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ENGLISH ONLY
(avec résumé en français)

SARDINIA AFTER MALARIA ERADICATION¹

by

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INTRODUCTION

The ERLAAS campaign covered the period 1946 to 1950. ERLAAS was supported in its work by the Rockefeller Foundation, various agencies of the Government of Italy, the local government of Sardinia, the United Nations Relief and Rehabilitation Administration, US Economic Cooperation Administration, and a number of private agencies. At the end, the eradication of the vector species, Anopheles labranchiae, had not been achieved. During 1950 A. labranchiae had been found in 148 different localities, largely in the north-east coastal area, (Gallura, Fig. 1) and experience ruled that, even though these areas had been intensively treated, some A. labranchiae would survive to propagate the following year. This, indeed, proved to be the case; nevertheless, the numbers of A. labranchiae had been so drastically reduced that malaria transmission had for all intents ceased. Relevant data for the five-year ERLAAS period are presented in Table 1 (from Logan et al., 1953).

¹ Note based on a visit to Sardinia from 27 September - 11 October 1964, to review the results of the former anopheline eradication campaign conducted by Ente Regionale per la Lotta Anti-Anofelica in Sardegna (ERLAAS) or Regional Organization for the Anti-Anopheline Campaign in Sardinia.

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TABLE 1. RESULTS OF A. LABRANCHIAE COLLECTIONS AND NUMBER OF CASES OF MALARIA IN SARDINIA DURING THE YEARS 1946-1950 (AFTER LOGAN ET AL., 1953)

<u>Anopheles labranchiae</u>			Cases of malaria reported by provinces	
Year	Total larvae collected	Larvae per 1000 man-days of scouting	Total	New
1946	20 950	166 270	75 447	10 149
1947	90 246	9 694	39 303	2 968
1948	10 370	59	15 121	341
1949	2 322	6	1 314	6
1950	1 407	8	44	4

The post-ERLAAS period. Every year the Ministry of Health, through the three Provincial Anti-Malaria Committees, has undertaken the residual spraying of all houses in areas where vector anophelines persist. DDT has been used in bedrooms, etc., but in kitchens, stables, etc., DDT plus Diazinon or Dithion was used in order to combat flies as well. In addition, the three Provincial Anti-Malaria Committees carried out small surveys looking for active malaria cases in children during the three-year period 1951-1953. Subsequently, a passive system of checking was instituted, as in the remaining regions of Italy. Malaria is still a reportable disease. Blood films are taken from all suspect cases and sent to a central laboratory for diagnosis or confirmation.

In 1951 the Autonomous Region of Sardinia brought into being the "Centro Regionale Antimalarico e Anti-Insetti" (CRAI), financed from the Sardinian Region with the contribution of the Cassa per il Mezzogiorno. Dr M. I. Gallus is the Director. Its primary function is responsibility for eliminating or reducing residual vector anophelism through larval scouting and larva control. The latter is accomplished with chemical insecticides and bonifica (land betterment) operations. In recent years pest mosquito control near tourist recreation areas has been added to CRAI's responsibilities. Some residual spraying for control of house-flies (and indirectly mosquitos) is also done.

