

THE ECONOMIC EVOLUTION OF A MINING COMMUNITY:  
SANTA ROSALIA, BAJA CALIFORNIA DEL SUR, MEXICO

by

Judith A. Cichowicz

A RESEARCH PAPER  
submitted to  
THE DEPARTMENT OF GEOGRAPHY  
OREGON STATE UNIVERSITY

in partial fulfillment of  
the requirements for the  
degree of

MASTER OF SCIENCE

December 1973

## TABLE OF CONTENTS

	Page
I. List of figures	iii
II. Abstract	1
III. Introduction	1
IV. Characteristics of mineral deposits and associated primary industries	2
V. The study area	3
VI. Early development	17
VII. A developing economy	19
VIII. Compania Minera de Santa Rosalia, S.A.	28
IX. A redeveloped infrastructure	31
X. New economic directions	33
XI. Conclusions	37
XII. Footnotes	42

## LIST OF FIGURES

Figure		Page
1	Municipio Mulege	4
2	Population: Municipio Mulege and Santa Rosalia	5
3	Santa Rosalia	9
4	Homes in the arroyo at Santa Rosalia	10
5	Population Pyramid: Mulege	14
6	Literacy in Mulege, 1970	15
7	Employment of Economically Active Population: Mulege, 1970	15
8	Occupation Structure: Mulege	16
9	World Interconnections	16
10	Employment in Mineral Industries: Santa Rosalia	20
11	Aspects of the Copper Industry: Santa Rosalia	21
12	Boleo Copper District	23
13	Production of Compania Minera de Santa Rosalia, S.A.	30
14	Infrastructural Changes	34

THE ECONOMIC EVOLUTION OF A MINING COMMUNITY:  
SANTA ROSALIA, BAJA CALIFORNIA DEL SUR, MEXICO

ABSTRACT. The original settlement of Santa Rosalia, Baja California del Sur, Mexico, was due to the exploitation of the copper resources in the Boleo copper district of Mexico. Mineral resources have always been significant in the economy of the town. Development in Santa Rosalia has been limited by the non-renewable aspects of mineral resources. Highway improvements, construction of a ferry route to the Mexican mainland and other projects sponsored by the Mexican federal government in the last twenty years have broadened the economic alternatives available to Santa Rosalia.

INTRODUCTION

Mineral resources exploitation has often provided the stimulus for town development in isolated areas of the world. In order to provide the service needs of minerals industries, mining communities evolve as centers of administration, transportation, labor and processing. Eventually, most of these communities are faced with the problem of economic decline because of the nature of the mining enterprise.

The problem of this research paper is to analyze the Mexican copper mining town of Santa Rosalia, Baja California as a case study. Field analysis was carried on there and in Mexico City in June, 1973. From its inception as a company town, its options for growth and development have been determined by its resource base, political structure,

population base and economic functions. Consideration of these phenomena will permit investigation of factors that are significant in the economic evolution of mining towns. Additionally, the paper will evaluate approaches to the economic revitalization of Santa Rosalia and focus on some of the economic alternatives that exist for the town.

The characteristics of mineral resources and associated primary minerals industries will first be reviewed. Second, a description of Santa Rosalia and its hinterland will be presented, followed by an assessment of its economic development. Finally, efforts at economic revitalization in Santa Rosalia will be analyzed and observations will be made concerning the future of the town.

#### CHARACTERISTICS OF MINERAL DEPOSITS AND ASSOCIATED PRIMARY INDUSTRIES

The characteristics of mineral deposits have direct and fundamental effects on the evolution and well-being of communities based on mineral exploitation. Therefore, the major characteristics of mineral deposits need to be understood as a basis for analysis of Santa Rosalia as a case study.

Mineral deposits occur in discontinuous locations, usually in rugged terrain. Because the resource is non-renewable, it can be exhausted at one location. The resource is generally hidden from view which creates a high-risk factor in exploration and development. The highest grade and most easily accessible ores are the first worked, and as poorer quality and less accessible ores are exploited, the cost of

the mining operation increases. As a result of increasing cost and decreasing productivity, investment decreases until finally it is economically unfeasible to continue operation.<sup>1</sup>

Initial processing of minerals may take place at the mine or at a processing center nearby which can draw on several mine sources for its raw material. When reduction in bulk is completed, further processing may be carried on near the mine, near the market, or at some intermediate site. Determination of the locations which are used for secondary processing depends on a combination of factors including ore grade, type of mineral, transport facilities, economic and political conditions. The case of Santa Rosalia will be examined to illustrate how these principals of mineral resources and mineral exploitation have in fact operated.

#### THE STUDY AREA

The primary concern of this study is the town of Santa Rosalia. Since the economic functions of the town are to be analyzed, its hinterland region will also be included. When data are not available for the town unit, the Municipio Mulege will be considered ( figure 1 ). Santa Rosalia has been, from its foundation, the most significant concentration of population and economic activity in the municipio ( figure 2 ). Although the town holds a smaller percentage of the municipio's population than in the past, its total influence is still important. In 1970, over fifty percent of the municipio population resided in the three towns of

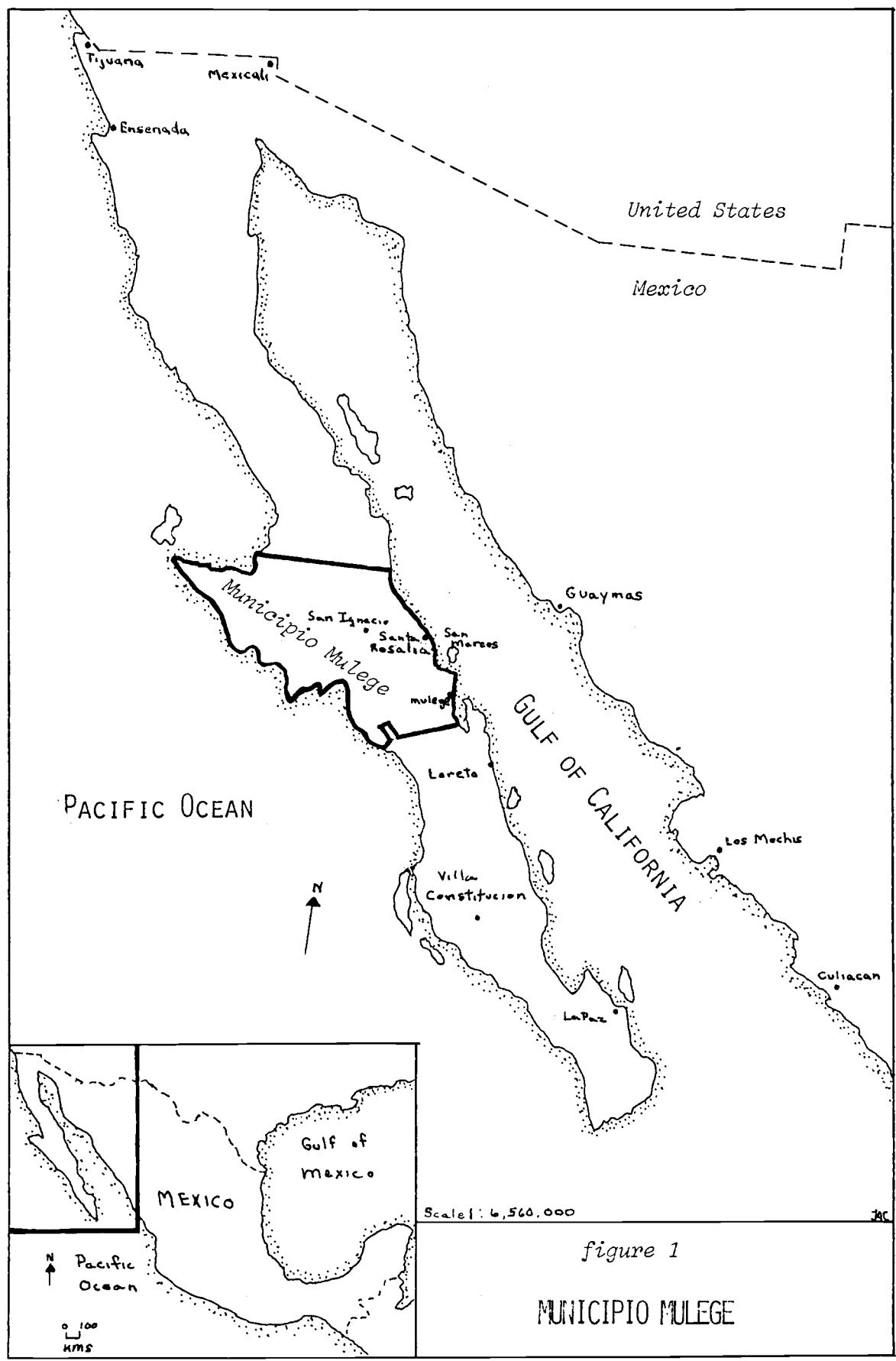
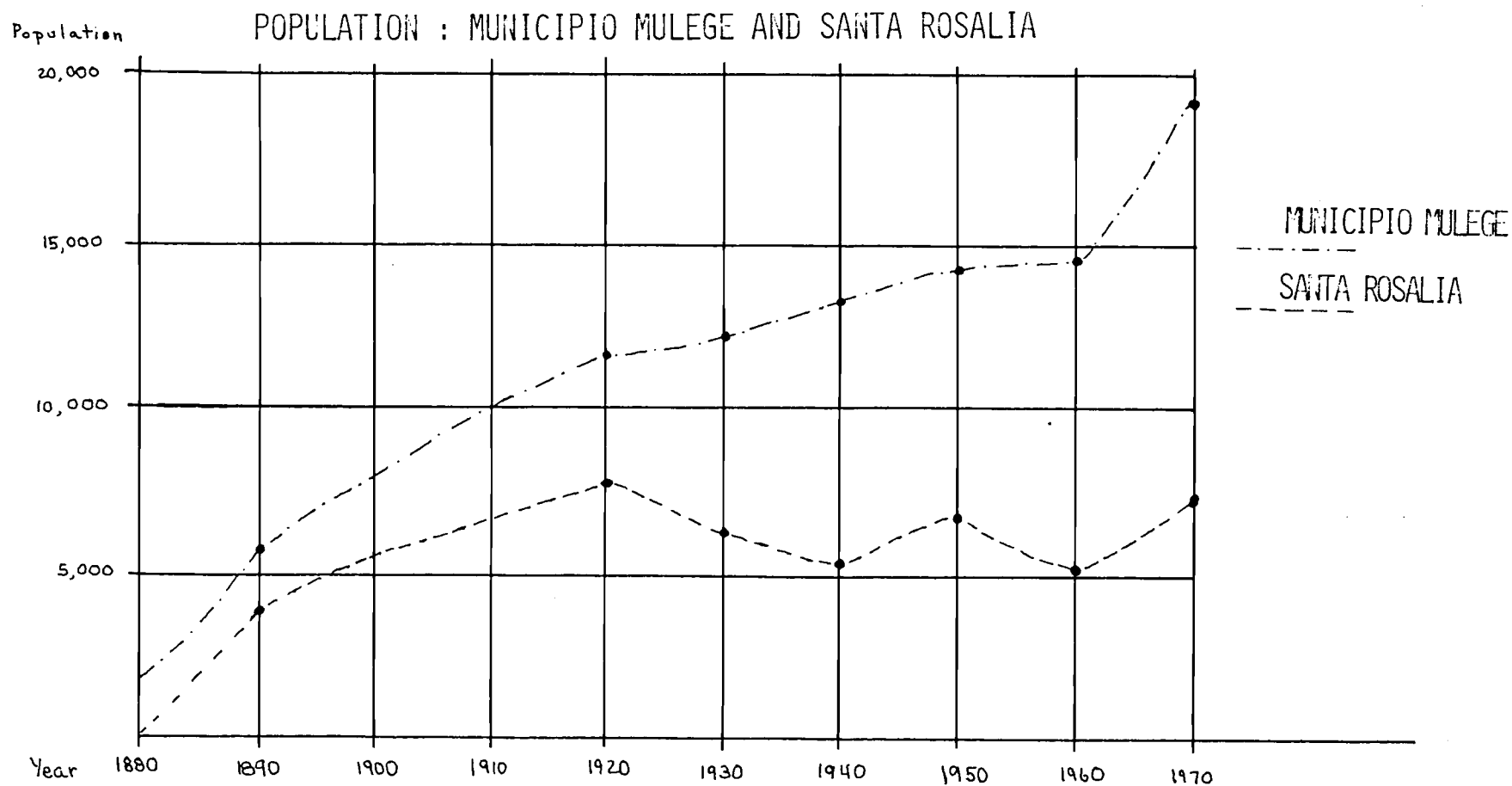


