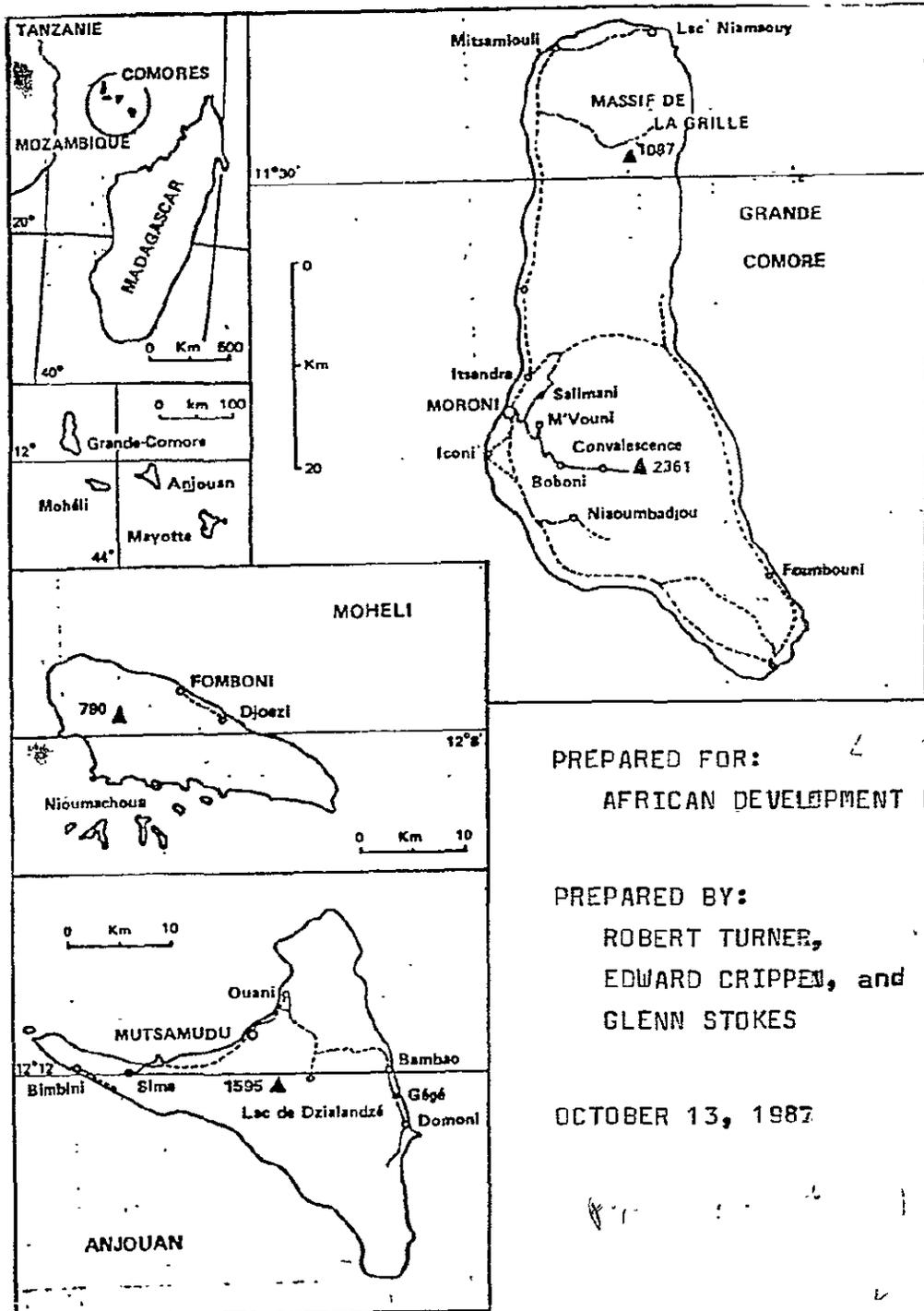


REPORT ON MALARIA CONTROL IN THE COMOROS ISLANDS



PREPARED FOR:

AFRICAN DEVELOPMENT BANK

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OCTOBER 13, 1987

TABLE OF CONTENTS

SCOPE OF WORK	1
OBSERVATIONAL COMMENTS BY THE TEAM	2
DEMOGRAPHIC INFORMATION	2
General	2
Population	2
OTHER HEALTH INFORMATION	3
INCIDENCE AND PREVALENCE OF MALARIA	3
ORGANIZATION OF HEALTH SERVICES	4
VECTORS	6
CONDITIONS FAVORABLE FOR THE SPREAD OF MALARIA	8
CURRENT ANTI-MALARIA PRACTICES	9
PREVIOUS INSECTICIDE CONTROL MEASURES	9
COMMENTS ON GOVERNMENT POLICY REGARDING MALARIA CONTROL	10
PUBLIC HEALTH LAB	1
RECOMMENDATIONS	1
Tactical Variants	10
PERSONS CONTACTED	14
REFERENCES	15
MAPS ANNEXE	

