DRY SEASON PATTERNS OF LIVESTOCK AND HUMAN DISTRIBUTION IN THE GOURMA REGION OF MALI

Preliminary Report to :

CIPEA
BP 60, Bamako,
Mali

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1. INTRODUCTION

During 1983, the International Livestock Centre for Africa (ILCA) selected the Gourma region of Mali as a case-study of sahelion pastoral conditions. During the first six months of 1983, ILCA has undertaken to demonstrate that an experienced and multi-disciplinary team of scientists can rapidly and cost-effectively survey a large tract of pastoral land and thereby identify some of the primary constraints within the system, as a guide to both future research and development options.

This report discribes some preliminary results of low altitude aerial surveys carried out over the Gourma region, covering about 83,300 km^2. An initial reconnaissance, at a low sample intensity, was carried out during the early dry season period of January. Results of this reconnaissance appear as an appendix to this report. A more detailed survey, carried out during the late dry season March period, provided a 9.06% sample cover of the Gourma and will be the base for future analysis.

The aerial survey will be repeated during the wet season of 1983, to provide the necessary comparative information on densities and movement patterns between seasons. A final report should be available before the end of 1983.

This aerial survey was carried out as a joint operation with ODEM, who provided the necessary experienced personal and some ground support. The operation was thus a continuation of the co-operative aerial survey programmes of the 1980-82 period between ILCA and ODEM. The results of the survey will provide an immediate data base for comparison to the adjacent Mali delta region, as well as the ecologically similar NRL project area in Niger that was surveyed by ILCA during the 81/82 period.

Results of this survey are for the discretionary use of ILCA and ODEM and the author retains the right to make minor alterations to the results in the light of the more detailed computer analyses necessary for final reporting. This prelimary report has a limited distribution to the following individuals:

MALI	CIPEA	-	Mr. T. Wilson (Team Leader)
			Mr. S. Cisse (Sociologist)
			Mr. J. Marie (Geographer)
			Mr. P. Hiernaux (Ecologist)
			Capt. J. Meunier (Pilot)
	ODEM	-	Dr. N. Diakete (Director General)
			Dr. M. Keita (Veternarian)
			Mr. G. Sidibe (Sociologist)
			Mr. A. Alkaouri (Cartographer)
			Ms. K. Hilderbrand (Nutritionist)
			Mr. C. Hesse (Sociologist)
UK	ILCA	-	Dr. J. Swift (Socio-economist)
			Dr. A. Hill (Demographer)
			Mr. M. Winter (Anthropologist)
ETHIOPIA	ILCA	-	Dr. J. Lambourn (Director of Research)
			Mr. P. DeLeeuw (Ecologist)
			Ms. C. Peacock (Animal Scientist)
FRANCE	ILCA	-	Prof. J. Gallais (Geographer)

2. METHODS

The basic methodology used for the aerial surveys follows that successfully used by ILCA in Nigeria, Mali, Niger, and Ethiopia and as discribed in reports from these countries (Milligan 1979, 1982a, 1982b, 1983)

Flight lines were spaced at five minutes of latitude intervals and the spacing down each systematic flight line provided a total of 992 grids, each of five minutes of latitude by five minutes of longitude. The flying altitude averaged 803 feet above ground level which resulted in an average sample of 9.06%.

The survey team was:

- Capt. J. Meunier (ILCA), BP60, Bamako Mali.	- Pilot
- Dr. K. Milligan (ILCA) PMB 2248, Kaduna, Nigeria	- Co-ordinator and recording ecological conditions
- Mr. Abdalla Ben Alkaouri (private) Topo-Azawad, BP 1148, Bamako, Mali	- Observer, animals and people
- Mr Gaousson Sidibe (ODEM) Severe, Mali	- Observer, animalsand people

For the initial reconnaissance, of January, Mr Sidibe's place was taken by Mr Jerome Marie of ILCA.

The following perameters were recorded during the survey:

Human Populations: the numbers of camps and individual camp sizes of : Sonrai, Pheul, Tamasheq, Bella and Maure. Villages (principally either Sonrai or Dogon) were excluded from the survey but incorporated into the inventory from the published IGN maps)

Livestock Populations: the size of each individual herd of cattle, sheep and goats, camels or donkeys. The definition of a "herd" was taken as the grazing unit as seen from the plane and would not necessarily correspond to household or ownership units.

Land Use:
- the proportion of land cultivated
- the numbers of wells or other major water sources. This data base was further complimented by reference to the published IGN maps.

Land Forms:
- the basic land-scape units, such as "undulating sand-dunes" or "hilly terrain"
- the grass cover
- the tree density per hectare

In this preliminary report only the following results and maps are presented:

a) the human populations
b) the livestock populations
c) water sources and grass cover

3. Results

3.1. Livestock Populations

3.1.1. Abundance

Table 1 provides estimates for the late dry season livestock populations within the 83,300 km^2 survey region of the Gourma. Results from the initial early dry season reconnaissance are in the Appendix as table A.1. A comparison between these two periods of the dry season are in Table 2.

The cattle population of the Gourma, of about 356,600 head, represents 38% of the total livestock populations and 74% of the total UBT. The most numerous livestock were sheep and goats, at nearly 600,000 head; however they represented only 1/4 of the total UBT. There were only a few camels and donkeys, at about 5,000 head each.

The early dry season totals were not significantly different to the late dry season totals. The sheep and goat population totals were almost identical with only a 1% difference. Although a greater difference (of about 33%) was recorded for the camels and donkeys, the general lack of precision associated with the few recordings of these two species means that this level of difference may not be significant.

The reason for the early dry season reconnaissance was the impression, from ILCA and other staff familiar with the area, that early dry season population totals would be significantly greater to those of the late dry season due to utilization of surface water ponds. This is clearly not the case. However, there was some initial alarm in 1983 concerning the possibility of severe drought during the 1983 dry season. This alarm was partly due to the early dry-up of surface water and thus animals may have established at their usual dry season levels more early then usual.

Fortunately, as the late dry season totals show, the drought, or general dry season conditions, were not particularily severe and the overall animal densities were not unusually low for such an ecological zone. A comparison to data from Niger (table 3), over a similar ecological zone, substantiates these statements. The Gourma region supports a cattle density 20% greater than that occurring in the NRL survey zone in Niger. However there were more sheep and goats in the Niger survey zone, considerably more camels with the result that overall UBT was also slightly greater. The only immediately striking difference is infact in the two camel estimates and it would be interesting to further explore the reasons for this.

3.1.2. Distribution

The dry season distribution patterns of cattle, sheep and goats, camels and donkeys are given in figures 2, 3, 4 and 5 respectively. Information on the distribution of these species, collected during the initial dry season aerial reconnaissance is given in the Appendix, as figures A2 to A5 respectively.

Cattle are well distributed throughout the Gourma. Suggestions about the restricted and clumped nature of dry season distribution are clearly untrue. Nonetheless certain areas of concentration are noteable. Some areas of the river Niger support high densities, but there are other areas of the river that have few animals. Thus, the river Niger does not seem to have an overriding importance. An exception would be the area south of Gao and towards Ansogo which supports the highest concentration of the Gourma.

Another obviously important area is around Hombori, where most grids stocked at less than 5 hectares per head. Although at lower densities, cattle occurred throughout the Hombori to Gossi region. The north western region, towards the dry lake areas, also supported many cattle, as did the south-western region which is extensively cultivated and where the numerous villages have permanent well sites. Similar conclusions can be drawn from the initial reconnaissance flights, except that the region between Hombori and the north-western dry lakes appears to be more important.

The sheep and goat patterns are similar to that of cattle, except that north-western areas, especially between the dry lakes and the river Niger are heavily stocked. The area south of Gao is also well stocked. This pattern and these conclusions are very similar to that detected during the initial reconnaissance.

Camels occurred throughout most of the Gourma, concentrating mainly in the Hombori to Gossi region. The results of the initial reconnaissance show greater concentrations towards the north-western dry lakes area.

Although only few donkeys were seen, there were no major gradients of distribution, except during the initial reconnaissance where densities were highest near the north-western lakes area.

These livestock distribution maps suggest the following (which will be latter more carefully qualified and interpreted)

a) the Gourma is relatively well stocked;

b) animals occur throughout the Gourma, though the Hombori area and the area towards the north-western dry lakes appear particularily well stocked

c) the river Niger, although supporting many animals along certain stretches, is not an overriding factor influencing livestock distribution in the Gourma.

d) late and early season patterns are similar with the only immediately obvious difference being a reduction in importance of the north-western dry lakes area as the dry season progresses.

3.2 *Human Populations*

Two important difficulties arose in estimating the distribution of pastoral camps:

a) a slight disagreement between the Aerial Team members, on identification of Maure camps.

b) an unprecise delination between camps and villages. Villages were recorded seperately from the air and then final village densities were mapped with reference to the IGN 1 : 200,000 maps. Some villages could be clearly identified as Sonrai or Pheul or Dogon, but most, especially the larger villages, must be recognised to contain an ethnic variety. Although camps were considered as those settlements with less than 50 habitations, such a distinction was often ammended by a judgement of their apparent permanency; for example twenty mud or banco houses would be deemed a village. The only major difficulty this has posed is with the distribution of the Sonrai; the given maps of Sonrai camps should thus be viewed in conjunction with the village map, as most of the villages along the river Niger are predominantly Sonrai.

Figures 6, 7, 8, 9, 10 and 11 show the distribution of villages, and camps of Tamasheq, Bella, Maures, Pheuls and Sonrai respectively. Similar information, from the early dry season reconnaissance, is given in the Appendix as figures A.6 to A.10 respectively.

There are essentially three areas of village concentration: along the river Niger; in the South-west around Hombori and west to Douentza and south toward the Upper Volta boarder; and near the north-western dry lakes. Most of the Gourma is devoid of villages.

The Tamasheq were found throughout the Gourma except in the extreme south-west. Areas of greatest concentration were the extreme south-east and the extreme north-west. Camps were generally well spaced. During the initial reconnaissance the north-western dry lakes area appeared to be substantially more important.

The Bella occupy three main areas: the entire south-east; the region around and to the north of Gossi; and; particularily, the north-western dry lakes area. Interesting, this north-western concentration was not found in the early reconnaissance while a major concentration north-west of Gossi was conspicuous. It is tempting to link the Tamasheq and Bella movement strategies and to thus suggest that during the early dry season period, the Tamasheq of the north-western areas move out of the Zone and their enterprises in this region are then managed by Bella moving in from the Gossi area.

Maures were found only in the northern regions, and mainly the north-west near the dry lakes. The early reconnaissance detected only a few, to the extreme north-west and thus as the dry season progresses there appeares to be a movement of Maures into the area from north-west, in an easterly direction.

The Pheuls are mainly in the Hombori area and regions south-west of Hombori. A few camps were detected to the north-west near the dry lakes and towards Gossi. The early reconnaissance produced a similar pattern.

Sonrai camps were almost totally restricted to the banks of the Niger. This distribution pattern should be viewed in conjunction with the map of villages.

3.3. *Pastoral Stratification*

An initial, and tentative, division of land into "social-pastoral" units would identify seven relatively discret units

a) the north-western dry lakes area:

Mainly sheep and goats. Some cattle early in the dry season but numbers decreasing as the dry season progresses. As well as the permanent village settlements, many Tamasheq and Bella camps, with the Bella concentration increasing as the dry season progresses and as the Tamasheq concentration decreases. Increasing influence from Maures as the dry season progresses.

b) *the north and north-eastern sanddunes;*

relatively few, and scattered, herds of all species with no obvious dominances. Mostly Bella with a few Tamasheq. Bella numbers decreasing as dry season progresses.

c) *the Gossi lake area:*

mostly sheep and goats, though also camel concentrations. Some Tamasheq but mostly Bella. .

d) *the Hombori sanddunes and mountains:*

major concentrations of cattle, sheep and goats and camels, persisting throughout dry season. Area of dense village settlement, both Pheul and Dogon. Although camps are dominantly Pheul, some Bella especially in early dry season period.

e) *the south-western farmed land:*

Areas of increasing importance to cattle as dry season progresses, but never site of major concentrations. More important for sheep and goats. Virtually no camels or donkeys. Area of dense village settlement, both Pheul and Dogon. Only important camps are Pheul.

f) *the south-eastern savannas:*

Important for all species, especially sheep and goats and donkeys. Bella concentration area, with some Tamasheq camps.

g) *the river Niger floodplains:*

Concentrations of cattle, sheep and goats, though unimportant for camels and donkeys. Dense village settlements, mostly Sonrai, along entire length of Niger. Although, some Bella concentration in extreme north-west and south-east, most camps are Sonrai.

Such divisions, which would need to be supported by the ecological discriptions that will be presented in final reporting, also need to be fully discussed with individuals who have ground experience in the Gourma. It may for example be useful to link the "north and north-eastern sanddunes" with the"south-eastern savannas" and the "Hombori sanddunes and mountains" to the "south-western farmed lands"

3.4. Grass Cover and Water Availability

3.4.1. Grass Cover

There are three main areas of substantial grass cover (figure 12): north-west, between Gossi and the dry lakes; west, between Gossi and Gao and stretching down towards Ansongo; and south-west, south of Hombori and Douentza and towards the Upper Volta boarder.

3.4.2. Water Availability

Dry season surface water, as lakes or undried stretches of streams, were only conspicuous at Gossi and in the extreme south-east (figure 13). Further discussions with ILCA staff will clarify the apparent discrepency between wells recognized by ILCA (Marie, pers comm) and those published by the IGN. ILCA recognizes 14 wells, while the IGN maps some 77 wells. ILCA's information is almost entirely restricted to the central and north-western areas, and corresponds, in only some cases, to those mapped by the IGN. The real situation, and the characteristics of each well, should be determined as a priority to any work in the Gourma, as the Gourma region would appear to have an exceptionally poor well coverage. By comparison, the region survey in Niger, of almost identical surface area, had about 530 wells. Only four pump stations are reported, with two of them established during the past year by SATOM. By comparison, the area surveyed in Niger had thirteen.

