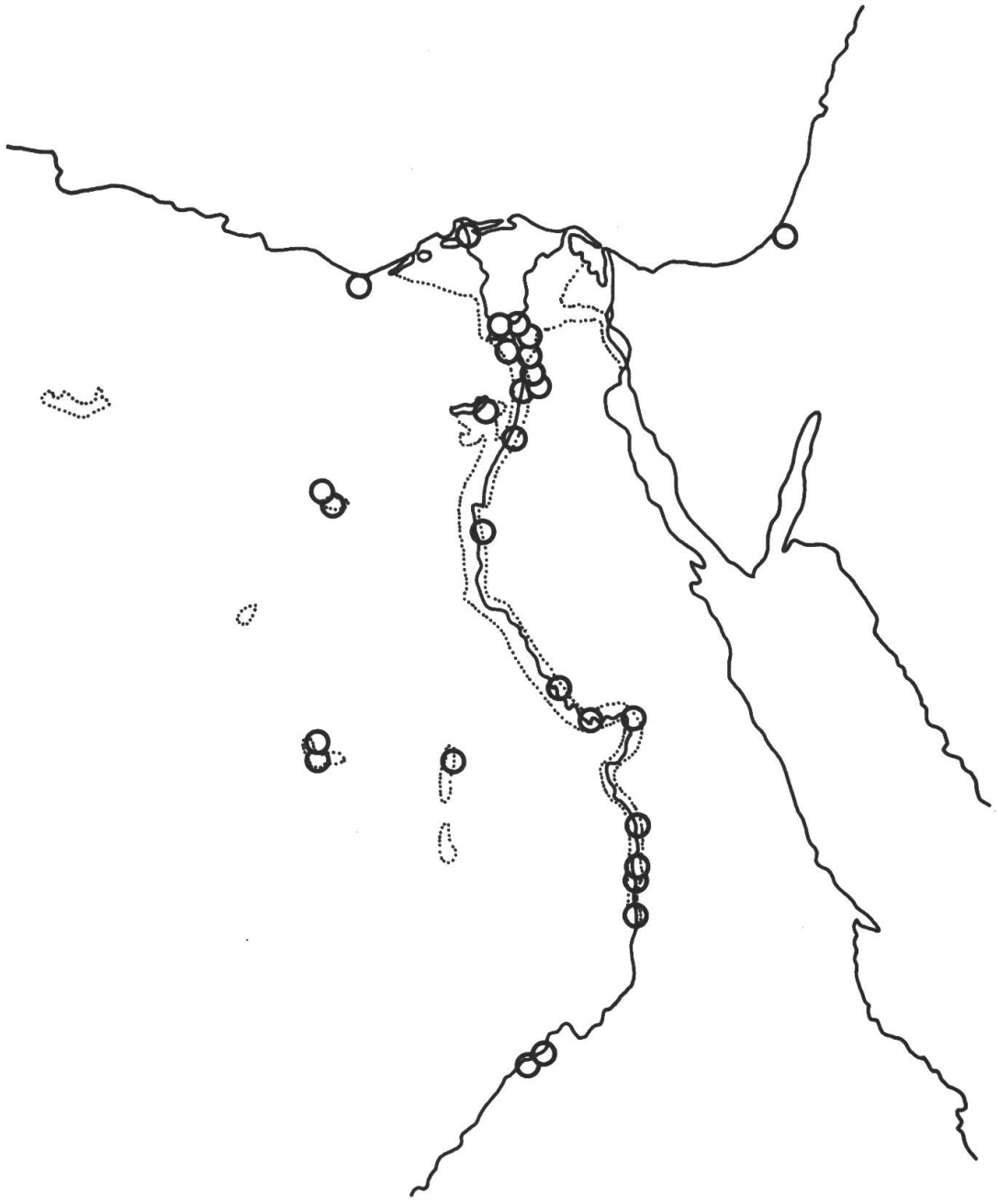

Fig. 6. – Local distribution of *Ambrosia maritima.*

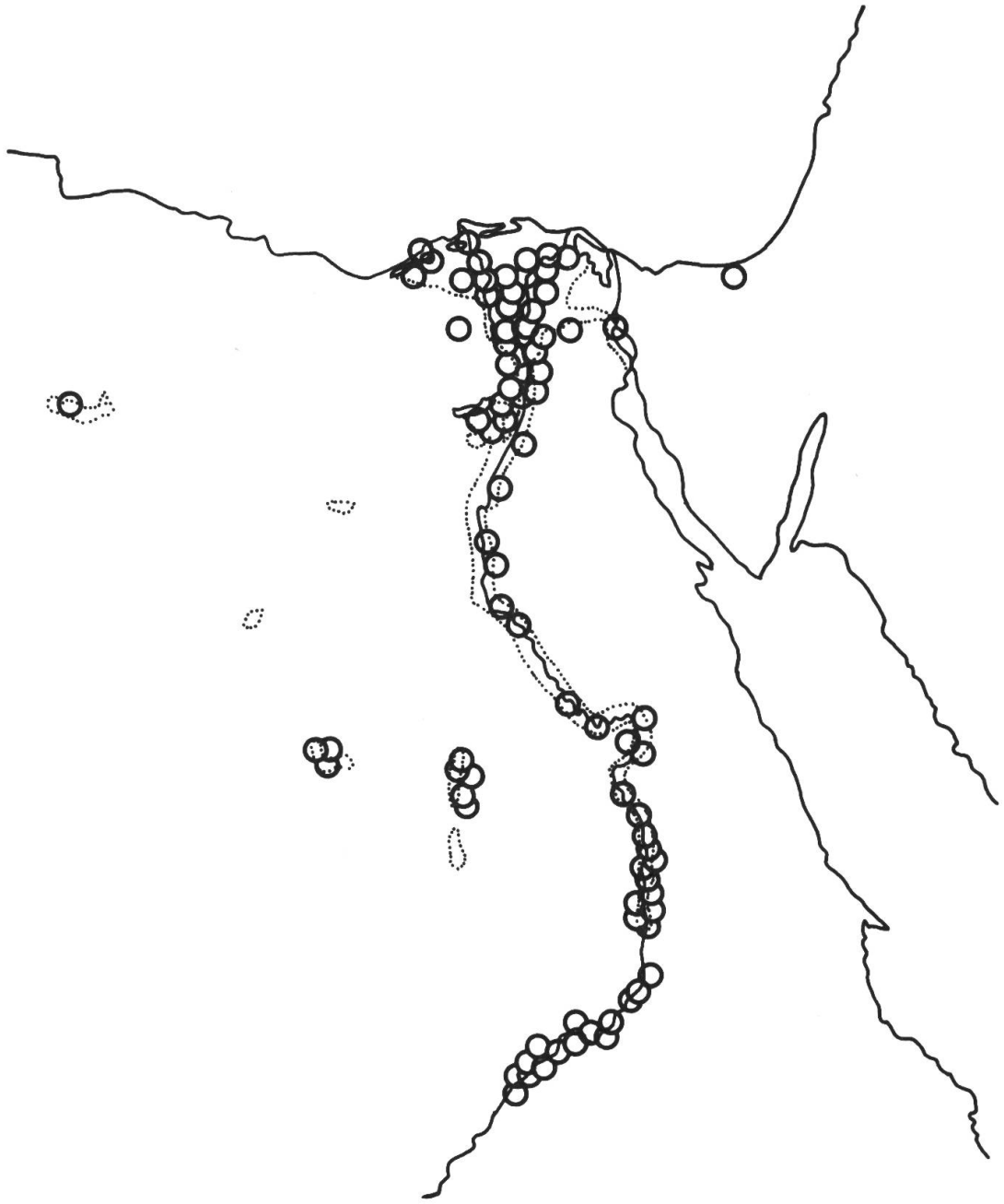

Fig. 7. – Distributional pattern of tropical synanthropophytes in Egypt based on the local patterns of 10 selected species: *Argemone mexicana, Bergia ammanitoides, B. aquatica, Chrozophora plicata, Corchorus olitorius, Gynandropsis gynandra, Lotus arabicus, Physalis angulata, Sida alba* and *Trigonella hamosa.*

| | | | |
|---|---|---|---|
| 1. Monoregionals | Total | 74 species | 22.3% |
| Mediterranean | | 32 | |
| Saharo-Sindian | | 33 | |
| Irano-Turanian | | 8 | |
| Sudano-Deccanian | | 1 | |
| 2. Biregionals | Total | 73 species | 22% |
| Mediterranean–Irano-Turanian | | 63 | |
| Mediterranean–Saharo-Sindian | | 6 | |
| Saharo-Sindian–Irano-Turanian | | 4 | |
| 3. Pluriregionals | Total | 184 species | 55.6% |
| Eurosibero-Boreoamerican–Mediterranean | | 4 | |
| Eurosibero-Boreoamerican–Mediterranean–Irano-Turanian | | 56 | |
| Mediterranean–Irano-Turanian–Saharo-Sindian | | 3 | |
| Tropical | | 55 | |
| Subtropical–Tropical | | 25 | |
| Boreo–Tropical | | 41 | |
| Total number of grouped species | | 331 | 100% |
| Total number of ungrouped species | | 71 | |

Table 2. — Numerical representation of the phytogeographical groups of the synanthropic Egyptian plants.

palaeotropical species (from Africa) in conformity with *Dactyloctenium aegyptiacum, Dinebra retroflexa, Brachiaria eruciformis,* and *Hibiscus trionum* (from Africa or Asia). Other tropical species, such as *Amaranthus panniculatus* and *Euphorbia prunifolia,* are of American origin.

There is a considerable amount of tropical neophytes in the Nile Basin recently reported from various localities in the Nile Valley and Delta (El Hadidi, manuscript; El Hadidi & Kosinová, 1971; El Hadidi, 1973; Imam, Chrtek & Kosinová, 1972): *Achrachne racemosa, Argemone mexicana, Eichhornia crassipes, Euphorbia hyssopifolia, E. hirta, Fuirena ciliaris, Nicotiana repanda, Paspalum distichum, Physalis angulata, Striga asiatica* and *Tagetes minuta.*

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