FIG.1 SARDINIA

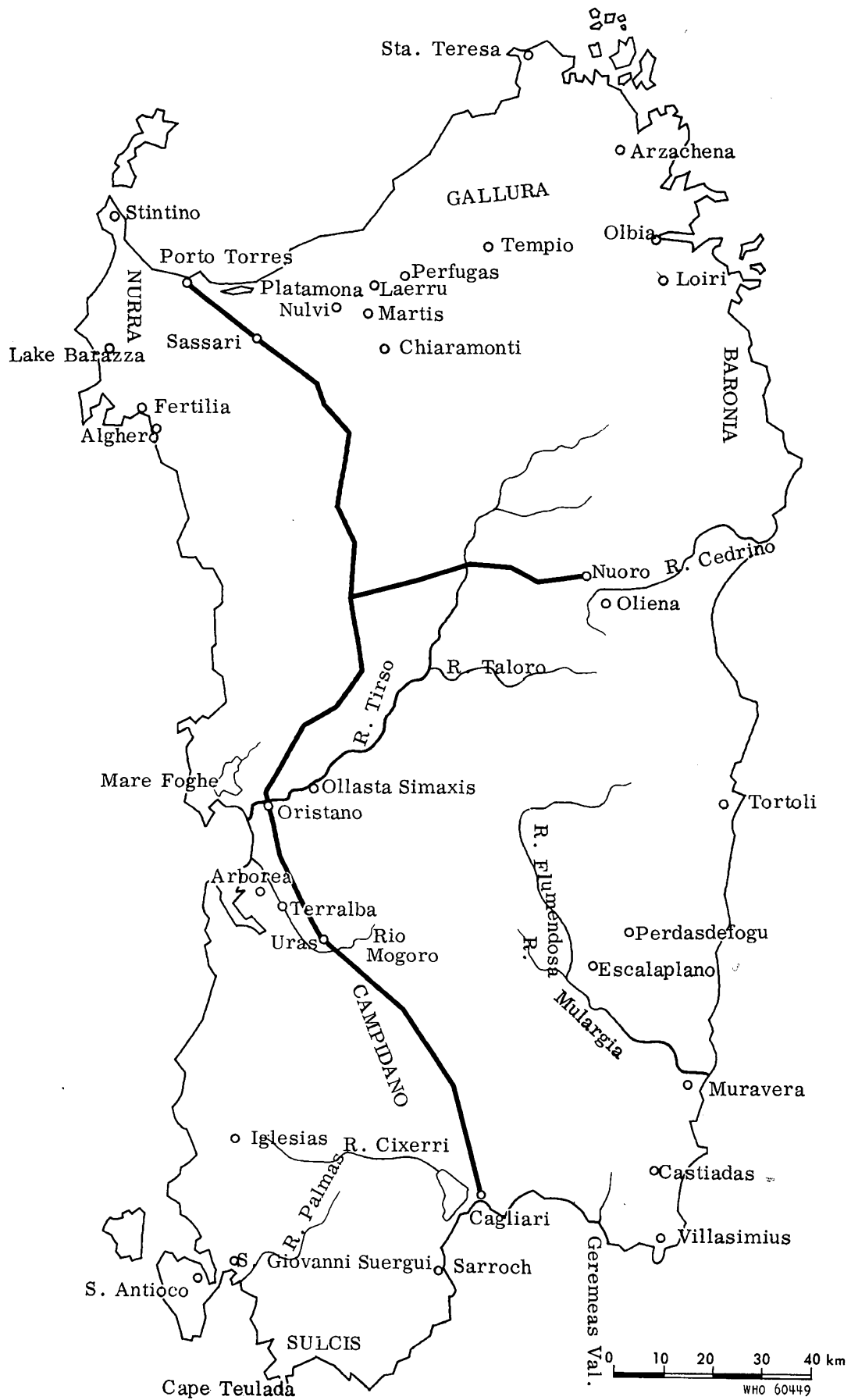
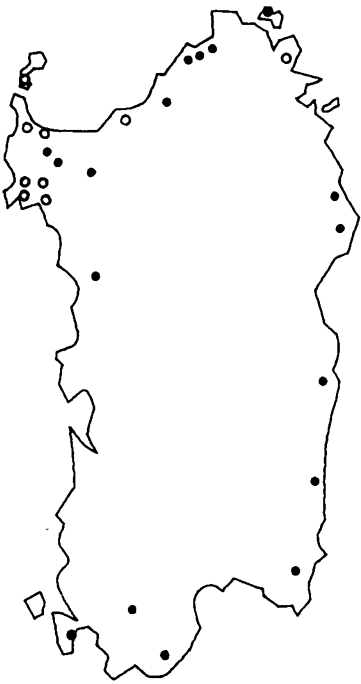