These water availability differences lead to interesting hypothesis considering that the two areas support similar livestock densities and are ecologically similar. On the one hand, the number of wells in the Niger area may be superfluous (an unlikely conclusion, as most are privately owned and dug with local labour and cost). Alternatively factors limiting the Niger region carrying capacity (grass availability or quantity?) may be of similar importance to those limiting the capacity of the Gourma (water availability?) If this latter is true, increasing water availability would be a rapid and feasable strategy for pastoral development of the Gourma. The subject requires substantially greater thought than given in this Preliminary Report and the obvious differences in both the ethnic populations of the two areas and the different livestock breeds need to be taken into consideration.

4. REFERENCES

Milligan K. Bourn D. and Chachu R. (1979) "Dry and wet season patterns of cattle and land use in four regions of the Nigerian Sub-humid Zone" Report to ILCA, Kaduna, Nigeria.

Milligan K. and Keita M. (1982a) "Recensement aerien saisonnier du cheptel et types de paysage du delta central du Niger au Mali" Report to ODEM/ILCA, Severe, Mali.

Milligan K. (1982b) "Recensement aerien des populations humaines et animales et conditions mesologiques d'une region due centre de la zone pastorale du Niger" Report to USAID, Niamey, Niger.

Milligan K. (1983) "An aerial reconnaissance of livestock and human populations in relation to land use and ecological conditions in the Sordu project area of southern Ethiopia" Report to RDP/ILCA, Addis Ababa, Ethiopia.

Table I. LATE DRY SEASON LIVESTOCK POPULATIONS (±%SE) IN THE GOURMA REGION* OF MALI

		TOTAL POPULATION		DENSITY (NOS/KM^2)	STOCKING (HA/HD)	TOTAL HERDS
1.	Cattle	356,644 (10)	8.87 %	4.28	23	7,749 (10)
2.	Sheep/Goats	581,028 (7)	9.32 %	6.98	14	8,156 (7)
3.	Camels	4,801 (15)	8.68 %	0.06	1,736	1,762 (10)
4.	Donkeys	4,891 (20)	8.92 %	0.06	1,704	723 (12)
5.	UBT**	361,884		4.34	23	-

* The Gourma region, as surveyed, is showen on figure 1 and covers about 83,300 Km^2

** UBT totals were calculated assuming: cattle 0.75; sheep and goats 0.15; camels 1.0; donkeys 0.5

Table 2. COMPARISON BETWEEN EARLY AND LATE DRY SEASON LIVESTOCK POPULATIONS IN THE GOURMA REGION OF MALI

	Early Dry	Late Dry	% Difference
ANIMAL DENSITY (Nos/km^2)			
Cattle	4,81	4,28	-11
Sheep/Goats	7.06	6.98	- 1
Camels	0.09	0.06	-33
Donkeys	0.09	0.06	-33
UBT	4.80	4.34	-10
HERD DENSITY (Nos/km^2)			
Cattle	0.135	0.093	-31
Sheep/Goats	0.138	0.098	-29
Camels	0.030	0.021	-30
Donkeys	0.013	0.009	-31
MEAN HERD SIZE			
Cattle	36	46	+28
Sheep/Goats	51	71	+39
Camels	3	3	0
Donkeys	7	7	0

Table 3

Comparison of dry season livestock densities in the Gourma to those of the Pastoral zone of Niger

Region	Gourma	NRL *
Surface Area (km^2)	83,300	81,555
Month	April	May
Year	1983	1981
Sample (%)	9.1	9.2
ANIMAL DENSITY (Nos/km^2)		
Cattle	4.28	3.54
Sheep/Goats	6.98	9.57
Camels	0.06	0.86
Donkeys	0.06	0.17
UBT	4.34	5.03
HERD DENSITY (Nos/km^2)		
Cattle	0.135	0.107
Sheep/Goats	0.138	0.208
Camels	0.030	0.158
Donkeys	0.013	0.024
MEAN HERD SIZE		
Cattle	36	33
Sheep/Goats	51	46
Camels	3	5
Donkeys	7	7

* Results of the NRL survey are given in Milligan 1982 b.

