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INVENTORY OF THE ECONOMIC ZONES OF THE FRENCH TERRITORIES IN THE PACIFIC

The ZoNéCo and ZEPOLYF Programmes

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Abstract

Until recent years, no systematic campaign of charting or evaluation of potential had been organized in the immense maritime economic zones of the French territories in the Pacific. The ZoNéCo Programme, for the economic zone of New Caledonia, and the ZEPOLYF Programme, for that of French Polynesia, have instituted a systematic process of drawing up an inventory or assessment of these regions, the method and the first results of which are described here.

PRESENTATION

Following the recognition in 1979 of the concept of "economic zones", many States have launched programmes for charting their seabeds and assessing their living and non-living resources. A certain number of developed countries, such as the United States, Great Britain and Japan, have already begun the systematic exploration of their economic zones.

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In France, under the impulsion of IFREMER (French Research Institute for the Exploration of the Sea), a national programme on French economic zones was initiated from early in the 1980s; its development off the shores of the mainland was, however, slowed down, because its purpose did not appear to be of priority importance. Early in the 1990s, the initiators of the programme therefore turned their attention towards the French territories in the Pacific, comprising New Caledonia and French Polynesia. Like many island territories, the latter have small dry-land areas compared with the size of their economic zones; for instance, French Polynesia, which has an economic zone of nearly 5 million km² for 3265 km² of dry land, can henceforth be considered to be a "maritime giant" on the world-wide scale, whereas its land-based natural resources are very limited and its coastal marine areas over-exploited.

The Territory of New Caledonia was the first to show interest in the evaluation of the marine resources in its economic zone. From November 1990, the Government Delegate representing the French State locally set up a working group charged with defining the basis of a programme with a view to such an assessment (**ZoNéCo** : **ZoNe économique de la Nouvelle Calédonie** or Economic Zone of New Caledonia).

This example was rapidly followed by French Polynesia, which set up the **ZEPOLYF** programme (**Zone Economique de la POLYnésie Française** or Economic Zone of French Polynesia), focussing on an inventory of the resources of the vast maritime areas of the Central Pacific.

Despite some differences of detail in the approach chosen for each, the two programmes adopted a common mode of operation in which a scientific inventory and an inventory of economic resources are carried out simultaneously, with the participation of all the potential partners involved (scientific, technical, economic and political) with a view to the rapid local valorization of the information and data gathered. Moreover, in both cases the complex administrative structures involved¹ led to the setting up of flexible "lightweight" programme structures in which participants of widely differing types (national and territorial administrative services, scientific bodies, universities) succeed in working together efficiently.

NEW CALEDONIA : ZoNéCo PROGRAMME

New Caledonia essentially consists of one principal island, Grande Terre, and the neighbouring archipelago of the Loyalty Islands (Ouvéa, Lifou, Maré and Tiga); the relevant economic zone, with an area of nearly 1 400 000 km², extends in the west to the Chesterfield archipelago and includes many shallow-water regions (ridges, plateaux and undersea mounts), corresponding a priori to living or fisheries resources, as well as geological structures potentially linked to mineral resources.

A Working Group created in 1990 included right from the initial stage of definition all the participants potentially concerned by this programme. Involving about

¹ New Caledonia and French Polynesia constitute "overseas territories" and are jointly administered by the State and by autonomous local authority.

fifty scientific experts and persons politically responsible for the area, it lay down during 1991 the basis for the ZoNéCo Programme.

Drawn up with a similar approach to that of most programmes of mining inventories, ZoNéCo was sub-divided into three phases:

- a strategic phase, the object of which was the establishing of the cartographic background essential for any inventory of resources and the analysis of data prior to the programme,
- a tactical phase, aimed at identifying and quantifying living and non-living resources,
- a target-study phase, for the evaluation of the economic potential offered by such resources, in particular in the fisheries and mining fields (hydrocarbons, mineral deposits).

The ZoNéCo Programme thus defined is shown to be multi-disciplinary with multiple participants representing:

- the French State : Ministry of Higher Education and Research (MESR), Hydrographic and Oceanographic Service of the Navy (SHOM);
- the Territory of New Caledonia : Service of Administrative Methods and Computer Science (SMAI), Service of Mines and Energy (SME), Territorial Service of the Merchant Navy and Maritime Fisheries;
- Research Bodies : French Research Institute for the Exploitation of the Sea (IFREMER), French Scientific Research Institute for Development in Cooperation (ORSTOM), French University of the Pacific (UFP).