FIG. 2
SECTORS POSITIVE FOR VECTOR SPECIES, 1953 TO 1964

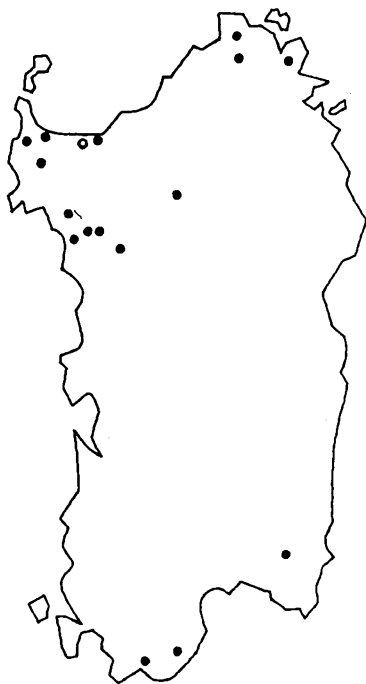
1953



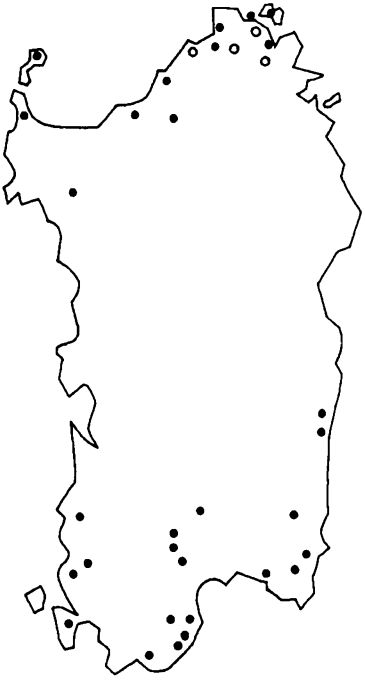
1954



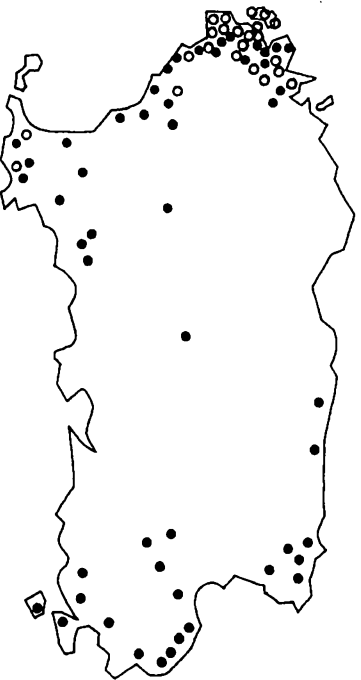
1955



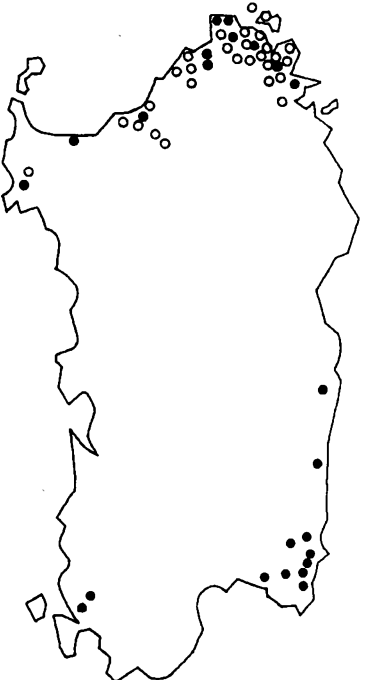
1956



1957



1958

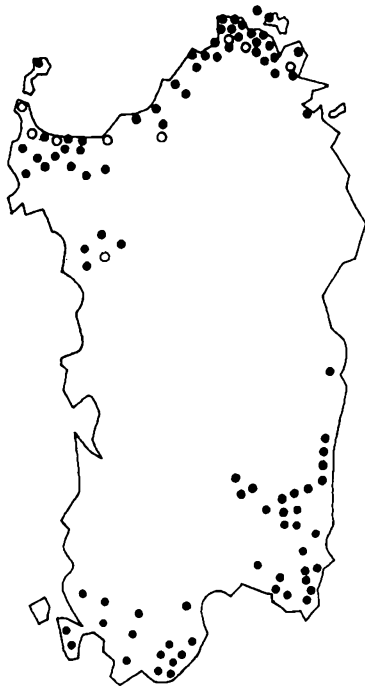


● A. labranchiae ○ A. sacharovi

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FIG. 2 (contin.)
SECTORS POSITIVE FOR VECTOR SPECIES, 1953 TO 1964

1959



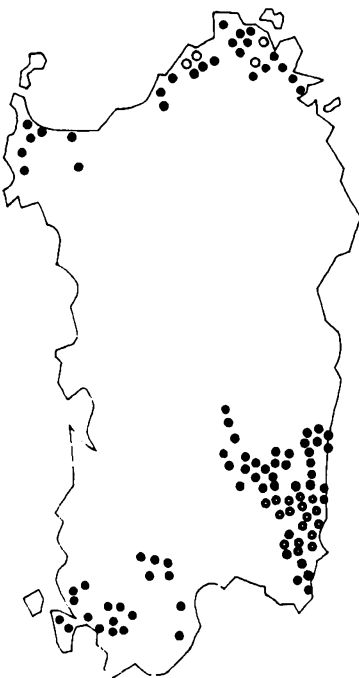
1960



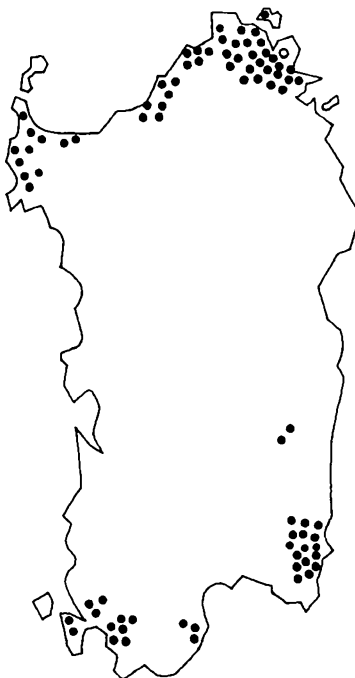
1961



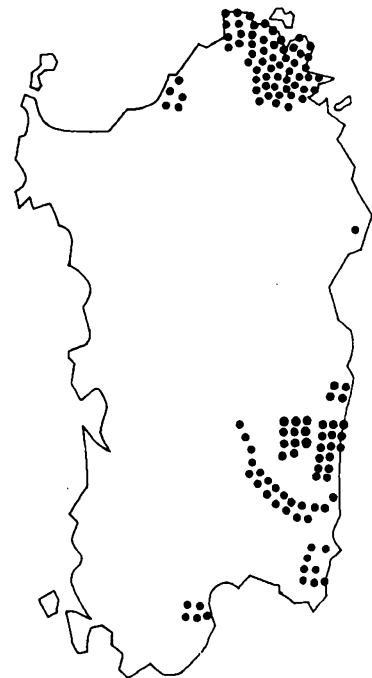
1962



1963



1964



• A. labranchiae ○ A. sacharovi

White (1964)