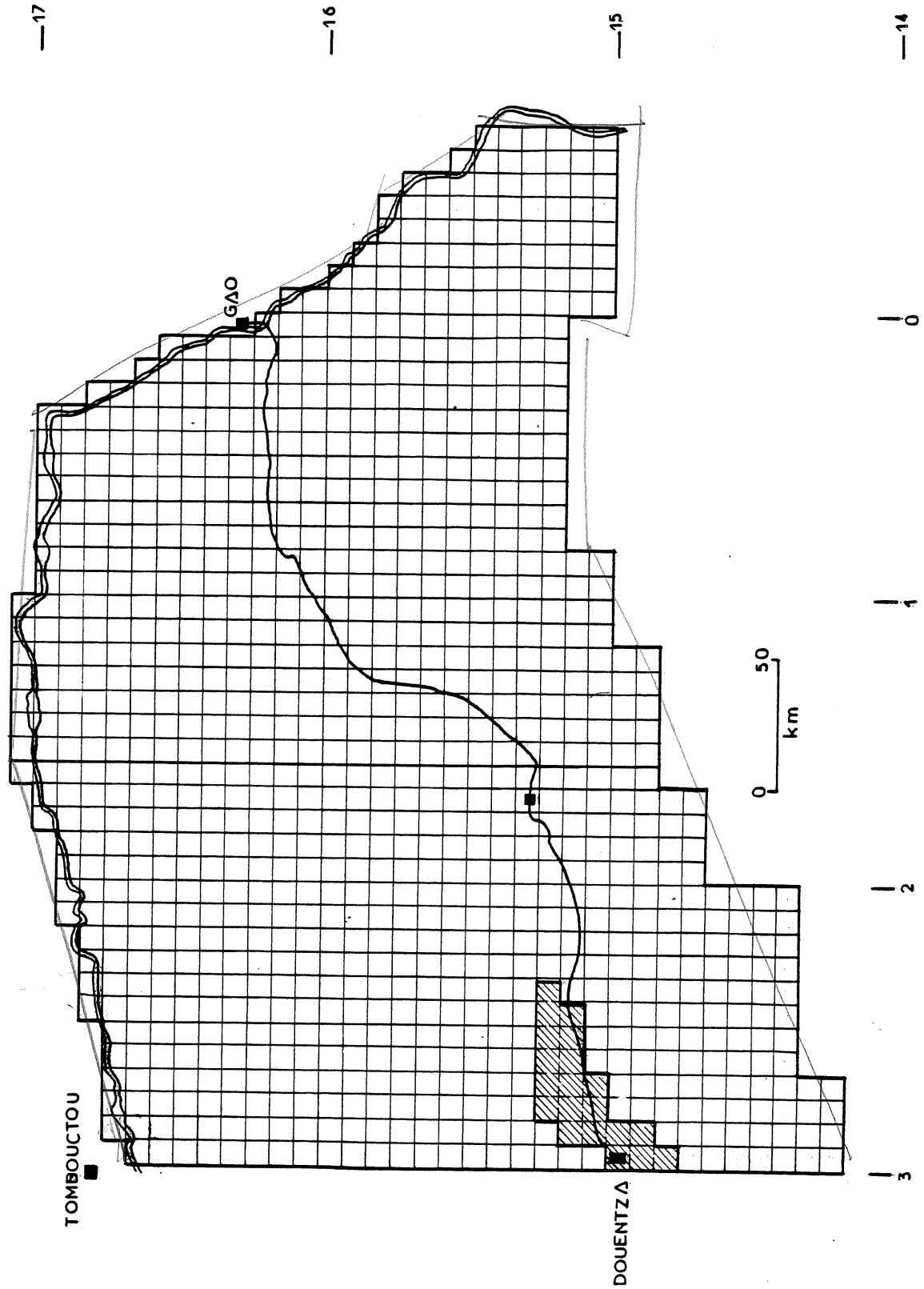


Figure I. Grid pattern used for aerial survey of the Gourma region of Mali

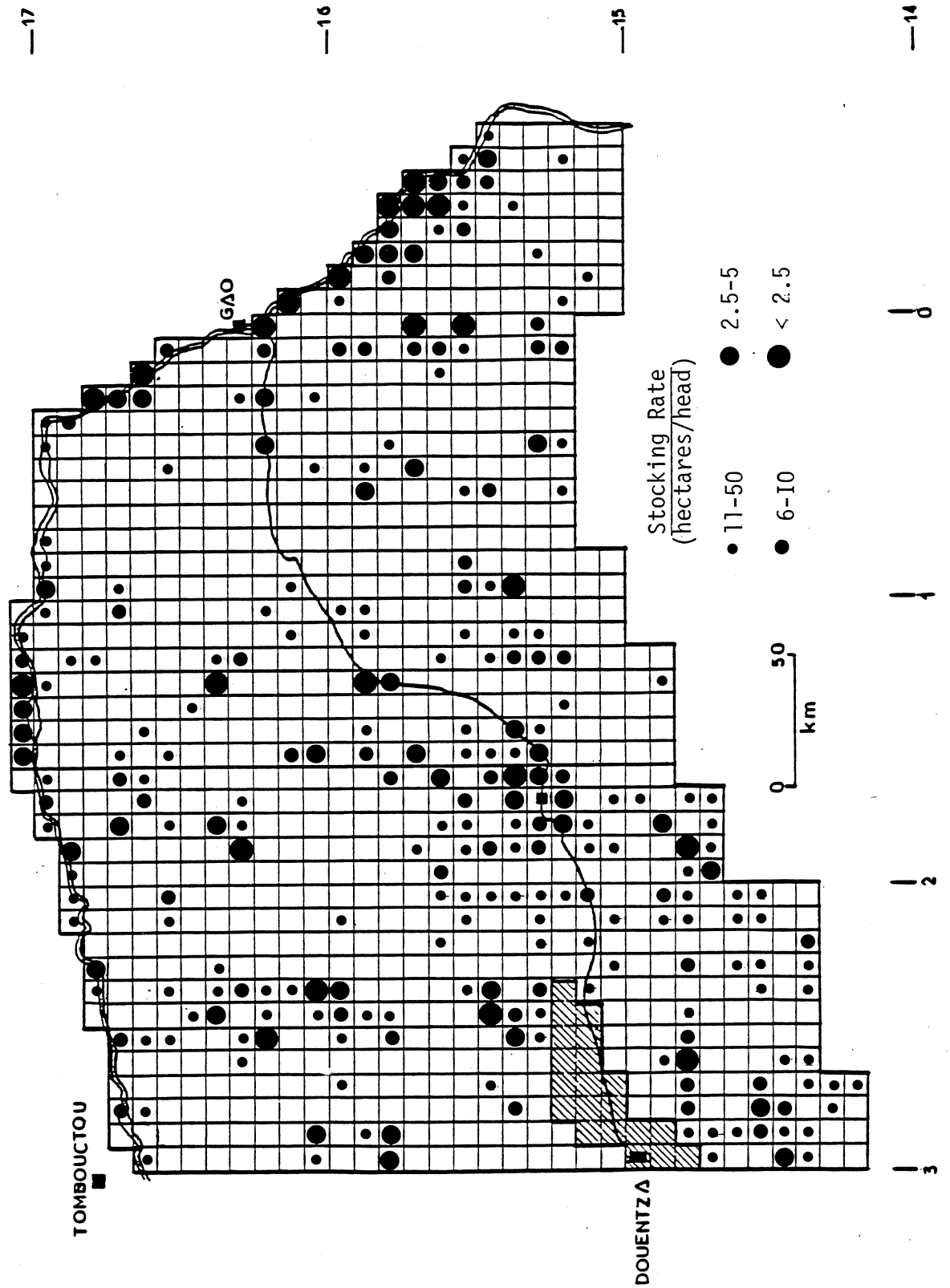


Figure 2 Dry season distribution of cattle in the Gourma region of Mali

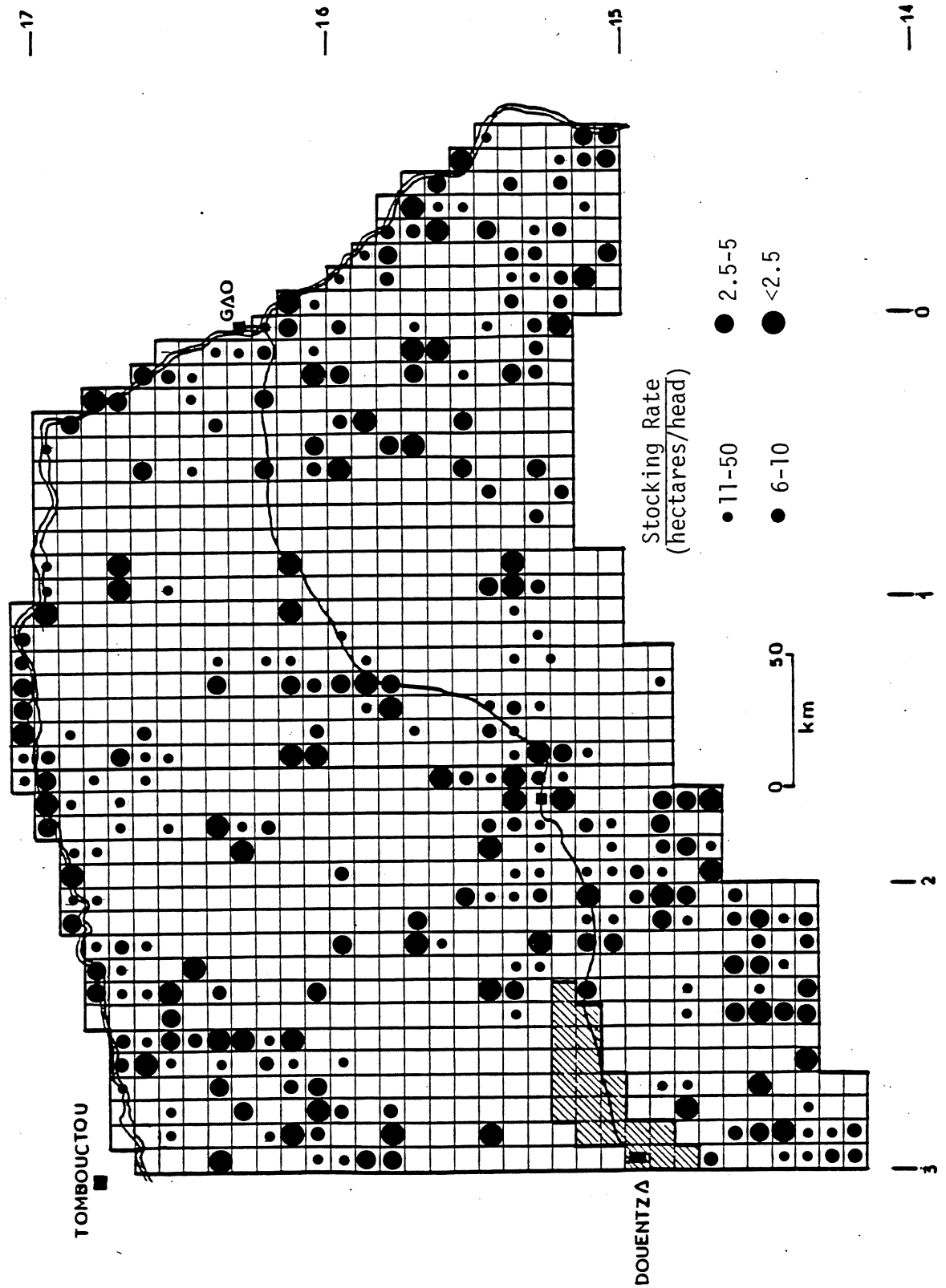


Figure 3 Dry season distribution of sheep and goats in the Gourma region of Mali

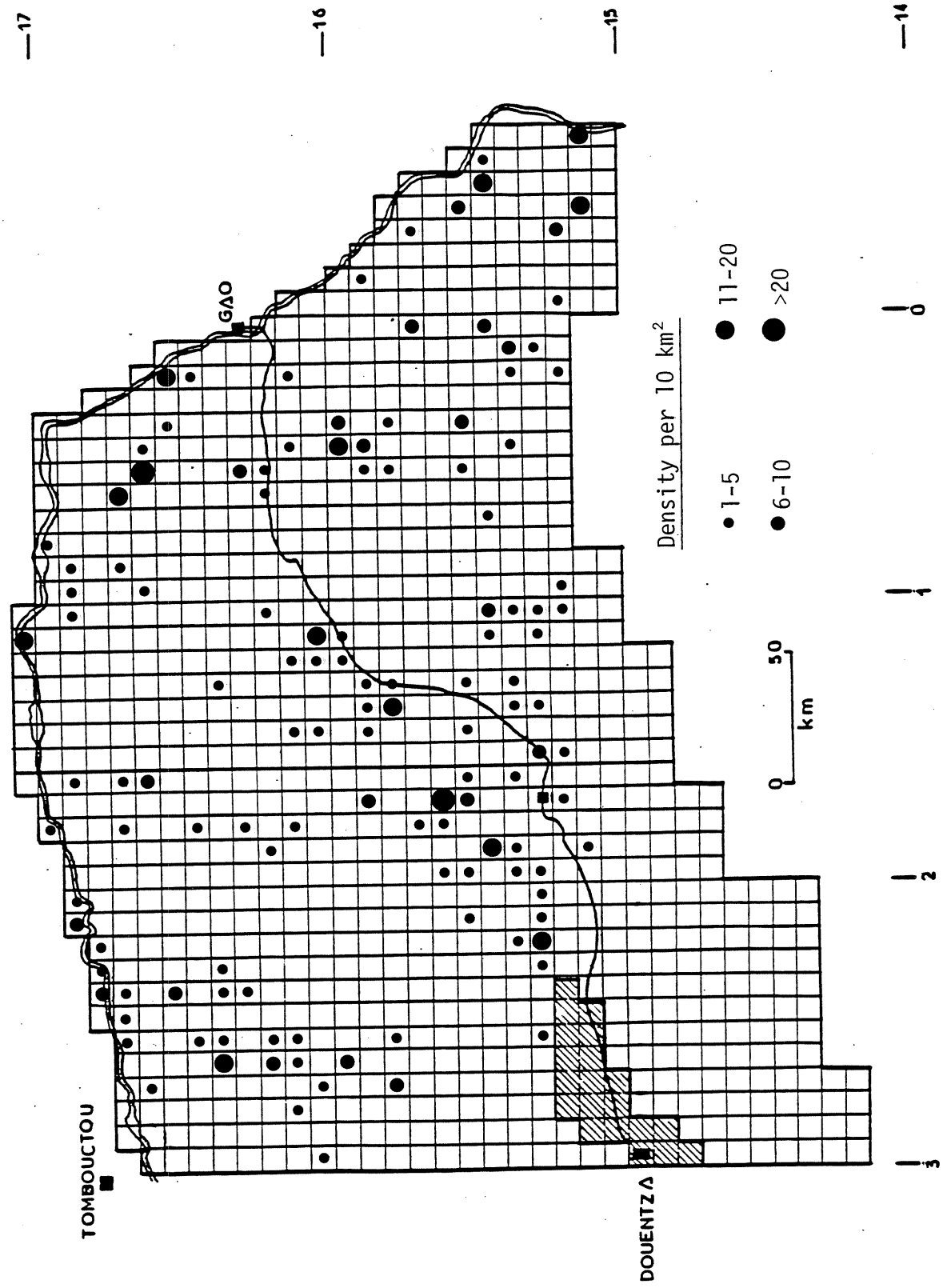


Figure 4 Dry season distribution of Camels in the Gourma region of Mali

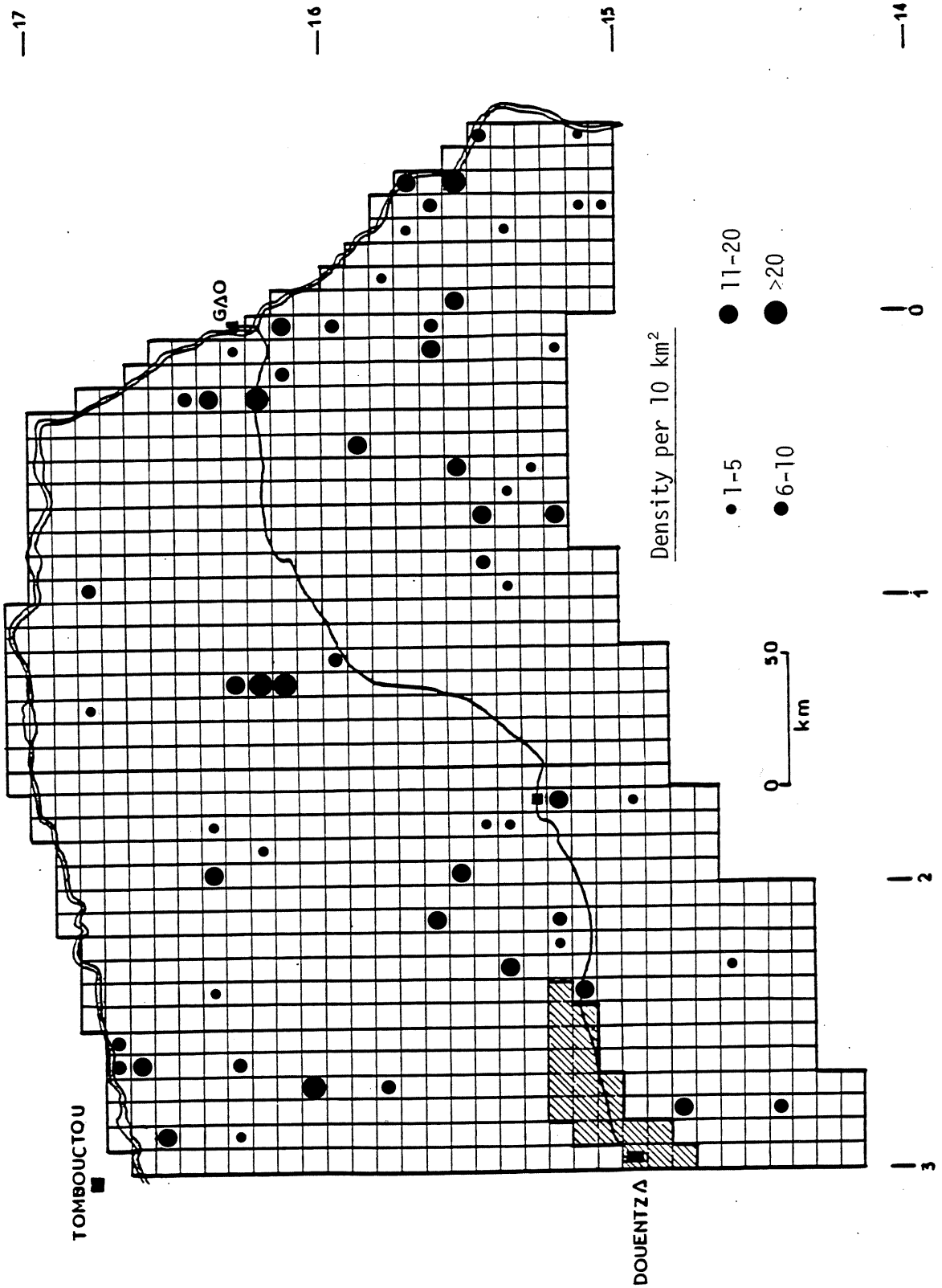
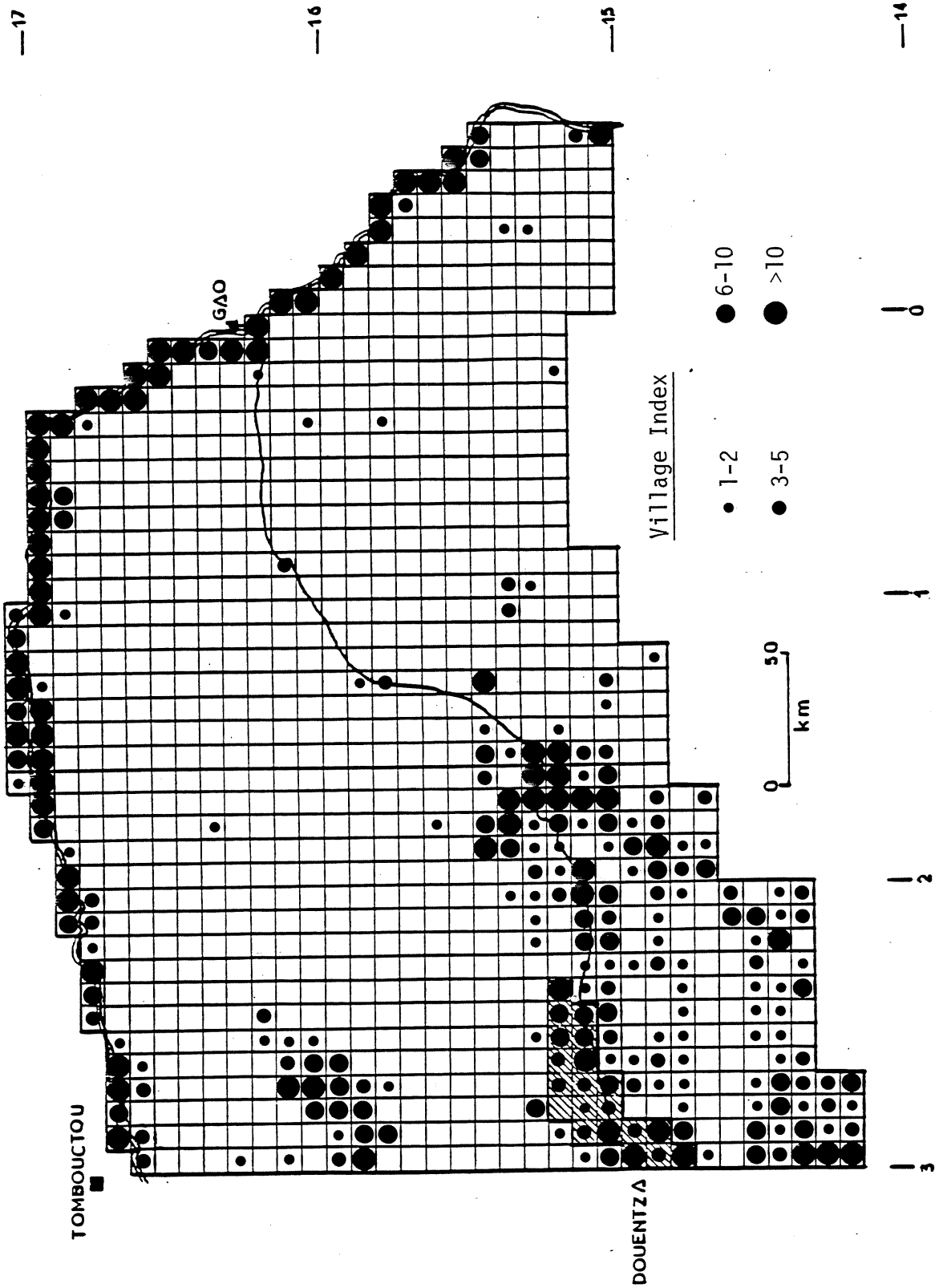