Organization

The method chosen for drawing up the Programme combines rigorous aims and flexible functioning.

The participants in the Programme undertake a commitment on the basis of a pluri-annual Framework Agreement (the first concerned the period 1993-1996; the second, the period 1997-2001). The Programme has a Pilot Committee made up of representatives of the institutions and bodies referred to above which meets regularly to decide on the main orientation of the Programme. A Project Group manages the details of running the Programme; it meets monthly. To respond to specific needs, the Project Group forms specialist working groups (promulgation of data, campaigns at sea, integration of geophysical data, integration of living resources data, integration of oceanographic data, etc...). Furthermore, ZoNéCo possesses a tool for the processing and archiving of data, referred to as the Management and Valorization of Data Structure (SGVL). The SGVL, based at the SMAI, also develops, in liaison notably with IFREMER, the software required for processing the data acquired by the Programme.

Progress of the ZoNéCo Programme

Strategic phase

The first activities consisted of the seeking and systematic analysing of the pre-Programme data available in bathymetry, geophysics, physical oceanography and fisheries oceanography. These preliminary analyses served as a basis for defining the first operations conducted by ZoNéCo.

Four campaigns (Fig. 1) were carried out between 1993 and 1996 aboard the oceanographic vessel "L'Atalante" equipped notably with EM12 DUAL and EM950 multibeam sounders. The principal objective of these campaigns was to achieve continuous bathymorphological cover (bathymetry and imagery) of areas defined as priority sectors because of the probable existence of submarine relief at depths of less than 1 500 m; whenever possible, precise position-fixing was carried out using Differential GPS. Also, single-track seismic profiles and profiles of magnetism and gravimetry were obtained simultaneously, together with current measurements using a Doppler profiler (ADCP) in the 0-800m water layer, bathythermic (XBT) measurements, and recordings with a surface thermo-salinometer.

- **ZoNéCo 1** (1993) made a reconnaissance survey of the southernmost points of New Caledonia and the Loyalty Islands
- **ZoNéCo 2** (1994) explored the Grand Passage (north of Grande Terre) and the Loyalty Basin
- **ZoNéCo 3** (1996) specified the structure of the surroundings of the Loyalty Islands in the 50-350m water layer (EM 950 shallow-water multibeam sounder) and completed the work begun during the ZoNéCo 1 and ZoNéCo 2 campaigns
- **ZoNéCo 4** (1996) made a reconnaissance survey of the zone to the west of Grande Terre comprising Fairway Reef, the Chesterfield-Bellona Reefs, and the alignment of guyots (tablemounts) on Lord Howe Rise.

At the same time, the Oceanographic Survey Unit of the Pacific (permanent branch of the Naval Hydrographic and Oceanographic Service) conducted supplementary surveys with the hydrographic survey vessel "LAPLACE" in the shallow-water areas (Grand Passage, outer edges of the barrier reef), the results of which were integrated by the SGVL into the bathymetric data base of the ZoNéCo Programme.

The charts constructed from the data collected during these campaigns are the basic instruments for the economic development of the territory. The results of the strategic phase include, in addition to these documents, numerous scientific papers, summary reports concerning the principal thematic areas taken from an analysis of the data collected prior to the ZoNéCo Programme and the first interpretations of the data from ZoNéCo campaigns Nos. 1 to 4.

In addition to the campaigns at sea, the ZoNéCo Programme promoted the production of synthesis reports resulting from the analysis of data previous to the Programme and notably:

