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DISSERTATION

SOME ASPECTS OF ACUTE ANTERIOR POLIOMYELITIS IN THE MALTESE ISLANDS IN 1950 and 1951

James H. Brodie, M.B., Ch.B.

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Introduction:

Small islands, since their populations are more static, lend themselves more readily to the study of the Epidemiology of disease than do land-bound territories where movement in and out of the country is more frequent. The islands of the Maltese Dependencies in this respect are particularly interesting since there is always a considerable movement of foreigners coming to and going from the islands yet the islanders themselves seldom journey abroad unless emigrating permanently to other lands.

Acute Anterior Poliomyelitis has been notifiable in the Maltese Dependencies since 1921 and up till 31st May, 1951, a total of 841 cases had been notified. 237 of these cases occurred between 27th May 1950 and the end of May 1951.

It is the purpose of this dissertation to comment upon the habits and customs of the people, the topography, water supply, sewage disposal and other Public Health aspects in the Islands and to ascertain whether any feasible explanation can be found for the progress of the disease on the islands during the year under study.

1. THE ISLANDS AND THEIR POPULATIONS

The inhabited islands are three in number and lie in the Mediterranean Sea, approximately 80 miles from Sicily and 200 miles from North Africa. Malta, the largest island, is 17 miles by 9 miles and had in 1950 a native population of 283,868. Gozo, about 36 sq.miles had a population of 28,005 and Comino, a very small island with a population of 100. In addition there is a Service population which in 1950 consisted of approximately 12,000 males, 3,000 females and 3,000 children between the ages of 0 and 15.

Most of the Service population live in Malta, there being only a very small detachment of R.A.F. personnel in Gozo.

Both Service and native communities in Malta mix freely in work and in play, but there is little movement of population between the islands. The Maltese consider the Gozitans to be dour, hard-headed and tight-fisted, and to be a little below their standard as to refinement. The Gozitans, in their turn, consider the Maltese to be lacking in stamina, "smart-Alec" business men who are a little too sophisticated to be taken really seriously.

The relationship is similar to that which might still exist between the Scots and the English had the two lands been separated by a stretch of water instead of only a land boundary.

2. THE OCCUPATIONS OF THE PEOPLE

The occupations on the islands differ considerably. Malta to the south-east is highly industrialised with the greatest density around the Naval Dockyard at Valletta Harbour (see Map 1). The remainder of the island is agricultural with several villages housing and catering for the social needs of the farmers and their families.

Gozo, on the other hand, is entirely agricultural with only 8 small villages.

Comino with its 100 agriculturists has communication with the outside world only on very rare occasions.

A ferry runs between Malta and Gozo daily but its main function is to bring agricultural produce from Gozo and there are normally only a handful of passengers on it.

3. THE CUSTOMS OF THE PEOPLE

Both Maltese and Gozitans are Phoenician by descent, but the upper classes have a great deal of Norman, Spanish and Italian blood.

All are intensely religious and Roman Catholicism plays a large part in their lives. Most of the social activities of the Islanders centre around their magnificent churches, and each church has a feast day for its own patron saint. Many of these feast days fall in June and

July and during these months there is always a great exodus from one village to another as the church-goers vie with one another to produce fire-works and other forms of amusement of the highest order.

Even at this time however the Maltese and the Gozitans keep very much to their own islands.

Being ardent Roman Catholics all forms of birth control are forbidden by Law on the islands and the Live Birth Rate in 1950 was 33 per 1,000. Children are held in high regard on the Islands and their welfare and family life is always a primary concern of the peoples.

4. THE NUTRITION OF THE PEOPLE

The basic diet of the people is "Pasta". This is a preparation of a glutinious wheat grown on the Islands and imported from Italy which is made into macaroni, spaghetti, vermicelli and similar dishes. An enormous quantity of bread is also eaten. This bread has a higher yeast content than the bread eaten in England so that special bakeries are used to bake bread for the Service population.

The general nutrition of the population is exceedingly good and a thin Maltese is as rare as an African at the North Pole.

5. THE GEOLOGY OF THE ISLANDS

The Maltese Islands consist largely of Tertiary Limestone with somewhat variable beds of Crystalline Sandstone, Greensand and Marl or Blue Clay. The series is in line with similar formations in North Africa and Sardinia.

Malta itself is divided into two by a geographical "Great Fault" which stretches from sea to sea running north to south through the centre of the island. The land to the east of the "Great Fault" is low lying, seldom reaching over 300 feet above sea-level while to the west of the fault it seldom falls below 600 feet above sea-level.

To the east of the "Great Fault" the strata consist, in descending level of:-

(a) Upper Coralline Limestone
(b) Yellow, Black or Green sand
(c) Marl or Blue Clay
(d) White and Yellow Sandstone
(e) Nodular layer
(f) Yellow Sandstone
(g) Lower Crystalline Limestone.

Although to the west of the "Fault" these layers reach to a greater depth, being much thicker, the Blue Clay at the higher levels forms a stratum impervious to water and holds up the rainfall which soaks through the porous coralline limestone.

6. THE WATER SUPPLY OF MALTA

The "Great Fault" provides Malta with two distinct water supplies. To the west of the "Great Fault" the water is pumped from 200 to 300 feet above sea-level while to the east the water is pumped from sea-level or below.

This is clearly shown by the difference in the salinity of the waters.

To the west of the "Fault" in 1950 the following readings were obtained:-

Ghain Tuffieha	-	17 parts Na Cl per 100,000
Imtarfa	-	20 " " " " 100,000

To the east of the "Fault" -

Valetta	-	120 parts Na Cl per 100,000
Sliema	-	180 " " " " 100,000
Paceville	-	240 " " " " 100,000
St.Patricks	-	325 " " " " 100,000

Map No.2 shows the water supply of Malta.

7. THE MILK SUPPLY OF MALTA

Both cows and goats are used extensively for providing milk for the people of the Islands.

The cows are at all times kept in their sheds, whereas the goats roam freely over the greater part of the Islands.

Many years after the Malta Fever Commission of

1905 to 1906 under the late Sir David Bruce an area in the neighbourhood of Valetta was designated by Law a "Closed Area". It is illegal for goats to enter this area except in transit, and it is also illegal to sell milk in this area unless it has been boiled or pasteurised.

A Government Pasteurisation Plant of the Holder Type is situated in Hamrun and all milk, both cows' and goats', sold in the "Closed Area" is pasteurised there. Samples of milk which has passed through this plant have always satisfied the Phosphatase Test.

The natives prefer goats' milk but the majority of the Service population drink dry, tinned or pasteurised cows milk. Only one case of Brucellosis occurred amongst British Service personnel and their families between 1948 to 1951, whereas the number of cases occurring amongst Maltese during the same period was 2,775. All these cases were from the open area or had drunk goats' milk or eaten its products in the open area.

Map No.3 shows the "Open" and "Closed" area.

8. COMMUNICATIONS IN MALTA AND GOZO

There are no railways in Malta or Gozo, but the roads in Malta are numerous for an island of its size.

All the villages are connected to Valetta, the Capital, by good roads and frequent bus services run between

Valetta and the main villages.

Communication between villages, unless they be on a bus route which connects them both with Valetta, is non-existant, and only on feast days do special buses cater for the pilgrims who wish to visit a village in which the feast is being held.

(Map No.1V shows the roads of Malta).

In Gozo there are few good roads. Vittoriosa the Capital is connected with Mgarr, the port, by a metalled road, but the roads between other villages and the Capital are little better than cart-tracks.

(Map No.V. shows the roads and villages in Gozo).

9. SEWAGE DISPOSAL IN MALTA

The centre of densest population in Malta has a complete main sewage system which extends to the west of Dingli, Rabat, Imtarfa and Mosta and to the south to Imkabba, Safi, Zeitun and Zabbar. The remainder of the island except for a small area at St. Pauls Bay, relies entirely on earth closets or similar contrivances, the contents of which are used in their raw state for manure.

The main outlet for sewage is at San Rocco to the south of Valletta Harbour. At Gzira there is a pumping station which pumps the sewage over a small hill which lies to the west of Valletta. This pumping station however is

incapable of dealing with the flow, especially after rain, so there is also an outlet to the south of Sliema, with the result that all the creeks in this area are contaminated with sewage.

The ships in Valletta Harbour similarly ensure that the harbour there is also contaminated. In consequence the area 1 mile to the north of Sliema and 1 mile to the south of San Roco is permanently out of bounds for bathing to all Service personnel.

(See Map No.V1.)

10. THE FLORA OF THE MALTESE ISLANDS

The flora of the islands is exceedingly limited and it is difficult to distinguish the indigenous from the imported plants. It is considered that the flora can have little influence on the subject of this dissertation and to avoid the insertion of completely extraneous material it has been decided to omit any detailed mention of them.

11. THE FAUNA OF THE MALTESE ISLANDS

Lizards, snakes, tortoises, frogs, weasels and rats are the only important fauna existing on the islands. Of these only Rattus rattus and Rattus norvegicus occur in any number.

Very few birds are indigenous but over 200 migratory

bird species have been recorded. The migratory birds harbour to the north west of Malta and in Gozo and Comino.

12. ARTHROPODA OF THE MALTESE ISLANDS

The insect life of the Islands is profuse. Musca domestica, Stomoxys calcitrans and Phlebotomus papatasi are however the three most troublesome.

The house-fly breeds in prodigious numbers both in the towns and in the countryside. Very little is done by the Civil Authorities to reduce their numbers, but in Service establishments and dwellings strict anti-fly precautions are at all times in force.

The stable-fly breeds in less numbers, mostly in the country districts,and in Gozo and Comino they are particularly troublesome.

The sand fly has its habitat all over the Islands but occurs and is most troublesome in the Valletta and Sleima areas. All Service personnel are issued with sand-fly nets and in the Army, at least, their use is strictly enforced.

Mosquitoes occur in considerable number during the summer and Culex molestus and Anopheles maculipennis are the species most often found.

13. CLIMATE OF THE MALTESE ISLANDS

The climate of the Islands is usually described as being warm but equable.

The tables for 1950 (Appendices A and B) show that the temperature varies between a maximum of approximately 94°F in August to approximately 45°F in December. The hours of sunshine vary from an average of 4.5 hours per day in December to 13.4 hours per day in July.

The winds are extremely variable but the prevailing winds are from the north and the west.

(Meteorlogical tables from 1st January 1950 - 31st December,1951 - Appendices A and B).

P A R T 11.

1. HISTORY OF ACUTE ANTERIOR POLIOMYELITIS IN THE MALTESE ISLANDS

Poliomyelitis has been notifiable in the Islands since 1921 but study of the Report of the Medical Officer for Health for that year or the immediately preceeding years gives no indication as to why it was decided to make the disease notifiable. Since that time the disease was found to be endemic on the Islands. The endemicity was however exceedingly low, the maximum number of notifications in any year until 1942 was 9. In 1942 however 188 cases occurred followed by 204 cases in 1943. In 1944 no cases occurred but the yearly number of cases afterwards never fell to the former level until 1949, when only one case occurred. The following table gives the notifications of the disease from 1921 to 1949:-

Year	No. of Notifications of Poliomyelitis	Year	No. of Notifications of Poliomyelitis
1921	Nil	1936	3
1922	Nil	1937	6
1923	3	1938	3
1924	Nil	1939	2
1925	9	1940	nil
1926	1	1941	1
1927	5	1942	188
1928	3	1943	204
1929	4	1944	nil
1930	1	1945	37
1931	4	1946	46
1932	6	1947	59
1933	4	1948	11
1934	2	1949	1
1935	1		

The 1942-1943 epidemic occurred under very different conditions from that of the 1950 epidemic. During the war most of the Maltese were living in very overcrowded conditions in caves in the rock; the resistance of the population was low due to a diet which at its best could only be described as exceedingly inadequate, and on occasions had reached such a low calorification value as to warrant the description of "semi-starvation".