figure 2



Source: Ivan Wilson and Victor Rocha, U.S. Geological Survey Professional Paper 273, 1955; Banco Nacional Hipotecario, Obras y Servicios Publicos Territorio de Baja California, 1959; Republica de Mexico, Censo General de Poblacion 1930, 1960 and 1970.



Santa Rosalia, Mulege and San Ignacio.

### Site and Situation

Santa Rosalia is in the Sonoran Desert on the Gulf of California coast of the Baja California peninsula. Its location is at the mouth of the Arroyo de Providencia and in the Boleo copper district of Baja California. Access to the Gulf of California and the mines of the Boleo copper district were basic to its site selection. The relative flatness of the arroyo bottom and the protective slopes of the surrounding mesas were originally viewed as locational advantages. The site choice in fact is not without problems since the arroyo is subject to flooding in periods of rain. It is though, no worse a site than other locations close to the mines and on the Gulf. It is isolated from the Mexican mainland. At the time of its founding in 1886, the only other sizeable settlements in Mulege were the towns of San Ignacio and Mulege, oases sites of Jesuit missions.<sup>2</sup> The same is true in 1973.

### Water Resources

The dearth of water resources has been the most significant constraint in the development of Santa Rosalia. The Rio Mulege is the only permanent river in the municipio. When it rains, water drains along the arroyos and fault lines into the Gulf. Aridity and the hard baked desert pavement limits the drainage of rain below the peninsular surface. Some water may be caught and stand longer in natural rock basins called tinajas. The closest permanent spring

is in Arroyo Santa Agueda, twelve kilometers south of Santa Rosalia. An oasis is found at San Ignacio to the north. The water table in the immediate area is about twenty-five meters below sea-level.<sup>3</sup> Deep mines penetrating below the water table have augmented fresh water supplies. Sea water has been utilized in the past to wet down dusty streets, as furnace water and circulation water in power house condensers.<sup>4</sup>

### Minerals

Copper is the most important mineral found near Santa Rosalia. The copper ores contain some silver, zinc, cobalt, lead and nickel. Small amounts of silver have been recovered from them. Sizeable deposits of gypsum are found close by, but the existence of higher grade deposits on the island of San Marcos have discouraged peninsular exploitation.<sup>5</sup> Workable deposits of low grade manganese are found in the Arroyo del Infierno to the north of Santa Rosalia, but mining operations there were destroyed by floods in 1959 and have not been resumed.<sup>6</sup> Other deposits accessible to Santa Rosalia include limestone, sandstone, sulphur, pumice and perlite. None of these are being exploited.

### The Town

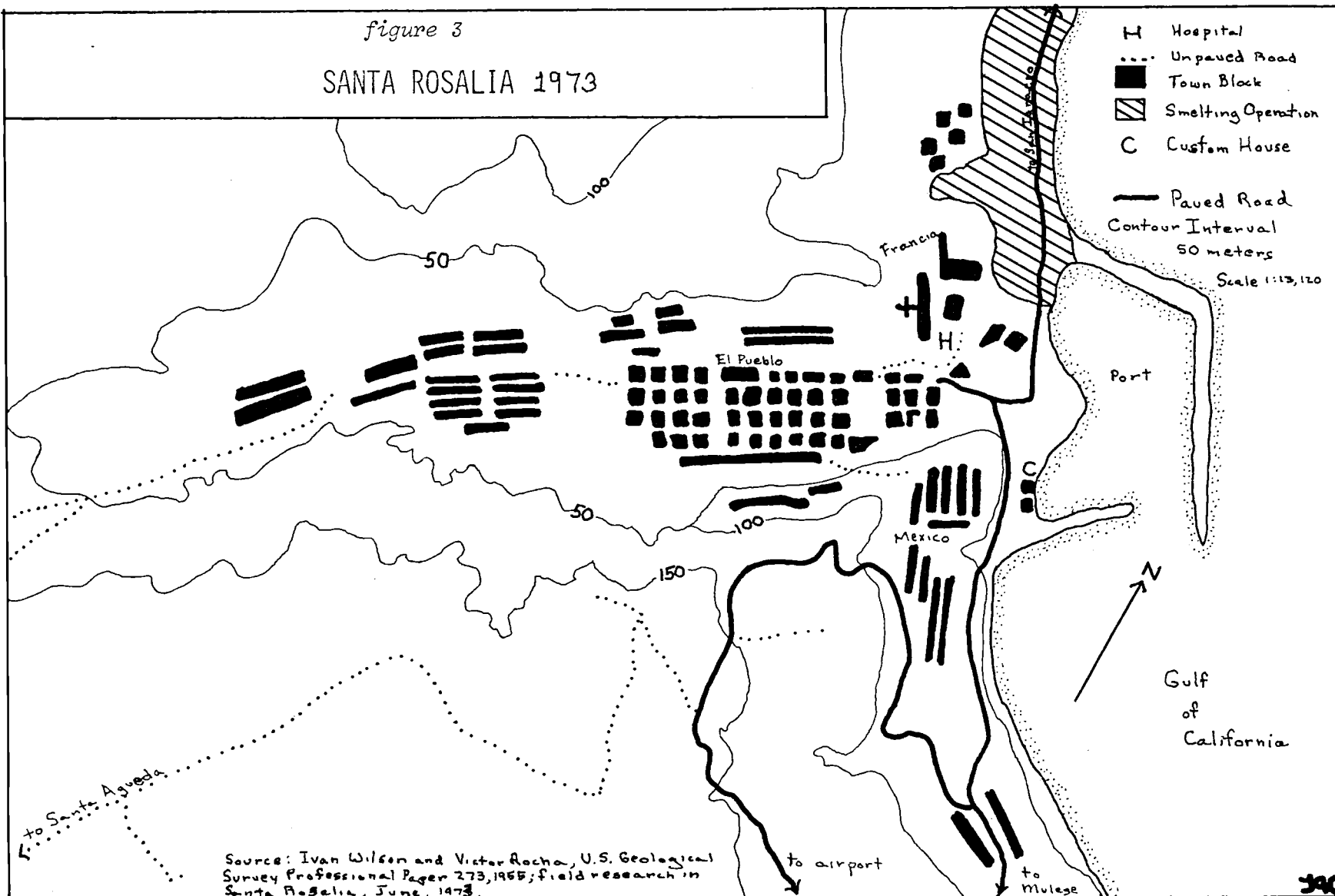
In 1885, the Mexican government sold the mineral concession of the Boleo copper district to the French mining company, Compania del Boleo, S.A.<sup>7</sup> The company constructed Santa Rosalia to function as an administration, transportation and ore reduction center for the district. As

originally laid out, the streets of the town were in a modified rectilinear grid ( figure 3 ). The Francia sector on the terrace north of the arroyo contained the hospital and company administrative building. This was also where the French employees were housed. Their homes were large, two story dwellings with high ceilings, large porches and many windows. . El Pueblo was the development in the arroyo bottom. In one story row houses, the Mexican laborers lived ( figure 4 ). Hotels and stores were also placed in El Pueblo along with the Roman Catholic Church, the traditional center of Mexican life. On the south terrace, Mexico, a military post was built.<sup>8</sup> An artificial harbor was dredged and constructed with two break walls of volcanic rock. The smelting operation for the company was located in the coastal area north of El Pueblo and below the residences of Francia.

Land use has not changed much in the town since its founding. Most of the original buildings are still in use. The hospital and administrative offices continue their functions in Francia. Although European mining officials no longer reside there, some administrative workers for the controlling Mexican mining company do. The smelting operation has not moved or expanded. Port facilities however, now include a modern ferry terminal and a tourist information center. The airport, built some time in the 1930's, is on the south terrace. The military post is no longer in existence. Little residential expansion has been made in

figure 3

SANTA ROSALIA 1973



*figure 4*

HOMES IN THE ARROYO AT SANTA ROSALIA



the arroyo, but new concrete block homes are being constructed on the slopes leading to the south terrace. Some homes have been put up just west of the smelting plant, but they are less permanent and belong to lower income families.

