

120 YEARS OF THE HYDROGRAPHIC AND OCEANOGRAPHIC SERVICE OF THE CHILEAN NAVY. ITS PAST, PRESENT AND FUTURE

by Captain Hugo GORZIGLIA ¹

INTRODUCTION

The 120th Anniversary of the creation of the Hydrographic and Oceanographic Service of the Chilean Navy was celebrated on 1 May 1994. This is a significant event which the present Director of the Chilean Service would like to share with the worldwide hydrographic community in general and with the International Hydrographic Organization in particular, by means of this paper that intends to summarize the major milestones in the history of those 120 years of activity. Therefore, to fully inform the reader about the significance that Hydrography has had in the Chilean history, it is necessary to trace the events which took place from the discovery of Chile until the XVIIIth century and the main events of the XIXth century. This is then followed by the events of the XXth century leading to the present date and the immediate future of the Hydrographic Service, including the challenge of the new techniques in development, is considered in the end of the paper (Fig. 1).

I. HISTORICAL ASPECTS FROM THE DISCOVERY UNTIL THE XVIIIth CENTURY

1. The discovery of Chile

Chile was discovered on 1 November 1520 by the distinguished mariner Ferdinand MAGELLAN (HERNANDO DE MAGALLANES), who was the first to undertake a voyage around the globe. Magellan was born in Portugal and had entered the service of King Manuel of Portugal, in 1495. In 1514, he fell into disfavour with King Manuel and formally renounced his nationality and went to offer his services to King

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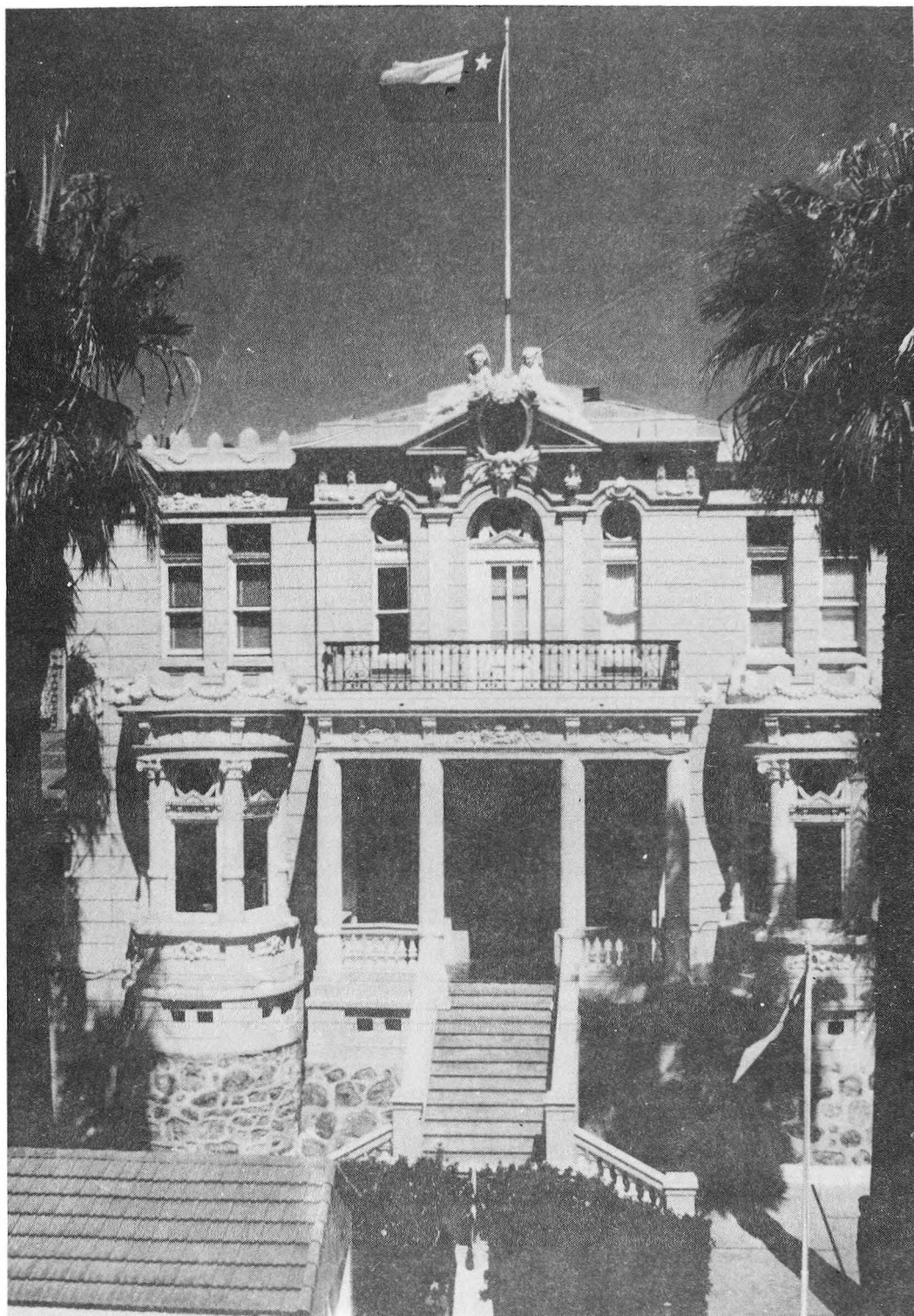