In 1950 however the population were receiving an adequate diet and overcrowding had been greatly relieved due to the rapid progress made in reconstruction since the end of the war.

The 1942-1943 epidemic was fully described by Professor H.J.Seddon in the Quarterly Journal of Medicine in 1945.

2. CRITERION FOR DIAGNOSIS OF ACUTE ANTERIOR POLIOMYELITIS

The great difficulty in any consideration of Acute Anterior Poliomyelitis is to establish which cases can be diagnosed as suffering from the disease, in which cases is the diagnosis doubtful and in which cases is it positive that the virus of Poliomyelitis is not causing the symptoms. At the International Poliomyelitis Conference of 1948 it was decided that only cases manifesting paralysis should be counted for statistical purposes. In some cases however

I have found the paralysis to be minimal, confined to one or two muscle groups only, and of a duration of only a few hours, recovery being complete sometimes in as short a time as six hours.

Since only the Service cases were seen by me I intend to include as proved cases of Poliomyelitis in Service personnel all cases showing paralysis even though paralysis was minimal. In Maltese cases I must accept the diagnosis of a notification of paralytic poliomyelitis by a Maltese physician or orthopaedic specialist.

The division of the cases into Service and civilian cases as recognised by the Maltese Authorities is exceedingly artificial since among the "Service cases" is included any individual "U.K.Based" or "Malta Based" who is entitled to admission to a British Military Hospital. It is considered that a more accurate definition would be (a) U.K.Service (b) Maltese, this latter category including Civilian and Maltese Service Personnel and their families. In these catogories there were 48 and 189 cases respectively.

It is emphasised that the Maltese soldier, unlike his U.K. counterpart, comes to his barracks at 0800 hr. daily in civilian clothes, changes into uniform and most days of the year returns home again in civilian clothes at 1330 hr. He is essentially a civilian who changes into uniform for his stay in the barracks, but in all other respect

is equivalent to an ordinary Maltese civilian.

In most established cases the disease manifested itself as an acute febrile illness with neck rigidity, headache and either respiratory or gastro-intestinal signs, with subsequent paralysis. Many of the early symptoms and signs were akin to those of Phlebotomus Fever. The significance of this will be realised when it is noticed that since the end of the Second World War until 1950, 50 to 60 cases of U.K.Based Army personnel were admitted to the British Military Hospital Malta during the months of July, August and September yearly. In 1950 however no case was "definitely diagnosed" as Sandfly Fever since it would have been difficult to justify such a diagnosis had the case subsequently developed paralysis. Most cases of presumptive Sandfly Fever were initially diagnosed as "? Acute Anterior Poliomyelitis" and subsequently as "Pyrexia of Unknown Origin" when paralysis did not develop.

3. PROGRESS OF THE MAIN EPIDEMIC

During the weeks ending 27th May 1950 and 3rd June 1950 only three cases occurred. Two were Maltese children, one lived at Qormi and the other at Tarxien. These villages are approximately two miles apart in a direct line and about three miles apart by road. A Naval Officer's wife from Tarxien reported to the hospital at the beginning of July with paralysis of several week's duration following a

febrile illness at the end of May. It was considered that she had contracted Poliomyelitis at the end of May.(Map V.

During the weeks ending 10th June and 17th June only two further cases occurred (Map V111). One Maltese case occurred at Qormi and another Naval Officer's wife from Sliema was diagnosed.

During the next fortnight only one further case occurred. This case again came from Tarxien (Map 1X). This is only a total of six paralytic cases since the beginning of the epidemic and these cases are as yet confined to two villages and one town on the island.

During the two weeks ending 15th July 1950 seven further cases occurred involving three other villages not previously involved, Luqa and Marsa, 1½ miles from the nearest previous case and Mosta, 4 miles from any previous case. One further case occurred at both Sliema and Tarxien (Map X).

In the next two weeks eight cases occurred bringing the total number of cases to 21. Qormi and Sliema were the only two places having cases in which the disease had previously been notified, but villages not far from where previous cases had occurred were implicated, namely Zabbar, Pawla, Kirkop and Gzira. (Map No.X1).

It is of interest that about a fortnight previous to two cases occurring at Kirkop there had been a mass movement of population from Tarxien where 4 cases had occurred to Kirkop since the church at Kirkop was holding its annual feast day. The case which occurred at Zabbar had visited Tarxien.

The weeks ending the 5th August and 12th August saw another six and nine cases notified respectively. The disease had now become more widespread, these cases coming from 12 different places. In only three of these towns and villages had previous cases occurred, so that nine new localities were now affected. (Map No.XII).

The peak of the epidemic was reached during the next two weeks when 38 paralytic cases occurred. It will be seen from map XIII that nine of these cases occurred at Imtarfa where the British Military Hospital is situated. This hospital had been receiving cases of the disease since 14th June,1950. Eight of the cases occurring at Imtarfa were Sisters and Orderlies attending to the cases of Poliomyelitis. One case came from the married families quarters at Imtarfa.

During this period the first case occurred at Gozo. The village Xewkija, in which this case occurred, is on the main road from Mjarr the port to Rabat the Capital. During the previous fortnight there had been mass movements

of population from Malta to Gozo since the Maltese elections were about to be held and the candidates from Malta had been invading Gozo with their supporters in order to win the votes for the Gozitans.

During the next 14 days 24 cases occurred (Map XlV), 7 of these were in Imtarfa, 4 of them the hospital staff. This gives a total of 12 cases from a staff of 120. No further case occurred at Gozo during this period.

From now on the tempo of the epidemic in Malta decreases; cases becoming more sporadic in nature and occurring mostly in locations where a nidus of infection had previously existed. The two weeks up until 23rd of September produced 16 cases in Malta (Map XV).

In Gozo however five cases occurred during this period. These were all confined to a village about two miles from where the previous case had occurred. This village actually consists of two straggling places called Nadur and Qala and it is difficult to know when one has passed through one and entered the other.

The weeks ending 30th September and 7th October produced 18 further cases in Malta and 3 in Gozo. Two cases occurred at Zebbuj and one at Marsashlok. Zebbuj is a large village but is not often visited by the villagers from other places since it is off the bus route to any of the other villages. Marsashlok is a fishing village which

again has little communication with the outside world. (Map XVI). In Gozo one case occurred at each Qala, Nadur and Rabat, the capital.

In Malta from now on the epidemic may be considered to have waned and the disease to have become endemic. The cases occurred with the following frequency until the end of May 1951:-

Fortnight ending	21st October,1950	-	10
"	"	4th November "	-	8
"	"	18th " "	-	13
"	"	2nd December "	-	14
"	"	16th " "	-	5
"	"	30th " "	-	14
"	"	13th January,1951	-	7
"	"	27 " "	-	2
"	"	10th February, "	-	4
"	"	24th " "	-	1
"	"	10th March, "	-	1
"	"	24th " "	-	1
"	"	7th April, "	-	Nil
"	"	21st " "	-	2
"	"	5th May, "	-	1
"	"	19th " "	-	1
"	"	2nd June, "	-	4
			Total	88

It is of interest that the only three villages, Mellieha, Dingli and Qrendi, in which cases did not occur, although between them they have a population of over 8,000, were villages which may be called "terminal" villages, that is either having no road through them, or, if a road is present, it does not lead to another village further from the places where cases did occur. (Map IV).

In Gozo only a further 9 cases occurred (Map No. VI) -

Xewkija	7th	October, 1950
Zebbuj	11th	" "
Nadur	11th	" "
Qala	2nd	November, "
Qala	3rd	" "
Rabat	3rd	" "
Qala	13th	" "
Xewkiji	13th	December, "
Nadur	14th	" "

Cases continued to occur in Malta during the remainder of 1950 but their number was comparatively small. Several were Service cases who had, only a short time previous to developing symptoms, arrived from the United Kingdom.

4. OCCURRENCE OF ACUTE ANTERIOR POLIOMYELITIS AT THE BRITISH MILITARY HOSPITAL IMTARFA

The sixteen cases which occurred at Imtarfa, and associated cases, are of special interest since with most of these a chain of circumstances could be traced leading back to some contact with a previous case.

The British Military Hospital at Imtarfa in May 1950 was receiving the following cases:-

(1) British and Maltese soldiers - Medical, V.D., Skins, Mental and Infectious diseases.

(2) All Service families - Maternity and Gynaecological Cases.

On the 12th June,1950, a Naval Officer's wife (Case No. was admitted to a two-bedded ward for observation for a gynaecological complaint and on 14th June developed a pyrexia and later paralysis. She was immediately isolated on developing her pyrexia. The other occupant (Contact No.1) was allowed to return home on the 15th June,1950. It was decided then that the British Military Hospital Imtarfa should accept cases of Acute Anterior Poliomyelitis from Service families.

On the 15th July,1950, Case No.2, who was a close friend of Contact No.1, was admitted with Poliomyelitis. The husband of Case No.2 was admitted on the 28th July,1950, (Case No.3) and died with an ascending paralysis on 30th July,1950.

Case No.4 was a Queen Alexandra Nursing Sister who had been transferred from the Royal Naval Hospital at Bighi to nurse Case No.3. She developed the disease on 19th August,1950.

Case No.5 was a civilian nursing sister who had nursed Case No.3. She developed symptoms on 21st August,1950

Case No.6 was a laboratory attendant who had been present, with Case No.3, when Cerebro Spinal Fluid had been withdrawn. He developed symptoms on 21st August,1950.

Case No.7 was an orderly who had nursed Case No.3. He also developed the disease on 21st August,1950.

Cases Nos. 8 and 9 had not nursed cases of Poliomyelitis but had lived in the same barracks block as Case No.7. They developed the condition on 22nd August,1950.

Case No.10 was a Nursing Sister of the Queen Alexandra's Royal Army Nursing Corps who had nursed several cases of Poliomyelits. Date of onset 24th August,1950.

Case No.11 came from the married families quarters about 500 yards from the hospital. She was a friend of Case No.14. Date of onset 24th August,1950.

Case No.12 was in charge of reception at the hospital and also in charge of the disinfector in which clothing etc. from cases was disinfected. He developed the disease on the 24th August,1950.

Case No.13 was again a Sister of the Queen Alexandra's Royal Army Nursing Corps who, although she had not nursed cases of the disease, had lived in the Sister's Mess with Cases Nos. 4, 5 and 10. She developed the disease on the 27th August,1950.

Case No.14 was the wife of Case No.17 and developed the disease on 28th August,1950.

Case No.15 was another orderly employed in the Poliomyelitis ward. Symptoms occurred on 29th August,1950.

Case No.16 developed the disease on 30th August,1950. Another nursing sister case who had been in close contact with cases.

Case No.17 was a medical orderly in a unit in which a case of Poliomyelitis had occurred on 20th August,1950, and had accompanied the case to hospital. He developed symptoms on 31st August,1950.

Case No.19 was the twin sister of Case No.16. She had not been engaged in nursing Poliomyelitis but was her twin's constant companion. Developed symptoms on 31st August,1950.

5. ATTACK RATES

It is not possible in this dissertation to give a complete statistical analysis, but it is considered essential to state that the attack rates amongst the Maltese population was .75% at the age o - 5 and fell rapidly to .019% at the age of 20 - 25.

Amongst the Service personnel and families however the attack rate at 0 - 5 was .57% and was .56% at the age of 20 - 25.