SCOPE OF WORK

The African Development Bank has undertaken a study regarding the possibility for an increased effort in the control of malaria in the Federal Islamic Republic of the Comoros. Observations regarding the first phase of a projected two phase study, have been made from September 17 to October 13, 1987, by three consultants (Team), as follows:

ROBERT L. TURNER - Malariologist, Team leader
GLENN M. STOKES - Entomologist
EDWARD F. CRIPPEN, M.D. - Public Health Physician

The Terms of Reference are, as follows:

- i) To review the literature on malaria control in the Comoros Islands and to collect relevant documentation on the subject.
- ii) Undertake an in-country assessment of the Comoros' malaria situation, in light of the documentation and discussions with interested parties.
- iii) To determine, among other things:
 - The incidence and prevalence of malaria;
 - Current practices by both, health personnel and the population in the prevention and treatment of malaria;
 - The type of vectors involved in the transmission process;
 - Conditions that are favorable to the spread of the disease;
 - Resources available to current malaria control efforts;
 - The population at risk; and
 - Prior use and type of insecticides used.
- iv) Assess Government policy with regard to malaria control.
- v) Propose strategies to be used in malaria control and obtain their approval by Government.

Additionally, comments were requested from the Team, relative to the need for the establishment of a central public health laboratory. It was suggested that consideration might be given to the possibility of expanding the functions of an existing limited service laboratory or the establishment of a multi-service laboratory for a more extensive range of public health functions.

OBSERVATIONAL COMMENTS BY THE TEAM

The Team has made extensive on-site observations throughout all three islands of the Comoros, has held discussions with government health workers, multi-lateral agency heads, other government workers, non-governmental personnel, and diplomatic staff. The existing literature has been reviewed. The need for an effective, well organized malaria control program, with adequate resources, is urgently needed in the Federal Islamic Republic of the Comoros. Our review and evaluation of the various critical parameters follows.

Infant mortality rate (est. 1982) 148/1000 live births
 Life expectancy (est. 1981) 55 years

DEMOGRAPHIC INFORMATIONGeneral

The Federal Islamic Republic of the Comoros, comprised of three islands (Grand Comoro (1148 km²), Anjouan (424 km²), and Moheli (220 km²)) is located in the Mozambique Channel of the Indian Ocean, between northern Madagascar and Mozambique. The country is situated close to 12° South latitude and 44° East longitude. The total land area is 1792 km². The capital, Moroni, is located on the western coast of Grand Comoro (Ngazidja). The other two islands, Moheli (Mwali) and Anjouan (Nzwani), are located in a north-west-south-east axis from Grand Comoro.

The climate is tropical marine, with a relatively stable temperature range (between a minimum of 15.5° to a maximum 32.8°C) which is favorable for malaria transmission. The islands may receive more than two meters of rain per rainy season.

Population

The last official census in 1980 showed the following:

	population	density per square km
Grand Comoro	188,000	164.6
Moheli	18,000	85.5
Anjouan	140,000	349.1

In 1987, the population of the three islands is estimated at just over 400,000 of whom more than half are less than twenty years old. Eighty-five percent live in rural areas. Among the three islands, only eight towns have a population of more than 5,000.

OTHER HEALTH INFORMATION

Estimated birth rate	47/1000 population
Estimated death rate	19/1000 population
Infant mortality rate (est.1982)	148/1000 live births
Life expectancy (est.1981)	46 years
Percent of population less than 14 years of age	47.3
Population per physician (1982)	10,600
Population per trained nurse or midwife	4,000
Percentage of births supervised	24%

Malaria, high infant mortality, and filariasis constitute the predominant health problems.

INCIDENCE AND PREVALENCE OF MALARIA

Malaria affects more than 80% of the Comoran population and causes a high incidence of infant morbidity and mortality. The entire population is at risk from malaria. Pregnant women and children from ages 2 to 9, are the most vulnerable to the malaria infection.

In the three islands, malaria is meso- to holoendemic, with 30% to 75% of the population positive for *P. falciparum*, the predominant malaria parasite. Malaria constitutes the highest number of diagnoses by various hospitals and clinics on the island.

Malaria is the main cause of mortality among children less than one year old and is the primary cause of spontaneous abortions.