FIG. 1.- The building of "SHOA" (Servicio Hidrográfico y Oceanográfico de la Armada).

Charles I of Spain (who was also the Emperor of Germany as Charles V). Magellan proposed King Charles I to reach the Spice Islands of the East Indies by the west; for that purpose he hoped to discover a strait at the extreme south of South America. On 10 August 1519, the fleet of five vessels, under MAGELLAN'S command, left Seville and on September 20, the armada put to sea. Of the vessels which composed it, the TRINIDAD was the flagship and the VICTORIA, the only one which accomplished the circumnavigation. On 21 October 1520, he discovered the eastern entrance of a strait, 360 m. long, often narrow and fringed by snow-clad mountains, which is the major channel between the Atlantic and Pacific Oceans. This strait, nowadays known as Strait of Magellan was then given the name of "Estrecho de Todos Los Santos", (Strait of All The Saints), to celebrate the date of its discovery All Saints Day in the catholic calendar.

2. Other expeditions in the XVIth century

In addition to the MAGALLANES expedition, the following campaigns also contributed to the knowledge of the long and irregular coast of Chile. Francisco Garcia LOAYSA (1526), Simon de ALCAZABA (1535), Alonso QUINTERO (1536), Alonso de CAMARGO (1539), Juan Bautista PASTENE (1544), Francisco de ULLOA (1553), Juan LADRILLERO (1557), Juan FERNÁNDEZ (1574), Francis DRAKE (1577) and Pedro SARMIENTO DE GAMBOA (1579 and 1584).

Besides these expeditions, various names of mariners from other European countries should also be included. The most important among them are the English and Dutch navigators Thomas CAVENDISH (1587), Richard HAWKINS (1594), Simon de CORDES (1599) and Oliver VAN NOORT (1599).

3. Expeditions in the XVIIth century

In this century, several navigators and scientists sailed along the Chilean coasts, making new contributions to the geographical discovery of the region. These included the Dutch Jacob le Maire, who, seeking a passage safer than the Strait of Magellan to get to the Mollucas, discovered, to the south of it, a strait. This strait bears the name of "Le Maire". Bartolome Garcia de NODAL and Gonzalo NODAL (1619), Jacob L'HERMITE (1624), John NARBOROUGH (1670), Bartolome Diaz GALLARDO (1674) and Antonio de VEA (1675) should also be mentioned.

4. Scientific expeditions in the XVIIIth century

The increased interest in scientific development in the XVIIIth century resulted in the organization of several geographic expeditions directed at scientific discovery in connection with commercial or military campaigns. This contributed to the discoveries of the 18th century. The following deserve to be mentioned : Jacob ROGGEVEEN (1721 and 1723), Lord George ANSON (1741), Commodore John BYRON (1764), Jose GARCÍA (1766), Samuel WALLIS (1766), Luis Antonio BOUGANVILLE (1767), Jose SOTOMAYOR and Francisco MACHADO (1768), James COOK (1768 and 1774),

Benito MARÍN Y JUAN REAL (1778-1779), Francisco MENÉNDEZ (1779 and 1791), Pedro GONZÁLEZ AGUEROS (1791), Antonio de CÓRDOVA (1785 and 1788), Jose de MORALEDA Y MONTERO (1787 and 1796) and Alejandro MALASPINA (1789 and 1794) (Fig. 2).