Figure 5. Dry season distribution of Donkeys in the Gourma region of Mali

Figure 6. The distribution of village sizes in the Gourma region of Mali



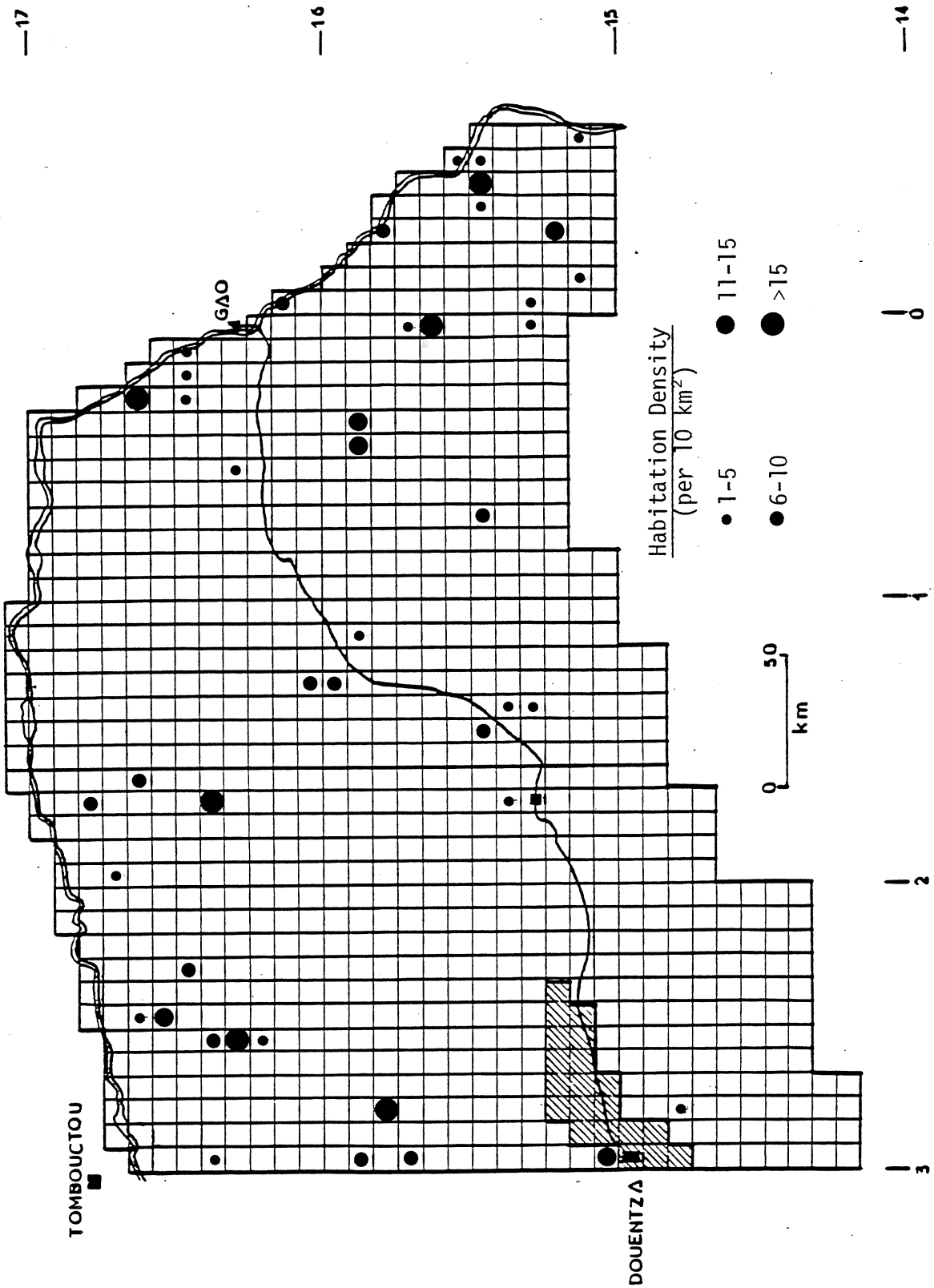


Figure 7. Dry season distribution of Tamasheqs in the Gourma region of Mali

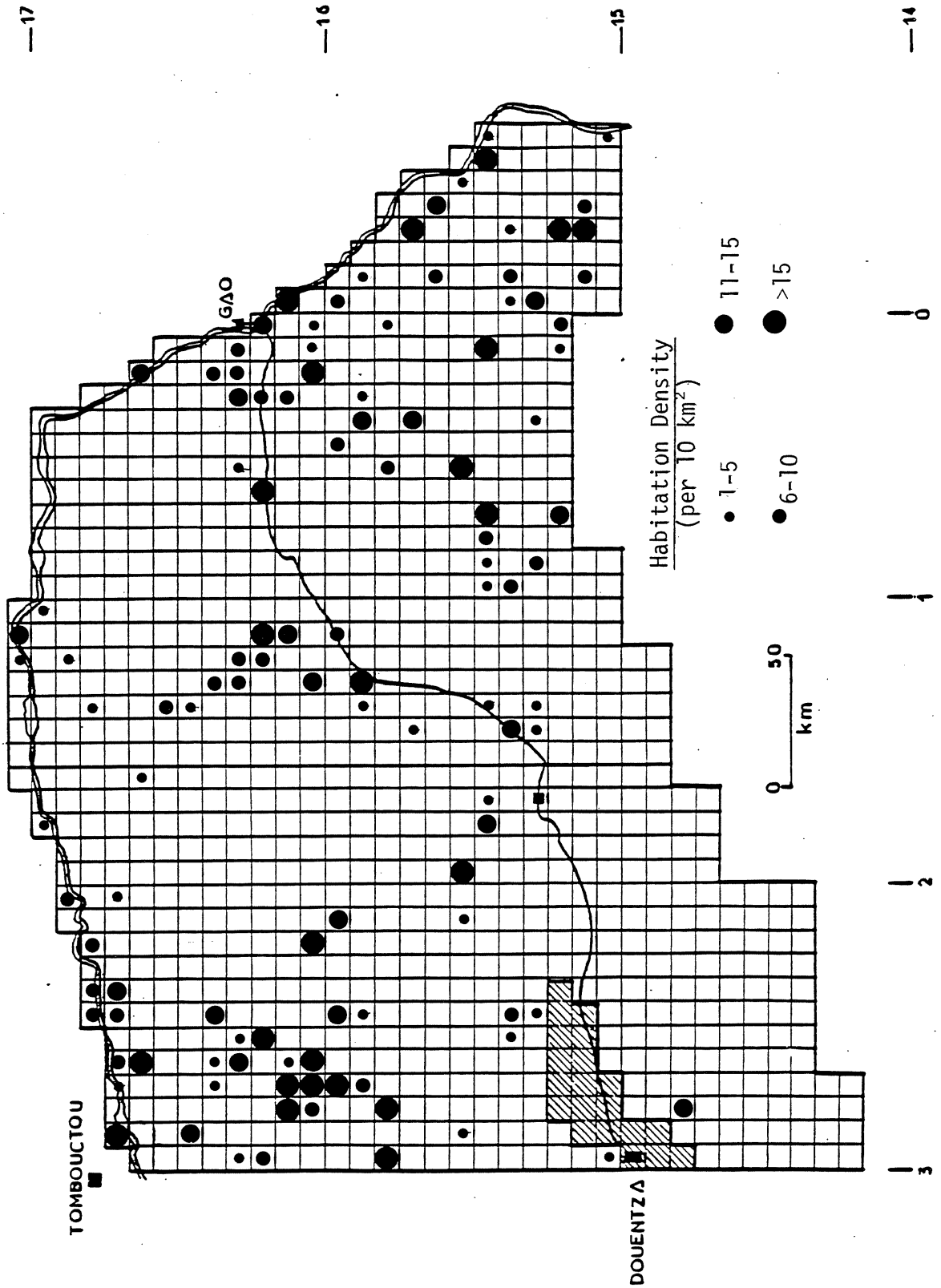


Figure 8. Dry season distribution of Bella in the Gourma region of Mali

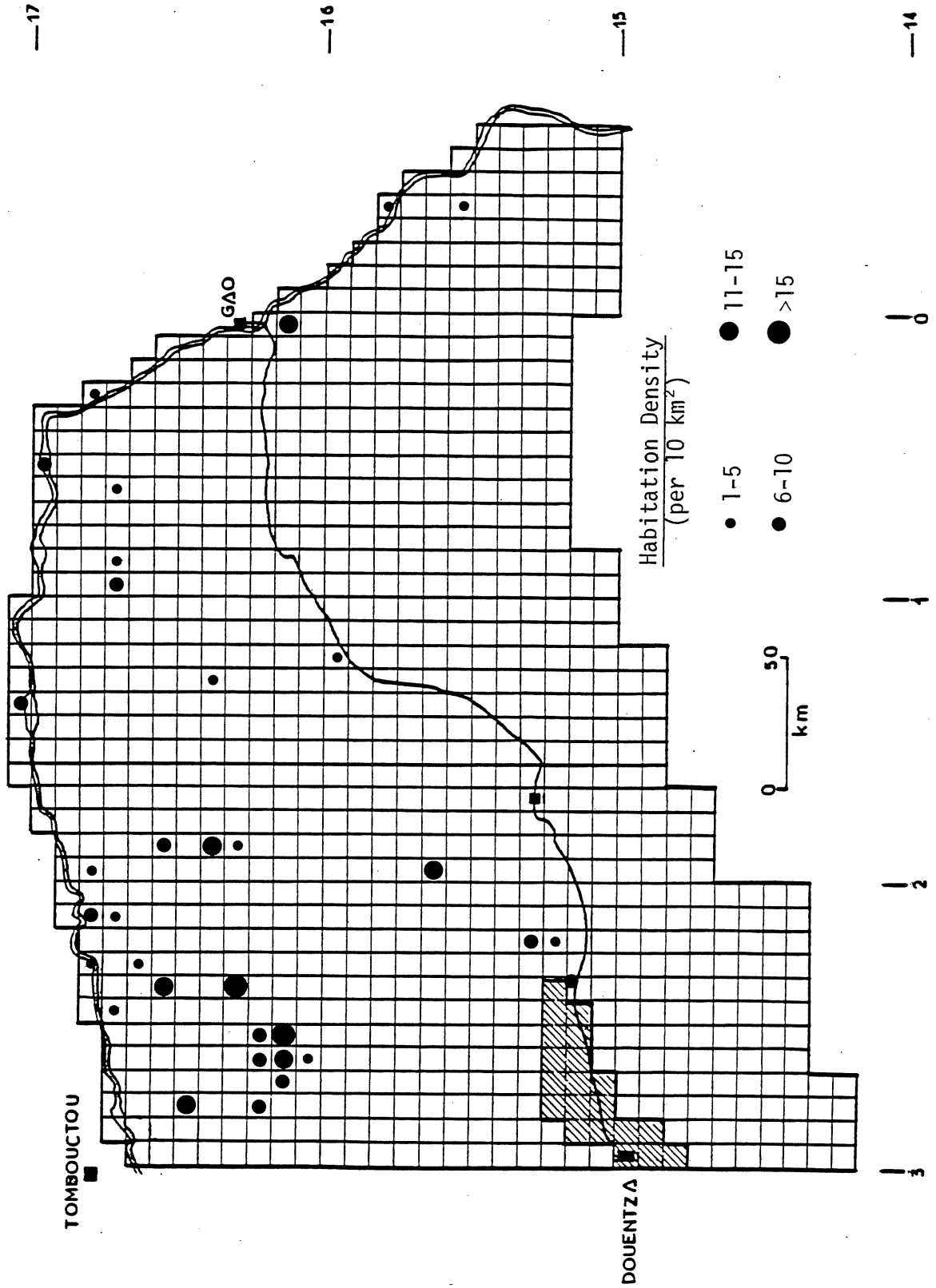


Figure 9. Dry season distribution of Maures in the Gourma region of Mali

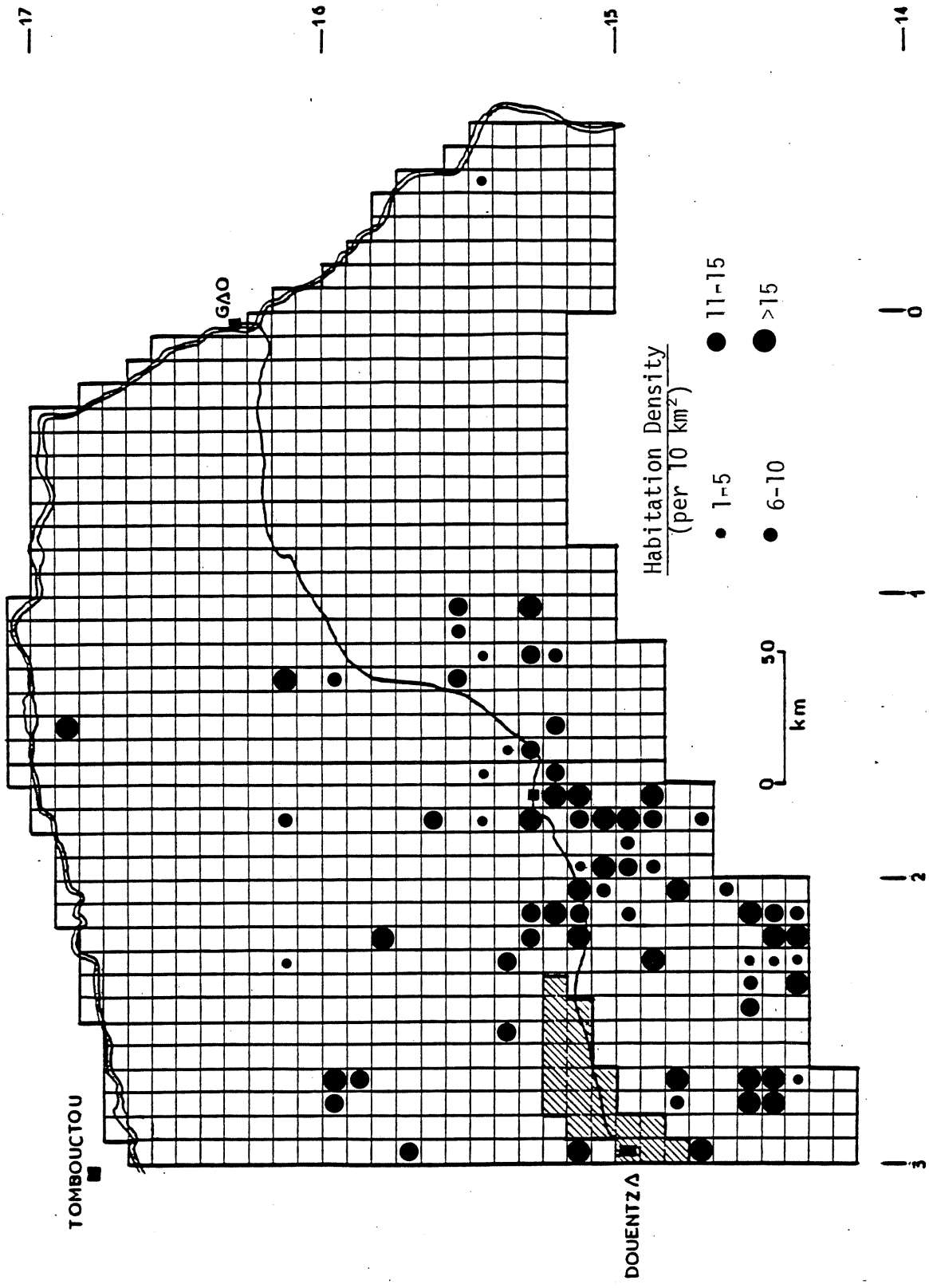
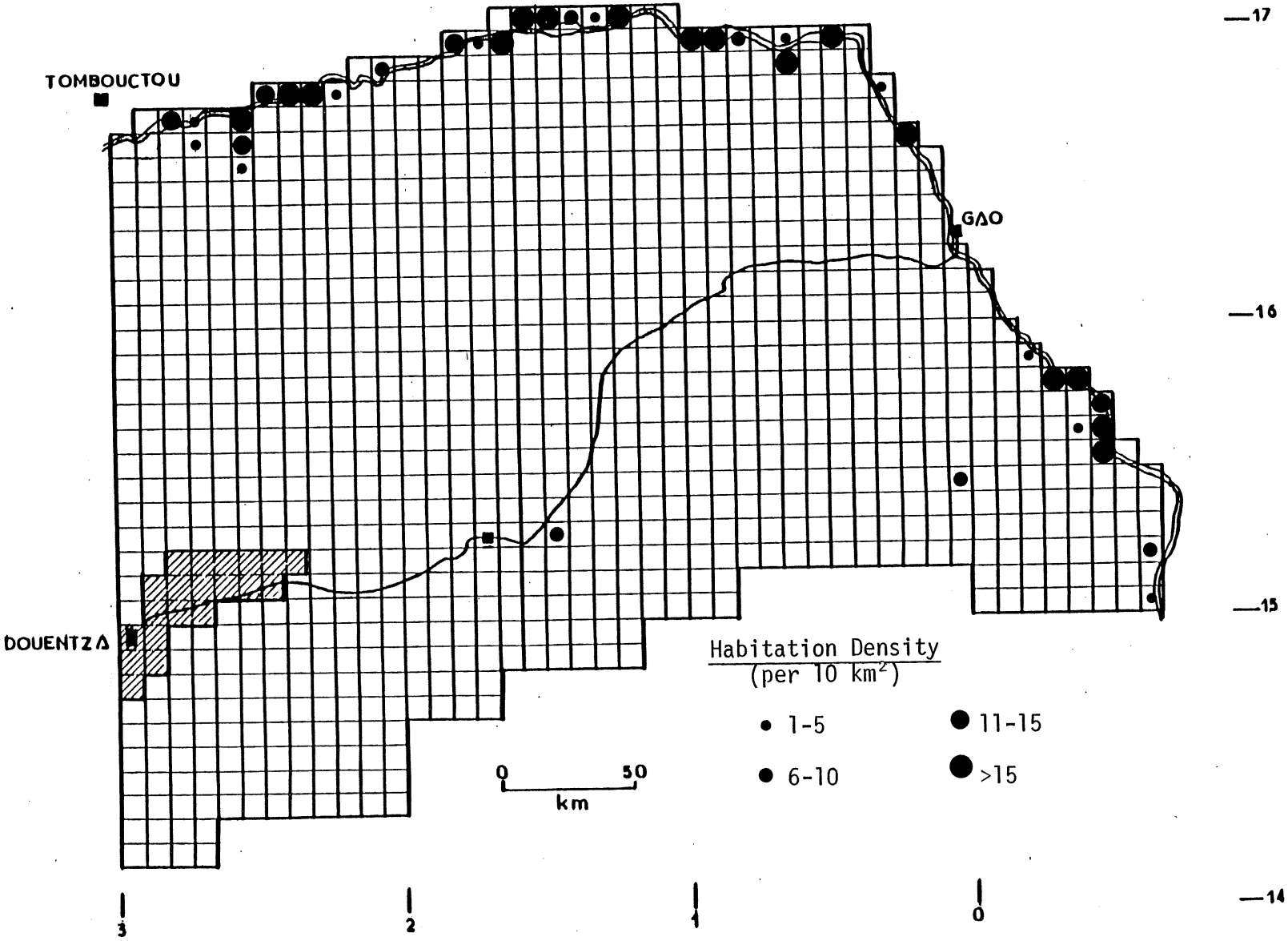