In 1982, in the El Marouf Hospital on Grand Comoro, 65.7% of 1,773 blood slides examined, were found to be positive. In 1983 at the same hospital, 75.4% of 3,519 blood slides were positive. In 1987, F. Benthain, W.H.O. Laboratory Technician, found that among 505 blood films of children, aged 0 to 9 years, 42.18% were positive; 39.2% were P. falciparum, 3.56% P. malariae, and 0.99% P. vivax. These latter studies were made at the Catholic Mission on Grand Comoro, and Moheli on October 1st and 2nd, 1987. Health fairs were observed. Discussions were held with health

On Anjouan in 1973, the infant parasite rate was reported as 56.8% among those children complaining of fever. It has also been reported that approximately 5,000 children, from ages 0-5, die annually from P. falciparum malaria. A total of 351 blood slides were collected from three regions in Moheli in 1980. The parasite rate ranged from 68.6% to 83.2%.

Thus, physicians and other medical personnel, as well as the general public, recognize that malaria is one of the leading health problems.

ORGANIZATION OF HEALTH SERVICES

The Ministry of Public Health is responsible for the overall planning and management of the health sector, the National Health School, and the Central Supply Pharmacy, as well as the operation of all hospitals and health centers. Included are divisions of maternal-child health (MCH), expanded program of immunization (EPI), malaria control, and health education.

Each island has a Regional Director of Health, assisted by a coordinator of maternal child health and family planning. The health services are further divided into Health Districts.

Each Health District is comprised of a Health Center, with patient beds or if there is a hospital near, there will be no beds. There is one hospital on each island, El Marouf at Moroni (420 beds); Hombo at Mutsamudu, Anjouan, (145 beds); and Fomboni at Moheli (45 beds). Also within a Health District functional Health Posts and rural maternity clinics are providing service to the population. There are also mobile vaccination teams (EPI) and Family Planning Components. Chemotherapy and chemoprophylaxis for malaria control are implemented within the network of Primary Health Care services.

The Team visited Anjouan and Moheli on October 1st and 2nd, 1987. Health Units were observed. Discussions were held with health personnel. Mosquito breeding places were seen. In the health units it was noted that good patient records (logs) were present. Details of age, address, diagnosis, and treatment were carefully noted. Health education posters on malaria information, family planning, nutrition, and vaccination were observed.

Anjouan has five medical centers, including a surgical unit at Domoni, a medical center at Mutsamudu and 21 Health Posts. One health center was newly constructed but awaiting equipment and furniture; two health posts and additions to two rural maternity clinics are under construction.

Moheli has one Medical Center, 12 Health Posts and two rural maternity centers. One Health Center and one Health Post are under construction.

Thus, there are 81 functioning health units, with fourteen either under construction, not yet in operation or in the planning stage. There is approximately one functioning health unit per 8,000 persons, or 1 per 6,000 at Anjouan and Grand Comore and 1 per 1,200 at Moheli.

There are fifty (50) physicians in the Comoros. The distribution is shown below:

TABLE 1 PHYSICIANS, PHARMACISTS AND DENTISTS
(Expatriates and Nationals)

<u>Health Region</u>	<u>Physicians</u>	<u>Dentists</u>	<u>Pharmacists</u>	<u>Total</u>
Grand Comoro	34	2	2	38
Anjouan	10	1	0	11
Moheli	6	0	0	6
Total	50	3	2	

TABLE 2 DISTRIBUTION OF PHYSICIANS ACCORDING TO ORIGIN

<u>Health Region</u>	<u>Expatriates</u>	<u>Nationals</u>	<u>Total</u>
Grand Comoro	20	14	34
Anjouan	4	6	10
Moheli	6	0	6

All health services are provided without cost. However, on Grand Comoro, about ten physicians are in private practice.

VECTORS

The malaria vector of the Comoros Islands are: Anopheles gambiae sensu lato, Anopheles merus and Anopheles funestus. On Grand Comoro island, only An. gambiae s.l. has been found. An. funestus is found on both Moheli and Anjouan. Brunnes (1977) summarized the known mosquito fauna of the Comoros and

Kassatsky (1980) reported on the malaria situation of the Comoros. Zahar (1985) pointed out that the main studies of identification, distribution and ecology of the vectors of malaria were carried out by missions from ORSTOM Center, Tananarive, Madagascar, during 1967-1974. Blanchy (1987) cites only Anopheles gambiae s.l. and An. funestus as malaria vectors.

Anopheles gambiae is a sibling complex consisting of six very similar species separated by banding patterns of their polytene chromosomes. They differ in certain aspects of their biology and behavior. An. gambiae s.s. (formerly species A) is the world's most efficient malaria vector. Larvae occur mainly in temporary habitats such as pools, puddles, hoof-prints, borrow pits, and rice fields. Females bite man both indoors and outdoors; in some areas also feed on domestic animals. They rest predominantly indoors after feeding.