The contribution of the Spaniard José de MORALEDA Y MONTERO in exploring the region specially the Chiloé and Chonos archipelagos remains one of the greatest scientific hydrographic contribution to the knowledge of the Chilean coast during the XVIIIth century.

II. THE GREATEST MILESTONES OF THE XIXth CENTURY

Four main events took place in the XIXth century which greatly influenced the development and future of hydrography in Chile. These events were the expeditions of Philip PARKER KING and Robert FITZROY, the rising of national marine scientific activity, the foundation of the Hydrographic Office and the hydrographic survey of Easter Island.

1. The expeditions of Philip Parker King and Robert Fitzroy

Between 1826 and 1830, the English explorer Philip PARKER KING, conducted five scientific expeditions in Chilean waters. These were followed by those of his countryman Vice-admiral Robert FITZROY, hydrographer and meteorologist, who continued the task. FITZROY was in command of the BEAGLE, a brig of 240 tons, which was employed on the survey of the coasts of Patagonia, Tierra del Fuego and the Straits of Magellan. It is to be mentioned that the BEAGLE sailed from Plymouth on 27 December 1831, carrying as a supernumerary the eminent scientist Charles DARWIN. The work carried out by these illustrious mariners and scientists is recognized for its geographic extent, multidisciplinary nature and accurate perfection as the most important contribution of that period. (Fig. 3).

2. The rising of the national marine scientific activity (1834-1874)

During the mid XIXth century, transportation on the rivers was of great importance for the internal and foreign trade. This fact led to Commander Roberto SIMPSON being despatched in December 1834 in the brigantine AQUILES to carry out a full survey of the coast and estuary of the Rio Bueno, in the Province of Valdivia (Fig. 4). This survey and its corresponding plan constituted the starting point of much valuable and indispensable work in exploring Chile's coastline, as well as in investigations over an immense area of the ocean bordering its coast. The results of this work in the form of the first Chilean nautical chart is preserved and displayed in the gallery of honour of the of the Hydrographic and Oceanographic Service. Cdr. Roberto SIMPSON, who later reached the rank of Vice Admiral and the post of Chief of Staff of the Chilean Navy, was the first Chilean Hydrographer and the brigantine AQUILES became the first Chilean hydrographic vessel. This fine Spanish sailing vessel of 338 tons, was armed with 20, 12-pound caliber guns. She was