During the first six post-ERLAAS years (1951-1956) routine prophylactic larviciding from April to October was carried out by CRAI in all areas believed to be still harbouring vector anophelines or considered potentially dangerous. In 1952 Anopheles sacharovi was rediscovered in the Gallura and Sassari area (Stintino) so that subsequently two vector species had to be dealt with. In addition, larva scouting was carried out in vector-free areas until such time as they became positive when they were placed under larval treatment. In subsequent years prophylactic larviciding was discontinued. Owing to insufficient funds in 1964, larviciding was greatly reduced and some vector-positive areas remained untreated; however, all tourist areas were treated. The larvicide used is Paris green and 50% Lindane wettable powder (HCH) is sometimes added. The treatment cycle in 1964 was every 15 days from July through October. As in the case of larviciding, scouting activities since 1956 have been greatly curtailed, so that at the present time it is difficult to assess the situation properly. Larva scouting figures for the post-ERLAAS period (through 1963) are presented in Table 2. It will be noted that there was a highly active scouting programme up to the end of 1956 (the island was divided into 5229 sectors), but after this period the activity decreased and the number of sectors positive for A. labranchiae and A. sacharovi increased; this may have been due in part to the cessation of prophylactic larviciding. Likewise, collections of vector larvae remained low through 1956. During three of those six years it would have taken one man, on the average, about three years to have made one collection of A. labranchiae consisting of about two larvae. Unfortunately, prophylactic larviciding masked some of the positivity, but it would appear that in spite of this vector densities were very low. Subsequently this has changed and in recent years the frequency of collections and the number of specimens found has increased. Fig. 2 illustrates vector positive sectors 1953-1964.

During the summer of 1952 Dr Harold Trapido and the senior author undertook a study of residual A. labranchiae development in the Geremeas Valley on the south coast. It was found that in the absence of any insecticide treatment the A. labranchiae population of the valley did not visibly expand and occupy additional territory. On the contrary, the measurable population gradually declined (based largely on larval observations) until it disappeared entirely by 19 September. Meanwhile, another species, A. hispaniola, which had been rare to virtually non-existent early in the ERLAAS operation, became the dominant anopheline and its larvae occupied the sunny algal mats of Spirogyra, previously the home of A. labranchiae; A. hispaniola larvae were still abundant on 26 September when observations ceased.

TABLE 2. RESULTS OF COLLECTION OF A. LABRANCHIAE AND A. SACHAROV
IN SARDINIA DURING THE PERIOD 1951-1963

Year	Sectors		No. of vector		Man-days scouting	Vectors per 1000 man-days	
	Inspected	Vector positive	Collections	Specimens		Collections	Specimens
1951	5 229	86	309	1 127	46 136	7	24
1952	5 229	74	200	776	100 636	2	8
1953	5 083	49	99	270	58 483	2	5
1954	5 187	26	37	124	44 342	1	3
1955	5 029	17	19	42	40 405	1	1
1956	5 166	34	43	158	51 129	1	3
1957	1 644	75	132	463	21 399	6	22
1958	429	55	116	524	7 912	15	66
1959	1 209	102	184	689	23 940	8	29
1960	1 094	84	157	571	21 080	7	27
1961	766	67	139	605	21 926	6	28
1962	959	103	207	818	14 339	14	57
1963	305	77	83	410	7 459	11	55

Some additional information regarding this valley for the years 1953-1963 is available from the Statistical Department of CRAI. The data concern Sector A which represents the Geremeas river mouth where much of our work in 1952 was carried on. It will be noted in Table 3 that larviciding was undertaken in 1953, 1954, 1959, and again in 1962 and 1963. In spite of larviciding in only five of the 10 years (it is understood that the Provincial Anti-Malaria Committee did not spray the very few habitations in the valley each year), the A. labranchiae population remained very low - only three larvae being found. It is true that relatively few inspections were made; nevertheless, from 1955 to 1957 and again in 1960 there were 11-12 inspections made (this could represent two visits monthly from May to October) and no A. labranchiae were encountered. Strangely enough, A. hispaniola was abundant only in 1955 and then it disappeared. The shade-loving A. claviger and A. algeriensis do not seem to have been

involved. Compared with these findings, we were informed by CRAI that A. labranchiae had been commonly found in Geremeas Valley in 1964. Yet, when visiting the valley on 29 September 1964, we were able to recover only six larvae (all A. labranchiae) in 68 dips made through ideal larval habitats of Spirogyra mats. We found no A. hispaniola larvae, a strange contrast with 1952 when by this date A. hispaniola was abundant in this niche. A suggestion put forward by one of us (Casini) for the paucity of larvae was that the local farmer may have sprayed his nearby fruit orchard with one of the new phosphorus insecticides which are commonly used in Italy these days, and drift from the spraying killed the larvae.

TABLE 3. SPECIES OF ANOPHELINE LARVAE
FOUND IN GEREMEAS VALLEY DURING 1953-1963

Year	Number of inspections	Larvae examined					Number of treatments
		<u>A. labranchiae</u>	<u>A. hispaniola</u>	<u>A. claviger</u>	<u>A. algeriensis</u>	<u>A. marteri</u>	
1953	2						13
1954	1						14
1955	12		1 084	21	66	58	
1956	11			28	491		
1957	12			34	155		
1958	0						
1959	3	3		5	13		19
1960	11			53	236		
1961	4				222		
1962	1						14
1963	1						8

In the Gallura (Arzachena area, which was said to have had considerable A. labranchiae larvae in 1964), we checked many stables in formerly highly malarious areas but found no adult mosquitos. By contrast, however, CRAI informed us subsequently that there had been fair numbers of A. labranchiae in the Muravera area (south-east Sardinia) in the same year and adults could be picked up in the country (away from villages). Unfortunately, these observations could not be substantiated with figures.