The larval habitats of An. arabiensis (formerly species B) are the same as those of An. gambiae s.s. Adults bite man and animals, indoors and outdoors, and afterwards rest indoors or outdoors. This species may have a greater tendency than An. gambiae s.s. to bite animals and rest outdoors. Of the other 4 sibling species, An. quadriannulatus (formerly species C), species D, An. melas, and An. merus, only merus is known from the Comoros. An. merus breeds in salt and brackish water lagoons and mangrove swamps. Their biting behavior is similar to An. gambiae s.s. and is a vector in certain coastal areas.

An. funestus is the most important malaria vector in southern Africa after An. gambiae s.s. and An. arabiensis. Larvae of this species occur in more or less permanent waters, especially with vegetation, such as swamps, marshes, and edges of streams, rivers, and ditches; they prefer shaded habitats. This species bites man predominantly but also domestic animals; feeds indoors and outdoors, and after feeding rests mainly indoors.

On Grand Comore island An. gambiae s.l. is the only anopheline known and predominantly occurs in drinking water cisterns and

ablution basins. Whereas on Anjouan and Moheli islands, An. gambiae s.l. breeds in blocked estuaries, springs, cisterns, gutters, ablution basins, swamps, puddles, road ruts, and streams (Zahar, 1985). Specimens of An. gambiae s.l. have been submitted to Coluzzi in Italy for positive species identification (personal communication, Blanchy, 1987).

Known vectors of bancroftian filariasis on all 3 islands are An. gambiae s.l. and Culex quinquefasciatus (Blanchy, 1987). Blanchy (1987) discusses the epidemiology, disease incidence, vectors, and recommended control methods of this disease. An. gambiae s.l. is a very effective vector and occurs the year round in all coastal villages. Cu. quinquefasciatus breeds in polluted stagnant water; it also occurs the year round. Common breeding sites are: cesspools, latrines, polluted streams, polluted ditches, containers, cisterns containing organic matter, and ablution basins. Anopheles funestus may be a minor vector of filariasis (Blanchy, 1987).

Filariasis is particularly bad on Moheli and Anjouan; Moheli is reported to have the highest incidence of human filariasis in the world (personal communication, Blanchy, 1987).

CONDITIONS FAVORABLE FOR THE SPREAD OF MALARIA

1. An. gambiae and An. funestus are present and are well documented efficient vectors of malaria. They occur in abundant numbers throughout the year and on all three islands.
2. The tropical climate, heavy rainfall, and ideal temperatures favor widespread breeding and biting activity by the vectors.
3. There are no organized control measures currently underway.
4. There is no monitoring of malaria cases at ports of entry.
5. Vector control monitoring and vector control are not carried out at ports of entry.
6. The occurrence of sporadic shortages of and distribution

difficulties for anti-malaria drugs, as well as adjunct medications.

7. The tendency, by persons purchasing anti-malaria drugs from non-health sources, to use improper dosages.
8. Organized health education programs, relating to malaria control are not implemented.

CURRENT ANTI-MALARIA PRACTICES

It appeared to the Team that the general public is not engaged in wide-spread malaria control activities. Such items as household insecticides, window screens, bed-netting, and mosquito repellents are very expensive. Mosquito coils are used by some families.

When fever occurs, treatment is sought at a government health facility. There the appropriate treatment is prescribed. Chloroquine has been available at various health facilities since March 1987. Anti-malarial drugs are also available from private pharmacies.

PREVIOUS INSECTICIDE CONTROL MEASURES

Prior to 1972 little information is available on insecticide use. In 1972, the Service de Santé de Base et des Grandes Endémies was established (Zahar, 1985). Starting in 1972, the houses in Moroni (Grand Comoro) were sprayed with a mixture of DDT and fenitrothion during the last quarter of the year. In 1974, DDT/fenitrothion spraying continued to be applied every 3 months in Moroni (Grand Comoro) and in 6 villages on Anjouan; the coverage in Moroni was estimated at 93% (Zahar, 1985). In 1975, control activities were stopped at the end of the year following the disestablishment of the S.S.B.G.E.

A village scale trial of temephos larviciding in cisterns was conducted in a western coastal area 5 km north of Moroni in 1973 and 1974 (Zahar, 1985). The village had 584 inhabitants and 40 cisterns. All cisterns were treated with temephos at a dosage of 2 ml/m³ of water, every 3 months. Altogether 5 treatments were applied between Feb.15, 1973 and March 9, 1974. The impact of this treatment on the prevalence of malaria was considered nil. Entomological evaluation showed the residual activity of temephos, at the dosage rate applied, lasted only 8 weeks (Zahar, 1985).

Insecticide susceptibility tests on Grand Comoro by Sarr in 1984 (ICP/WHO team) showed Anopheles gambiae s.l. to be susceptible to all insecticides tested; whereas Culex quinquefasciatus larvae were found resistant to DDT by W.H.O. in about 1973 (personal communication, Blanchy, 1987).