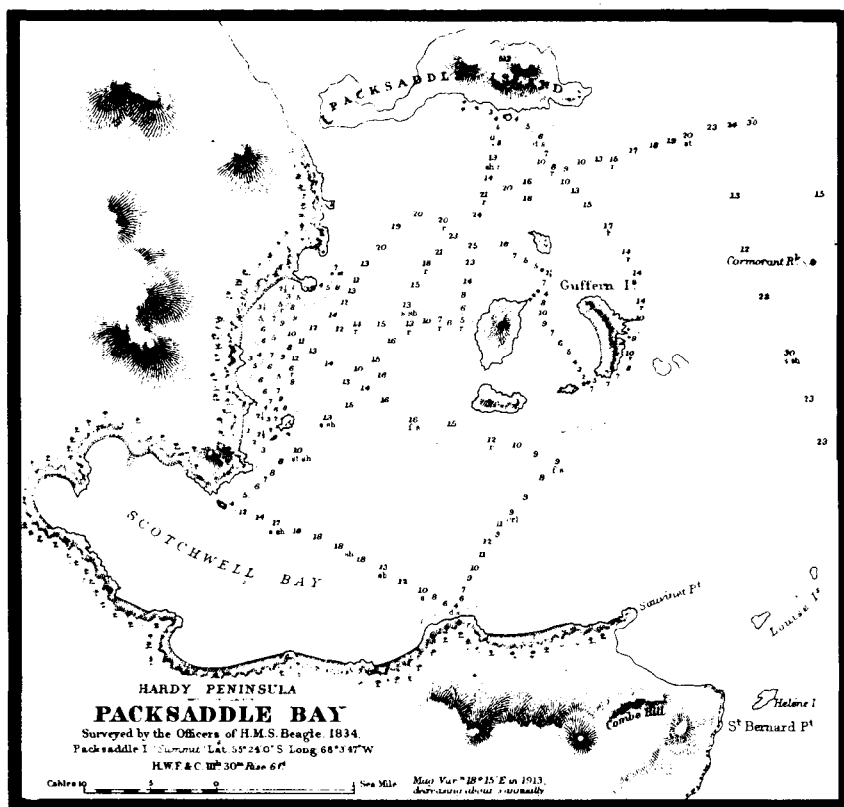


FIG. 3.- Chart 1834 Packsaddle Bay. Surveyed by the Officers of HMS Beagle.

commissioned in the Chilean Navy in 1825, when an officer and a group of Chilean crew members, prisoners in the vessel, captured her while she was anchored in Guam and sailed the vessel back to Valparaiso. In 1839, the vessel was lost in the same anchorage, due to a fierce storm.

The hydrographic and oceanographic activities along the lengthy Chilean coastline steadily increased after 1838 and continued for a period of 40 years, with distinguished hydrographers and several vessels contributing greatly to the production of nautical charts and scientific publications. In 1879, the scientific activity had to be temporarily abandoned for a short period due to the war with the confederation Peru-Bolivia, in order that it might take up various works of a geographical nature and other information which might be useful to the Army and Navy in their war operations. However, the task was taken up again in 1841.

Foreign explorers and mariners who contributed significantly to the investigations along the Chilean coasts during this period were: Julius Caesar DUMONT D'URVILLE (1837), Charles WILKENS (1839), James CLARK ROSS (1842), Richard C. MAYNE (1866-1869), Sir George NARES (1879-1880), Carlo de AMEZAGA

(1882), Giovanni PALUMBO (1882), Louis F. MARTIAL (1882-1883) and the German Captain PLÜDDEMAN (1883-1884).

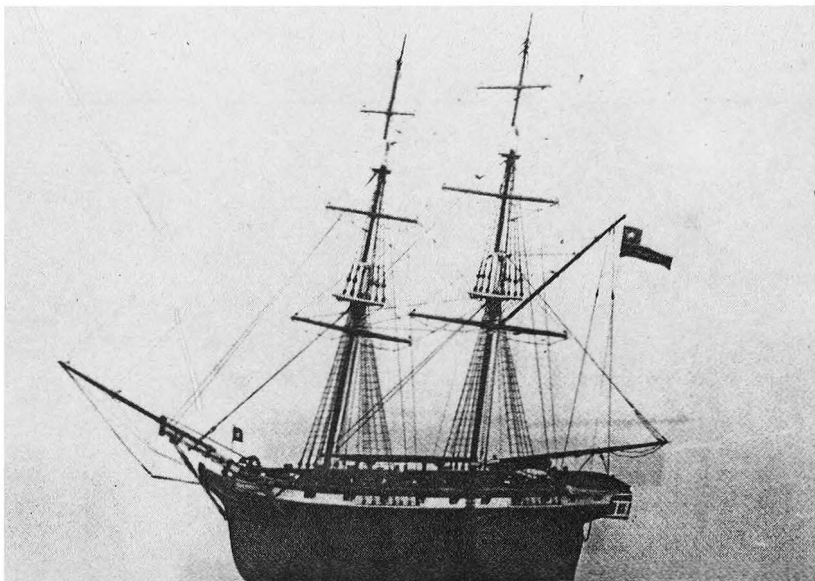


FIG. 4.- First hydrographic vessel AQUILES of the Chilean Navy.

This period marked the end of foreign contributions to the discovery of the Chilean coastline, following which the ongoing work remained entirely in national hands.