6. PREVENTIVE MEASURES TAKEN

It was considered that the most likely method of infection was excremental and all precautions possible were taken to avoid contamination of food and drinks. This was especially so at the British Military Hospital Imtarfa where an exhaustive fly campaign reduced the insect population to an unprecedented level for the area. Strict measures were enforced for the staff to wash their hands after handling any cases. Unfortunately due to a preliminary dearth of masks the precautions taken against droplet infection were exceedingly inadequate. It was not possible to enforce the use of masks until cases had been diagnosed. This usually meant until paralysis had developed.

The schools were closed during August for the summer vacation and were not re-opened until the end of October. The Civil Government, by Law, attempted to reduce the droplet infection amongst the younger age groups by prohibiting the admission of children under 18 years of age to cinemas. The Child Health Clinics, both Civil and Service, were closed to prevent the assembly of children in closed spaces. Operations on the tonsils and adenoids were suspended as were vaccinations and preventive inoculations against diphtheria.

CONCLUSIONS

The epidemic of Poliomyelitis in the Maltese Dependencies in 1950-1951 shows great similarities to the epidemic in these islands in 1942-1943 and to similar epidemics which have occurred in Mauritus and St.Helena.

It would appear from the factors studied that:-

(1) Insects seem to play no part in the transmission of the disease since the disease occurred uniformly over the island and the greatest incidence occurred in the area in which insect life was practically eliminated.

(2) The water supply cannot be implicated since the disease occurred in communities with entirely separate water supplies.

(3) The presence of main drainage in towns and villages had no influence in the prevention of the spread of the disease.

(4) The use of night soil had no influence in the spread of the disease since the disease occurred in both agricultural and town areas.

(5) The milk supply can be exonerated since the cases in no way coincide with the different milk supplies of the populations involved.

(6) It is regretted that the occurrence of cases cannot be compared after the 31st December,1950, with the

meteorological conditions appertaining, but the weather tables for Malta for 1951 have not yet been published. It is however most unlikely that temperature, rainfall, humidity or wind variations had any influence on the spread of infection.

(7) The basic diets of the Service population and the Maltese population are distinctly different, and that of the Services of a higher calorific value and more balanced than that of the Maltese, yet, the adult of the Service population was more susceptible than the Maltese counterpart. It would appear therefore that diet has no part in the spread of the disease.

(8) The only feasible explanation for the spread of the disease in the epidemic at present under discussion is by droplet infection possibly with a high carrier rate. When dealing with cases of the disease it is absolutely essential that all precautions against droplet infection be taken. It is considered that the high attack rate amongst the staff of the British Military Hospital was due to the fact that droplet infection as a possible method of spread was, if not completely ignored, treated as of secondary importance to other methods of spread.

(9) Movements of population, especially mass movements such as occur during feasts, festivals, elections etc. appeared to result in the spread of the disease.

SUMMARY

(1) The epidemic of Acute Anterior Poliomyelitis in the Maltese islands has been studied as regards place and time and, to a minor extent, as regards persons involved in the epidemic.

(2) The feasibility of various methods of spread has been examined and the conclusion reached that the most likely method of spread of this disease is by droplet infection with a high carrier rate.

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Station --- Valletta, Malta. Longitude 14°30'. Latitude 35°53'. Height above mean sea level 185 feet.

Height of Therms above the ground 71 feet. Height of the Rainguage above the ground 59 feet.

Months	Mean Pressure (8 a.m.)	AIR TEMPERATURE							Tension of vapour (8 a.m.)	Relative humidity (8 a.m.)
		Adopted Mean Temperature	Means of		Absolute Minimum and Maximum					
			Minimum	Maximum	Minimum	Date	Maximum	Date		
January	30.012	54.8	51.8	59.1	46.0	14th	65.0	7th	10.8	75
February	30.099	56.0	52.6	60.5	49.1	10th	66.8	13th	11.0	77
March	29.973	56.8	53.1	61.1	46.9	3rd	67.1	12th	11.9	76
April	29.886	60.8	56.4	66.0	49.7	4th	78.2	15th	13.3	74
May	30.008	68.2	63.9	73.7	55.2	6th	88.6	27th	16.4	71
June	30.040	76.3	70.7	82.3	65.7	10th	91.4	18th	21.2	68
July	29.926	80.7	74.9	86.2	82.0	17th	92.2	31st	25.3	70
August	29.941	80.9	75.5	86.7	81.7	18th	94.8	3rd & 4th	22.1	69
September	30.011	77.0	69.8	83.3	68.8	25th	92.4	2nd	22.2	68
October	30.043	70.7	66.8	74.9	61.0	31st	80.0	1st	18.7	73
November	30.027	63.9	60.5	68.3	61.0	29th	73.6	5th & 9th	14.2	70
December	29.866	57.4	54.1	62.1	45.3	29th	71.8	8th	11.4	71
YEAR	29.986	66.9	62.5	72.0	45.3	29th Dec.	94.8	3rd 4th Aug.	16.8	72

APPENDIX B.

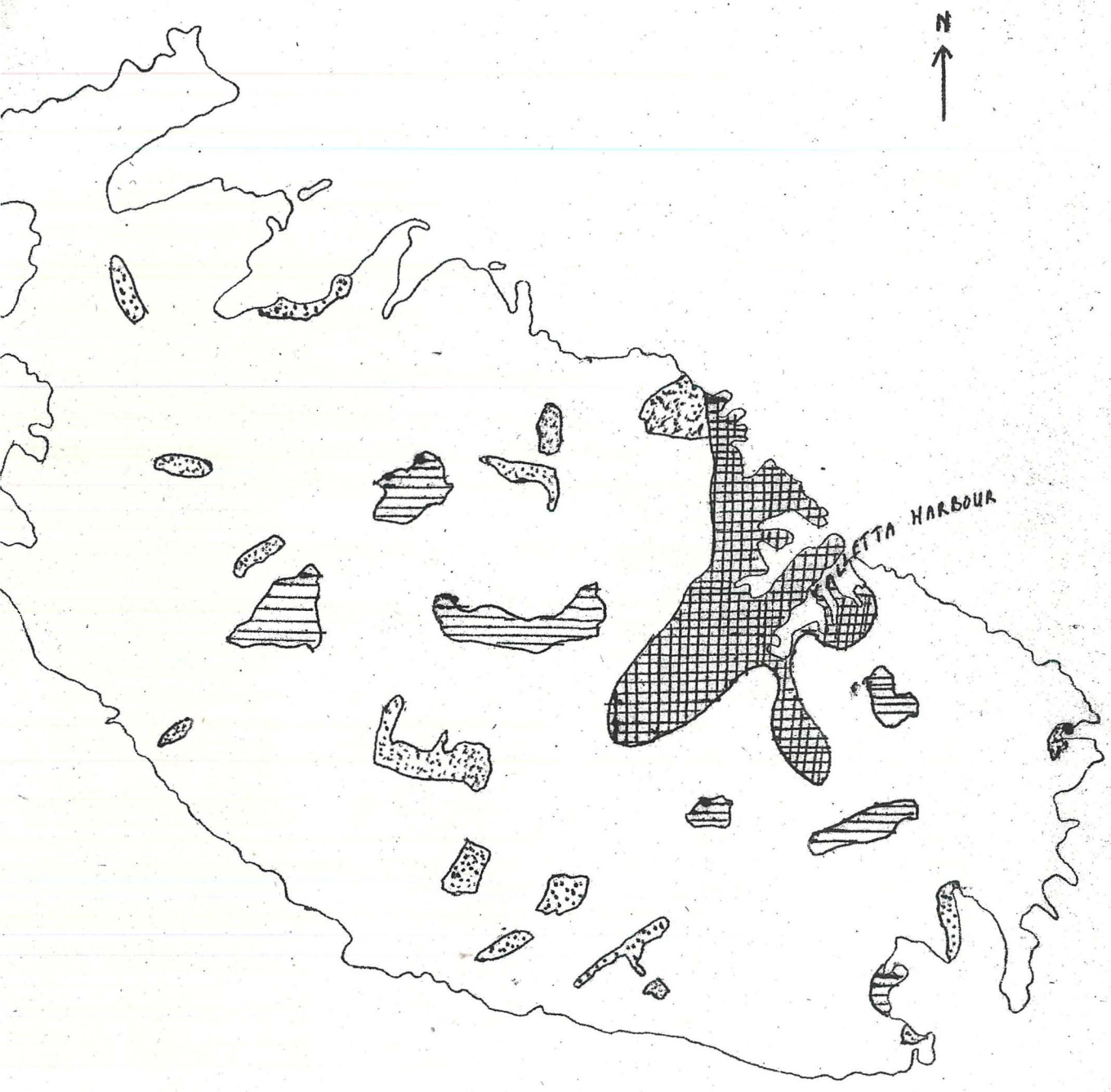
Station ---- Valletta, Malta. Height of Therms above the ground 71 feet.

Height of the Rainguage above the ground 59 feet.

Months	Cloud (8 a.m.)	Average sunshine hours of	Rainfall			Weather -- No. of days of							Wind -- No. of Observations of (8 a						
			Total ins.	Maximum ins.	Date	Rain	Snow	Hail	Thunder-storms	Clear Sky	Overcast	Gales	N.	N.E.	E.	S.E.	S.	S.W.	W.
January ...	6.3	5.5	4.25	1.75	2nd	18	-	2	3	-	10	2	4	2	2	1	3	7	8
February ...	6.7	6.6	1.98	0.61	18th	10	-	-	3	3	15	3	2	5	1	1	3	2	5
March ...	5.8	6.5	2.97	1.24	2nd	8	-	2	2	3	13	1	1	3	3	2	-	3	5
April ...	5.3	8.0	0.81	0.31	5th	5	-	-	3	5	10	2	3	2	1	4	3	5	4
May ...	5.0	9.7	0.31	0.21	6th	5	-	-	-	4	10	-	5	4	3	3	4	-	1
June ...	2.8	12.4	-	-	-	-	-	-	-	12	2	-	10	3	5	3	1	1	1
July ...	0.4	13.4	-	-	-	-	-	-	-	25	-	-	9	3	1	-	-	-	2
August ...	1.5	11.9	0.02	0.02	17th	1	-	-	3	17	1	-	5	1	1	-	1	2	3
September ...	3.2	9.4	0.03	0.03	30th	1	-	-	-	5	4	-	2	2	1	1	2	1	5
October ...	6.5	5.4	3.08	1.05	27th	15	-	1	10	1	14	-	2	3	2	8	2	3	2
November ...	6.7	7.0	0.71	0.39	21st	4	-	-	3	-	9	-	4	1	2	3	2	2	7
December ...	7.2	4.5	4.80	1.12	25th	21	-	1	9	-	17	2	1	-	-	-	5	8	8
YEAR ...	4.7	8.4	19.86	1.75	2nd Jan.	88	-	6	36	75	105	10	48	29	22	26	26	34	51

POPULATION DENSITY OF MALTA (1950)

I.



ER 20,000 per sq. ml.