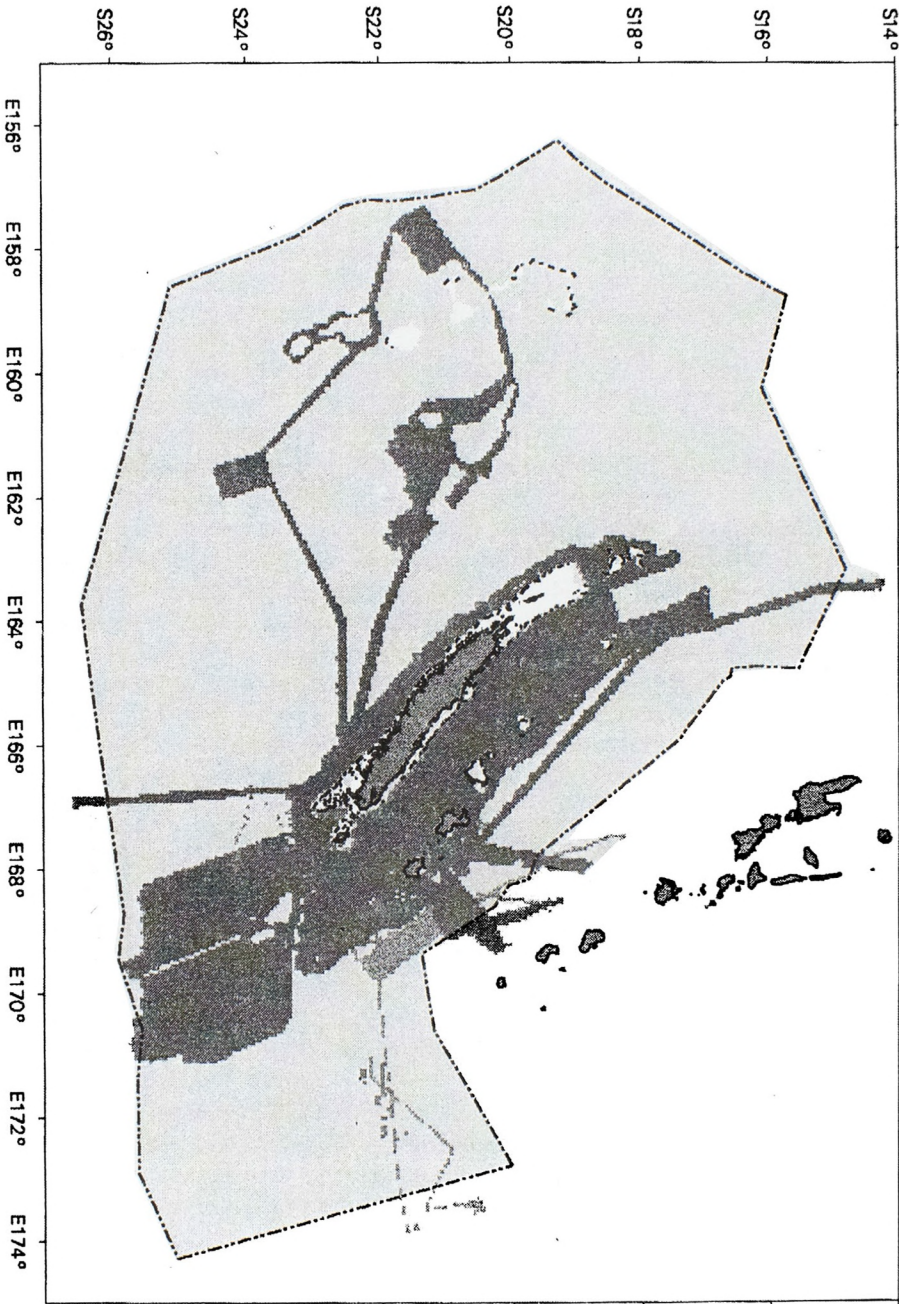


FIG. 1. - Exclusive economic zone of New Caledonia. Limits of zones covered by ZoNéCo campaigns 1, 2, 3 & 4 (© ZoNéCo).

- an "Assessment of information concerning evaluation of the oil potential of New Caledonia and its dependent territories", which lists and analyses the work carried out on shore and at sea in the framework of the search for hydrocarbons and shows that the operations carried out in the marine environment are still too fragmentary to allow the potential to be defined with precision. However, promising zones are identified in the western, northern and southern lagoons, in Grand Passage and on the Chesterfield Reef.
- a document of the same type draws up an assessment of information concerning polymetallic encrusting.
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- a synthesis document on the organisms (fish, shellfish and molluscs) living on the outer slopes of the reef between 100m and 400m depth.

All these data were transferred into the fisheries data base of the SGVL (Fig. 2).