Figure 10. Dry season distribution of Pheuls in the Gourma region of Mali

Figure 11. Dry season distribution of Sonrai in the Gourma region of Mali



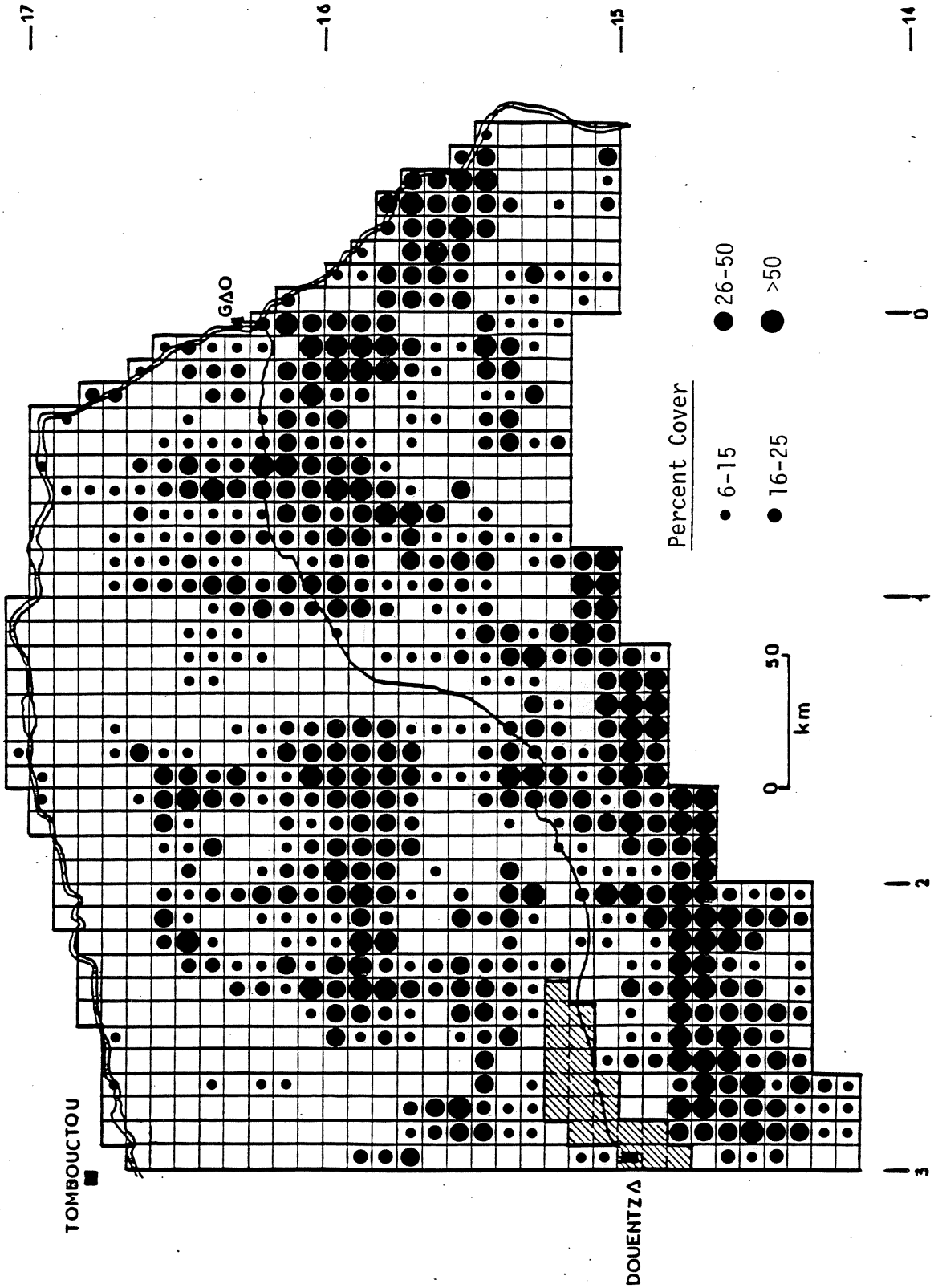
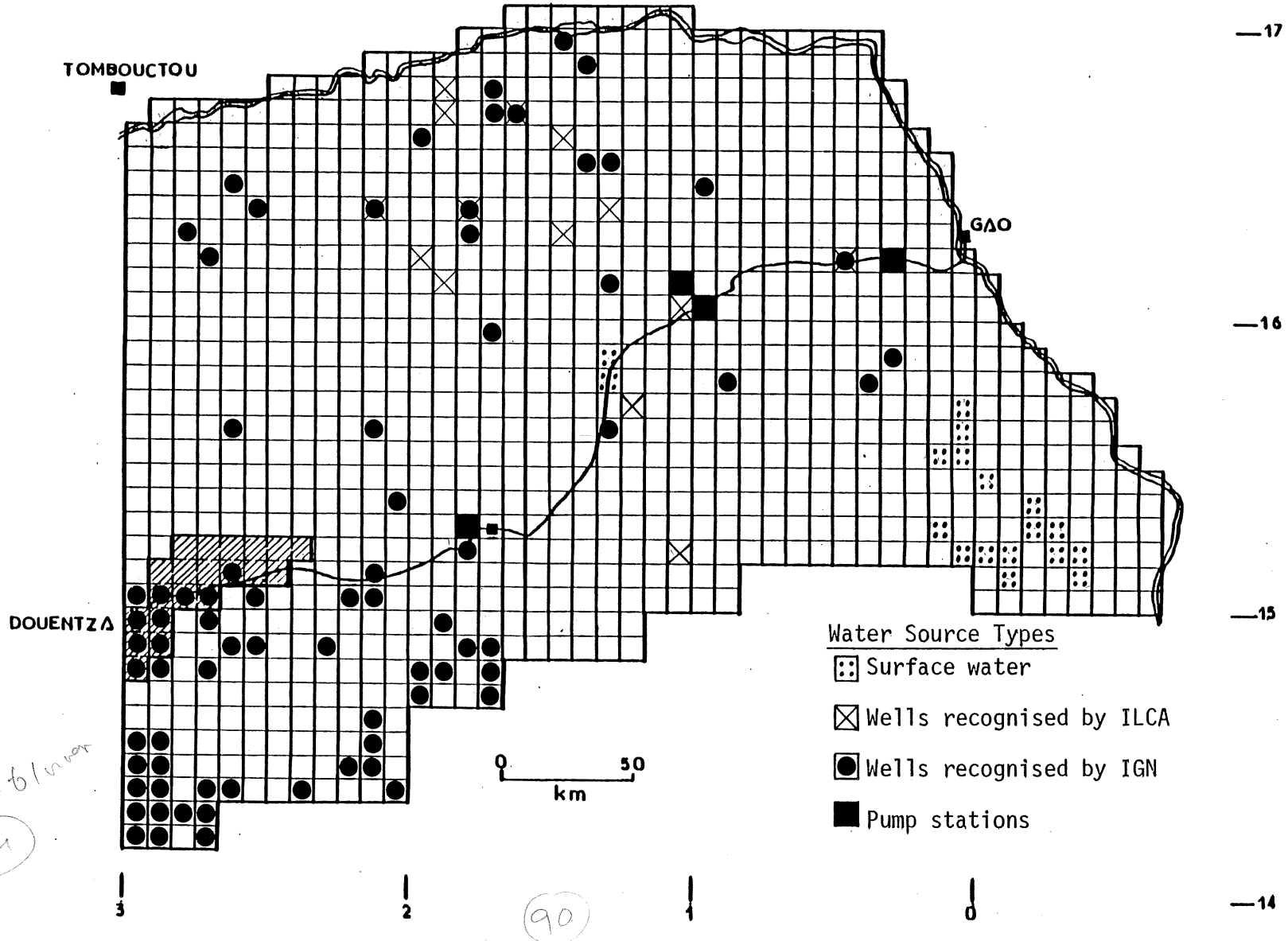


Figure 12. Dry season distribution of Grass cover in the Gourma region of Mali

Figure 13 Distribution of wells and dry season surface water in the Gourma region of Mali



APPENDIX

Preliminary Results from an Initial Reconnaissance
of the Gourma Region of Mali
carried out during the early dry season period