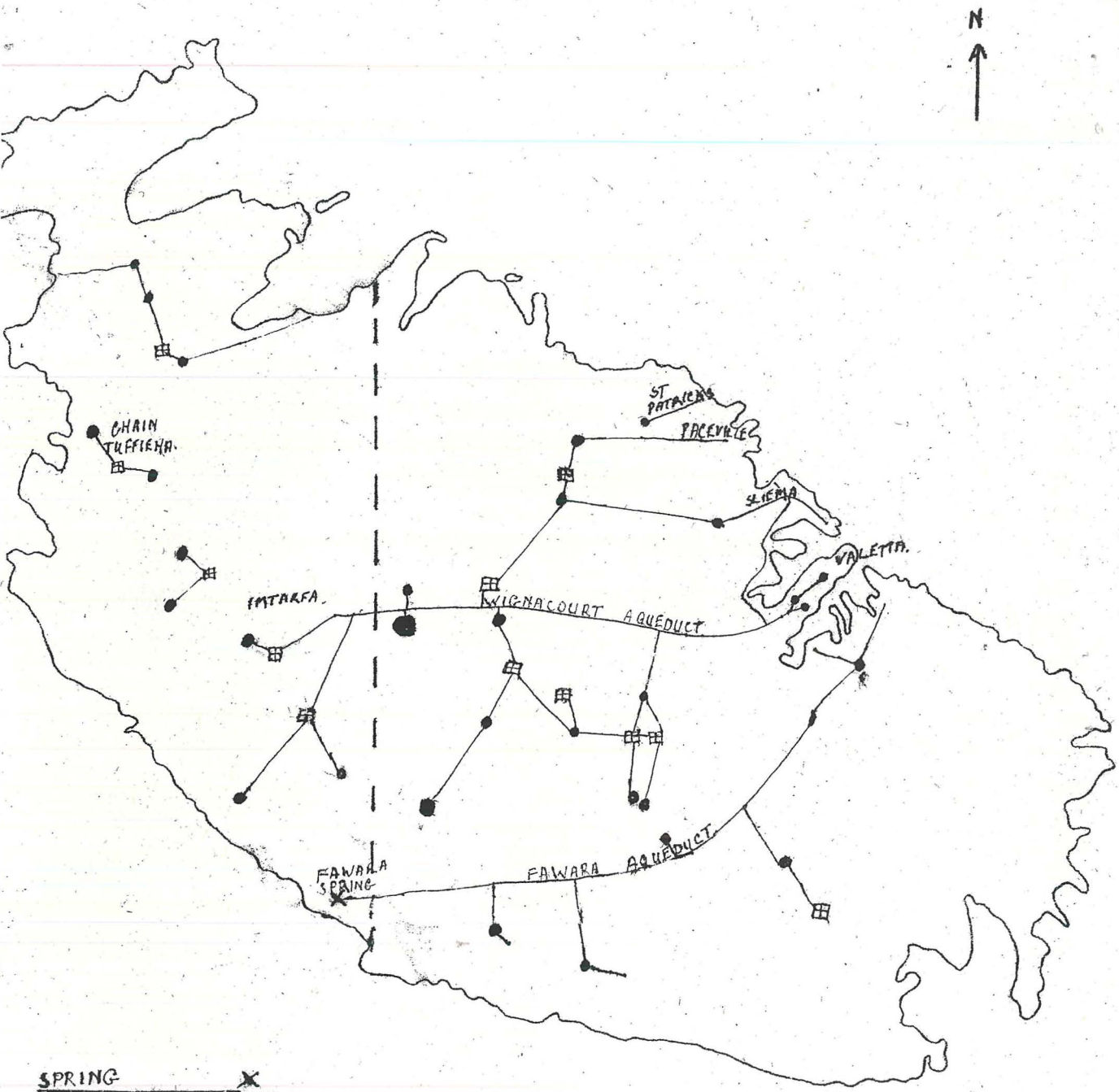
,000 – 19,999 per sq. ml.

,000 – 9,999 per sq. ml.

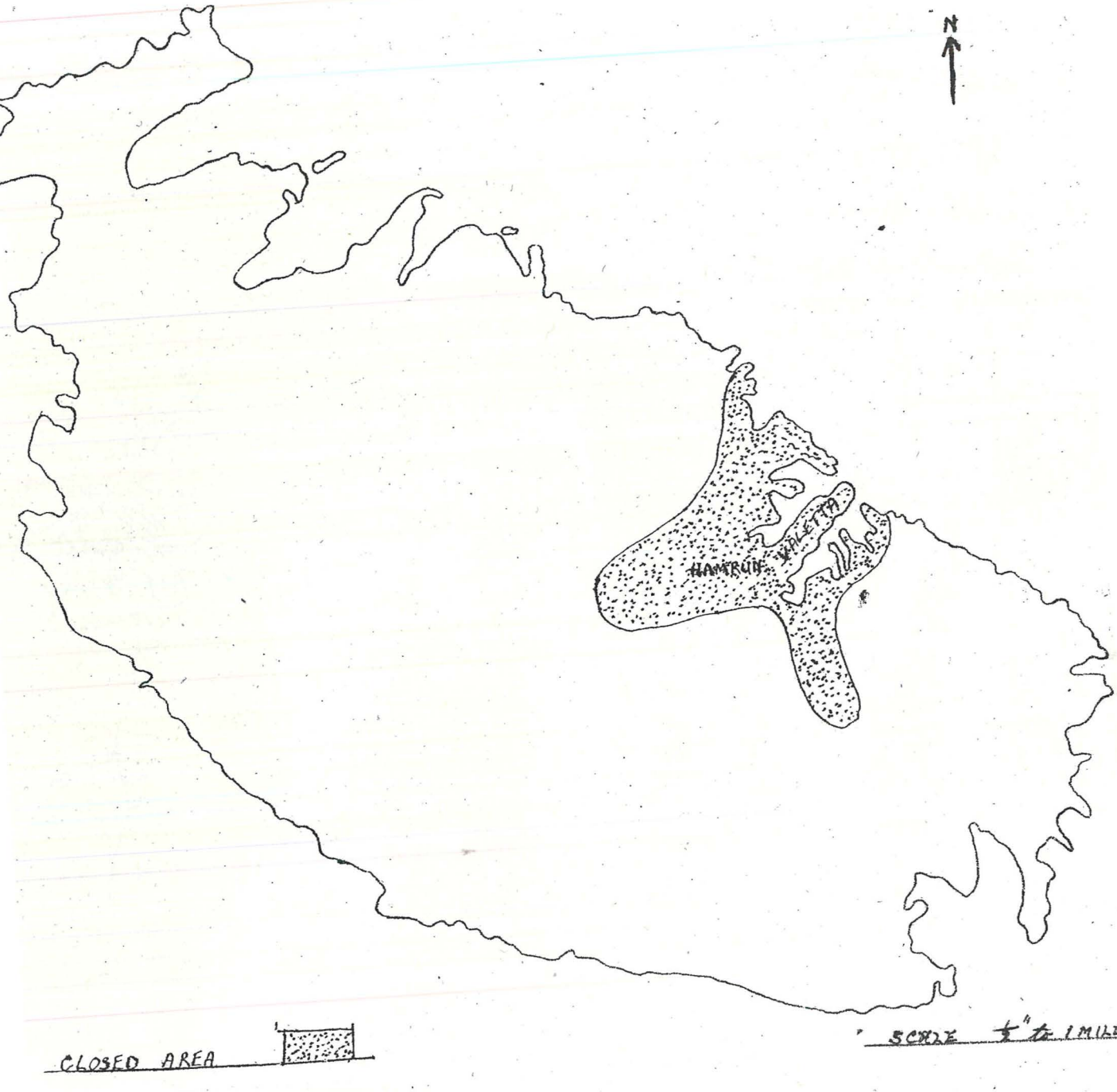
UNDER 999 per sq. ml.

SCALE 1" TO 1 MILE

WATER SUPPLY OF MALTA (1950) II

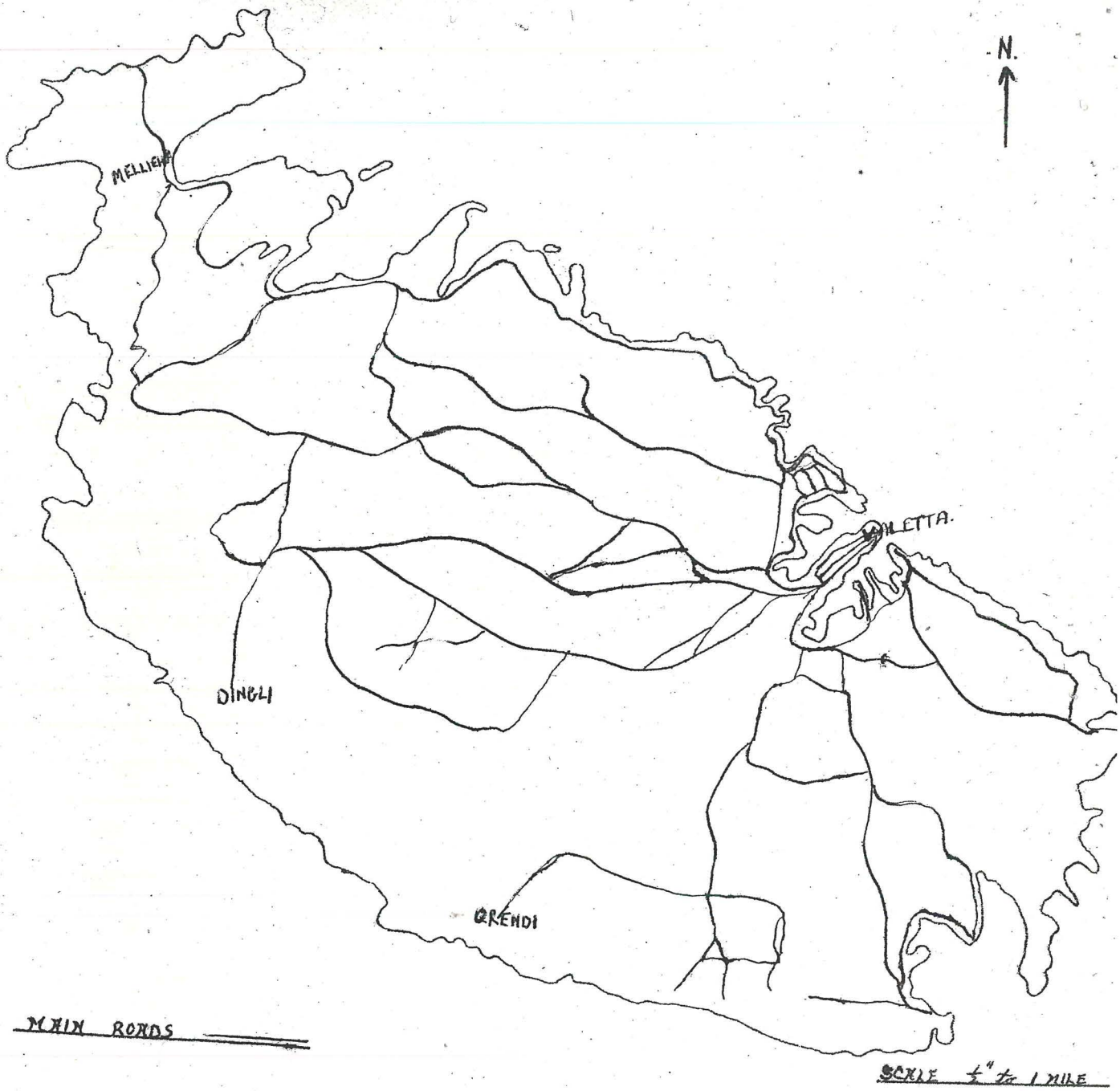


MAP SHOWING OPEN AND CLOSED AREAS FOR GOATS. (MALTA 1950)



ROAD COMMUNICATIONS IN MALTA (1950)