Tactical phase

The work in the tactical phase was directed primarily towards the study of living resources. Four fisheries campaigns were carried out between 1994 and 1996:

- HALIPRO 1, aboard the oceanographic vessel "Alis" (18-25 March and 29 March - 1 April 1994), a campaign of exploratory fishing with seabed trawl nets at depths of 200-1200m along the east coast and to the south of Grande Terre,
- HALICAL 1, aboard the oceanographic vessel "Alis" (21 November-1 December and 12-23 December 1994), a campaign of exploratory fishing using ground lines at depths between 300m and 800m to the north of Grande Terre and on Loyalty Ridge.
- HALICAL 2 (17-27 January and 1-10 February 1995), a campaign of exploratory fishing using ground lines at depths of 300m-800m to the north of Grande Terre and on Loyalty Ridge.
- HALIPRO 2, a campaign undertaken in November 1996 by the research vessel "Tangaroa", chartered from New Zealand's National Institute of Water and Atmospheric Research Ltd. (NIWA), carried out exploratory trawling at depths between 230m and 1800m over the tablemounts and seamounts of Loyalty Ridge and Norfolk Ridge (indicating the existence of numerous Beryx), then over Lord Howe Rise.

In addition, still within the framework of the Programme, systematic observation of the water masses (temperature and salinity) was carried out by means of the thermo-salinity-meters installed at various fixed points (coast stations) or carried aboard commercial ships (e.g. ferries) crossing the economic zone.