#### Transportation and Communication

Santa Rosalia was designed by the French to serve as a distribution center for its copper ores. This, coupled with its place in the economic hierarchy of Baja California, has created the need for continued transportation growth originating at the town. Boats provided Santa Rosalia with its first contact with the world, and ships continue to be influential on town life. In December, 1971, the Mexican government inaugurated the first regular passenger ferry service between Santa Rosalia and the mainland at Guaymas.<sup>9</sup> This modern car ferry, holding several hundred people, is comfortable, fast and inexpensive. Salon or second class passengers pay forty-five pesos ( \$3.60 ) for the air-conditioned ride. Boats arrive from Guaymas and leave again every Sunday, Thursday and Saturday. The ferry and its terminal provide a range of services from clean restrooms to restaurants. The trip takes six hours in the day and nine hours at night. Sleeping cabins are available.

The highways of Lower California were notorious for their treacherous routes. A good paved two lane highway connects Santa Rosalia with La Paz to the south now. Daily bus service in air-conditioned vehicles is also

available between La Paz and Santa Rosalia. The trip takes about eight hours. The highway north between Ensenada and Santa Rosalia is scheduled for completion in December, 1973.

Air service has been available for about thirty years. In the summer of 1973, Aeronaves del Oeste, S.A. had two flights daily between Santa Rosalia and Guaymas in twin otter planes. One flight offers continuing service to or connections from Loreto, Villa Constitucion, Los Mochis and Culiacan ( figure 1 ). The Santa Rosalia airstrip is the first paved airstrip south of Ensenada on the peninsula.<sup>10</sup>

Telephone service is provided in Santa Rosalia but can only be used locally. Telegraph service, including fund wiring, is operated on a seven day basis to the mainland and the rest of the world. Radio signals are sent across the Gulf from Guaymas.

One weekly paper is printed in the town by a labor organization. Papers from Mexico City can be purchased with a one day delay for delivery.

#### Population

Prior to the earliest discovery of copper in the Boleo district in 1868, the only permanent habitation near the site of Santa Rosalia was Rancho Santa Agueda, twelve kilometers to the southwest. Other important population agglomerations were at San Ignacio ( 600 people ) and Mulege ( 800 people ).<sup>11</sup> With the construction of Santa Rosalia, the population dispersion of the municipio shifted. Although relatively isolated from the rest of Mexico, the population

of Santa Rosalia increased as laborers migrated from Mulege, La Paz, Ensenada and Mexicali in the late nineteenth century ( figure 2 ). By 1918, when copper production was greatest from the Boleo mines, Santa Rosalia and associated mining camps made up sixty-eight percent of Municipio Mulege. As the copper industry declined in the period from 1930 to 1950, workers left the town for other employment in Ensenada or Mexicali.<sup>12</sup> Despite this, Santa Rosalia continued to have the largest population in the municipio. In 1940, the town held forty-one percent of the total municipio population. In 1950, it held forty-eight percent.<sup>13</sup> By 1970, thirty-eight percent of the municipio still resided in Santa Rosalia. San Ignacio and Mulege, the next largest communities together comprised fourteen percent of the population. The other forty-eight percent of the municipio lived in concentrations of less than one thousand people.<sup>14</sup>

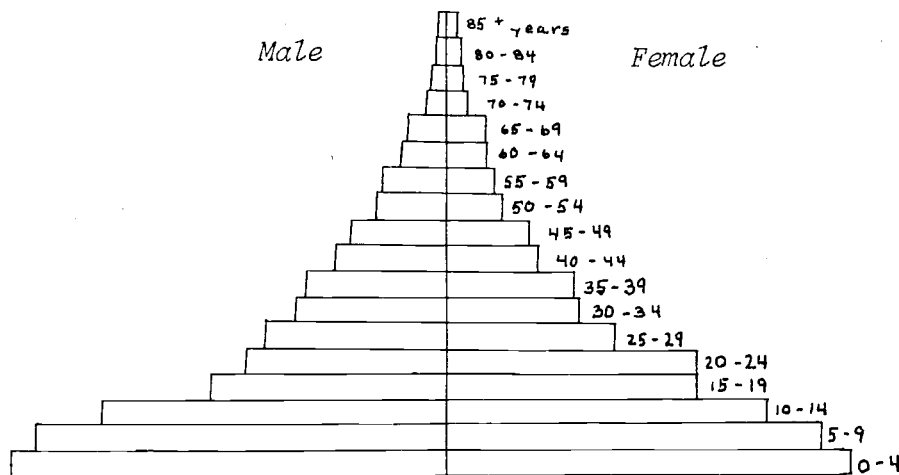
The population pyramid for Mulege has an even sex ratio ( figure 5 ). The broad base of the graph is indicative of a young population. Fifty-five percent of the people were less than twenty years old in 1970.

Municipio Mulege has a high literacy level with only 6.5% of the population over the age of six unable to read and write. ( figure 6 ). The town has one parochial school and five public primary schools, as well as one parochial and one public secondary school. The public schools are operated and financed by the Mexican federal government.<sup>15</sup>



figure 5

## POPULATION PYRAMID : MUNICIPIO MULEGE 1970

Republica de Mexico, Censo General de Poblacion 1970.

Unemployment was low for those considered economically active in 1970 ( figure 7 ). Among those considered economically inactive but not considered to be unemployed are students and domestic help.

## The Economy

The economy of Santa Rosalia has been dominated by primary activity ( figure 8 ). Attempts at commercial agriculture, mainly to decrease dependence on imported food, have had small success outside of the oases of San Ignacio and Mulege. Ranching, begun in several locations by the French mining company, was made more difficult by a thirty year drought in the early twentieth century. For the most part, attempts at ranching had to be abandoned by them.

figure 6

## LITERACY IN MULEGE, 1970

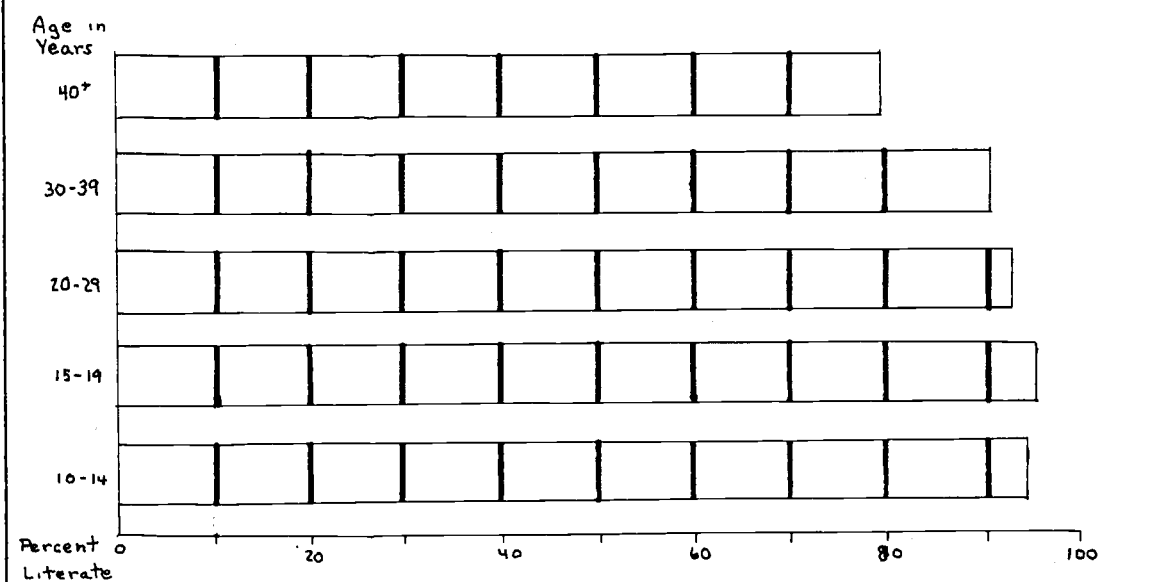
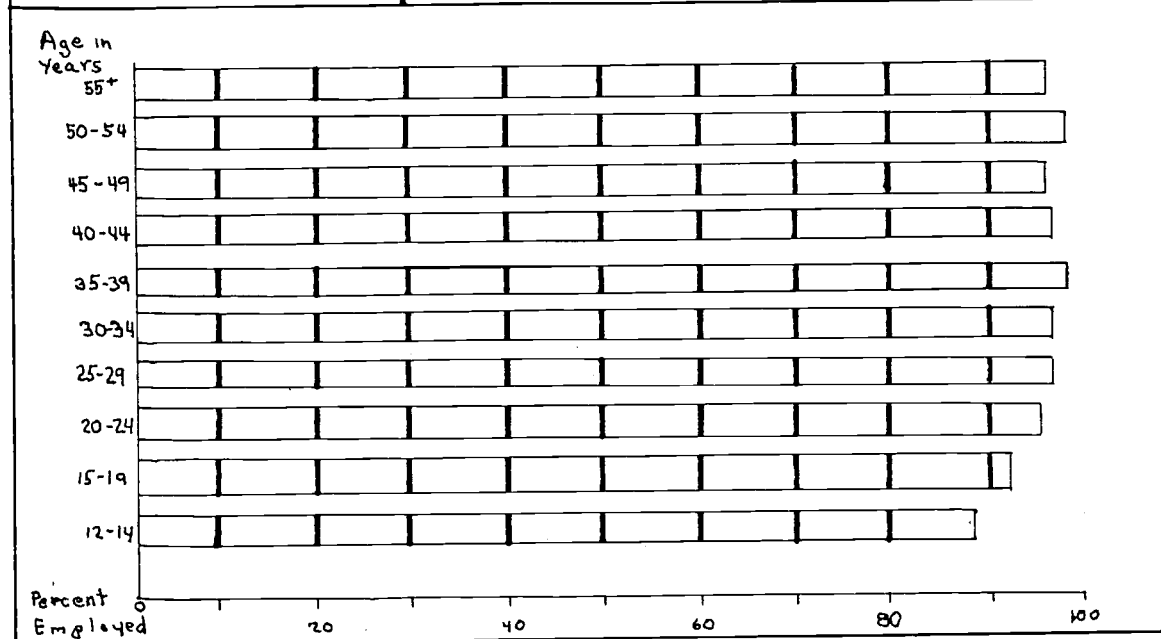
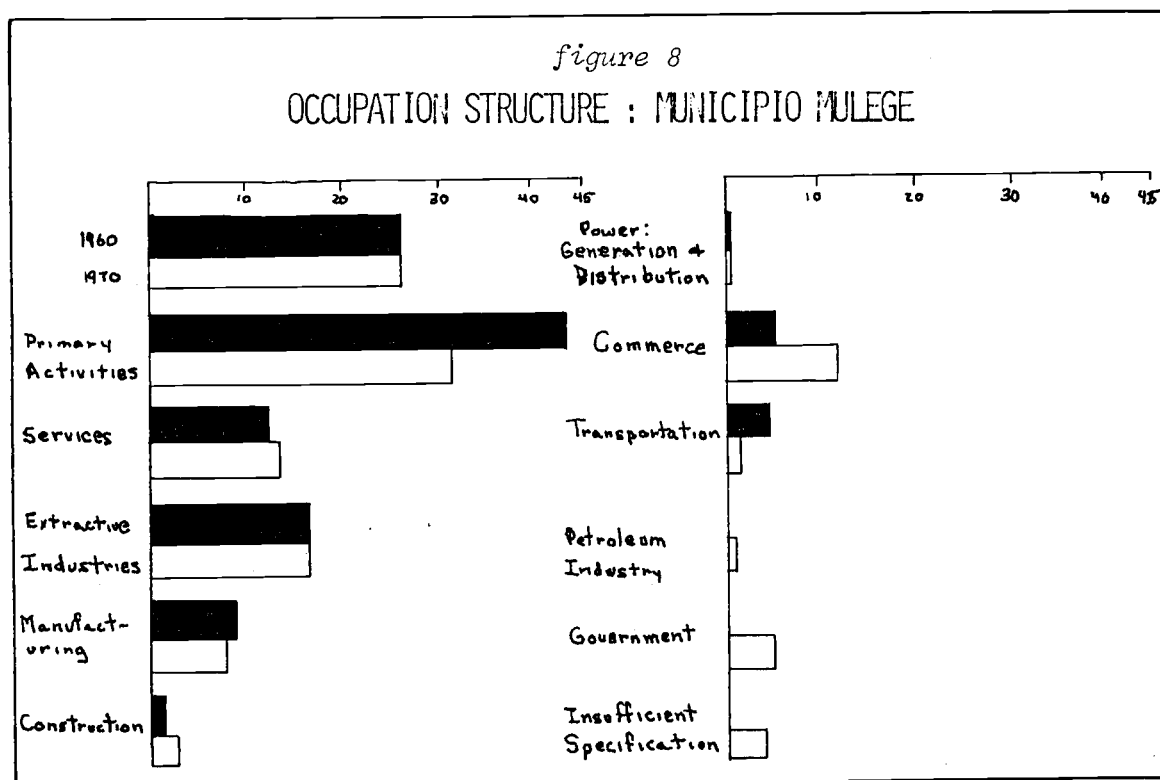
Republica de Mexico, Censo General de Poblacion 1970.