IV



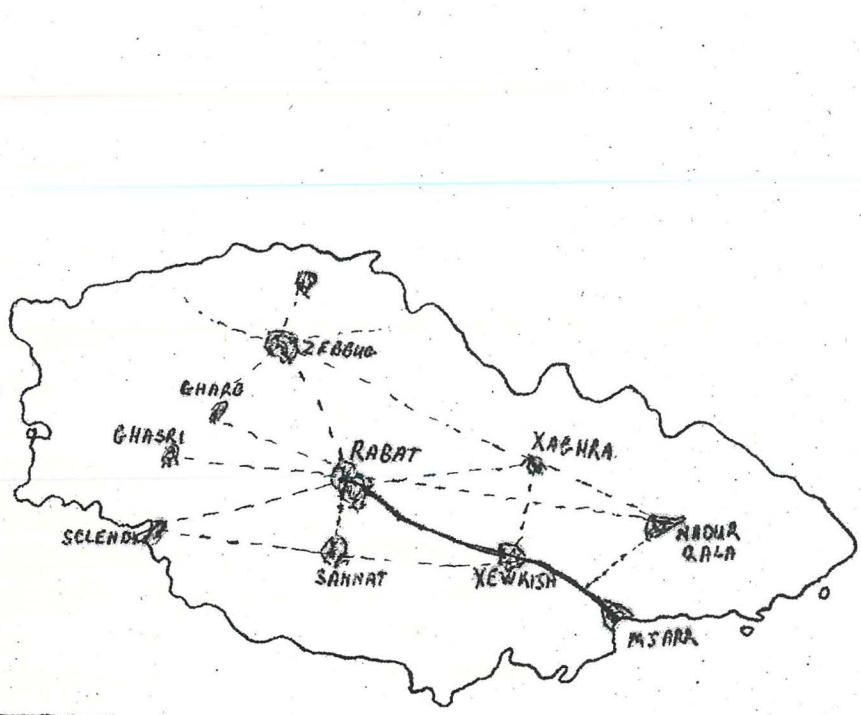
MAIN ROADS ———

SECONDARY ROADS ———

SCALE ½" to 1 MILE

ROADS AND VILLAGES IN GOZO (1950)

V



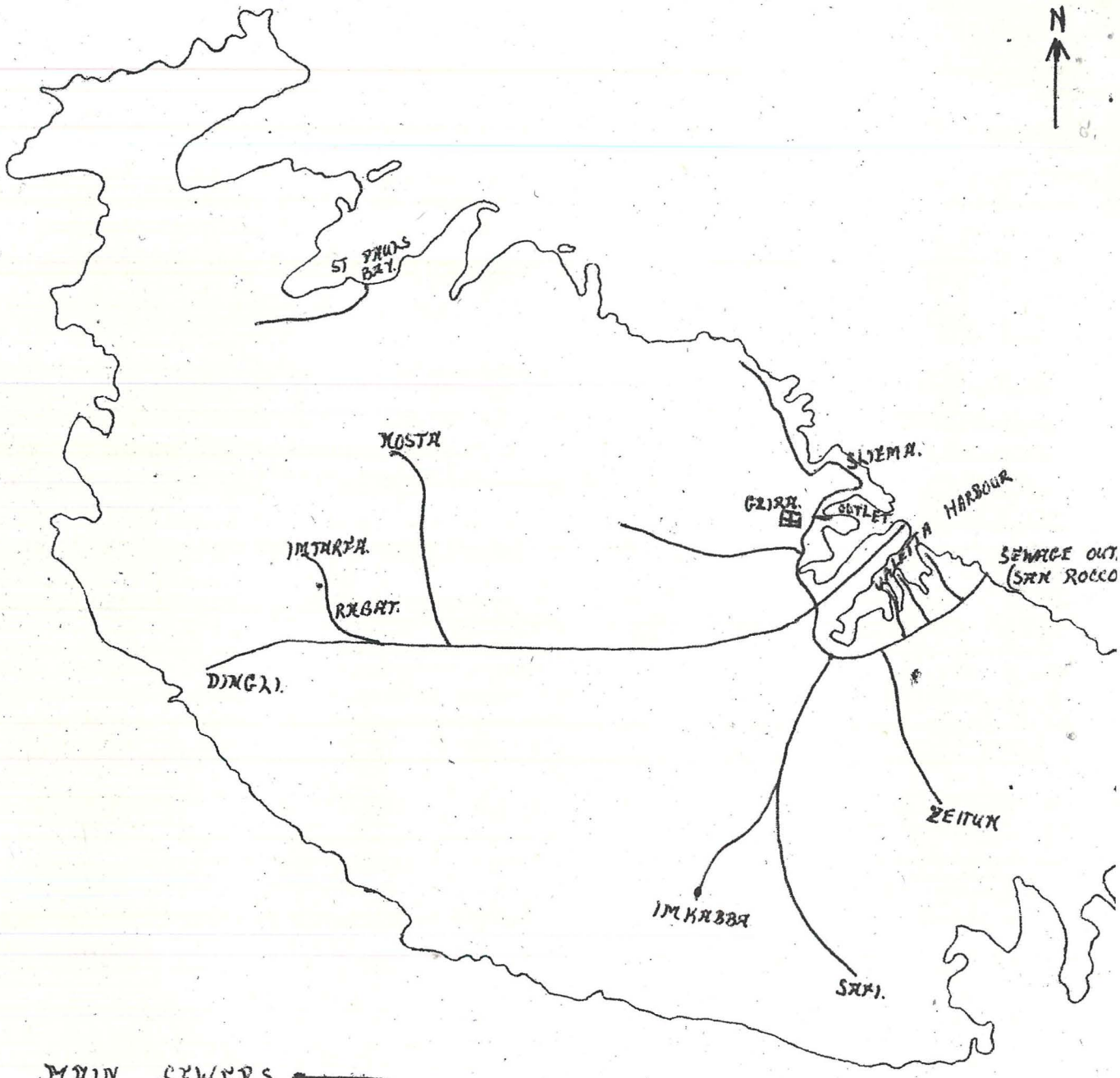
MAIN ROAD ———

SECONDARY ROAD - - - -

SCALE 4" to 1 MILE.

MAIN SEWAGE DISPOSAL OF MALTA (1950)

VI

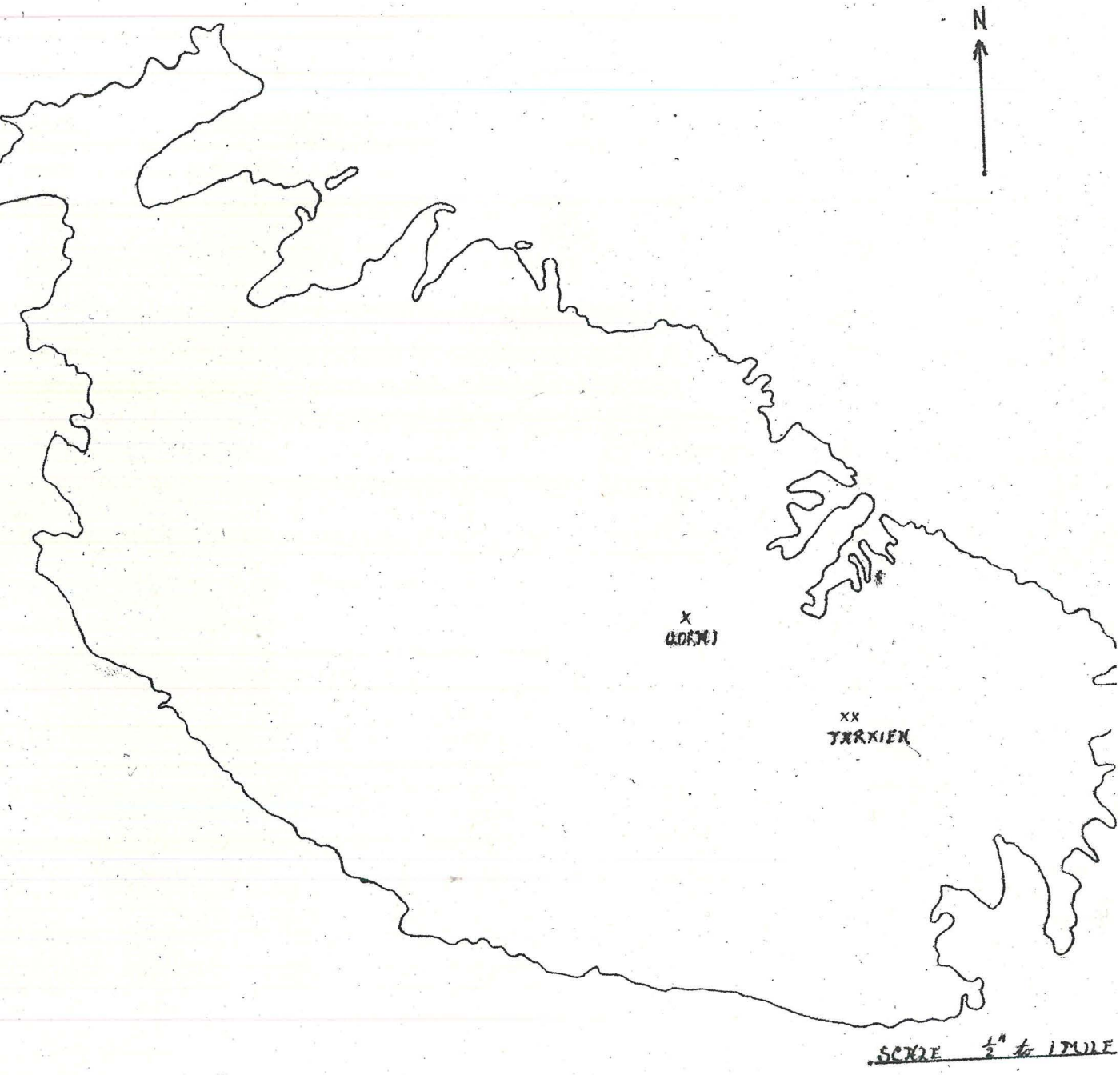


MAIN SEWERS ——

PUMPING STATION ⊟

SCALE ½" to 1 MILE

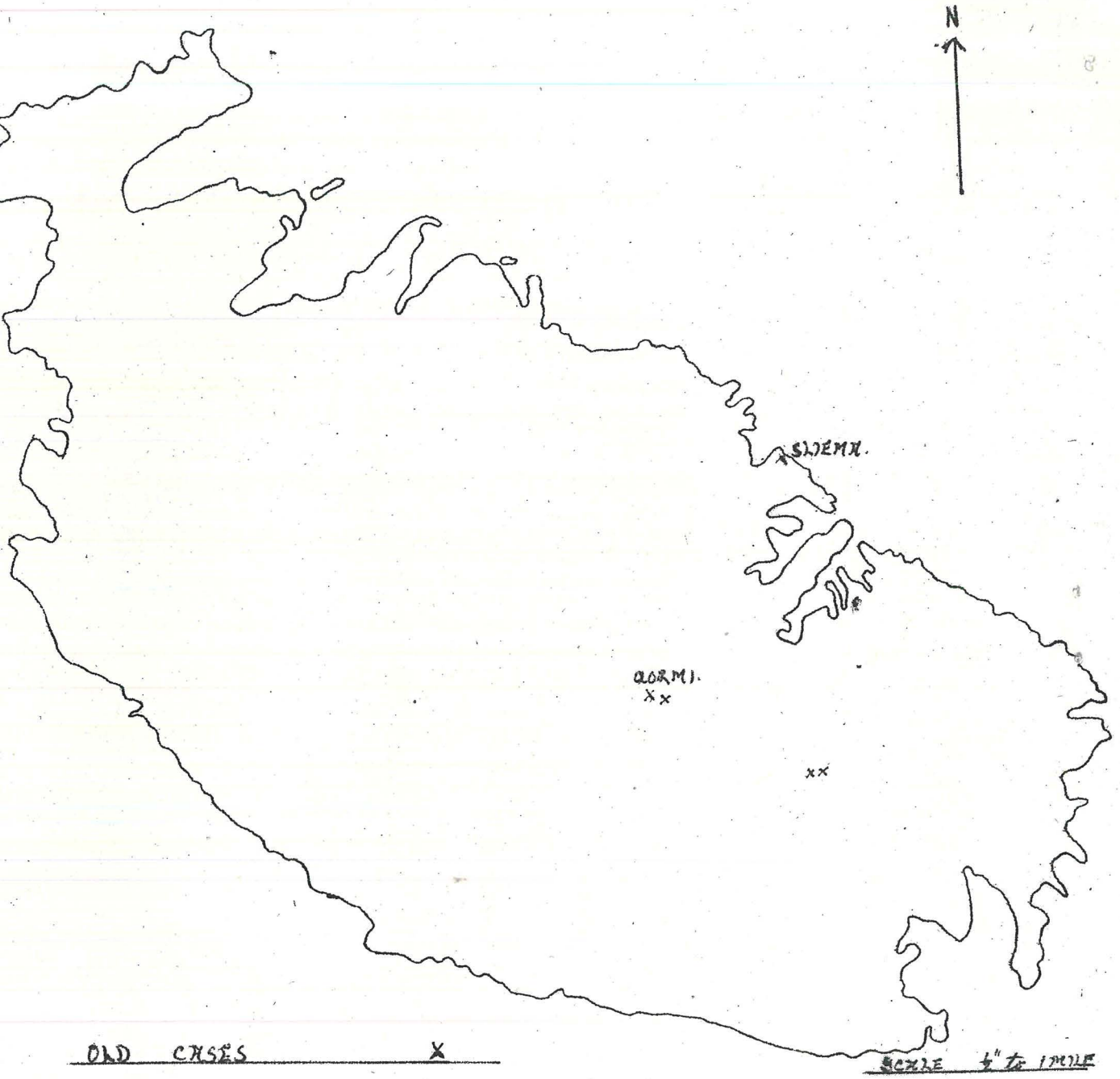
LOCATION OF CASES OCCURRING DURING WEEKS
ENDING 27.5.50 AND 3.6.50 (MAITH 1950) VII