It is tempting to speculate that a sylvatic strain of A. labranchiae has been selected by insecticidal activity over the past 17 years which is characterized, at least temporarily, by its lack of interest in man-made shelters. This possibility has been mentioned in the chapter "Biological Considerations" by Trapido in The Sardinian Project (Logan et al., 1953), but that writer points out that the residual A. labranchiae population probably has sufficient plasticity to re-invade man's habitat as it did in prehistoric times. In any event, this is an important point to follow up and warrants further investigation. The subject has also been discussed by Trapido & Aitken (1953).

Over the years, since the cessation of ERLAAS operations, CRAI has put a lot of effort into permanent projects, i.e. bonification work (Anon., 1960?; Gallus, 1960). We saw numerous instances where swampy areas have been eliminated by construction of drainage canals. These are completely lined with cement, or only the revetted sides are cemented, or perhaps the cementing is done at intervals along the canal. Sometimes a deep tank is left in a canal to provide a watering place for cattle and a source of pumped irrigation water during the dry season. This type of operation is expensive but over the years pays off, since besides eliminating a mosquito-breeding area it allows the surrounding land to be put into cultivation. Unfortunately, in some canals, which had cement revetments only, reeds have been allowed to grow up again.

Two good examples of post-ERLAAS land bonification are to be found in Oristano Division (west central Sardinia). Mare Foghe was a tremendous swamp of several hundred acres north-west of Oristano town. It was an almost impossible place to treat properly because of its extent and the heavy growth of reeds and other aquatic plants. This swamp is now almost dry as a result of revetments, canalization, and a pumping station. A private company has acquired some 145 hectares (350 acres) and is preparing the rich soil for artichoke and sugar beet production. Another formidable swamp, Ollasta Simaxis (see Fig. 71, Logan et al., 1953, p. 355), which caused a lot of trouble, has been drained and its rich agricultural possibilities are now being exploited. The last A. labranchiae larvae were found in Oristano Division in 1949 (Rio Mogoro). This is amazing as the area has a tremendous amount of mosquito breeding water (some of the worst in the island) in the form of swamps, rice fields and streams. Since ERLAAS, some 700 to 800 additional hectares of rice fields have been planted. Added to those previously in existence in the Bonifica of Arborea, there are some 1300 hectares (3200 acres) of rice fields in the Oristano area.

Malaria has for all intents disappeared (Table 4). From 1951 to 1963 there have been 75 cases reported, of which 42 were relapsing infections, 23 were ascribed to transfusion practices, and 10 were considered primary malarias. It will be noted that the great majority of infections were quartan malaria, the few Plasmodium falciparum and P. vivax infections were limited to the immediate post-ERLAAS period except for the odd imported case. Six of the 75 cases were imported, the remaining 69 being considered autochthonous cases, essentially quartan which is known to relapse over a long period. The relatively high incidence of transfusion malarias suggests latent infections. Casini & Gallus (1961) refer to the work of Pampana & Casini (1940) at Loiri, Sardinia, in 1939, when they found an incidence of 87% asymptomatic carriers, and they also cite WHO figures for Taiwan where such rates reached 91%. Sardinia might well be a good place to increase our knowledge of the importance of asymptomatic malaria carriers.

Eight of the 10 primary infections are of greatest interest because they are thought to be autochthonous. Of two so-called primary cases in 1951, one might have been an old P. malariae infection in a three year old child, while the second, a case of P. falciparum in an 18 month old child, was probably a bona fide primary infection.

Of the five 1959 cases, all were quartan malarias. One occurred in April at San Giovanni Suergiu in the Sulcis Region (south-west Sardinia) in an area where A. labranchiae was known to persist. The remaining four cases concerned adults (three women and one man; two lived together and the other two nearby) who had their infections sometime between December 1958 and January 1959 in the village of Nulvi in northern Sardinia. All declared they had no previous history of malaria and this information was confirmed by the family doctor. Known recent malaria activity in the area was limited to three relapsing P. malariae infections, one at Perfugas (13 km north-east) in 1954, one at Nulvi in 1956, and one at Chiaramonti (7.5 km south-east) in 1958. Vector anophelines had not been found at Nulvi for many years; however, eight larvae (two fourth instars) of A. sacharovi were collected during the summer of 1958 in the Rio Giunturas near Perfugas some 10-12 km distant. Inasmuch as A. sacharovi in parts of its range (Israel) is known to fly up to 14 km on autumnal dispersal flights, one of us (Dr Casini) who investigated the cases at the time of their occurrence, concluded it was conceivably possible for infected anophelines to

have brought the Nulvi malarias from outside. To accomplish this, A. sacharovi had to pass by several other villages (Laerru, Martis and Chiaramonti) to arrive at Nulvi situated on a hilltop at 1500 feet elevation. We visited the family doctor and discussed the cases. There has been no known malaria activity in the village since.