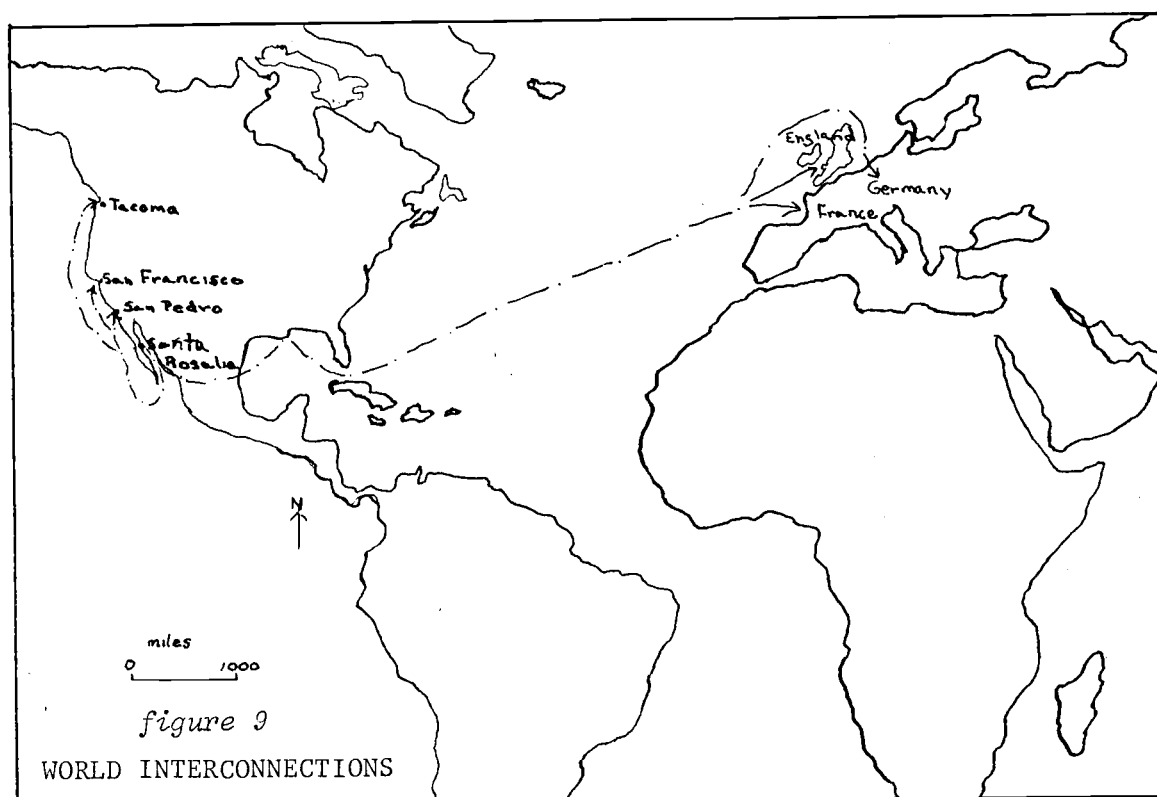
figure 7

## EMPLOYMENT OF ECONOMICALLY ACTIVE POPULATION : MUNICIPIO MULEGE 1970

Republica de Mexico, Censo General de Poblacion 1970.



Source: Republica de Mexico, Censo General de Poblacion 1960 and 1970.



Source: Ivan Wilson and Victor Rocha, U.S. Geological Survey Professional Paper 273, 1955.

Commercial fishing has been and continues to be run on a limited scale. Fishermen, working independently, are the basis for the industry in this part of Mexico. Distance to market and lack of investment in cannerys and refrigeration facilities have been limiting factors to growth in commercial fishing.

Copper mining formed the original economic base for Santa Rosalia. The construction of the smelter in the town accounted for the first secondary activity in the area. Mining is in the decline in the hinterland of Santa Rosalia, although the smelter remain operational. The economy has since been able to diversify by the expansion of commercial activities such as banking and retailing.

#### EARLY DEVELOPMENT

The Boleo copper deposits were first discovered in 1868 by Jose Rosa Villavicencio, owner of Rancho Santa Agueda.<sup>16</sup> After filing a claim, he sold his deposit rights to the Mexican government. The government, under the direction of Benito Juarez, found it necessary to bolster the economy of Mexico after the ravages of a civil war. Thus, various European enterprises were permitted to begin production of Boleo ores. No reduction was carried on locally in the first years of activity, so only ores with a copper content of more than twenty percent were shipped to world markets. The rest was dumped near the mines. By 1874, over six thousand tons of ore had been removed to Europe.<sup>17</sup>

When Porfirio Diaz became President of Mexico in 1 76,

he encouraged economic development of the country through foreign capital investment. This attitude made it possible for the French mining company, Compania del Boleo, to purchase the entire mineral concession of the Boleo copper district from Mexico in 1885. Before efficient mining could be continued, the company decided to develop an infrastructure within the district. Mines in the region were further developed; the first smelter was completed in 1886; the town, harbor and mining camps were built; a railroad was constructed connecting the mines and smelting operation; a water pipeline was constructed to Santa Agueda, the closest native fresh water source.<sup>18</sup>

With the infrastructural expansion of the area, this isolated, previously uninhabited desert was brought into contact with the nineteenth century world ( figure 9 ). Lumber for housing and mine beams were shipped in from Tacoma, Washington. San Francisco and San Pedro in California sent in most of the food supplies to the region as well as fuel oil to run the smelting furnace. Copper matte and black copper were produced at Santa Rosalia and sold to Germany, France and England. While all these distant connections were being established with the outside world, little was being done towards linking Santa Rosalia with the rest of Mexico. The markets and suppliers of the town and company were in other, more economically advantageous locations. There was little need to link up with Mexico. Because the French controlled the activities of the Boleo district,

the historical events of the European- North American world had a pronounced affect on Santa Rosalia during its early years, rather than the events of Mexico.