ACCUMULATIVE TOTAL OF CASES ON 17·6·50

(MALTA.)

VIII



OLD CASES X

SCALE 4" to 1 MILE

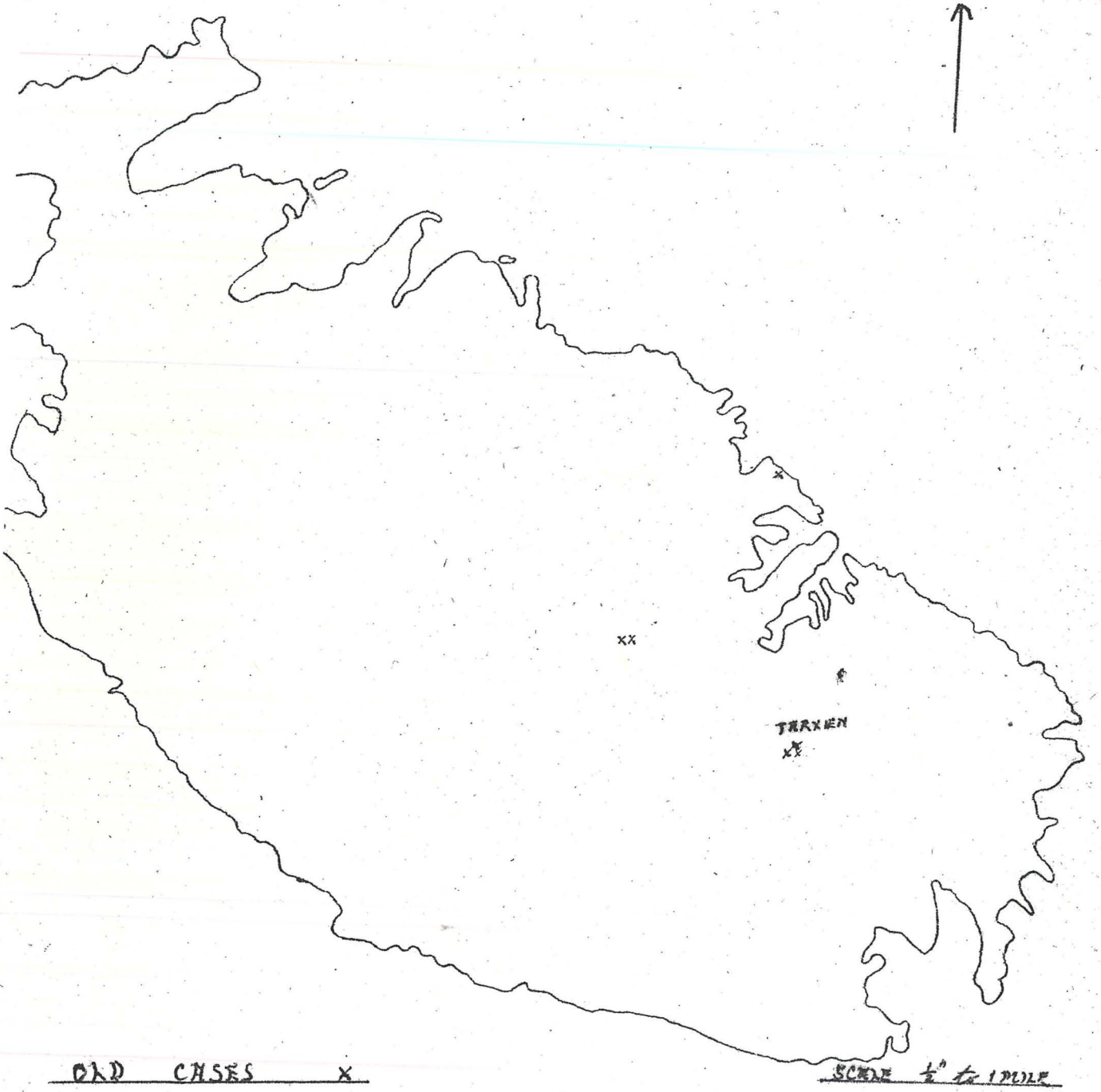
CASES OCCURRING DURING WEEKS ENDING 10·6·50 AND 17·6·50 X

ACCUMULATIVE TOTAL OF CASES ON 1.7.50.

(MALTA)

IX

N.



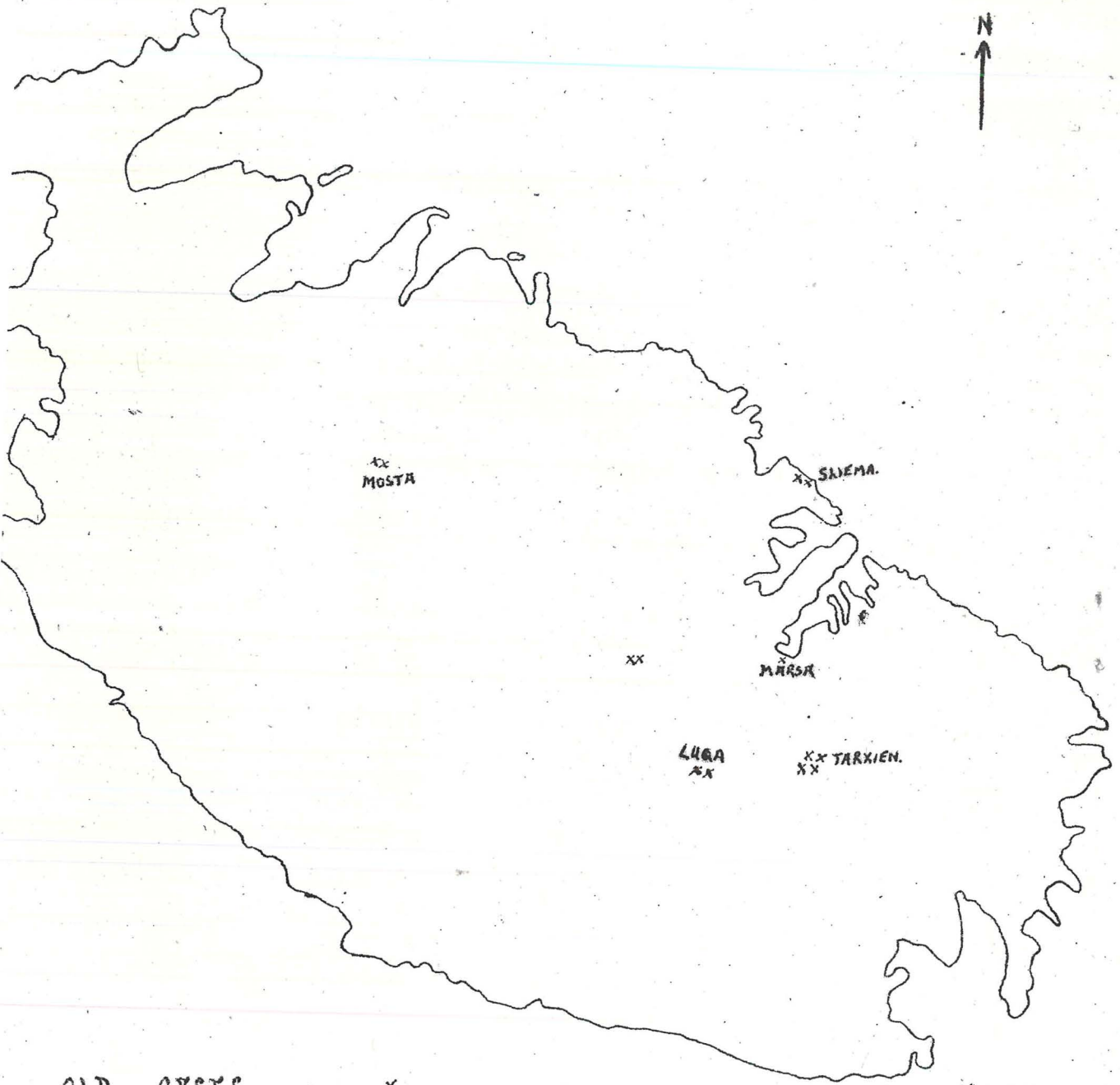
OLD CASES x

NEW CASE OCCURRING DURING WEEK ENDING 24.6.50. X

SCALE ½" to 1 MILE

ACCUMULATIVE TOTAL OF CASES ON 15·7·50.
(MALTA.)