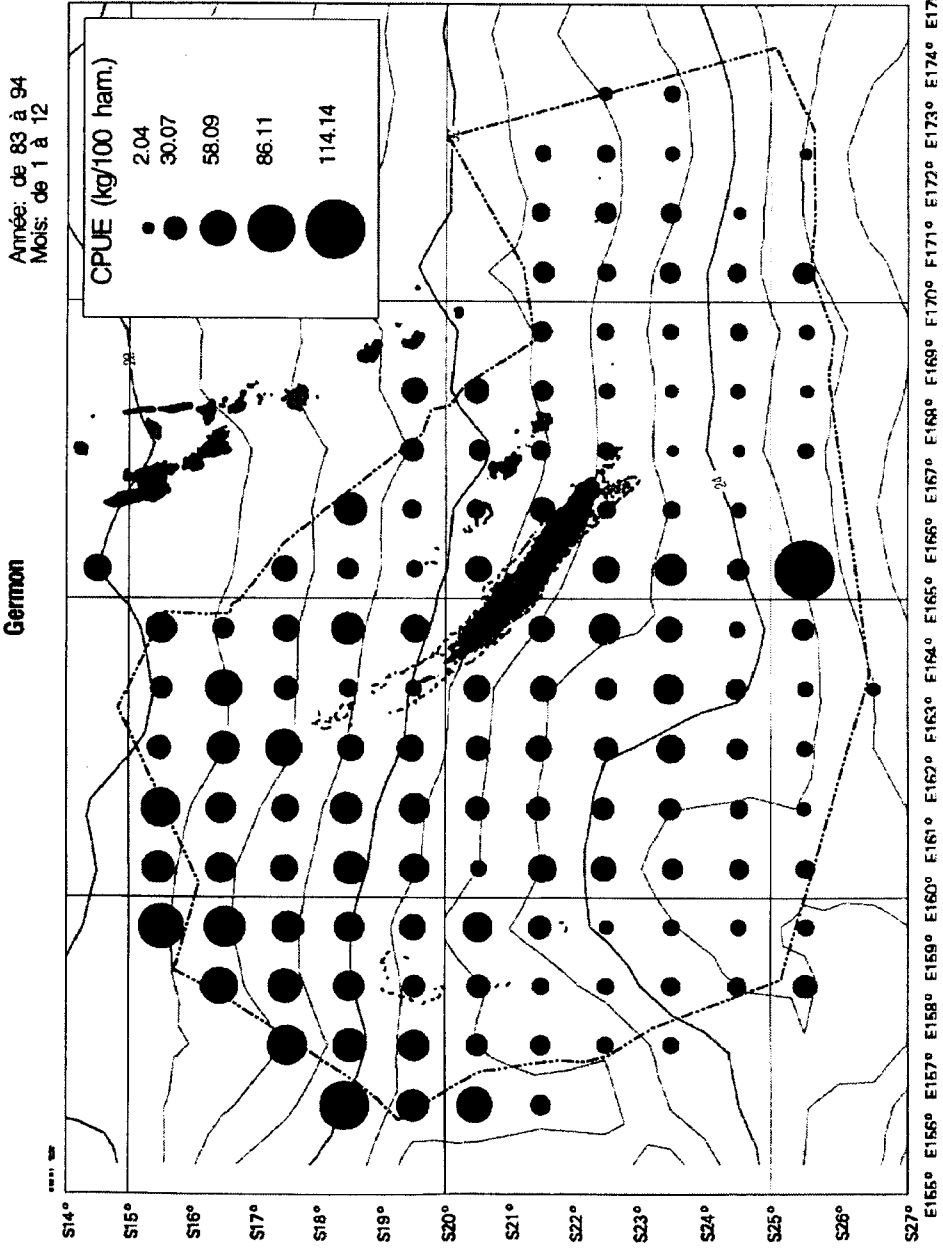


FIG. 2. - Example of a product of the SGVL (© ZoNéCo).

First overall results of the Programme

The results of the first part of the Programme are very encouraging; knowledge of the region has progressed considerably in every aspect:

- *Bathymorphology and geophysics* : a great deal of the seabed at depths under 1000m and areas likely to contain bathymetric anomalies were explored and many volcanic structures with summits rising to less than 1000m depth were discovered; the existence of a navigable zone for ships of heavy tonnage was also confirmed in Grand Passage to the north of Grande Terre;
- *Physical oceanography* : a certain number of original structures were revealed, such as, for example, during the ZoNéCo campaigns, an anticyclonic eddy on a meso scale (100 to 200km in diameter), stable throughout the campaign and affecting the 0-500m water layer in the southern prolongation of New Caledonia, or coastal surface and sub-surface currents and upwellings of cold water (coastal upwellings).
- *Living resources* : the installation of ground lines carried out in the north and on Loyalty Ridge confirmed that the bathymetric charts produced during the ZoNéCo 2 campaign prove to be a precious assistance tool for fisheries and for defining the extension of the habitat of great reproducers of species exploited by artisanal fishing and to highlight the abundance of species that are still unknown on the local fisheries market. The potential in fishing resources of the zones charted was estimated.
- *Mining resources* : the EEZ's potential as regards mineral resources is now considerably better known; the work already carried out has identified areas that are a priori favourable for concentrations of minerals (ferro-manganese encrusting, phosphate deposits, nodules) and to highlight the contribution made by ZoNéCo's multi-disciplinary approach.

ZoNéCo : future prospects

In the context of the general scheme defined in the Framework Agreement 1997-2001 and corresponding essentially to the tactical phase of the Programme, the continuation of geological and fish-sampling operations is envisaged; in particular, geological sampling by dredging and coring and campaigns of exploratory seabed trawling and ground-line fishing.

ZoNéCo serves as a pilot programme in the south-west Pacific area. Already, a programme similar to the ZoNéCo strategic programme has been carried out aboard the oceanographic vessel "L'Atalante" by teams from IFREMER and ORSTOM on behalf of Fiji, the Solomon Islands, Kiribati and Vanuatu. Called SOPACMAPS and coordinated by the South-West Pacific Applied Geosciences Commission (SOPAC), it has resulted in the bathymorphological and geophysical charting of part of the economic zones of the countries mentioned. A new proposal, modelled on ZoNéCo and called SOPACMAPS 2, with as its objective the collection of geological and fishing

samples with a view to an inventory of resources, is being developed in New Caledonia in concertation with SOPAC and the countries concerned. The ZoNéCo programme offers an excellent basis for cooperation with neighbouring countries, particularly New Zealand (HALIPRO 2 campaign) and Australia (cooperation project for the carrying out of a seismic survey between Australia and New Caledonia with, among other aims, that of pin-pointing any areas with deposits of hydrocarbons).

FRENCH POLYNESIA : ZEPOLYF PROGRAMME

For the ZEPOLYF Programme the same mode of operation as that of ZoNéCo was adopted: namely, assessment of existing knowledge by a group of scientists and assembling of the sparse amount of data available; grouping of all the participants concerned, including the French State and the Territory of French Polynesia; defining of an exploration strategy linking coordinated "strategic" and "tactical" approaches; study of targets and the setting up of a local organization for the valorization and exploitation of the data collected.