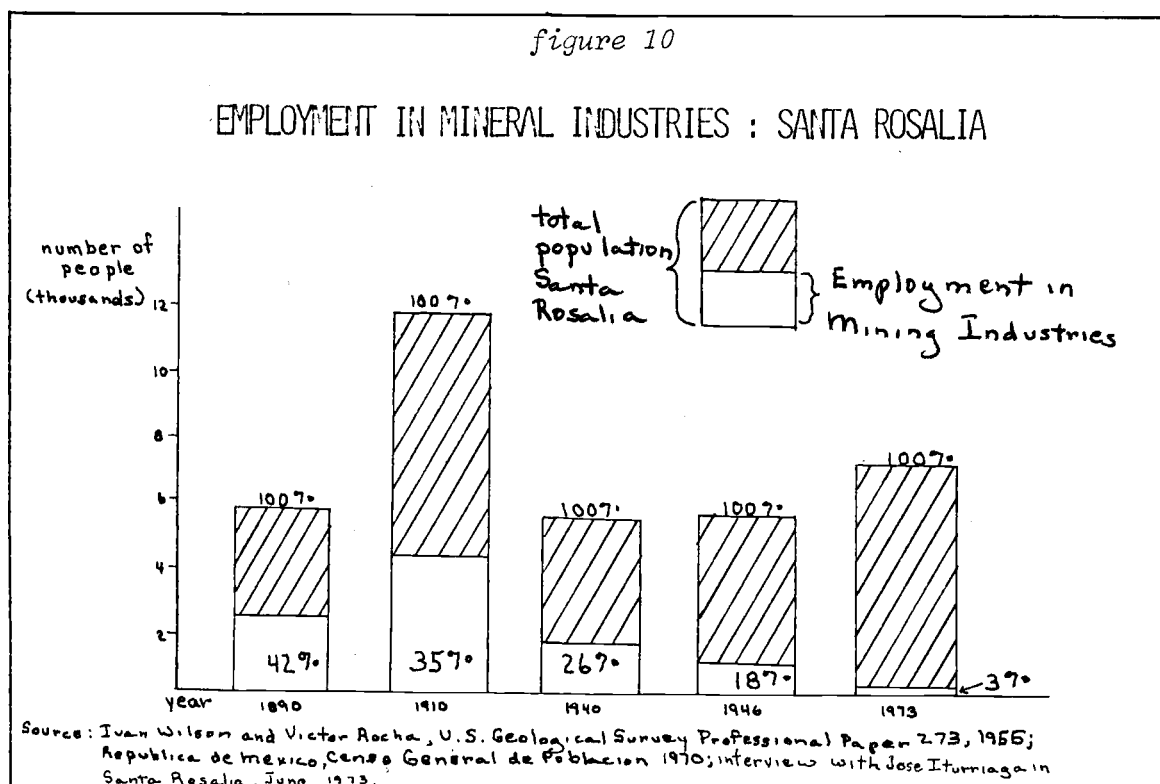
#### A DEVELOPING ECONOMY

Any assessment of the economic development of Santa Rosalia must be divided into two periods, the French and the Mexican. The French period began with the establishment of the town and continued until about 1940 when the company began efforts to dissolve its interests there. The Mexican period followed and runs to the present time. Such a division will be used here because each period had its own unique set of cultural, political and economic forces acting on Santa Rosalia.

#### Compania del Boleo

Because Santa Rosalia began as a mineral based community, original employment in the mineral industry was high ( figure 10 ). The percentage of people directly employed by Compania del Boleo dropped during the years of peak production ( 1919- 1918 ) , although total employment increased. By 1940, fewer people were associated with the company and, a dramatic drop in relative and absolute employment by the company occurred between 1940 and 1946. Despite this shift, the town still relied heavily on the mineral industry for employment. In 1946, one out of every five people in Santa Rosalia worked for the Boleo interests. This percentage is even greater than first observed since it is drawn from total population rather than employed

figure 10

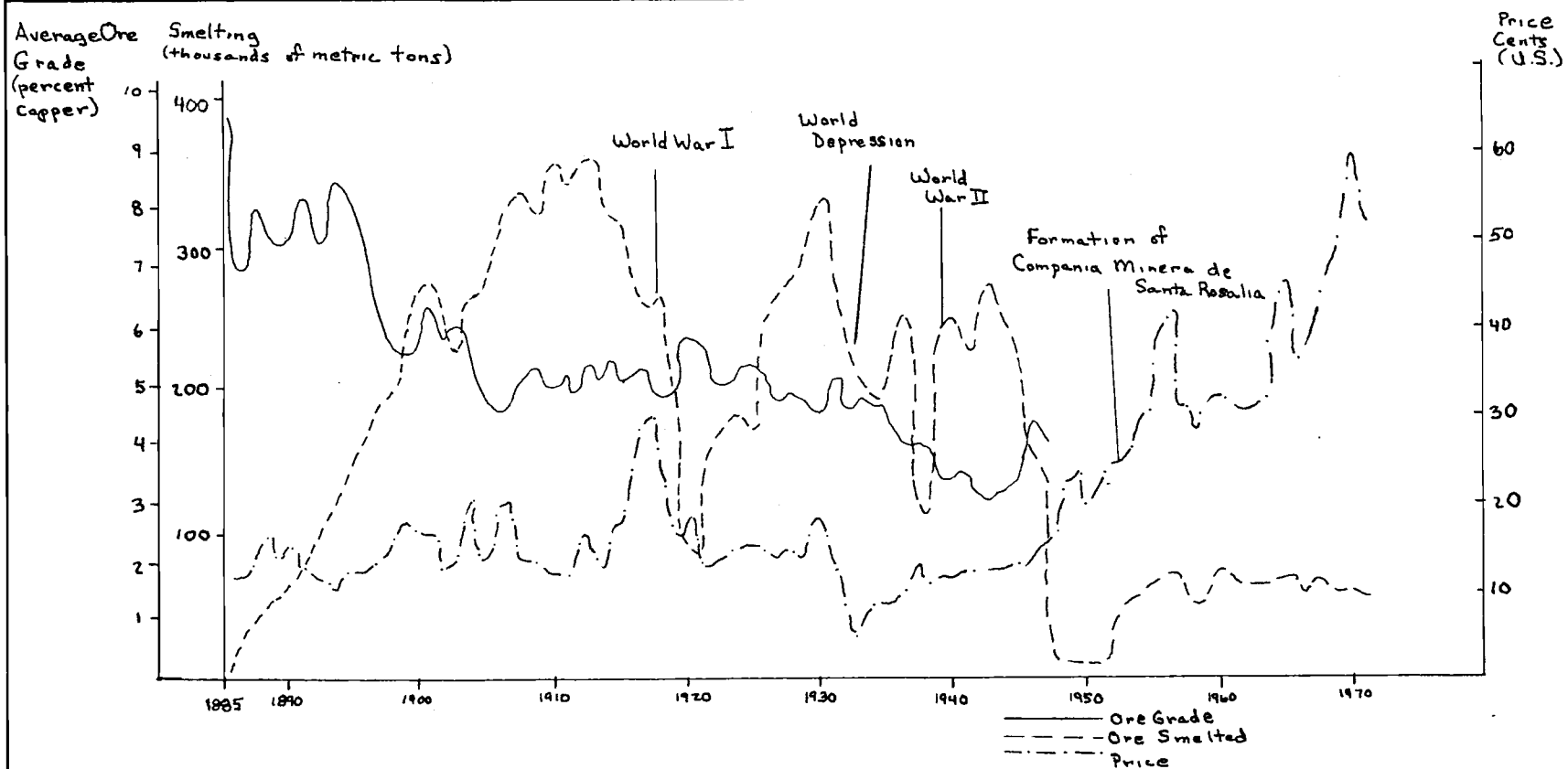


population. In reality, nearly all employment in Santa Rosalia was based on the mining and ore processing of the Compania del Boleo. The economic significance of this information is derived from the fact that minerals industries are unstable in terms of location. Mineral resources can be exhausted and when this occurs, the industry as a source of employment is gone.

Prior to the company take over in the Boleo district, only ores of higher than twenty percent grade could be profitably shipped to market. With the addition of the smelter, lower grade ores could be utilized. The average grade of copper ore produced before 1900 was more than seven percent ( figure 11 ). By 1910, this average dropped to about five

figure 11.

## ASPECTS OF THE COPPER INDUSTRY SANTA ROSALIA



Source: Ivan Wilson and Victor Rocho, U.S. Geological Survey Professional Paper 273, 1955; interview with Jose Iturriga in Santa Rosalia, June, 1973.



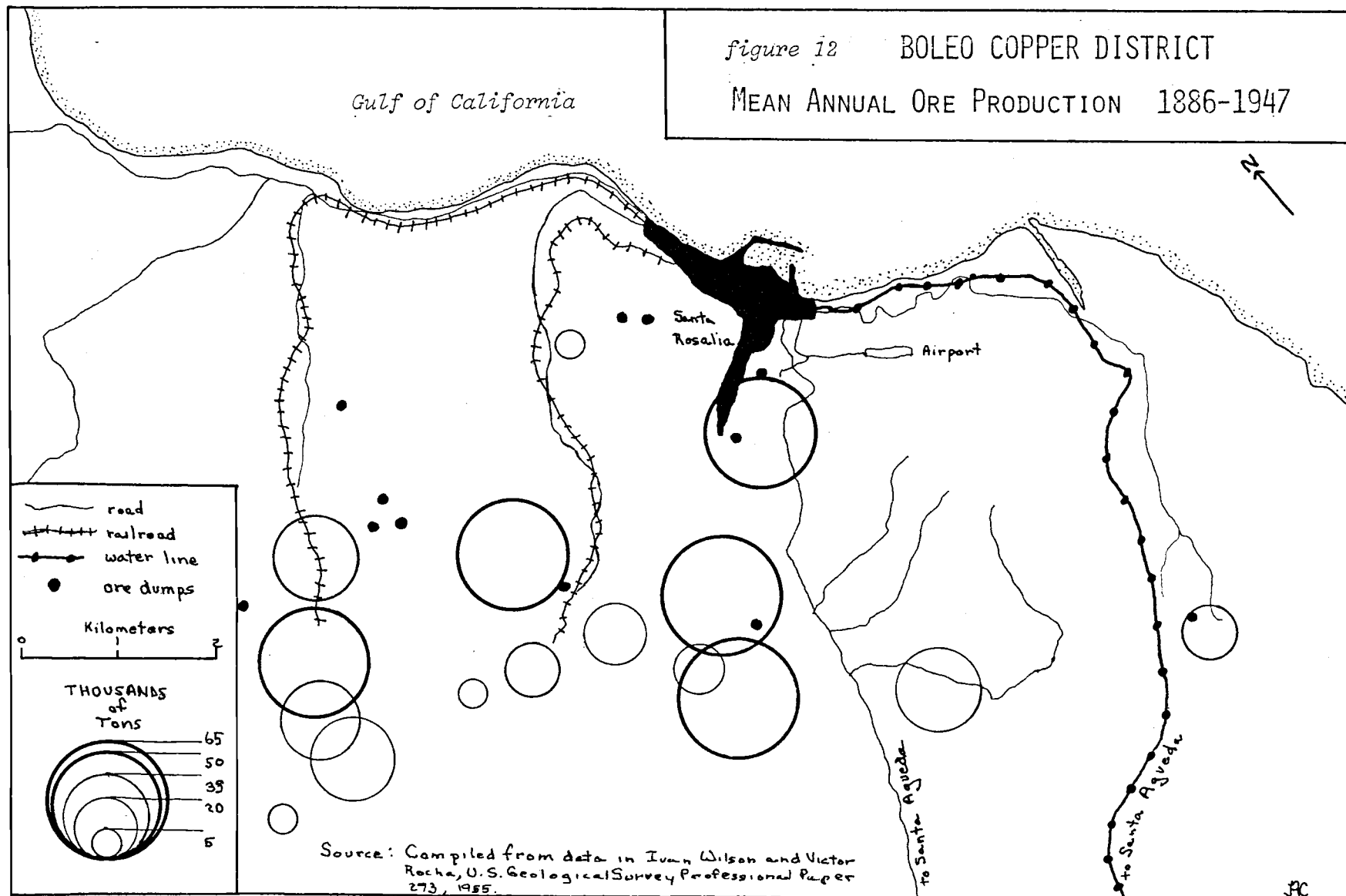
percent. Of the 13.6 million tons of ore mined by the company to 1954, the average ore grade was 4.81%.<sup>19</sup>