X



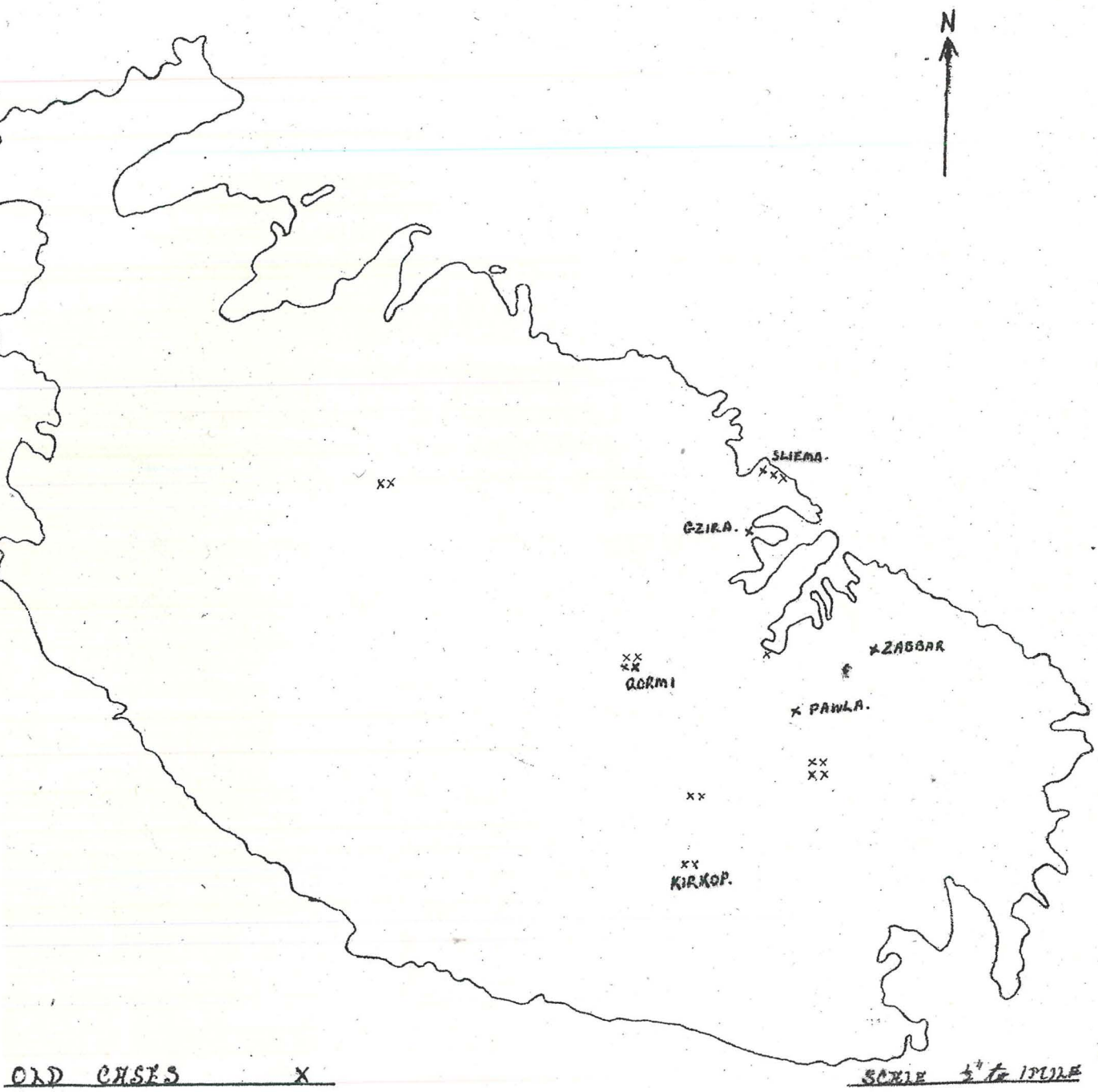
OLD CASES X

NEW CASES OCCURRING DURING WEEKS ENDING 8·7·50 AND 15·7·5

ACCUMULATIVE TOTAL OF CASES ON 29·7·50

MALTA.

XI



OLD CASES X

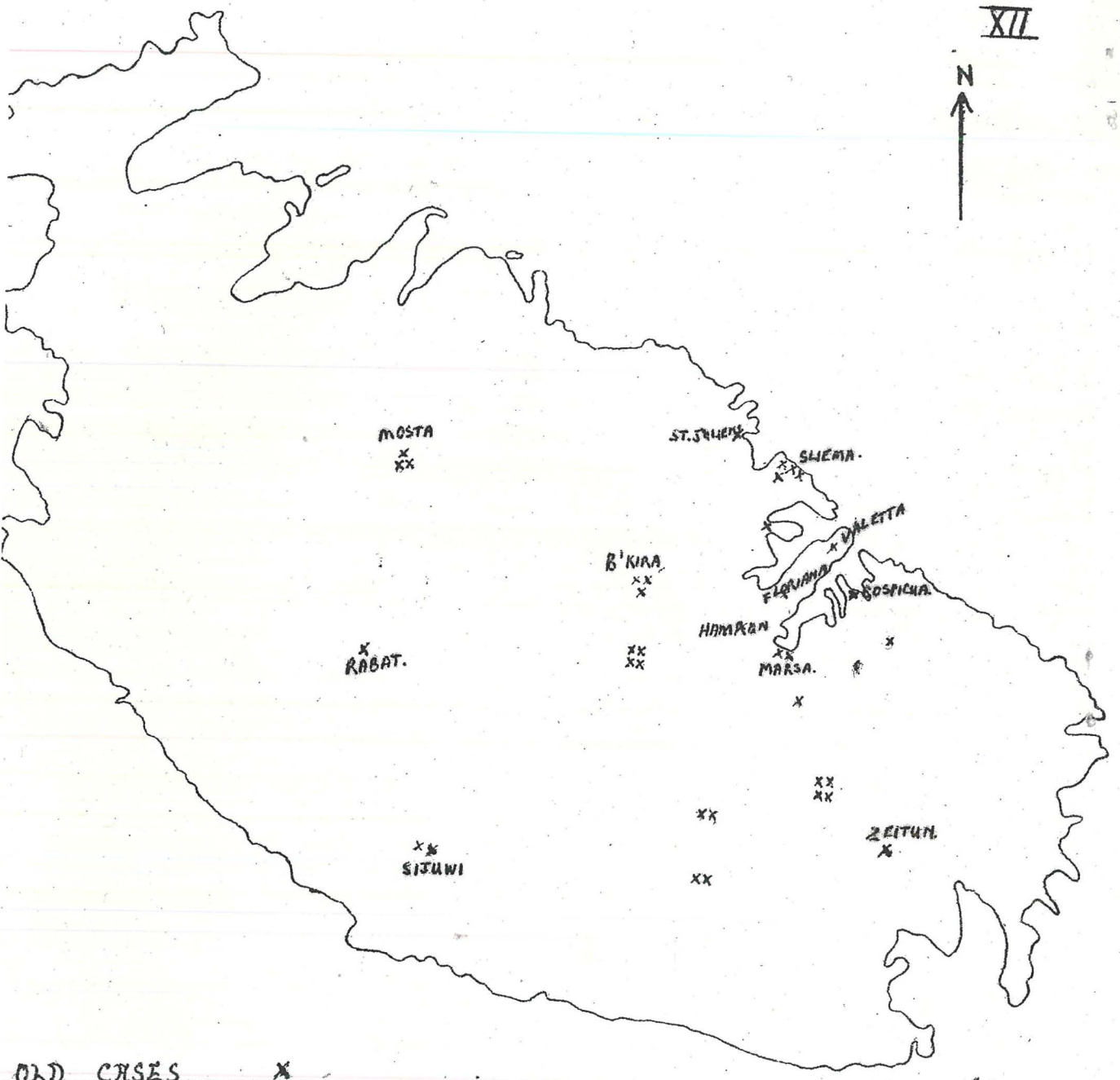
SCALE ½" to 1 MILE

NEW CASES OCCURRING DURING WEEKS ENDING 22·7·50 AND 29·7·50 X

CUMULATIVE TOTAL OF CASES ON 12·8·50.

(MALTA)

XII



OLD CASES X

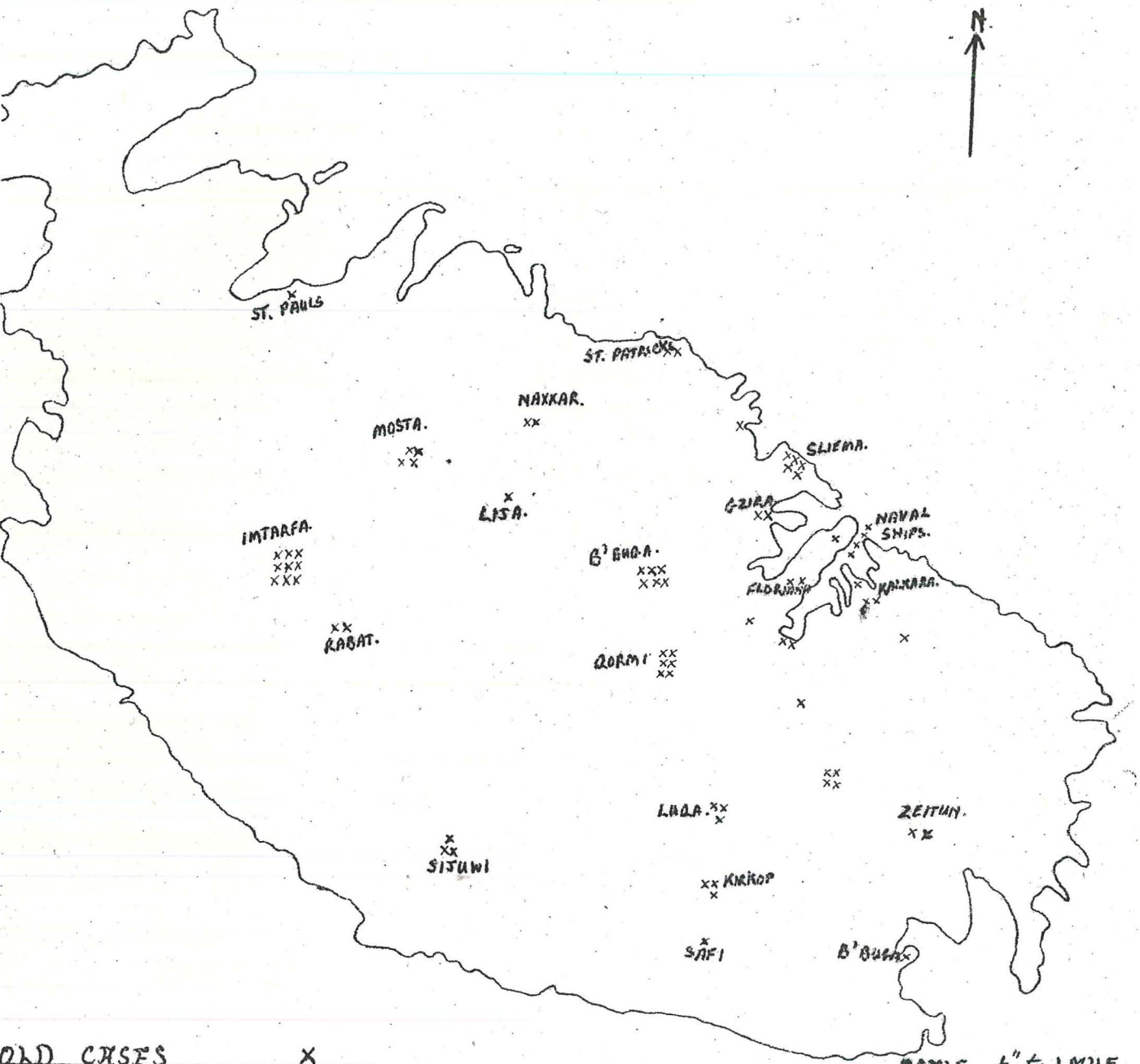
SCALE 4" to 1 MILE

NEW CASES OCCURRING DURING WEEKS ENDING 5·8·50 AND 12·8·50 X

ACCUMULATIVE TOTAL OF CASES ON 26·8·50

(MALTA.)