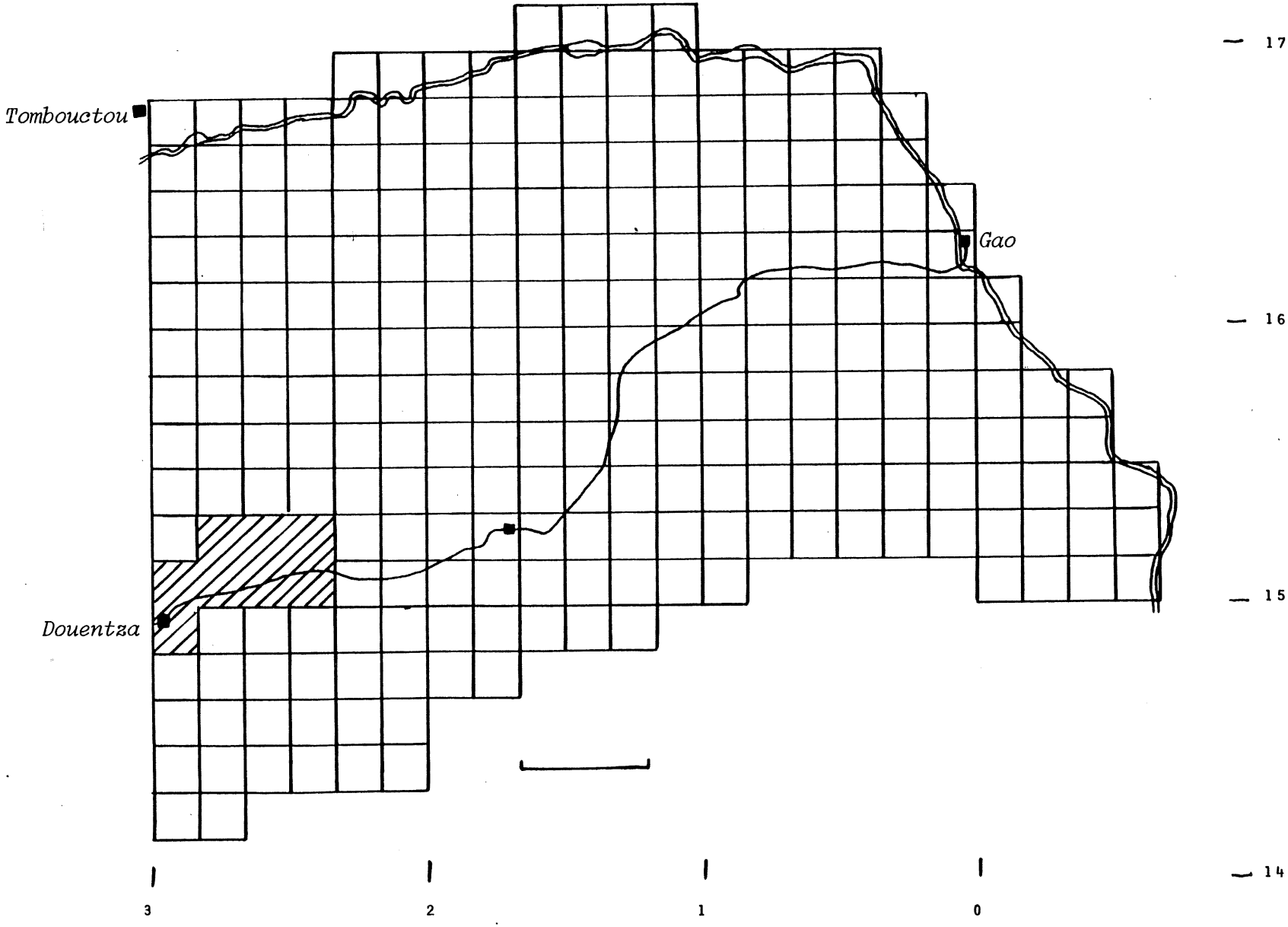
Table A.1 EARLY DRY SEASON LIVESTOCK POPULATIONS (±% SE) IN THE GOURMA REGION* OF MALI

		TOTAL POPULATION	DENSITY (NOS/KM^2)	STOCKING (HA/HD)	TOTAL HERD	MEAN HERD SIZE
1.	Cattle	397,423 (13)	4.81	21	11,116 (10)	36
2.	Sheep/Goats	583,311 (9)	7.06	14	11,427 (10)	51
3.	Camels	7,319 (19)	0.09	1,129	2,503 (14)	3
4.	Donkeys	7,144 (21)	0.09	1,156	1,043 (12)	7
5.	UBT **	396,455	4.80	21	-	-

* The Gourma region, as surveyed, as shown in figure A.1., covers about 82,612 km^2

** UBT totals were calculated assuming : 0.75; sheep and goats 0.25; camels 1.0; donkeys 0.5.

Figure A.1 *Grid pattern used for initial early dry season aerial reconnaisance of the Gourma region of Mali*



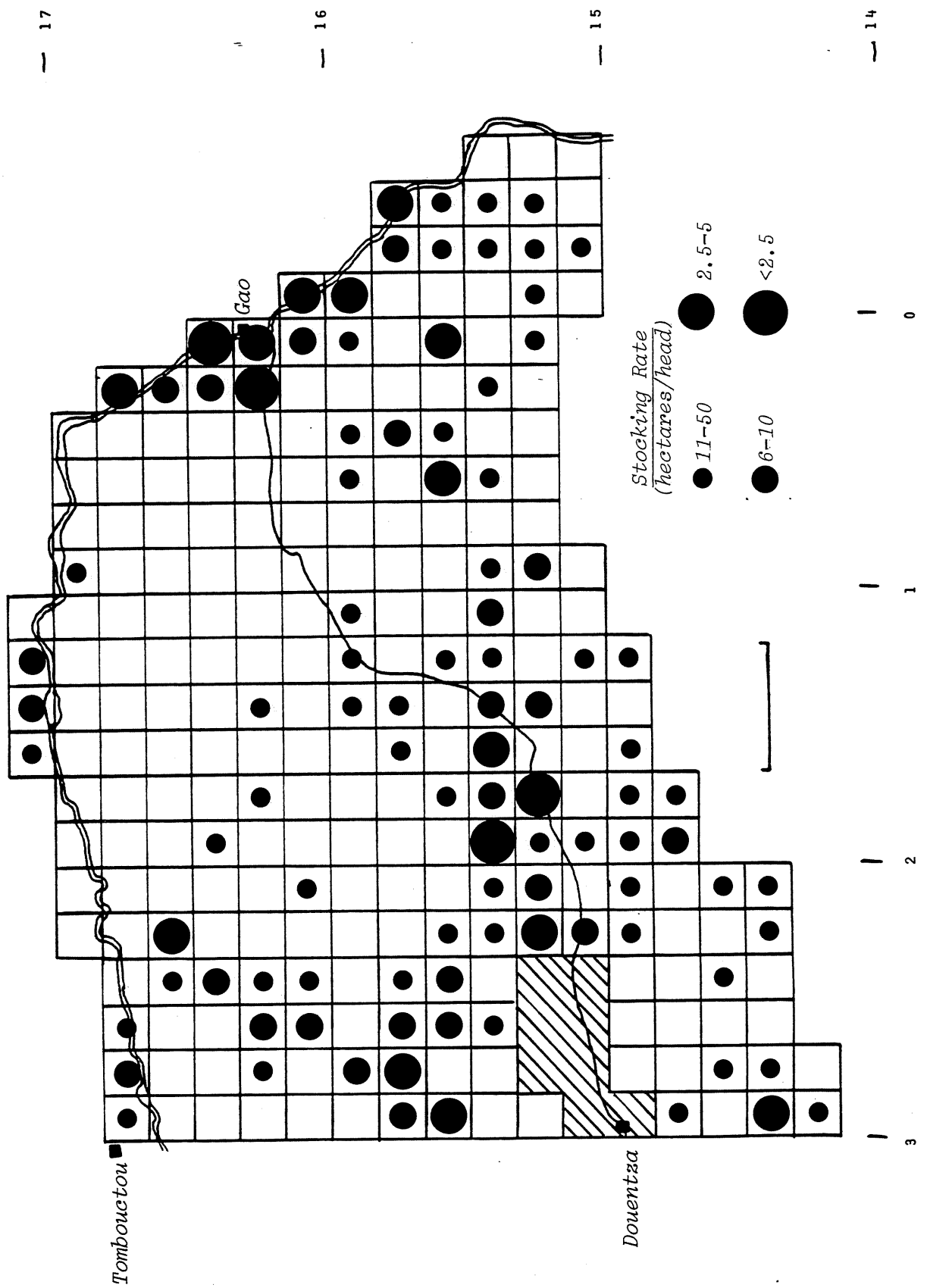
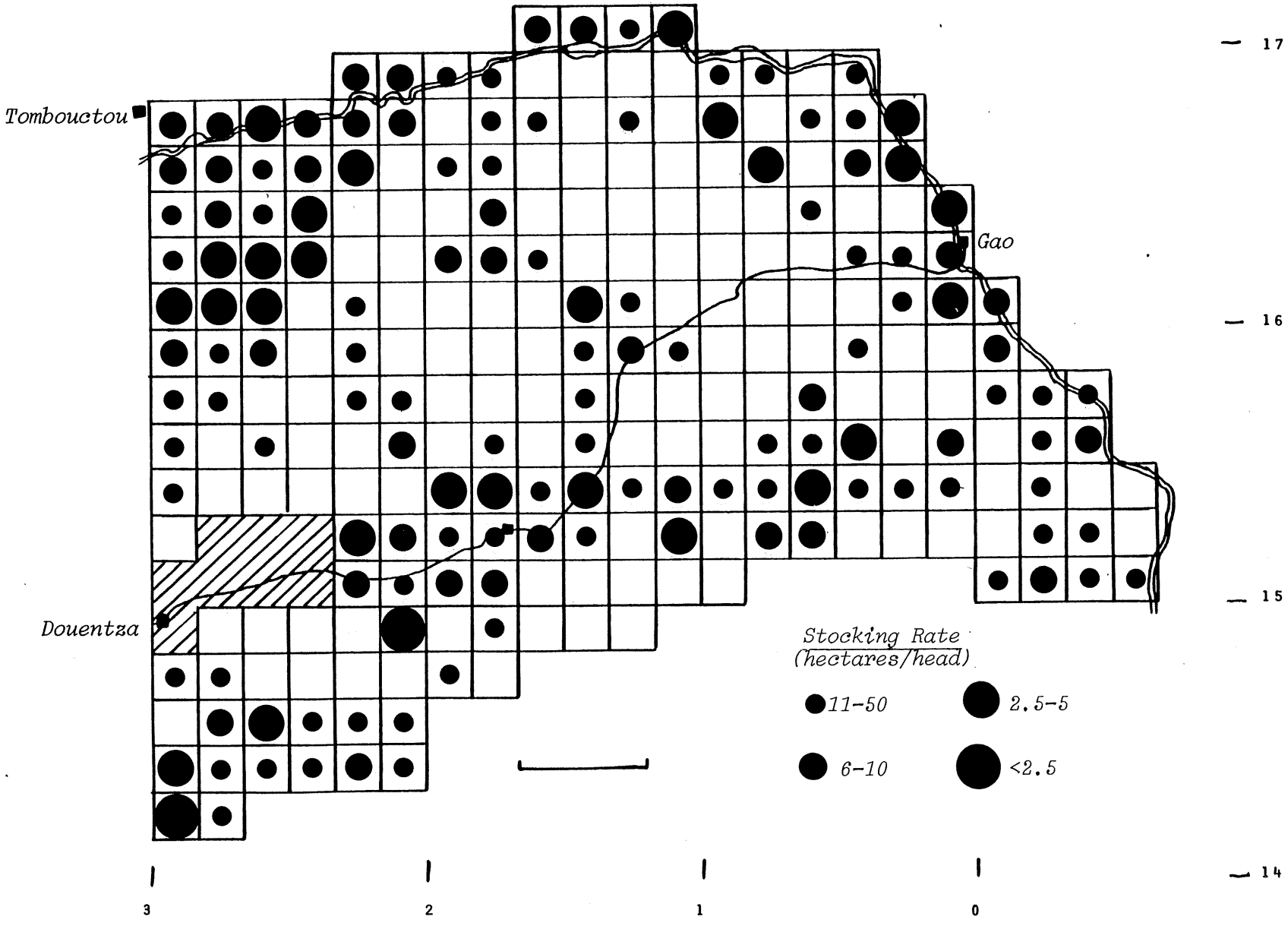


Figure A.2 Early dry season distribution of cattle in the Gourma region of Mali

Figure A.3. *Early dry season distribution of sheep and goats in the Gourma region of Mali*