Mining methods used were similar to those for mining thin coal seams. The ore beds contain a significant amount of soft clay which is susceptible to cave-ins. Deep shafts were dug, extending at times to depths of twenty-five to fifty meters below sea level. Because of the high probability of collapse, unusually large amounts of timber were required. Both temperatures and humidity in the deep shafts were high. Heat increase was at a rate of one degree centigrade per fifteen meters of depth.<sup>20</sup>

After 1938, as ore grades lowered and the cost of the mining increased because of greater depths, the company gave up most of its mining activities. Some mines were kept open by "poquiteros" or small independent operators.<sup>21</sup> They also worked ore dumps located near some mines and were able to supply enough ore for the smelter to continue to be operational ( figure 12 ).

The smelting operation was carried on in blast furnaces until 1922. Ore was smelted directly after crushing and drying. Direct smelting required the use of relatively high grade ores ( 3 to 3.5% ) to remain commercial.<sup>22</sup> Flux was not available for smelting so narrow smelting zones and high slag temperatures were maintained to produce a successful operation.<sup>23</sup>

In 1922, smelting was modernized with the installation of six reverberatory furnaces which permitted production



of blister copper. The blister was then shipped to Tacoma, Washington, for further processing. An electrolytic smelter was built at Santa Rosalia in 1924, but was abandoned six months later when the operation proved unsatisfactory. Blister copper continued to be sent to Tacoma for electrolytic processing.

The amount of ore mined and smelted was not always directly related to the price of copper ( figure 11 ). During the period of World War I, the amount of ore smelted decreased rapidly although prices rose. At that time, a reduction in the technical and administrative staff occurred because those men were French nationals and had been drafted into the French army. The affect of this is illustrated by the concurrent decrease in production. After the war, copper prices remained low but production at Santa Rosalia increased. New production was stimulated by the addition of new smelting furnaces in 1922. Then the world wide depression, waning ore deposits and low prices all contributed to a decrease in production during the 1930's.

The Compania del Boleo went into liquidation in 1938 and almost closed. World War II increased world demand for copper and operations continued. In 1946, the company announced a definite closing and many employees emigrated from Santa Rosalia to seek employment in Ensenada, Mexicali or Tijuana.<sup>24</sup> Increases in copper prices, coupled with favorable subsidies from the Mexican government encouraged the continuance of small scale production.<sup>25</sup> The company

was reorganized in 1948 as Boleo Estudios y Inversiones Mineras, S.A. Complete control of the mining concession was given to the Mexican government in 1954.<sup>26</sup>

The history of the French operation illustrates two important factors connected with minerals industries and consequently with development in regions dependent on mineral exploitation for an economic base.

- 1) Mineral industries are cyclical in nature.
- 2) The cycle is controlled by outside socio-economic forces and physical restrictions.

The continually high percentage of people in Santa Rosalia employed by the Compania del Boleo throughout its history reinforced the susceptibility of the town to the negative affects of the mineral industry cycle. The addition of new equipment in the 1920's and the government subsidies during World War II, served only to delay the inevitable problems associated with ore depletion and the lack of economic diversification. When the Mexican government took over the mineral concession in the 1950's, the town was in a state of economic decline.

#### INFLUENCING GROWTH AND DECLINE

What factors were influential in stimulating the growth of Santa Rosalia during the French period? The primary one was the injection of foreign capital which permitted the initial construction of the town. As the spatial interconnections of the town increased, it was able to expand its market area for copper to include the industries of the United States.

The character of Santa Rosalia as administrative center for a foreign owned enterprise, dependent on imports for basic supplies, lead to its early acquisition of international port-of-entry status. Since Santa Rosalia was the only legal port-of-entry on the peninsula between Ensenada and La Paz, it had a locational advantage for the growth of commercial activities that require overseas trade. Furthermore, port-of-entry status makes it possible for the Santa Rosalia airport to handle direct flights to and from foreign countries, although it does not yet do so on a commercial basis.

There were however phenomena which deterred economic growth in the town and eventually lead to its economic decline. One cause of decline is explained by the nature of the dominant economic activity of the town, minerals industries. Mining is an industry based on the extraction of a non-renewable, locationally finite resource. As the known copper resources of the Boleo district were used up, the chances of finding new supplies that could be mined economically decreased. The Compania del Boleo was aware of this. As ore grades began to decline in the 1930's and a shrunken world market developed from the depression, the company chose to wear out what remained of its capital investment rather than seek out new ore deposits or construct more modern facilities that could utilize lower grade ores.

Also significant in the economic decline of Santa Rosalia is the situation in which foreign investment was

never used to diversify the economic structure of the town. This is understandable, since the French were interested in profit, not increasing the economic options for the town. In addition, those options were limited because the location of the town was inhospitable to some activities like brewing or other market oriented activities. At the same time, the Mexican government did not financially or administratively try and decrease the town's dependence on one industry. So eventually, as the mineral industry declined, so did the economic base of the town.

By 1938, the Mexican government was in a position to begin having some influence on the Santa Rosalia copper industry. In that year, the Mexican government expropriated foreign oil assets in Mexico. This was a legal development from regalian theory which is subscribed to by the governments of Latin America. The theory states that subsoil property rights are the domain of the crown or, as later defined, the government. It included all mineral deposits. Understandably the Compania del Boleo would not risk further investment in Santa Rosalia if the prospect of nationalization loomed in the future. In reality, the copper industry was not nationalized in Mexico. And, after 1938, a series of government subsidies encouraged the copper company to continue smelting in Santa Rosalia although most mining by the company had ceased.

#### The Transition to Mexican Control

In the 1940's, a stable and financially solvent

Mexican government became interested in the condition and future of Santa Rosalia. The town was one of the few large concentrations of population on the Baja peninsula outside of the border region. It had an established infrastructure and a resource base. Through cooperation with the United States Geological Survey, the Mexican government had a comprehensive report prepared on the mineral resources of the Boleo district. Completed in 1949, the report was not published until 1955. It is still used for assessment of the mineral distribution and potential of the Boleo district.<sup>27</sup> The Mexican government had slowly begun to enter the economic picture of the town. In 1948, it aided in the reorganization of the mining company in an attempt to keep the economic lifeblood of the town and region operational. Finally, in 1954, the Compania Minera de Santa Rosalia, S.A. was formed by the government to take over the entire French concession of the Boleo district. The original goal of the government was keeping the smelter running, even at a financial loss, in order to maintain the dominant economic function of the town for at least a short time longer.

#### COMPANIA MINERA DE SANTA ROSALIA, S.A.

The first problem faced by the Compania Minera de Santa Rosalia concerned ore. Ore had become expensive to mine in Boleo and ore grades were low. Many of the mining areas use by the Compania del Boleo had been depleted, resulting in mine closures. Most importantly, no exploration

24

for new copper resources in Boleo had been successful for twenty-five years. Ore samples gathered by the U.S. Geological Survey in conjunction with their report consistently indicated that only low quality ore remained in the Boleo district. The smelter was able to continue operation on a limited scale however and production began to increase through the late 1950's ( figure 11 ).

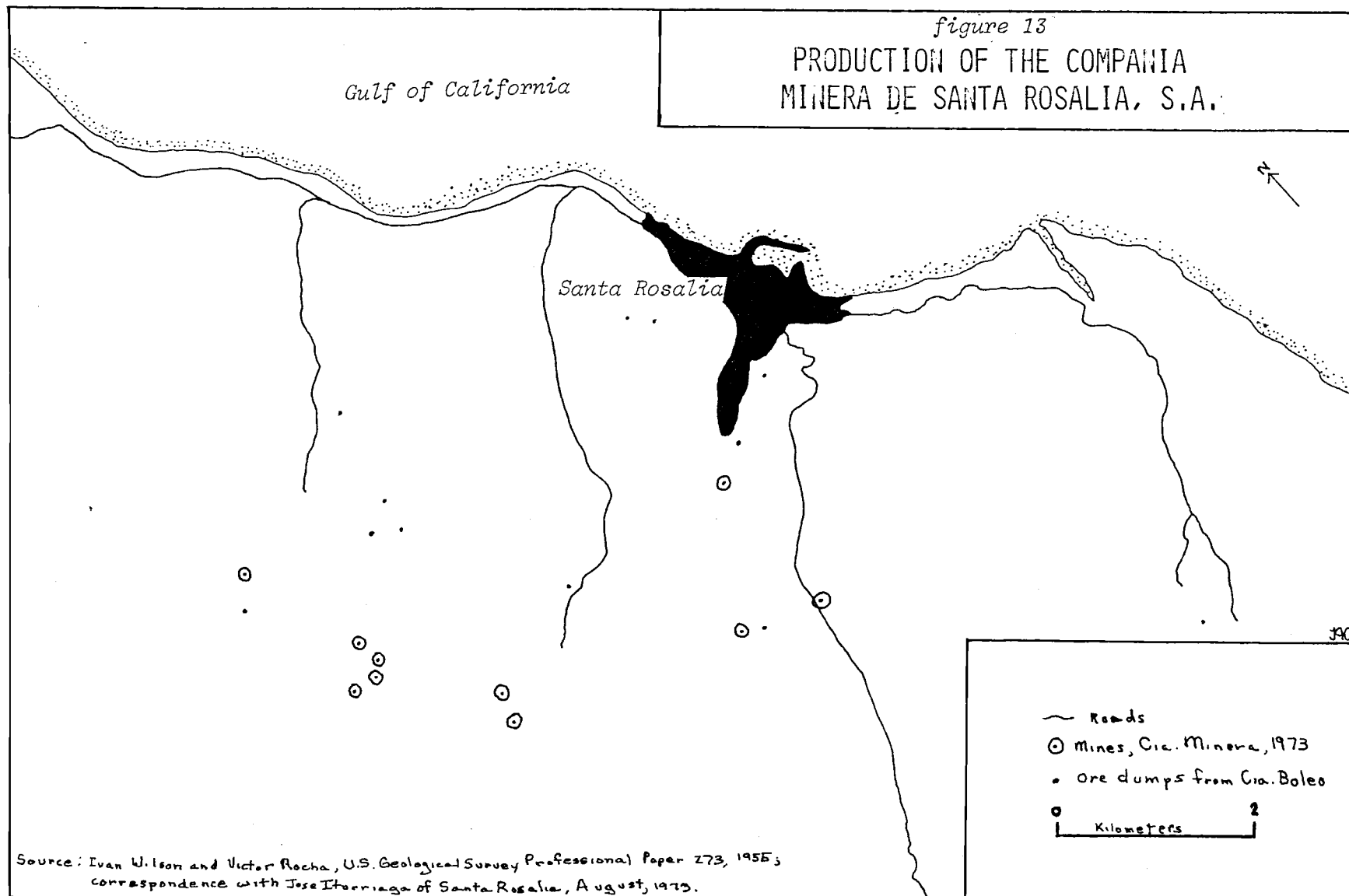
The Compania Minera operated at a loss for several years.<sup>28</sup> In 1962, a favorable shift in the international price of copper, enabled the firm to make its first small profit. But, smelter production did not increase to meet world demand. Two factors created a stabilization in smelter production at that time.