In view of the very limited amount of insecticides previously applied against anophelines in the Comoros, no insecticide resistance is likely to exist. Both larvae and adults of anophelines should be susceptible to any of the several recommended larvicides and adulticides. Likewise Culex should be susceptible to all commonly used insecticides in view of the small amount of prior selection pressure.

COMMENTS ON GOVERNMENT POLICY REGARDING MALARIA CONTROL

The Government has paid particular attention to increasing the effectiveness of the peripheral health services during 1987.

In addition to strong interest in the launching of a country-wide malaria control program, the Government considers that the same insecticidal measures directed towards the adult anopheline vectors would also be effective for reducing filariasis. The reason being that Anopheles gambiae s.l., is also a principal vector of Muchereria bancrofti, the filaria parasite.

The programs of malaria and filariasis control are being considered for implementation within the primary health care system, with active community participation. In order to develop these programs to an effective level, additional financial and technical assistance will be essential.

Since early 1987, preliminary studies in the Comoros have been underway, by a group of three scientists on malaria and filariasis. The group leader is a Malariologist (supported by the French Government); Entomologist (World Health Organization); and a Laboratory Technical Officer (World Health Organization). The W.H.O. officers are supported by the United Nations Development Fund.

Activities of this group include the study of problems and proposing implementing actions, including the following:

- Training and retraining health personnel for the treatment and prevention of malaria and filariasis. Also included are entomological and parasitological techniques useful in epidemiological evaluation.
- The activation of a program of disease prevention, including practical aspects of applied hygiene.
- The inclusion of preventive practices among the activities of health centers and health posts.
- Trials of practical control measures suitable for use on the three islands.
- The coordination of health delivery services among different health units, along with environmental sanitation, proper care of water storage cisterns and latrines.
- Encouragement of the supply of essential drugs throughout the peripheral health system.

The Government Malaria Section has also prepared and disseminated medical and vector control information.

Some examples include:

1. Prevention of malaria by the midwife health posts and rural maternity clinics. Ref. 87-932/DPSP/PALU-4 June 1987.

2. The use of Abate 50CE for larval control in Grand Comoro.
Ref.87-043/MSPP/PALU-8 July 1987
3. Usage of the anti-malarial, Fansidar.
Ref.87-006/MSPP/D.P.S.P.-25 Feb. 1987
4. Using chemotherapy and chemoprophylaxis to control malaria
in the Comoros. Ref.87-016/MSPP/PALU-20 April 1987
5. A program for the control of malaria through vector control
in the Comoros. Ref.87-025/MSPP/DPSP/PALU-11 May 1987
6. A program to control filariasis in the Comoros.
Ref.87/065/MSPP/DPSP/PALU-15 Aug. 1987

PUBLIC HEALTH LAB

Although it was not our primary purpose as consultants, we are convinced there is a justifiable need for an expanded Public Health Laboratory. The present Public Health Laboratory building also houses the Ministry of Planning (on the top floor), along with malaria and filariasis slide analysis and mosquito research. A true Public Health Lab should contain as a minimum the following laboratory sections: malaria, filariasis, insectary, diarrhea, water, anemia, and tuberculosis. The most cost-effective way to have such a Public Health Laboratory would be to expand the existing building. There is ample property for such expansion. And the Ministry of Planning offices should be relocated.

RECOMMENDATIONS

Based on our findings and evaluations, a fully integrated malaria control program is recommended for the Federal Islamic Republic of the Comoros. This program should be horizontal and incorporated into the Primary Health Care System. Specifically the control program should include adulticiding, larviciding, source reduction, biological control, and public education. The unique problems of each island will dictate the precise control measures needed and thus applied.

We further recommend that all 4 tactical variants, as defined by the World Health Organization in 1978, be considered in the Comoros. Descriptions are shown below:

TACTICAL VARIANTS

- (1) Reduction/prevention of mortality due to malaria by administration of anti-malarial drugs to those suffering from the disease.
- (2) Reduction/prevention of specific mortality and reduction in morbidity by providing anti-malarial drugs to all those suffering from the disease and to those in highly vulnerable groups (children, labour aggregations or other population groups).
- (3) Prevention of mortality and reduction of morbidity and prevalence by administration of anti-malarial drugs and by carrying out vector control measures.
- (4) Application of control measures on a country-wide basis with the ultimate objective of eradicating the disease.

Again we emphasize that the unique problems of each island will dictate the application of tactical variants. Adjustments in the utilization of the tactical variants should be considered. For example, mass chemoprophylaxis is no longer recommended by W.H.O., as suggested in tactical variant (2).

These tactical variants should be applied as rapidly as financial, logistical, personnel, equipment, and chemical resources allow. It should be pointed out that all islands need not necessarily be at same stage of tactical variants. For example, Anjouan might be at tactical variant 3, whereas Moheli and Grand Comoro are at tactical variant 2.