French Polynesia has a very extensive EEZ, the exploitation of which represents a considerable task. Those responsible for the Programme therefore chose to highlight a certain number of aspects of specific interest, centred on knowledge of shoals and seamounts, the evaluation of fisheries resources and the locating of potential mineral deposits.

Objectives

The first objective of ZEPOLYF is to obtain bathymorphological knowledge of the zone, with particular attention to the exhaustive charting of seamounts and shoals at depths of less than 2000m.

Following this first stage, experimental fisheries campaigns will aim at the identification of biological resources; at the same time, an inventory could be begun of the "cobalt encrusting"-type mineral resources on the shoals detected.

Finally, in the course of this work, a geo-referenced data base will be constituted on behalf of French Polynesia which will be a synthesis of the results of the Programme (bathymetry, oceanography, sedimentology, fisheries studies).

Programme development

The general organization of the Programme is, again, similar to that of ZoNéCo, stressing flexibility of functioning:

- a pluri-annual framework agreement defines the objectives on which the participants have agreed and the means they decide to devote to them; the first such agreement covers the period 1996-1999. The policy thus defined is implemented through the Pilot Committee;

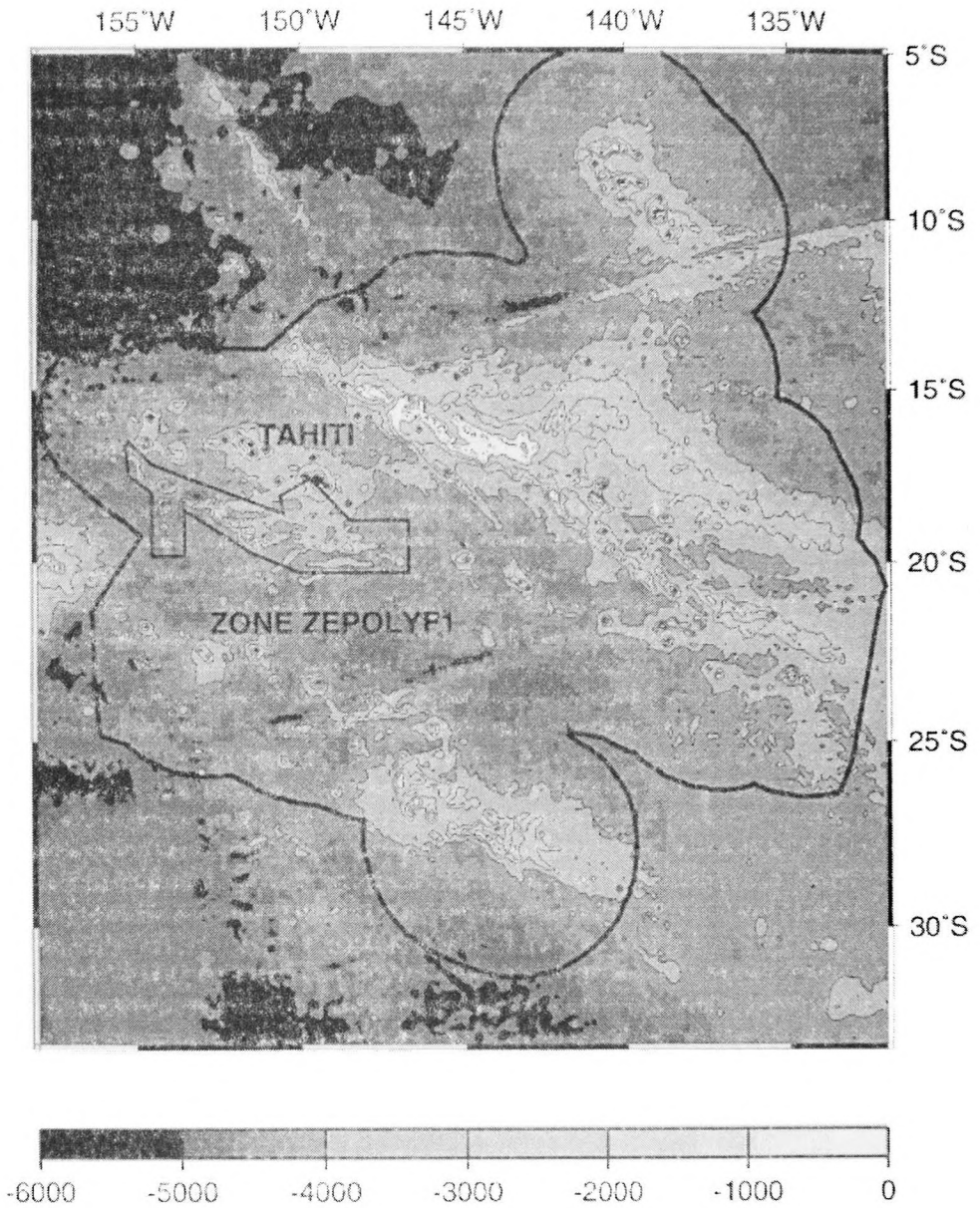


FIG. 3. - Exclusive Economic Zone of French Polynesia. Limits of areas covered by the ZEPOLYF 1 campaign.

- a project group ensures the functioning of the Programme.

Those participating in ZEPOLYF are:

- the State: "Ministère de l'Outremer", Ministry of Education, Research and Technology, Ministry of Defence (SHOM),
- the Territory of French Polynesia: Ministries of the Sea and Research, territorial services (Establishment for the Valorization of Aquaculture and Maritime Activities),
- the State research bodies present in the Territory (IFREMER, ORSTOM, UFP).

The State and the Territory of French Polynesia finance the programme (average annual flow in the range of 3.6 million FF) and the other partners contribute in kind.

Strategic phase

The work at sea was preceded by a phase of systematic research and synthesis of the information available concerning the zone studied: bathymetric charting through synthesis of existing surveys (bathymetry, gravimetry) and of satellite altimetry data; inventory of existing data relating to oceanography, marine biology and fisheries, marine geosciences.