- 1) The Boleo region could not supply enough copper ore to increase production.
- 2) The equipment used was old and not designed to handle low quality ores.

In 1972, the Compania Minera turned to new raw material sources for the smelter at Santa Rosalia. Concentrates of twenty-five percent copper were imported from Peru. They account for about seventy-seven percent of the ore used each month. The other twenty-three percent continues to be supplied from Boleo ores since some mines have been reopened ( figure 13 ).

A low grade, but sizeable copper deposit was discovered in 1972 about 150 miles ( 241 kilometers ) northwest of Santa Rosalia and outside of the Boleo concession. The ore cannot be used by the Compania Minera despite its





accessibility. The American Smelting and Refining Company, which owns that particular mineral concession, is from the United States and supplies ore only to its own smelters in Mexico.<sup>29</sup>

The Compania Minera has become active in exploration in the Boleo district. Preliminary results are expected by April, 1974. An additional year will be needed to confirm those results. If they are positive, new mines could be opened by 1977.<sup>30</sup>

The Mexican government is aware of the need for beneficiation in Santa Rosalia, if it is to remain competitive. The type of concentration which would be successful is a process of leaching, precipitation and flotation.<sup>31</sup> Further capital investment has not yet been made by the government and the possibility of future expansion is small according to Jose Iturriaga, current manager of the Compania Minera.

Employment by the Compania Minera has decreased a great deal when compared with the employment of Compania del Boleo ( figure 10 ). In 1973, 225 people were employed by Compania Minera. Of that number, twenty-five percent worked in administration, the rest being classified as laborers.<sup>32</sup>

#### A REDEVELOPED INFRASTRUCTURE

Although internal connections for the Boleo district were excellent at the beginning of the century, given the technology and conditions of the district surrounding the

town, the aerial trams, railway, and truck routes leading to the mines did not help to integrate the Boleo region and Santa Rosalia with the nation of Mexico. By the close of World War II, the Boleo district was only slightly more accessible. The coach which ran from Ensenada to La Paz via the old road through the town, carried passengers and mail about two times a week. The dangers and inconveniences of that unpaved road are still evident since much of the new highway parallels the old route. The problems include huge boulders, treacherous climbs along switchbacks and the crossings of arroyos with their particular flashflood problems. One street in Santa Rosalia is the major route of stream flow when it rains. A bridge was constructed across it to permit foot travel when it floods.

Passenger travel by boat into Santa Rosalia was not well developed even in 1948. Small boats left Guaymas on the mainland two or three times a week making the trip to Santa Rosalia in ten to fourteen hours. From the United States, passengers to the town could catch a freighter to Tacoma, Washington, on its return trip to the smelter of Santa Rosalia for more blister copper.<sup>33</sup> Connections by air were made twice a week with Guaymas, La Paz and Tijuana.<sup>34</sup> The number of national merchant marine vessels registered for Santa Rosalia in 1954 was eight. Two were steam boats, five had motors and one was a barge.<sup>35</sup> As late as 1955, surface connections were still

meager for the entire peninsula, the most modern routes existing in its northern portion ( figure 14 ). By 1954, when the Mexican government regained control of the Boleo mineral concession, some of the intra-district connections from the French era had fallen out of use. The railway which had hauled ore no longer functioned. The trams were discontinued and parts of the rucking network disappeared through lack of use and flood destruction.

#### NEW ECONOMIC DIRECTIONS

Shifts in the employment mix have been evidenced in the municipio since the federal government took over the mining and smelting through Compania Minera de Santa Rosalia. The primary sector accounted for sixty-one percent of the employment in Mulege in 1960, but only fifty-one percent in 1970 ( figure 8 ). During that same period, secondary activities stabilized at about twelve percent of total employment although the real number of jobs grew. Rapid expansion in the tertiary activities, most notably in commerce and construction, permitted that sector to absorb more of the labor force. Tertiary grew from twenty-three to thirty-four percent of total employment. The largest real increase was in commerce, providing about 400 new jobs with a doubling of its percentage of total employment. The new employment mix indicates:

- 1) greater economic diversification and
- 2) decreased dependence on non-renewable resource based industries.

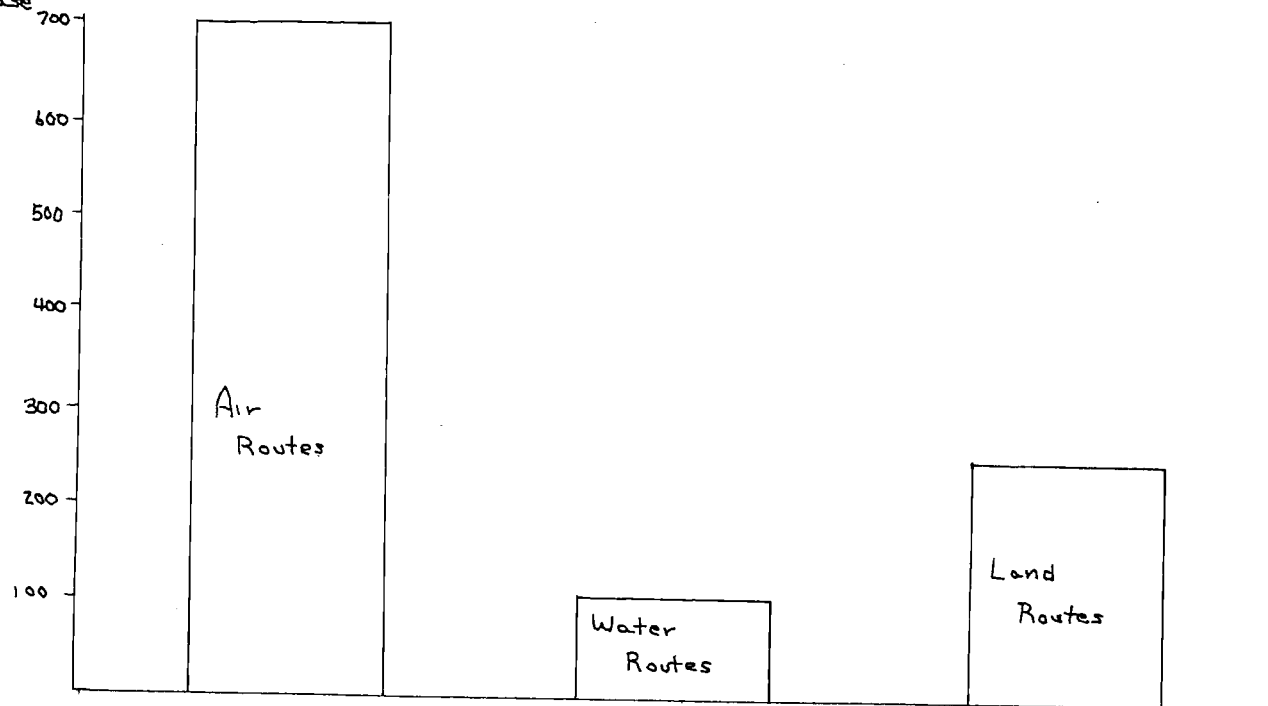
Population has increased in Santa Rosalia since 1940.

figure 14

## INFRASTRUCTURAL CHANGES

1955-1973

Percent  
Increase



Source: Juan Wilson and Victor Rocha, U.S. Geological Survey Professional Paper 273, 1955;  
Banco Nacional Hipotecario, Obras y Servicios Publicos Territorio de Baja California, 1959;  
field research in Santa Rosalia, June, 1973.

That, coupled with an influx of tourists to Santa Rosalia because of greater accessibility, has expanded the market for new tertiary activity. Commercial functions and construction are two of the areas stimulated by the larger market.

It is too early to quantify the economic impact of the highway-ferry system. Initially, this new system is increasing the number of tourists who enter the area for camping, fishing, hunting and swimming. The greatest portion of tourist capital will probably be derived from the United States, principally from Southern California. The typical tourist demand generated is and will continue to be for hotels, restaurants, recreation areas, modern sanitation facilities and most critically, water.