3. Foundation of the Hydrographic Office. First Works

On 1st May 1874, the President of the Republic Mr. Federico ERRAZURIZ ZANARTU and the Minister of the Navy Mr. Anibal PINTO GARMENDIA signed a decree instituting a Hydrographic Department based at the Ministry of the Navy in Santiago. Some years later, it became the "Hydrographic Institute of the Chilean Navy", without changing its basic structure. Commander Francisco VIDAL GORMAZ was nominated as the first Director, as a result of his efforts leading to its creation, as well as a recognition of his talents and achievements as a hydrographer, astronomer and gifted writer. Commander VIDAL started his work in the field of hydrography in 1857 and remained dedicated to the profession for a period of 34 years. During his term of Director of the Hydrographic Office he was promoted to Captain and stayed as Director until the end of his career, completing 17 years in that post.

The Hydrographic Office was the first national cartographic Agency established in South America and the 17th in the world to be established.

The year of its creation, the Office started with the publication of the Notices to Mariners and the first hydrographic plan was published (Maullin River). The following year, the first volume of the Hydrographic Yearbook was published (The latest volume published is N° 46) (Fig. 5).



FIG. 5.- First nautical chart 1874. Maullin River.

During the period 1874-1899 the country had to face two critical events, the Pacific Ocean War and, later, the 1891 Revolution. These events, besides their political and historical effects, altered the normal development of the Office. During the Pacific Ocean War, due to the absence of other cartographic bodies, the Hydrographic Office had to enlarge its area of competence to geographic studies and the production of topographic charts of the northern area of the country, to satisfy the needs of both the Navy and the Army.

During the period until 1899, 21 hydrographic yearbooks, 85 nautical charts and 19 publications on hydrography, navigation, nautical geography, sailing directions etc., were produced. A number of hydrographers and vessels were assigned to the task of surveying the long and intricate Chilean coast.

In mid 1899, the Hydrographic Department was transferred to Valparaíso, and occupied a building beside the Muelle Prat which was partly destroyed in the earthquake of 1906. Some important equipment, archives and instruments were lost.

The historical museum in the present Hydrographic and Oceanographic Service exhibits its history and recognizes its scientific contributions to hydrography. Among these contributions, the following should be mentioned : International Exhibition, Chile 1875, First Prize; International Geographic Congress, Venice, Italy, 1881, Diploma of Honour First Class; National Exposition, Chile 1884, First Prize; International Exposition, Chile 1884, First Prize; International Exposition, Liverpool, England 1886, Gold Medal and Diploma; Universal Exposition, Barcelona, Spain 1888; Gold Medal and Diploma and national exposition, Chile 1888, First Special Prize. The above mentioned awards correspond to the so-called "Golden Age of the Chilean Hydrography" which spans from the creation of the Hydrographic Office to the end of the XIXth century, specially the period under the direction of Captain Francisco VIDAL GORMAZ, who is nowadays considered as the father of the Chilean Hydrography.

4. Hydrographic survey in Easter Island

Near the end of the XIXth century, an important survey that produced a new chart of Easter Island was carried out under the command of Lt. Cdr. POLICARPO TORO, in command of the ANGAMOS. The plan of Easter Island produced from this survey has an historical importance, as it was included in the documentation officially presented for the signature of the agreement incorporating the island to the Chilean territory.

III. ACTIVITIES OF THE HYDROGRAPHIC OFFICE DURING THE XXth CENTURY (1900-1994)

The XXth Century will be notable as a period of significant technological development which had great influence on marine scientific activities. To mention some of them: the development of wireless radiotelegraphy that allowed in 1904 two Chilean Navy vessels to communicate at sea, causing the Hydrographic Office to broadcast time signals; the mechanical log (1900); the radiogoniometer (1907); the development of aviation; the development of the photographic and graphic arts techniques and the development of the hydrographic and oceanographic instruments.

In 1908, the Hydrographic Office moved to its present premises in Valparaíso, from the temporary home found in the Naval Dockyard buildings whilst awaiting definitive headquarters, after the earthquake of 1906. It incorporated, in 1911, the time signal station previously installed in the Naval Academy. In 1914, the School of Navigation and Hydrography was created. It has graduated 274 officers to date, including the graduation of some foreign officers.

The hydrographic and oceanographic field work continued intensely and continuously, surveying and studying the lengthy coastline and large oceanic area

facing Chile. In 1916, the Navy carried out its first Antarctic operation by means of the ship YELCHO. Under the command of the pilot 2nd class Luis PARDO VILLALON, it rescued the crew of the English vessel ENDURANCE, under the command of Sir Ernest SHACKLETON, which was trapped in the ice in the Weddell Sea and subsequently sank.