TABLE 4. INVESTIGATION OF MALARIA INFECTIONS DETECTED IN SARDINIA, 1951-1963

Year	Total cases	Species of plasmodium				Clinical form			Source	
		falcip.	vivax	mal.	mixed	primary	relapse	transf.	autoch.	imported
1951	17	7	4	6		2	14	1	17	
1952	9	3	5	1			9		9	
1953	2		1	1			1	1	2	
1954	2			2			2		2	
1955	7			7			4	3	7	
1956	2			2				2	2	
1957	9		1	8			3	6	8	1 (Sicily)
1958	3			3			2	1	3	
1959	11			10	1	5	3	3	10	1 (Nigeria)
1960	4			4		1		3	4	
1961	2	1		1			2		1	1 (Ivory Coast)
1962	3	2		1		2		1	1	2 (West Africa)
1963	4			4			2	2	3	1 (Ethiopia)
Total	75	13	11	50	1	10	42	23	69	6

The 1960 case was also quartan malaria. A two month old child of Terralba (just south of Oristano in the Campidano) became ill in May, and a blood film disclosed P. malariae. The mother had no history of malaria and repeated blood films and sternal punctures were negative. No A. labranchiae have been found in the Oristano area since 1949. The only anopheline found after much searching was A. algeriensis, a species of little consequence as a transmitter of malaria. Again we are faced with an incongruous story, an isolated case, in a young child and in a locality where known vectors

apparently have been absent for years and what anophelines are present are uncommon. There was said to have been one new case in 1964 in a child from Sant' Antioco, an island off the south-western tip of Sardinia, but the evidence was controversial.¹

It should be pointed out that, whenever a case comes to the attention of the authorities, the Medico Provinciale and CRAI immediately initiate an epidemiological investigation. If the case is one of transfusion malaria, curative treatment of the case as well as the blood donor (if found) ensues. If the case is considered a primary or relapsing infection, the Provincial Anti-Malaria Committee undertakes residual spraying of the houses; CRAI initiates a quick search for anopheline vector larvae followed by anti-larval treatment (weekly or fortnightly) of a 3-4 km area (or larger) until the end of October.

A visitor to any country after an absence of a dozen years is sure to note changes, but the senior author was completely unprepared for the revitalized Sardinia which he saw during the two weeks of his visit. It is true that many aspects of Sardinian life have not changed. The rather sombre clothing characteristic of many villagers (particularly that of the women) is still in evidence. The old-style native costumes, however, did not seem to be so common. Village women still carry water in containers on their heads. Old men still sit in the sun in the piazza and gossip. Prickly pear fruits are collected with long cane wands and fed to the animals. Oxen are still used in some parts (usually hilly) to plough the soil. Some villages, where the terrain is particularly inhospitable, appear to look as they always have, but in general, there is a sense of animation about the island. This feeling is stimulated by the sight of new construction in the villages, TV aerials, increased traffic, substitution of bottled gas for charcoal as a fuel, mechanized farm methods, irrigation canals, new roads, rosy-cheeked children, etc.

Flying into Cagliari one is immediately struck by the size of the city. It has expanded so that nearby villages have been engulfed. Tremendous apartment houses have sprung up everywhere. "Skyscraper" apartments and office buildings are to be seen in Cagliari as well as in Oristano, Iglesias, Sassari, Tempio, Nuoro and many

¹ In August 1965, a primary infection of P. vivax occurred in a 15 year old girl who had spent a few days in the rural area called San Paolo, near San Gregorio in the foothills east of Cagliari. The last verified Sardinian autochthonous case of vivax malaria occurred in 1953. It is believed the present case represents a transmission from an infected immigrant from the Belgian Congo living at San Paolo.

other places. The population of Cagliari province is said to have increased from 678 000 in 1950 to 757 000 in 1963. This increase has largely been felt in Cagliari proper where the population expanded from 136 000 to 200 000. Porto Torres, a city on the north coast which is experiencing an industrial boom, has also grown, but strangely enough, in many parts of the island, particularly in the villages, there has been a decline. Some villages report a drop of 50%. Many young people, having become dissatisfied with local conditions or wishing to feel emancipated and to seek adventure, have gone abroad - to northern Italy, France, Switzerland, Germany, and elsewhere where they are working in factories, mines, as craftsmen, etc. One is struck by the paucity of people in many villages and the few seen are frequently the very young and the old.

Travelling about the island one is impressed by the road-building programme. Many new thoroughfares have appeared since the days of ERLAAS. Many former dirt roads are now beautifully asphalted. This is particularly true along the coast in what were formerly backward areas (such as the indescribably bumpy road from Cagliari to Villasimius in the south-east), but where now the land is highly desirable real estate for the development of seaside villas. The road between Cagliari and Sassari is being expanded into a four-lane highway with bypasses around the intervening villages.