In summary, we feel that effective malaria control is vital to the health and well being of the Comoros. And we feel that a well-planned and well-executed integrated malaria control program that is horizontal in character and carried out under the Primary Health Care System can be effective.

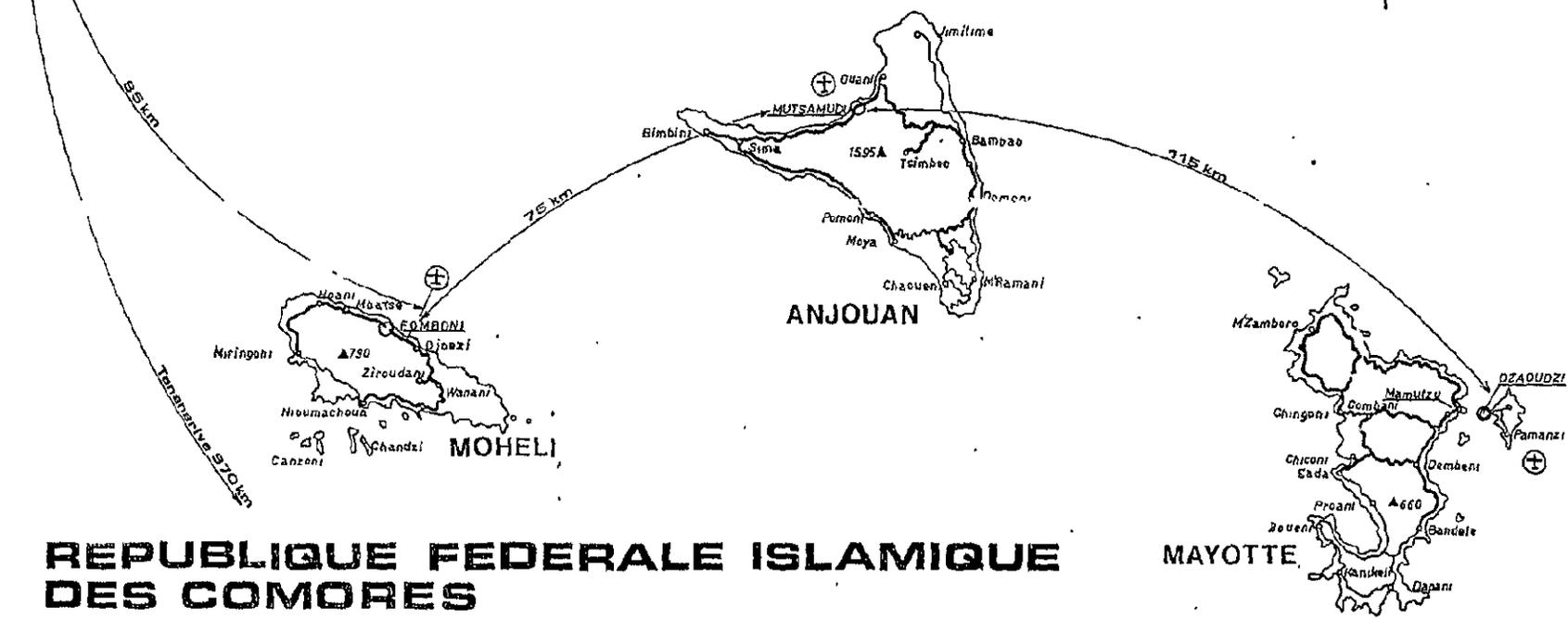
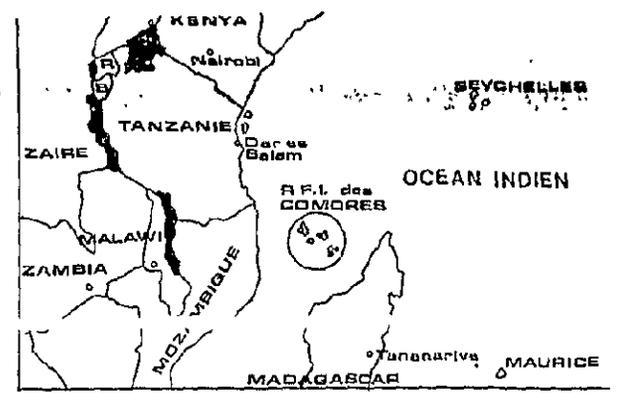
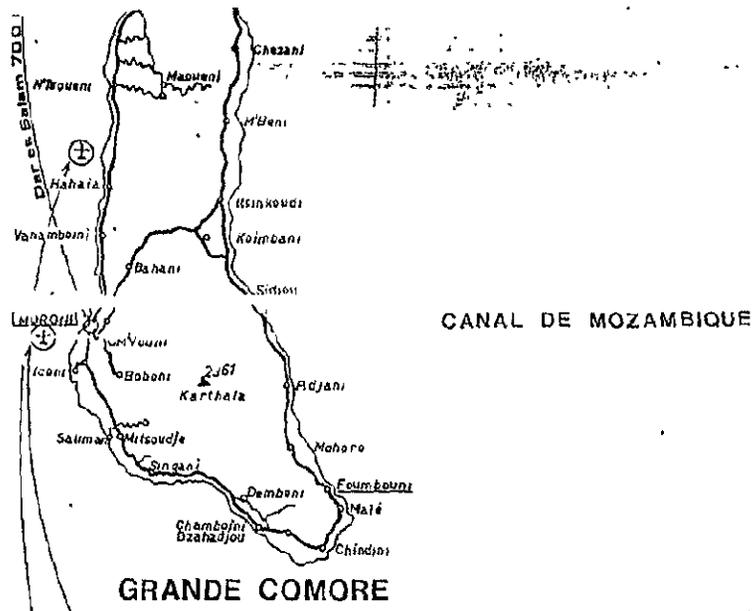
PERSONS CONTACTED