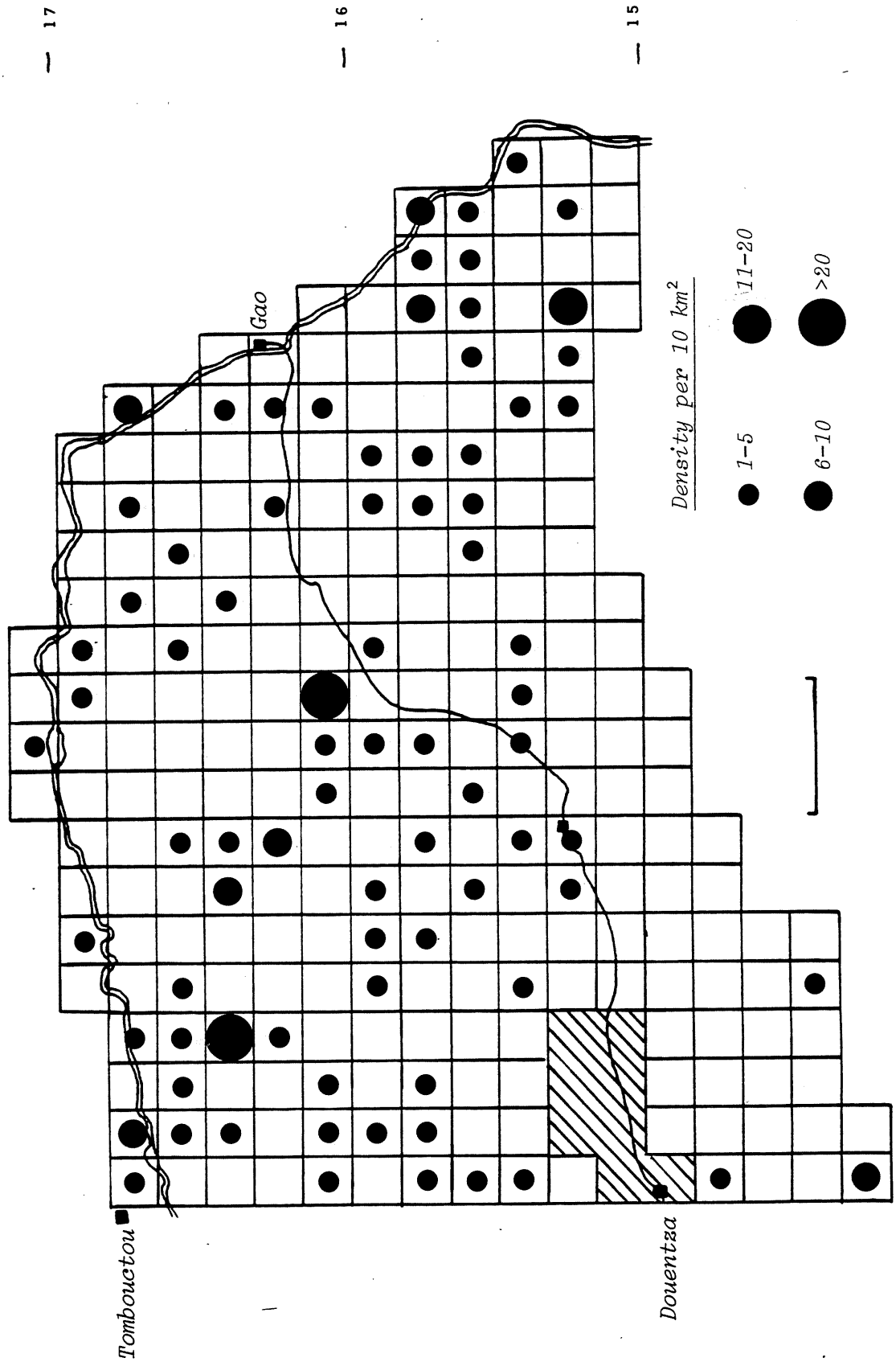


Figure A.4. Early dry season distribution of camels in the Gourma region of Mali

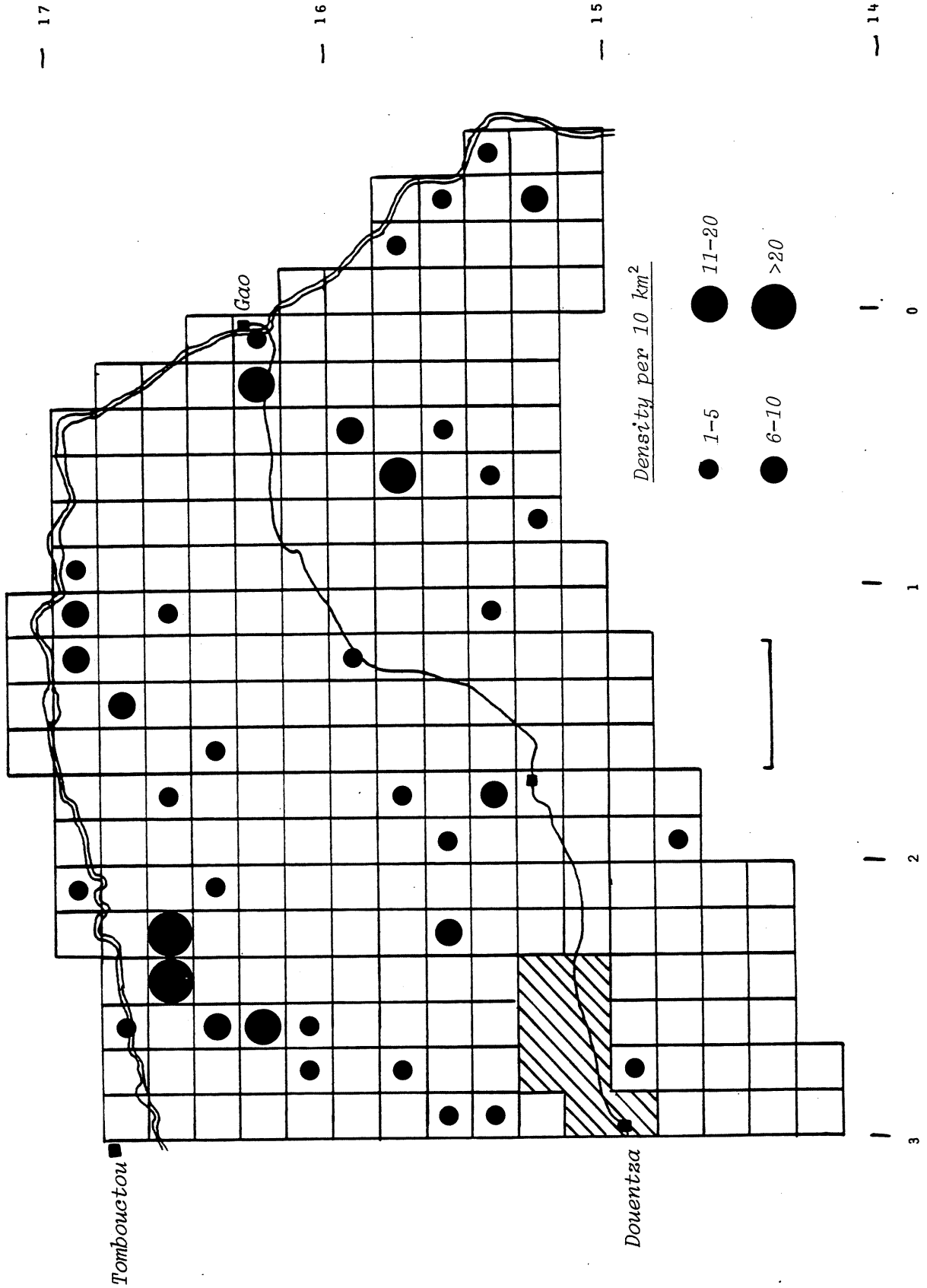


Figure A.5. Early dry season distribution of donkeys in the Gourma region of Mali

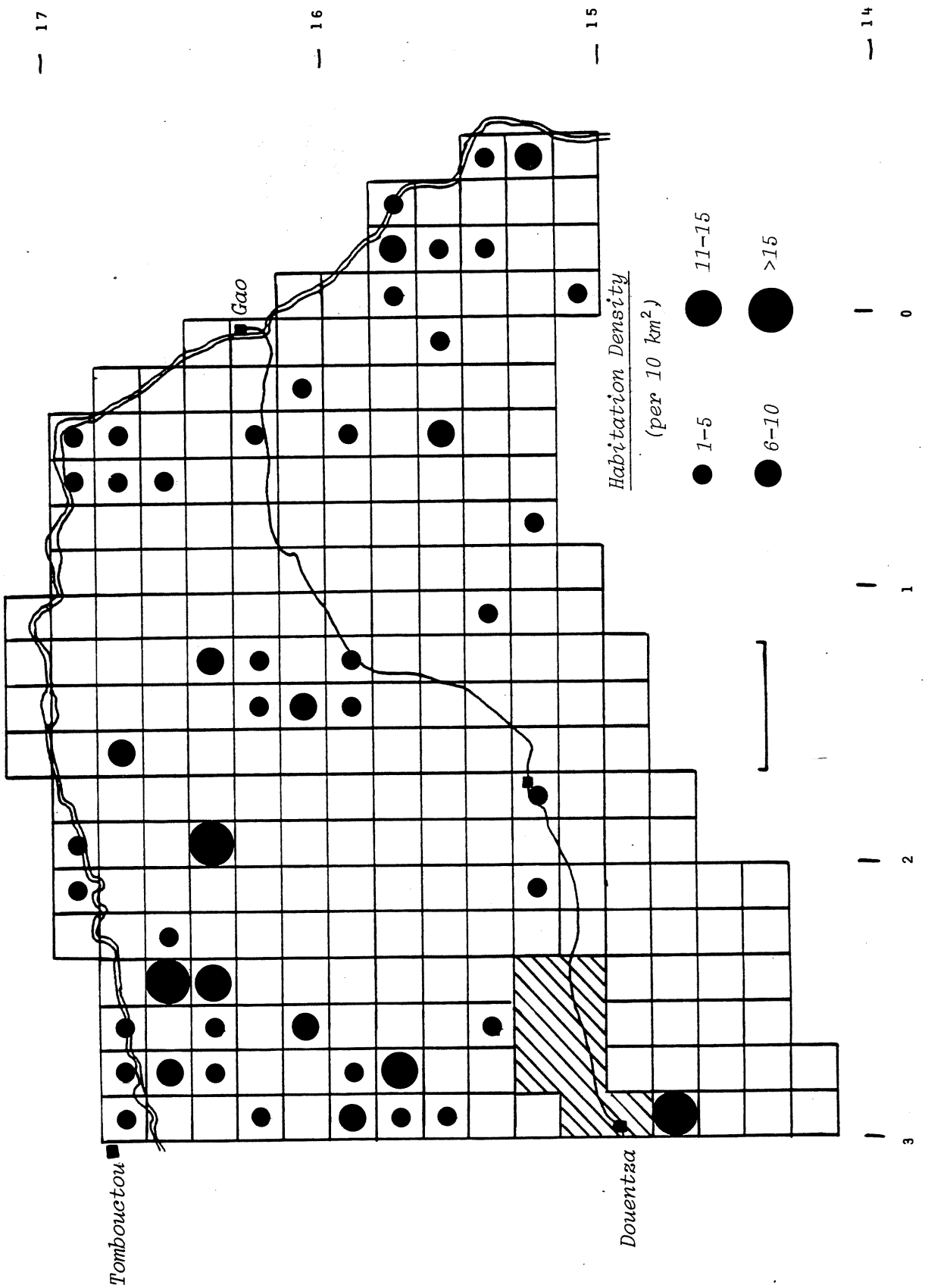


Figure A.6. Early dry season distribution of Tamasheqs in the Gourma region of Mali