There has been a spate of dam building in many parts of the island with the object of increasing drinking water supplies and providing irrigation water and hydro-electric power. These projects involve the Rio Palmas, Rio Cixerri, Rio Mulargia, the Flumendosa, Taloro, Cedrino, etc. Elaborate plans have been prepared for irrigating the Cixerri Valley, the Campidano, and parts of the Palmas basin. Mention was made earlier of the expansion of rice culture in the Oristano area. A large rice-growing section has also evolved in the Palmas basin near Sant' Antioco. It was amazing to see the frequency with which small irrigation projects were being developed using small portable pumps to pump water from rivers or ponds or else by using small earth dams across water courses and transporting water long distances in metal irrigation pipes. Crops are then watered by sprinklers or by simple irrigation. In this way much land has been opened up to the cultivation of artichokes, alfalfa, and sugar beet. Sprinkler irrigation was unheard of in ERLAAS' days. Lake Barazza in the Nurra in north-western Sardinia is a case in point. Formerly this body of water was situated in a sandy desert of scrub and was a frequent source of A. labranchiae. Now the

anophelines are said to have gone (last collected in 1963), pumps and irrigation pipes have been installed, and the whole area is under cultivation. The Government appears to have embarked on an extensive re-forestation programme (mainly pines, but also eucalyptus, etc.). Many of the watersheds of the newly created impoundments are thus being protected, and plantings may be seen in many other areas as well. Mechanical methods of farming are everywhere in evidence, tractors for ploughing, reapers, trucks for hauling grapes to the wineries, and many other innovations. As a result, horses and cattle, particularly in the lowland areas, are far less frequently seen than before.

Many new bonifica developments have come into being largely through the agency of ETFAS (Ente Trasformazione Fondiaria e Agraria in Sardegna - Organization for the Transformation of Land and Agriculture in Sardinia). This in some ways was the most heartening aspect of our visit, for here one saw flourishing agricultural settlements in areas which formerly were left to the animals, the shepherds, and the hunters - wasteland of macchia in many instances. Now, through the agency of ETFAS and other organizations, farmhouses have been built, and the land reclaimed has been converted to vineyards, fruit orchards, fields of alfalfa, etc. These bonificas, for example, are to be found at Castiadas, Sarroch, Cixerri Valley, Uras, Oliena, the Baronia, and the Nurra, to mention a few. At Oliena the people return to Oliena at night, but the fact remains that the villagers have built small houses in the country where they are working during the day and eventually the time may come when a few and then more and more villagers may elect to remain in the country. The Nurra is an especial show-place. Formerly only one bonifica was there, called Fertilia, but it was faced with many problems. Now there are many, and the entire countryside has been transformed into a garden with small village centres (in addition to the rural farmhouses) with schools, recreation areas, shops, etc.

Many small industries are springing up in various parts of the island, such as plastics factories, paper mills (wood pulp), scrap metal works, three or four small oil refineries. Near Cagliari several large nurseries with many greenhouses have come into being. One such establishment harvests 18 000 - 30 000 carnations daily for shipment three times a week on chartered flights to Copenhagen and Malmö during the winter season. Roses and asparagus fern are the other important trade plants. Coastal properties have been, and are being, rapidly bought up by speculators and investors alike as well as by the common man who wants a place by the sea. An ever-increasing number of pretty villas is appearing in such situations.

Perhaps the biggest repercussions in the developing Sardinia are to be found in the tourist industry. Each year sees more and more tourists visiting the island (Table 5). They come by air (two airfields, Cagliari and Alghero) and by sea (Cagliari, Olbia, Sta. Teresa and Porto Torres), many different arrival times daily, and they travel about the island in buses, bicycles, trains, or in their own cars. Where formerly one had access to a dozen or so hotels of modest to poor accommodation, now there must be 100 or more excellent hotels in the island. Many are built along the coast as resort hotels and are open only during the tourist season (April or May to September). There are some 20 hotels scattered about the island, belonging to either a big Italian commercial hotel chain or Ente Sardo Industrie Turistiche, a quasi-governmental organization. In addition, many private syndicates (north Italian, English, Swedish, etc.) have built resort hotels and more are going up all the time. Antiquities are coming into their own. Ruins are being restored. Medieval churches and fortifications, the ancient nuraghe and domus de janas and other points of interest are now becoming sources of general interest. Highway road signs direct the traveller on his way and help him to find his objective.

TABLE 5. PERSONS ACCOMMODATED IN SARDINIAN HOTELS (1957-1960)

	1957	1958	1959	1960
Italians	473 429	492 136	476 478	541 292
Foreigners	120 857	136 545	129 498	135 240
No. of beds	4 282	4 907	5 107	5 635

(From: "Assessorato. Trasporti, Viabilità, Turismo" Regione Autonoma della Sardegna, 1957-1961, page 41.)

All of these are encouraging indications of things to come. None could have survived in the presence of malaria. One can only hope that the present emigration of young people will shortly cease, in favour of gainful employment in the new industries springing up at home.

CONCLUSIONS AND REMARKS

It is evident that great social and economic changes have occurred and are continuing to take place in Sardinia since the burden of malaria has been withdrawn. It is highly desirable to document these changes before it is too late.

Malaria transmission no longer poses a problem. The Government appears to have adequate means of extinguishing any flare-ups which might occur. A wonderful and perhaps unique opportunity exists to study latent malaria, and it is to be hoped that the opportunity will not be allowed to slip by.

A. labranchiae and A. sacharovi appear to be increasing, but to what degree is difficult to establish. There was not sufficient time during the present visit to investigate this matter fully. An effort was made to try and interest CRAI in carrying out a careful study of A. labranchiae. It would be highly desirable to initiate a study to determine if possible whether the residual population of A. labranchiae now differs in regard to its domestic and sylvatic habits. Is it really re-occupying its former habitats? Is it doing this rapidly or slowly? How is this affecting other anopheline species?