In 1921, together with other 17 national Hydrographic Services, it took part in the creation of the International Hydrographic Bureau, established in Monaco.

In 1930, the time signal station was modernized by the installation of an electromechanical pendulum system. In 1941, uninterrupted tide recording started in several places along the coast, to start with the annual publication of the tide tables of the Chilean coast. During the international geophysical year, 1957/1958, the Service represented successfully the country in the area of physical oceanography.

To date the Service has performed a total of 42 oceanographic cruises on board Chilean navy vessels and a similar number on board foreign research vessels. At present, the Service is taking part in six international oceanographic programmes, covering the Southeast Pacific Ocean and the Southern Ocean.

Another element contributing to Chile's international involvement in hydrography has been its participation in the IHO. During the VIIth International Hydrographic Conference in Monaco, Captain Alberto ANDRADE, the Director of the Service and Chilean delegate to the Conference, was elected Vice Chairman of the Conference; another Director and delegate to the Conference, Captain Raúl HERRERA, was elected as Chairman of the Nautical Publications Committee and Oceanographic Publications Committee, respectively, during the Conferences in 1967 and 1972.

In 1959, the Service joined the Pacific Ocean Tsunami Warning System, starting with the national system in 1964. The same year, the time signal station was upgraded to incorporate quartz oscillators. Later in 1971 and 1975, it was complemented and improved by the addition of atomic time reference oscillators based on cesium crystals, which provide high accuracy and thus a greater safety to the navigation through the Chilean waters.

In 1968, the National Oceanographic Data Centre was created.

In 1971, after the Chilean Government ratified the Convention of the International Hydrographic Organization, the service became the official national representative to the Organization (Fig. 6). Also during that year, the National Oceanographic Committee (CONA) was created and established in the Office's facilities. This Committee was tasked by the State with the responsibility of coordinating and controlling the scientific and technological marine science research conducted in national waters.

On 1 May 1974, the then "Hydrographic Institute of the Chilean Navy", celebrated its first centennial with various ceremonies attended by governmental and naval authorities, as well as directors of foreign allied Hydrographic Services and Captain Francisco VIDAL GORMAZ's direct descendants. As a recognition of the solid prestige built up by the Office, the IHB published a special article in the

International Hydrographic Review designed to inform the hydrographic community about the 100 years of achievements of the Service.



FIG. 6.- Session of the National Oceanographic Committee.

In 1980, the first Courses of Specialism for officers, one in Maritime Signalling and the other in Oceanography were implemented. The same year, the Service became a member of the Executive Committee of the International Association of Lighthouse Authorities (IALA) and hosted the 57th meeting of IALA. Another event of that year occurred when the Office was tasked to organize and host the VIIth Meeting of the International Coordinating Group of the Pacific Ocean Tsunami Warning System, which was attended by delegates of several countries.

During the XIIIth International Hydrographic Conference, in 1987, the Service was nominated as Regional Coordinator for the international chart scheme of the Southeast Pacific, Region C2, and started immediately to prepare the scheme working jointly with the Hydrographic Services of Colombia, Ecuador and Peru.

In 1990, the former "Hydrographic Office of the Chilean Navy", changed its name to "Hydrographic and Oceanographic Service of the Chilean Navy", as a way of properly reflecting the outstanding development achieved by the office in the oceanographic sciences during the last 50 years.

In April 1991, at its meeting held in Bandung, Indonesia, the FIG/IHO International Advisory Board, formed by members of the two organizations, recognized the course of hydrographic engineering implemented by the service, as

a course meeting category "A" Full recognition, in both specialisms "Nautical Charting" and "Port and Nearshore Surveys". Also during this year, as a result of a Chilean initiative, the Regional Hydrographic Commission was created, holding the first meeting in Valparaiso in June of the same year, with the attendance of the Directors of all the Hydrographic Offices of the region: Colombia, Ecuador, Peru and Chile and including representative of the IHB (Fig. 7).



FIG. 7.- Constitution of the Regional Hydrographic Commission of the South West Pacific.