1. H.E. Ali Hassenali - Minister of Health and Population
2. Dr. Youssouf, Mdahoma - Director General, Ministry of Health
3. Mr. Mohammed Lutfi - Secretary-General, Ministry of Health
4. Dr. Marcel Velo - Director of Programs, Ministry of Health
5. Dr. Sixte Blanchy - Malariologist, Malaria Program
6. Dr. Guido Sabatinelli - Entomologist, Malaria Program
7. Mr. Franz Benthien - Laboratory Technician, Malaria Program
8. Dr. Kambiré - World Health Organization Representative
9. Mr. Kevin McGrath - Resident Representative, United Nations Development Program
10. Dr. Clement Beaucage - Technical counselor, Ministry of Health
11. Dr. John - Director of Medicine, Mitsamiouli Health Center
12. Dr. Choibau - Director of El Marouf Hospital, Moroni
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14. Dr. Islam - Pediatrician, El Marouf Hospital
15. Dr. Blayrol - Dental Surgeon, El Marouf Hospital
16. Mr. Petat - Pharmacist - Director of Laboratory, El Marouf Hospital
17. Mrs. Huliva Darwesh - Midwife, Ministry of Health
18. Dr. Allaoui - Regional Director of Health, Anjouan
19. Dr. Kaponda - Director of Hospital at Fomboni, Moheli
20. Mr. Msa Mliva - National Coordinator, Expanded Program on Immunization
21. Mr. Ahmed Ali - Governor, Anjouan
22. Mr. Ahmed Matoir - Governor, Moheli