ACKNOWLEDGEMENTS

The writers wish to acknowledge with thanks the great assistance provided by Dr Marco I. Gallus, Director of CRAI, and his staff during the course of the visit to Sardinia.

EDITOR'S REMARKS

1. The extraordinary development of international tourism in Sardinia during the past ten years can be judged from the following table, obtained through the courtesy of Dr M. I. Gallus, Director, Centro Regional Anti-malarico e Anti-insetti, Cagliari.

Table: Numbers of foreign visitors to Sardinia during the period 1955-1965

<u>Year</u>	<u>Numbers</u>	<u>Year</u>	<u>Numbers</u>
1955	30 535	1960	139 418
1956	93 117	1961	187 511
1957	120 857	1962	199 045
1958	136 545	1963	220 465
1959	129 498	1964	311 312
		1965	326 322

2. The term "autochthonous cases" used in this paper should not be confused with "indigenous cases". "Autochthonous" means that the case of malaria could be either "indigenous" (recent local transmission) or relapsing or induced. The term "primary cases" refers to all cases which had their first manifestation in Sardinia.

3. Three additional references concerning the problem of P. malariae and the relationship of malaria eradication in Sardinia to the tourist industry are of interest:

- (a) "Il turismo nel pirno quinquennale" in La Programmazione in Sardegna, 1 p.3, Cagliari, Feb. 1966
- (b) "Abbasso la malaria" in Il Tempo, 29 Jan. 1966
- (c) Gramiccia G. (1964), The problem of P. malariae in the eradication of malaria, Rivista Parasit. 25, 1

SELECTED REFERENCES

- Aitken, T. H. G., Maier, J. & Trapido, H. (1954) The status of anophelism and malaria in Sardinia during 1951 and 1952, Amer. J. Hyg., 60, 37
- Aitken, T. H. G. & Trapido, H. (1961) Replacement phenomenon observed amongst Sardinian anopheline mosquitoes following eradication measures, Internat. Union Conserv. Nature and Nat. Res. Symposium, 15-24 July 1960, Warsaw, pp. 106-114
- Anonymous (1960) Il centro regionale antimalarico e anti-insetti (C.R.A.I.) nel quadriennio 1957-1960. Regione Autonoma della Sardegna. Presidenza, Soc. Edit. Ital. Cagliari, 30 pp.
- Casini, G. U. & Gallus, M. I. (1961) Anofelismo e malaria in Sardegna dal 1950 al 1960, Il Policlinico, 68, 1287
- Gallus, M. I. (1960) Lotta antimalarica in Sardegna, Riv. Malar., 39, 245
- Logan, J. A. et al. (1953) The Sardinian project. An experiment in the eradication of an indigenous malarious vector, Amer. J. Hyg. Monogr. Ser., No. 20, Johns Hopkins Press, Baltimore, Md.
- Pampana, E. J. (1963) A textbook of malaria eradication, OUP, London
- Pampana, E. J. & Casini, G. U. (1940) Studi di epidemiologia malarica in Sardegna, Riv. Malar., 19, 273
- Trapido, H. & Aitken, T. H. G. (1953) Study of a residual population of Anopheles l. labranchiae Falleroni in the Geremeas Valley, Sardinia, Amer. J. trop. Med. Hyg., 2, 658

RESUME

La campagne d'éradication des anophèles entreprise en Sardaigne par l'Ente Regionale per la Lotta Anti-Anofelica in Sardegna (ERLAAS) s'est étendue sur la période 1946-1950. A la fin de cette période, l'éradication de l'espèce vectrice Anopheles labranchiae n'était pas réalisée, mais la transmission du paludisme avait pratiquement cessé.

Une mission a été envoyée en Sardaigne en septembre-octobre 1964 pour évaluer les résultats de cette campagne d'éradication des anophèles.

Il est évident que de grands changements sociaux et économiques se sont produits et continuent de se produire dans l'île depuis que le paludisme n'y sévit plus. La transmission de cette maladie ne pose plus de problème. Le Gouvernement paraît avoir à sa disposition tous les moyens nécessaires pour éteindre les flambées qui pourraient survenir. C'est peut-être sur l'industrie du tourisme que les effets de cette campagne se font le plus favorablement sentir.

On suggère d'entreprendre une étude pour déterminer dans quelle mesure la population résiduelle de A. labranchiae a pu changer ses habitudes domestiques et sylvatiques par rapport à ce qu'elles étaient antérieurement.

Une occasion excellente et peut-être unique s'offre ainsi d'étudier le paludisme latent et il faut espérer qu'on ne la laissera pas échapper.

The purpose of the WHO/Mal series of documents is three-fold:

- (a) to acquaint WHO staff, national institutes and individual research or public health workers with the changing trends of malaria research and the progress of malaria eradication by means of summaries of some relevant problems;
- (b) to distribute to the groups mentioned above those field reports and other communications which are of particular interest but which would not normally be printed in any WHO publications;
- (c) to make available to interested readers some papers which will eventually appear in print but which, on account of their immediate interest or importance, deserve to be known without undue delay.

It should be noted that the summaries of unpublished work often represent preliminary reports of investigations and therefore such findings are subject to possible revision at a later date.

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