XIII



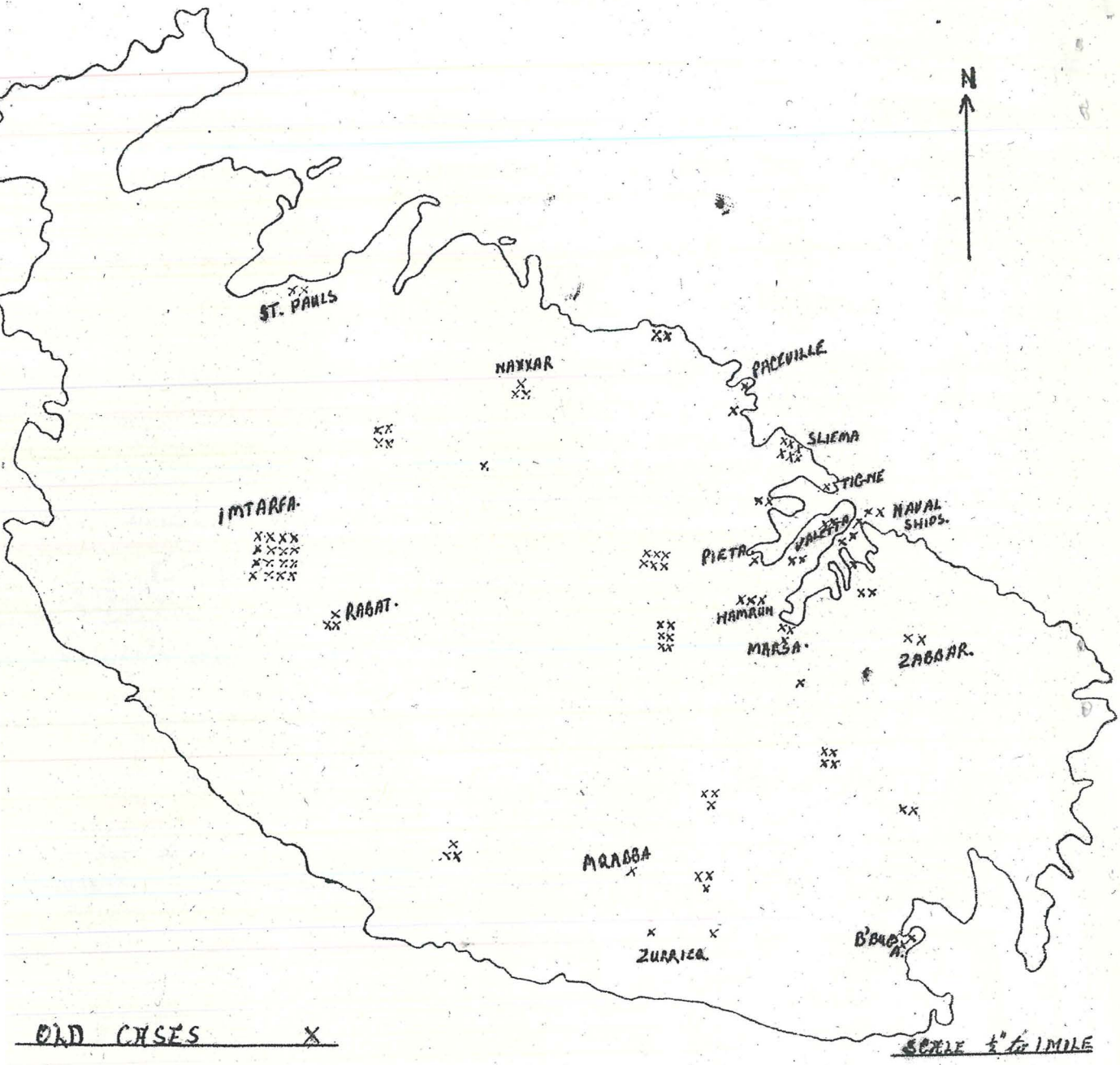
OLD CASES X

NEW CASES OCCURRING DURING WEEKS ENDING 19·8·50 AND 26·8·50. X

ACCUMULATIVE TOTAL OF CASES ON 9.9.50.

(MALTA)

XIV



OLD CASES X

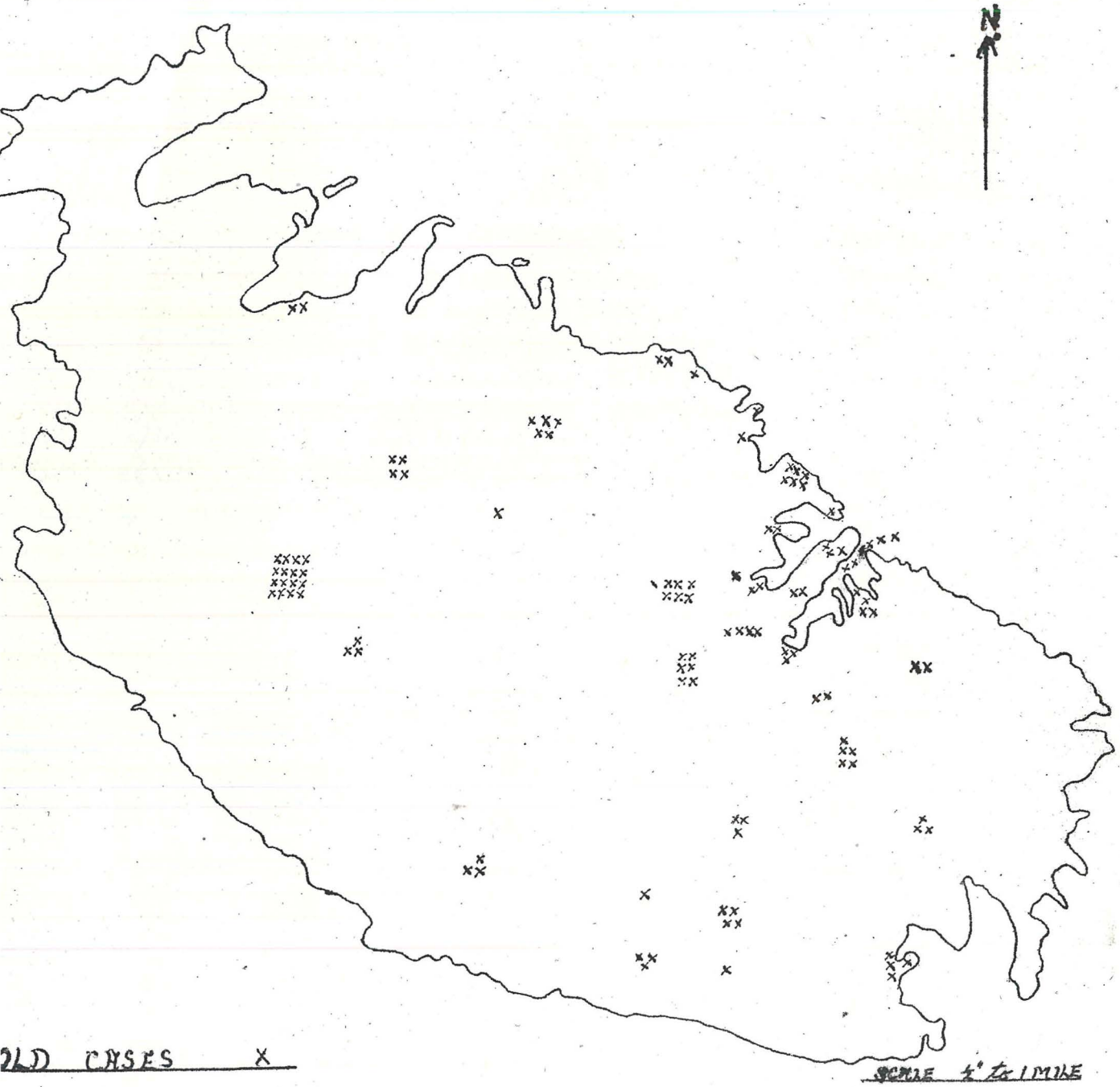
SCALE ½" to 1 MILE

NEW CASES OCCURRING DURING WEEKS ENDING 2.9.50 AND 9.9.50 X

CUMULATIVE TOTAL OF CASES ON 23·9·50.

(MALTA)

XV



OLD CASES X

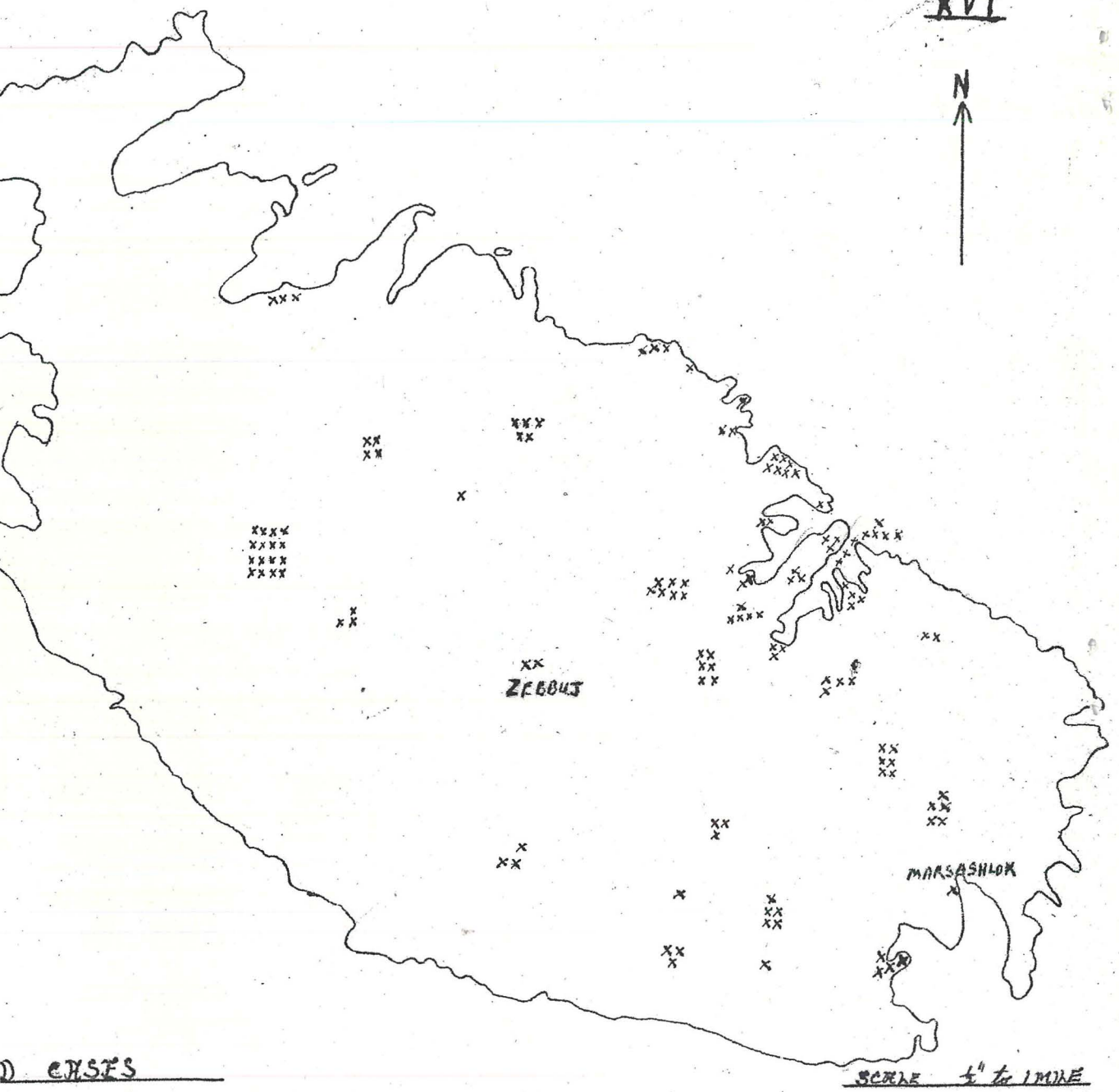
SCALE 4" to 1 MILE

EW CASES OCCURRING DURING WEEKS ENDING 16·9·50 AND 23·9·50

CUMULATIVE TOTAL OF CASES ON 7·10·50

(MALTA).

XVI



D CASES

W CASES OCCURRING DURING WEEKS ENDING 30·9·50 AND 7·10·50.

SCALE 4" to 1 MILE