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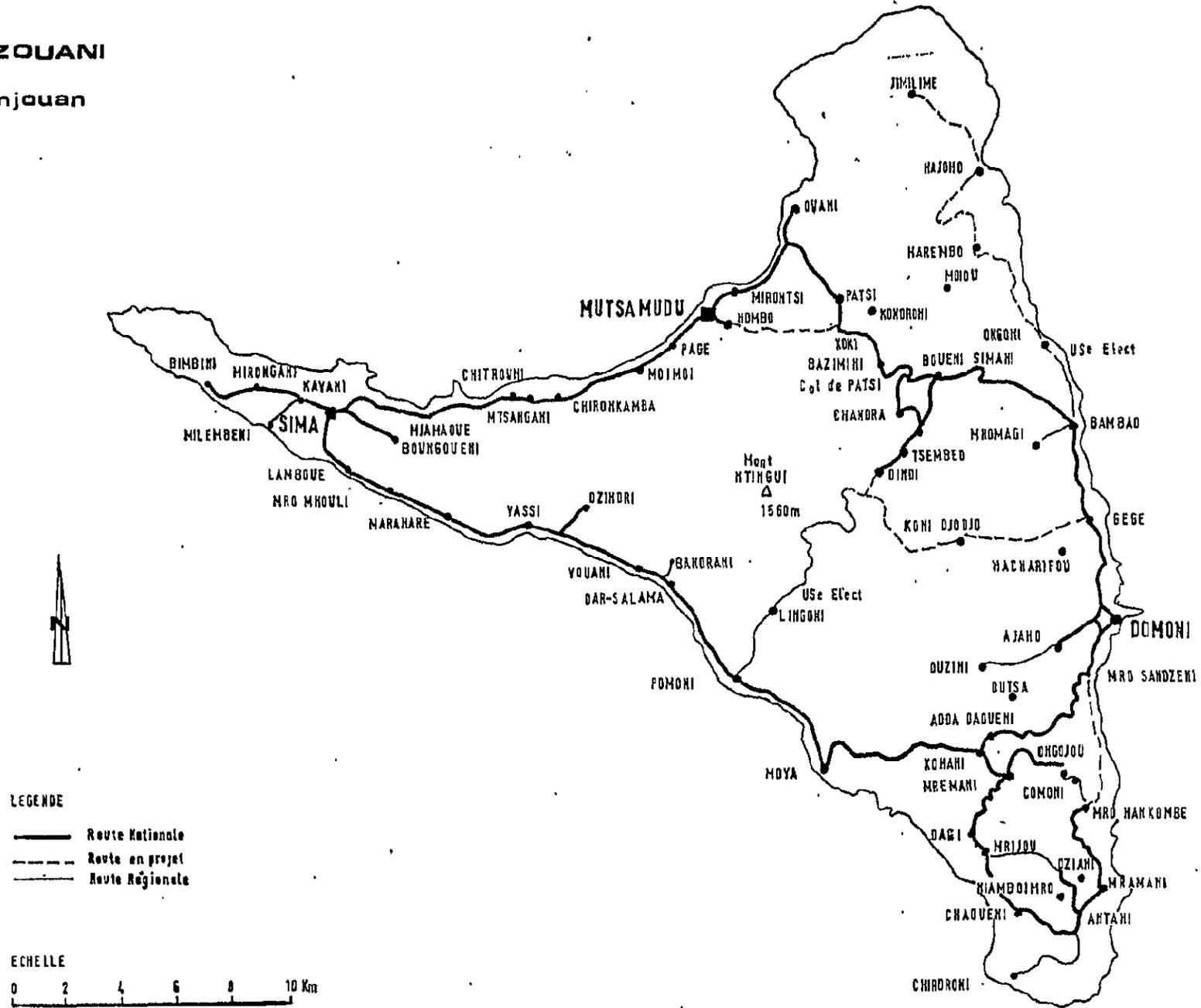
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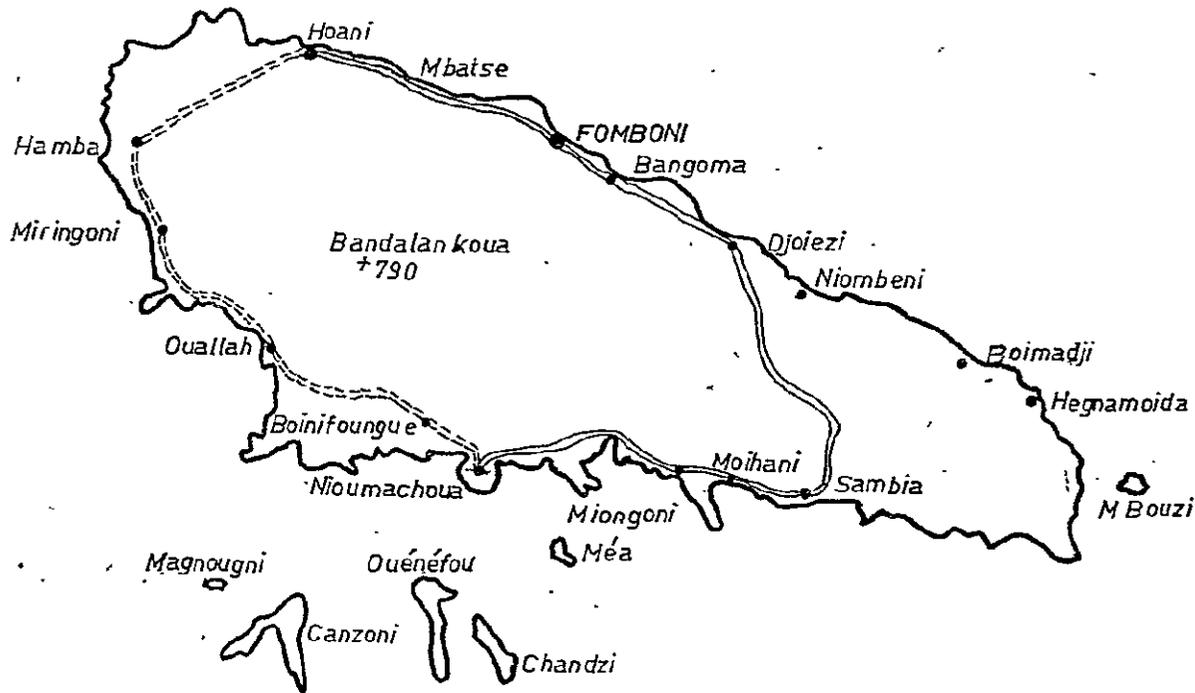


N'DZOUANI

Anjouan



MOHÉLI
échelle 1/200 000



==== routes principales

----- routes en constructions