A first campaign at sea, ZEPOLYF 1 (see fig. 3) was carried out 8-28 December 1996 on the Savannah seamount chain situated between the Isles de la Société and the archipelago of the Australes, which includes about ten seamounts rising to less than 1000m depth, with trace of the activity of two "hot spots" or sensitive areas: the oceanographic vessel "L'Atalante", its position fixed by DGPS, systematically deployed an EM12 DUAL multibeam sounder (bathymetry, imagery), a gravimeter, a magnetometer, a sediment sounder, and equipment for rapid seismic measurements, and effected numerous oceanographic observations (thermosalinograph, XBT).

During this campaign, almost 110 000 km² were charted, 5000 km² of which were at depths of less than 2000m.

Tactical phase

Like its counterpart in New Caledonia, ZEPOLYF provides for a tactical phase centred on the study of targets: zones where the fisheries potential is considerable and sites where polymetallic encrusting is likely.

FUTURE PROSPECTS

The action initiated through the ZoNéCo and ZEPOLYF Programmes is likely to be extended to the economic zones of the other French territories (such as Wallis & Futuna); such programmes are regional in dimension and may be integrated within

the framework of the CPS (cooperation with other countries in the zone, setting up of a joint data processing centre, etc.).

By means of an original "integrated" approach, ZoNéCo and ZEPOLYF have been in a position to mobilise the political deciders of the State, the Territories and the Provinces along with scientific participants from research bodies. This type of programme - a very short-term one when compared with conventional programmes in such fields - is likely to move speedily from the scientific field to economic applications; the results already obtained, for instance by ZoNéCo in the area of fisheries, leave room for hope that the momentum will be transferred to the development aspects in the short or middle term (3 to 5 years), which can be compared with about twenty years required before hoping for any notable economic fallout from a "conventional" programme.

This approach would appear to be exportable both to national departments and territories and to the multitude of small island States in the inter-tropical zone of the world's oceans. In all these States, because of over-exploitation of shallow coastal areas due to the steady increase in population and the introduction of efficient fisheries equipment, it is necessary to move towards fishing further out at sea, aimed in particular at tunny and deep-sea fish on the outer slopes of reefs and on seamounts.

In the context of such a change, programmes such as ZoNéCo will prove to be particularly precious implements in creating a dynamic regional thrust, in linking all the potential participants (scientific, political and economic), and finally in providing a global picture of resources which could only be discerned with difficulty from conventional programmes with specific themes.