Late in 1992, the 1994 tons research vessel VIDAL GORMAZ was commissioned into the Chilean Navy. This vessel, together with YELCHO (1935 tons) and the PILOTO PARDO (2000 tons), provide the platforms for the service to conduct oceanographic and hydrographic field work.

During the period 1991-1992, the SHOA's computer assisted cartography system was developed under the project name of AUTOCARTA. This system has permitted the acceleration of the compilation, colour separation and maintenance processes of nautical cartography. The first chart produced entirely from the system was one of the AYSÉN sound, in 1993 (Fig. 8).

In order to satisfy the increasing demand for nautical charts and a wide variety of hydrographic and oceanographic studies, the SHOA requested the Government for an extraordinary budget in 1992, in order to modernize and improve its capabilities. The extraordinary budget was approved for the period 1993-1995. To date, this supplementary budget has allowed the SHOA, among other improvements,

to automate the field data collection, and to incorporate GPS technology and data processing (Fig. 9).

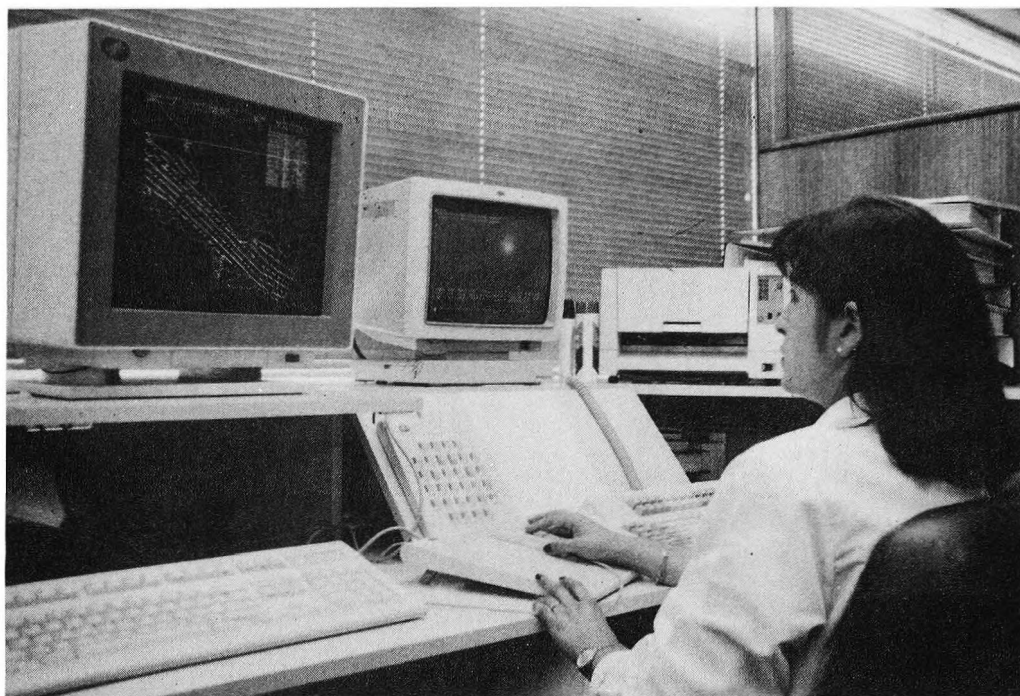


FIG. 8.- Cartographic work station.

In 1993, the Service hosted the first meeting of the IHO's Permanent Working Group on Hydrographic Cooperation in the Antarctica.

On 1 May 1994, the SHOA celebrated its 120th anniversary. To mark the occasion, it presented the Ministry of Education with a set of four publications about tsunamis and earthquakes and an oceanographic atlas. These presentations demonstrated the policy of SHOA to contribute to teach the people that knowledge of the oceans is a basic fact for the development of the country.

Today, the Service participates actively in the following Commission, Committees and Working Groups of the International Hydrographic Organization:

- Regional Coordinator for the INT Chart scheme (Region C-2).
- Chart Standardization Committee (CSC).
- Committee on ECDIS (COE).
- Commission on Radiobroadcasting of Notice to Mariners (PCRNM).
- FIG/IHO International Advisory Board on Standards of Competence for Hydrographic Surveyors.
- Working Group on Norms in Tidal Data Delivery to Commercial Companies.
- Working Group on Technical Aspects of the Law of the Sea (TALOS).