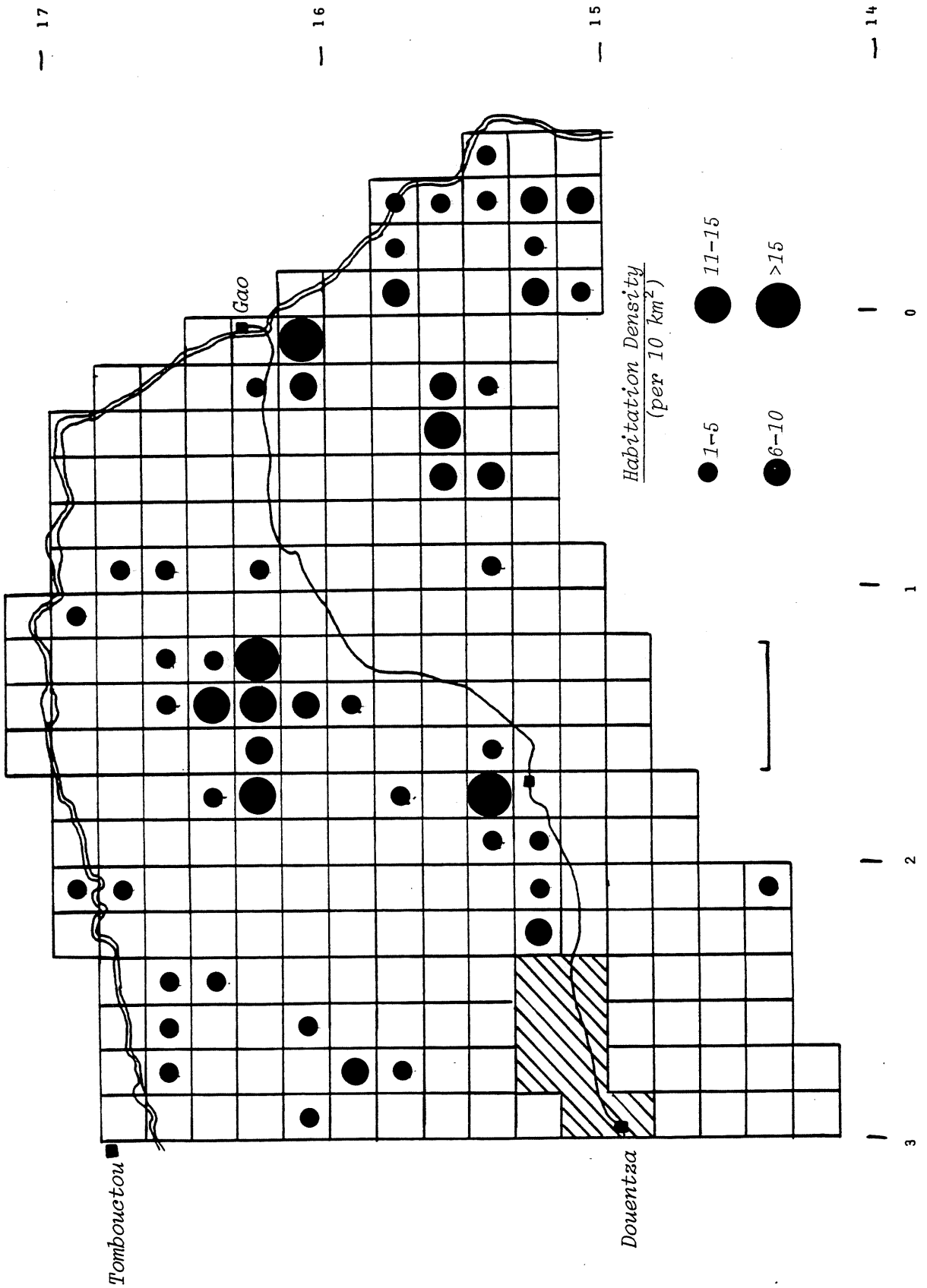


Figure A.7. Early dry season distribution of Bella in the Gourma region of Mali

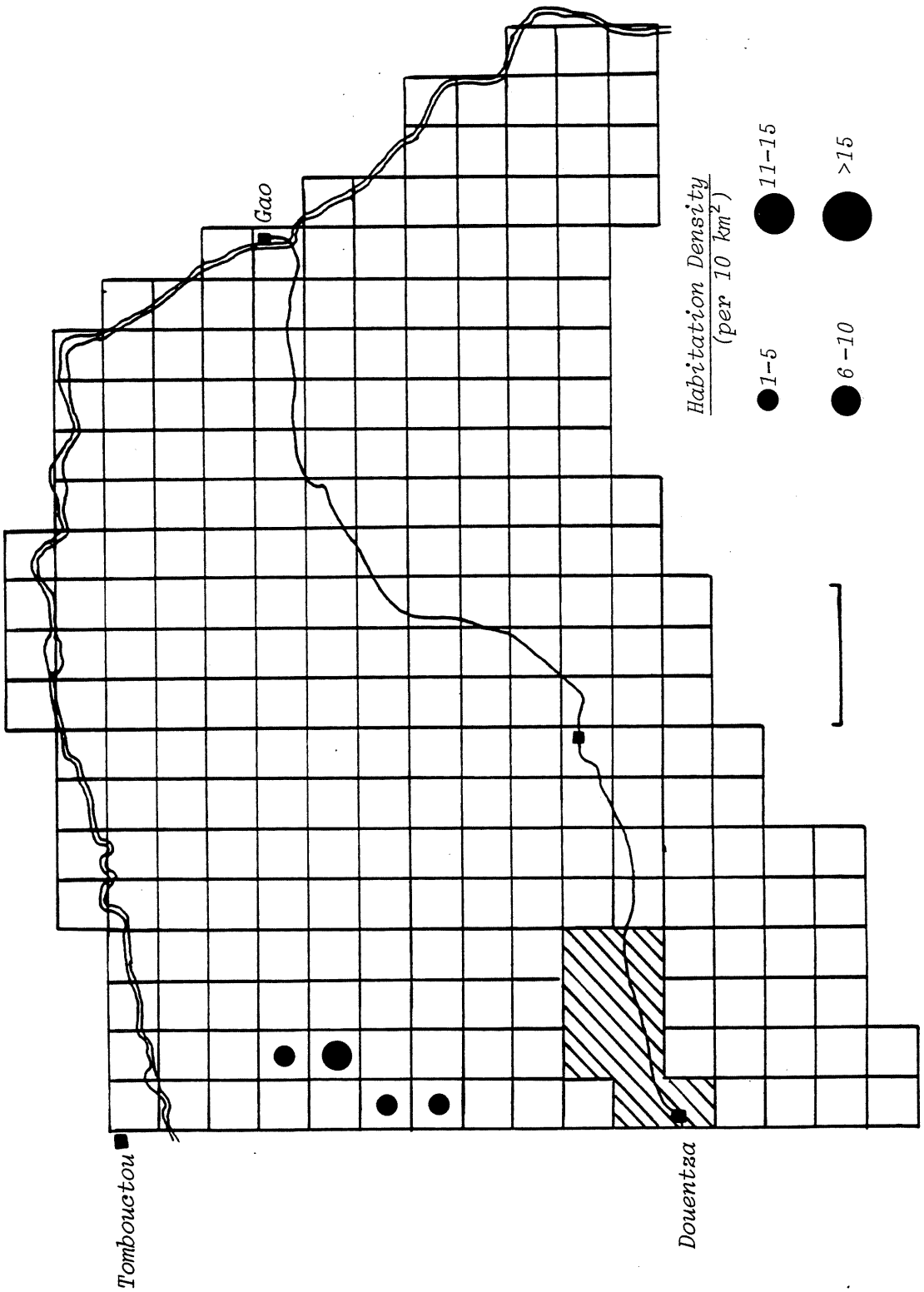


Figure A.8. Early dry season distribution of Maures in the Gourma region of Mali

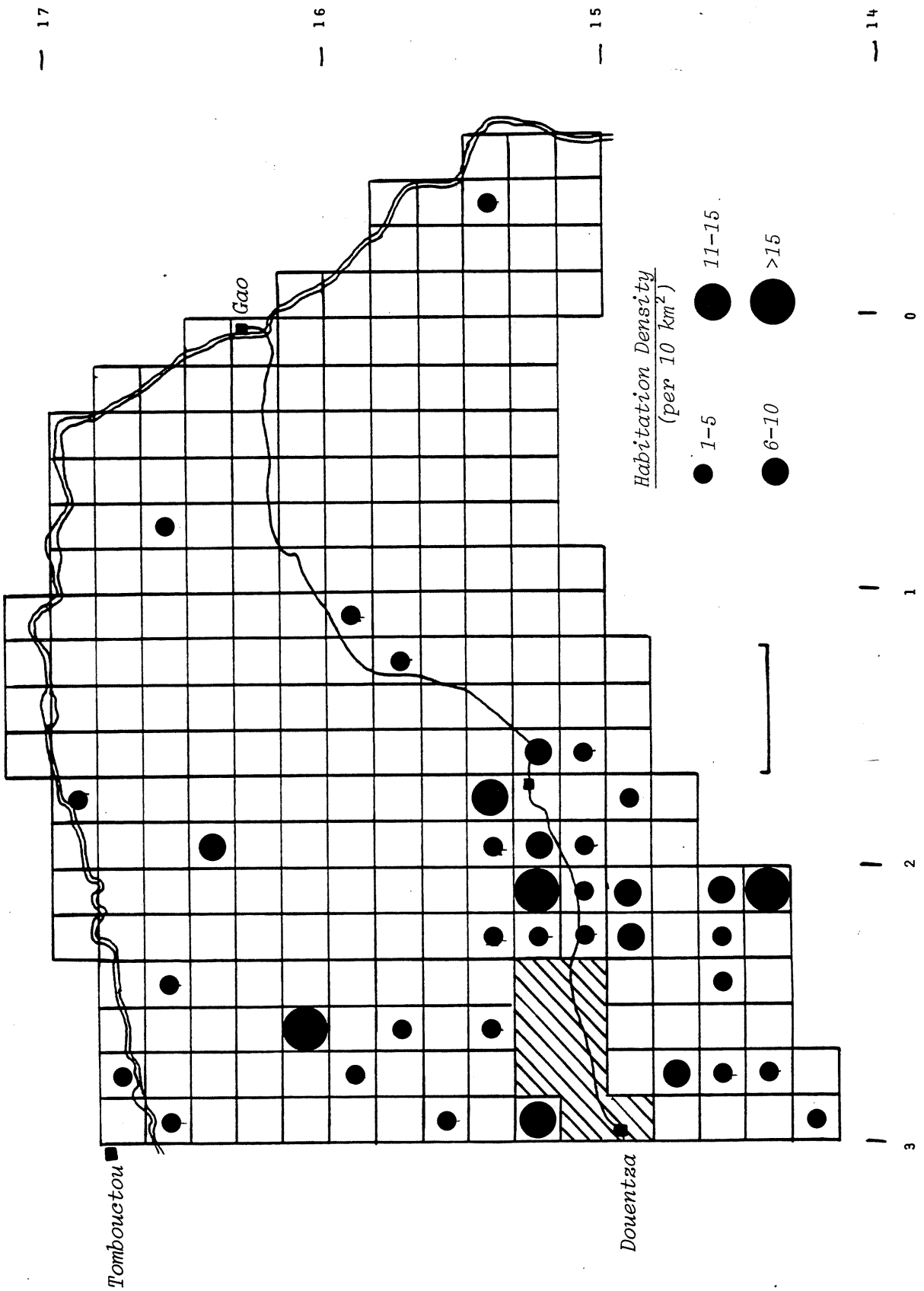


Figure A.9. Early dry season distribution of Pheuls in the Gourma region of Mali

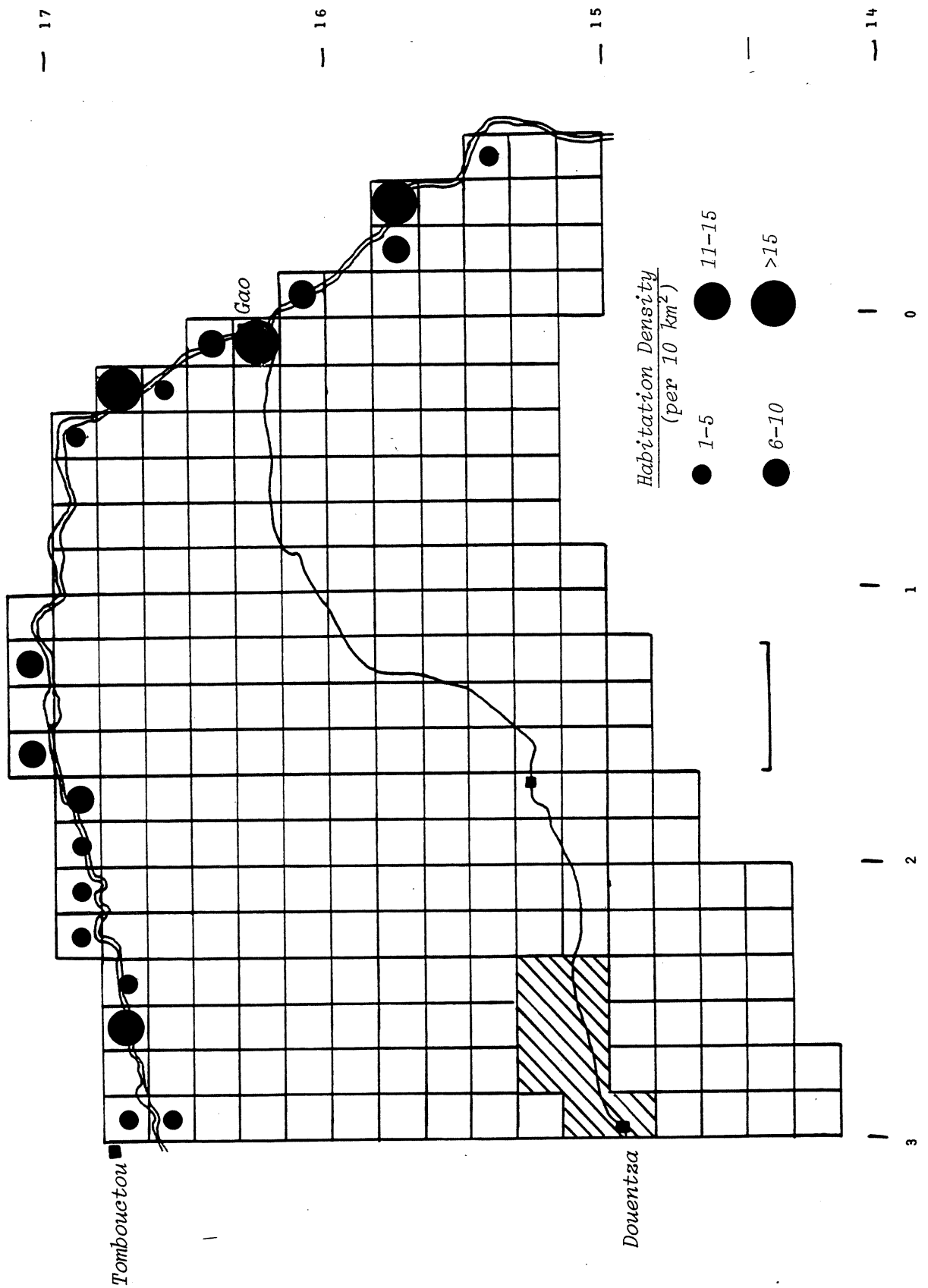


Figure A.10. Early dry season distribution of Sonrai in the Gourma region of Mali

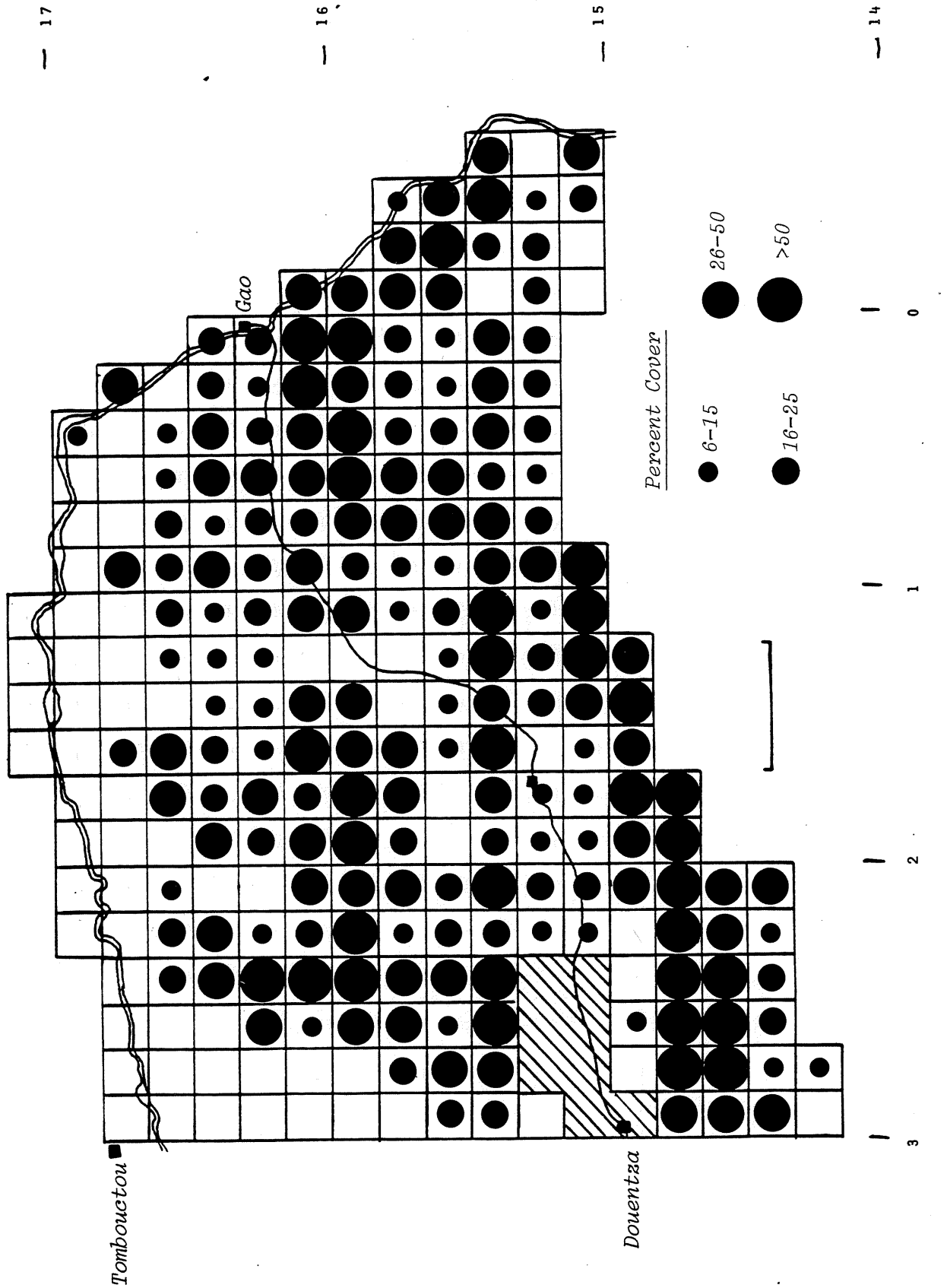


Figure A.11. Early dry season distribution of grass cover in the Gourma region of Mali