Santa Rosalia does not yet provide these goods and services. The one commercial hotel in town has only seventeen rooms and the bath/toilet must be shared by all customers. When water is in short supply, particularly during the hottest months, the water system in this hotel is shut down for periods that can range as long as twelve daytime hours. This leaves hotel patrons without the use of showers or flush toilets. Drinking water is less of a problem since it is always a priority use and quantity requirements are not as high as for other uses. The small number of rooms also puts a burden on tourists who may arrive late in the day. There is a good selection of food service facilities in the town, ranging from sidewalk vendors to a hotel restaurant that features French cuisine. Food prices are higher than in many

mainland Mexican restaurants of similar quality owing to high transportation costs. There is only one outdoor recreation area in Santa Rosalia, a small littered public beach. The first tourist office was established in the town in 1973. There is an opportunity for investment in the establishment of a sportsfishing company. The town has a theatre, pool hall, and dances and parties sponsored by the town government or Catholic Church. Sufficient fresh water supplies and sanitation facilities for the town and its tourists are still unavailable.

The advantages which are accruing to Santa Rosalia from its growing tourist industry include:

- 1) rapid influx of outside capital;
- 2) greater employment opportunities;
- 3) sophisticated communications with the world;
- 4) rapid increase in consumption potentials enabling larger economies of scale to be reached in imports;
- 5) increased economic diversification;
- 6) cultural exchange.

Tourism will very likely bring its share of problems to Santa Rosalia and Mulege. Because few services are now available, a tremendous pressure will be placed on a limited and ecologically sensitive land base. As employment possibilities grow, a too rapid population increase through in-migration and a high birth rate could place an undue strain on the desert environment. Despite increased service demands from a tourist population, absolute growth within

the town is restricted by limitations of fresh water supply. Consideration must also be given to solid waste disposal from a larger population, both stationary and transitory.

If the economic base redevelops with too great a reliance on tourism, it could continue the economic monoculture from which Santa Rosalia traditionally suffered. Tourism can be an unstable industry. Demands may be seasonal. Likewise demand is highly elastic and will fluctuate depending on war, economics, natural disaster and the whims of tourists.

It may be possible for the economy of Santa Rosalia to continue diversifying because of tourism. With a larger population and a greater local and tourist market, certain types of light manufacturing may be able to function there. Possibilities include fish processing, handicrafts and specialty clothing items such as Baja California tee shirts. In the commercial sector there is already high demand for sporting goods including fishing gear and camping equipment. As the number of economic functions grows to meet the demands of tourism, there will be a stimulation of activity to serve the needs of the new permanent town residents.

## CONCLUSIONS

### Boundaries of Growth

Five factors have been prominent in the restriction of growth in Santa Rosalia.

- 1) The principal economic activity of the town relied on the exploitation of a non-renewable resource.



- 2) The economy was not sufficiently diversified.
- 3) The company which founded and controlled the town throughout most of its history was foreign owned and had no interest in securing the economic viability of Santa Rosalia.
- 4) Santa Rosalia was physically and socially isolated from Mexico.
- 5) The physical environment, especially the lack of adequate fresh water supplies, limited the number of people the town and region could support at a given level of technology.

#### Re-establishing the Growth Potential

The decisions which re-established a growth potential for Santa Rosalia were all a consequence of interest by the Mexican federal government. The government during the Second World War, under Manuel Avila Camacho, had again become active in a program of economic growth. It was that government which granted subsidies to the Compania del Boleo to keep it operative. It was that government which arranged for a comprehensive study of the Boleo district by the United States Geological Survey. Slowly, the government became more involved in the town, knowing that the copper industry had been the sole basis for its existence to that time. The return of the Boleo mineral concession to the Mexican government in 1954 marked the first major breakthrough in the revitalization of Santa Rosalia.

Since then, important factors in revitalization have included:

- 1) operation of the smelter at a financial loss;
- 2) infrastructural expansion and development;
- 3) use of imported copper concentrates.

27

The decision to continue smelter operation meant that the major employer for the town was kept active while other steps were being taken toward a revitalization effort. The town was given the time it needed to modernize the infrastructure and seek out alternative economic functions. Among the new activities in Santa Rosalia were additional banking facilities and new construction, both of which developed because of the program for a new highway and ferry system. The recent importation of ore concentrates will permit the smelter to operate economically without the requirement of investment in expensive, new exploration. Exploration for additional ore beds is being carried on, but any discoveries will serve to reinforce the smelting operation rather than determine its continued existence.

#### Socio-Economic Developments

The population of the town and municipio has increased. It is a young population which will demand more employment opportunities than are now available in the town. A continued young population will bring increased pressure to the community in terms of new schools, housing and a need for even more economic expansion. The physical limits of the land will prove critical in determining the future quality of life. The population is largely literate and no major unemployment now exists. Greater diversification of culture and economy should result as more communications with Mexico and the world are opened.

### Prospects

This study has considered some of the phenomena which influence a community developed by foreign capital investment on the basis of the exploitation of a mineral resource. This kind of situation is not uncommon in the world.

Because Santa Rosalia now has an educated, growing population and a developing infrastructure, it has the potential to sustain its economic viability. It cannot be guaranteed however. On the negative side, the town is still not well diversified in its economic structure. Continued expansion and diversification are strongly related to the availability of adequate fresh water supplies. Consideration should be given to the construction of a desalinization plant to satisfy future water demands in Santa Rosalia.

Despite the increased accessibility of Santa Rosalia, tourism will not become important there without improvements in the service sector. This will mean construction and modernization of hotel, restaurants, and recreation facilities. Because these tourist demands are currently met in the city of La Paz and the town of Mulege, Santa Rosalia must compete with them. The proximity of Mulege to Santa Rosalia could jeopardize future economic growth for Santa Rosalia if expansion in the service sector is slow.

If Santa Rosalia is to continue reinforcing its economic

viability, the problems described here must be faced and an organized approach towards finding solutions should be initiated. The Mexican federal government has invested heavily in the initial stages of economic revitalization. In order for that investment to be justified, private capital investment should be made in the town and the region it serves. Investment should be directed at the expansion of hotels, restaurants, sports facilities and housing during the earliest years since the addition of the new highway and ferry system. As the service market increases in Santa Rosalia and the population expands, investigations should be made for the addition of further light manufacturing in the town. If the situation connected with the lack of fresh water can be solved, the town could maintain these new economic functions and serve demand generated throughout the peninsula. What remains to be done in the town is the recruitment of more secondary activities and expansion of the tertiary sector. Federal help will still be necessary in alleviating the situation of limited fresh water sources; but if it can be worked out soon, the potential for new growth and the security of a stable economy can be assured.

## FOOTNOTES

- 1 Homer Aschmann, "The Natural History of the Mine," Economic Geography, Vol.46 ( 1970 ), pp. 172-189.
- 2 Ivan Wilson and Victor S.Rocha, Geology and Mineral Deposits of the Boleo Copper District Baja California, Mexico U.S.Geological Survey Professional Paper 273 ( Washington,D.C.: Government Printing Office, 1955), p.13.
- 3 Wilson, op.cit., footnote 2, p.12.
- 4 Lindsay Duncan, "Copper Operation of Compagnie du Boleo," Engineering and Mining Journal, Vol. 104 ( 1917 ), p.416.
- 5 Wilson, op.cit., footnote 2, p.12.
- 6 Interview with Padre Mario of Santa Barbara Church, Santa Rosalia, Baja California del Sur, Mexico, June 22, 1973.
- 7 This company, formed in Paris in 1885, was originally known as Compagnie du Boleo.
- 8 Duncan, op.cit., footnote 4, p.416.
- 9 This service is operated by the Caminos y Puentes Federales de Ingresos y Servicios Conexos. Reservations and tickets may be obtained from the following:
  - Mazatlan, Sinaloa  
Prolongacion Calle Carnaval  
(Muelles Fiscales) Tel.: 24-54
  - La Paz, Baja California del Sur  
Independencia No. 107-A  
Tel.: 2-01-09
  - Mexico, D.F.  
Baja California No. 272 Esq. con Culiacan  
Tels. 564-62-7, 564-50-33 Exts. 186 y 187
  - Guaymas, Sonora  
Aguiles Serdan No. 355  
Tel.: 2-33-93
  - Santa Rosalia, Baja California del Sur  
Muelles de la Aduana  
s/n.

- 43
- 10 Communication with Ray Harrison of Pao Alto, California, an American tourist flying his private plane around the Baja peninsula, June 20, 1973.
  - 11 Wilson, op.cit., footnote 2, p.90.
  - 12 Wilson, op.cit., footnote 2, p.13.
  - 13 Obras y Servicios Publicos de Territorio de Baja California, ( Banco National Hipotecario Urbana y de Obras Publicas, S.A., 1959 ), pp. 10 and 40.
  - 14 IX Censo General de Poblacion 1970 28 of January 1970 Territorio de Baja California ( Mexico, D.F.: Estados Unidos Mexicanos. Secretaria de Industria y Comercio Direccion General de Estadistica, 1970).
  - 15 Interview with the director of Benito Juarez School in Santa Rosalia, Baja California del Sur, June 23, 1973.
  - 16 Wilson, op.cit., footnote 2, p.88.
  - 17 Wilson, op.cit., footnote 2, p.89.
  - 18 Wilson, op.cit., footnote 2, p.89.
  - 19 Interview with Jose Iturriaga, manager of Compania Minera de Santa Rosalia, S.A., in Santa Rosalia, Baja California del Sur, June 22, 1973.
  - 20 Wilson, op.cit., footnote 2, p.95.
  - 21 Wilson, op.cit., footnote 2, p.90.
  - 22 Wilson, op. cit., footnote 2, p. 102.
  - 23 Duncan, op.cit., footnote 4, p.417.
  - 24 Wilson, op.cit., footnote 2, p.89.
  - 25 Wilson, op.cit., footnote 2, p.30.
  - 26 Iturriaga, op.cit., footnote 19.
  - 27 Wilson, op.cit., footnote 2, p.90 and Iturriaga, op.cit., footnote 19.
  - 28 Iturriaga, op.cit., footnote 19.
  - 29 Iturriaga, op.cit., footnote 19.
  - 30 Iturriaga, op.cit., footnote 19.

- 31 Comision de Fomento Minero, Cobre ( Mexico, D.F.:  
Depto. de Estudios Economicos: 1970 ), p.34.
- 32 Iturriaga, op.cit., footnote 19.
- 33 Wilson, op.cit., footnote 2, p.7.
- 34 Wilson, op.cit., footnote 2, p.6.
- 35 Secretaria de Economica, Anuario Estadistico del Comer-  
cio Exterior de los Estados Unidos Mexicanos 1954  
( Mexico, D.F.: Director General de Estadisticos,  
1956) , p. 620.