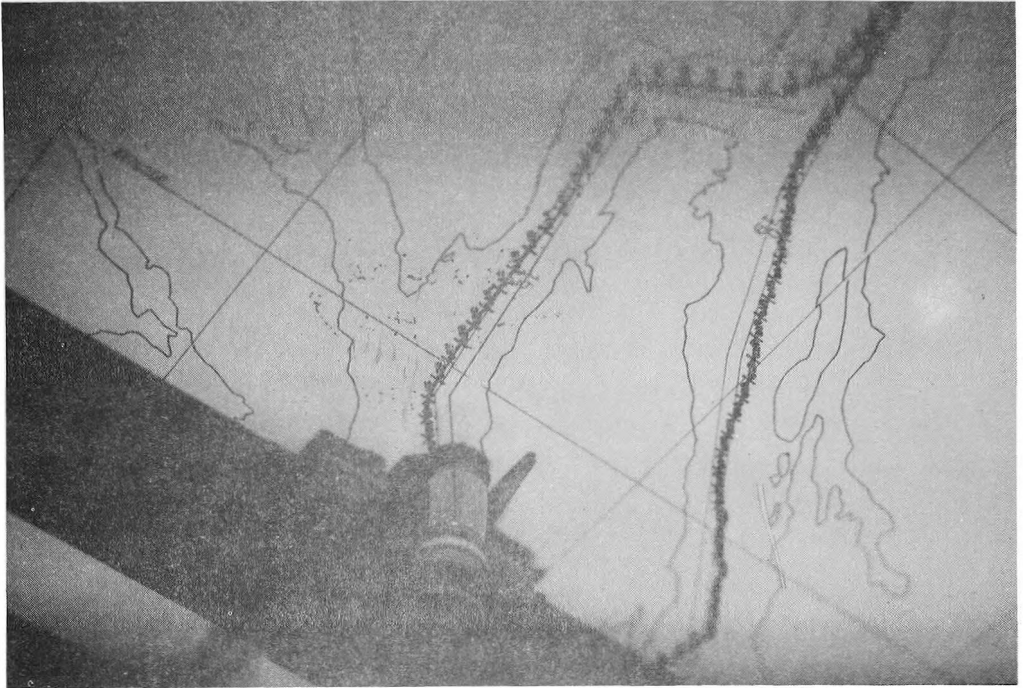


FIG. 9.- Plotter during sounding operation.

- IHO Permanent Working Group on Hydrographic Cooperation in the Antarctica (PWGCA).
- IHO Special Committee on Worldwide Electronic Navigational Chart Data Base (WEND)
- Southeast Pacific Regional Hydrographic Commission.

IV. THE IMMEDIATE FUTURE

The hydrographic, cartographic and oceanographic activity carried out through the years has been great, but much still remains to be done, due to the large national maritime territory involved, totalling 4,633,615 km², which compared to the 756,848 km² of the continental and insular territory, represents more than six times the land territories. This without considering the Antarctic Territory, which is under the regime of the Antarctic Treaty.

The SHOA is well aware of the objectives of both the national and international communities. Its contribution to the country's development, through an adequate response to all the technical and scientific requirements is an unavoidable responsibility. It is vital to increase and consolidate a higher degree of efficiency in meeting the broad variety of functions within the legal frame of its

attributions. At present several initiatives have been identified for the progressive steps of future development :

1. Automation of the Chart Correction Process.

In this respect, a level of partial automation is sought by employing a low cost configuration, based on a personal computer connected to a digitizer and a plotter. Graphic software will allow the automatic orientation and scaling of the charts to be corrected before being distributed to mariners. The Notices to Mariners bulletin will continue to be the main source for the corrections to the published charts.

2. Upgrading of the National Tsunami Warning System.

The French technology system called "Tremors" will shortly be incorporated to the Service's capabilities. The main advantage presented by this system is the drastic reduction of the time needed to evaluate and to transmit a tsunami warning, as well as to determine, with high accuracy, the earthquake epicenter and magnitude. These capabilities will allow the civil authorities to make better and quicker decisions in case of this kind of natural disasters.

3. Education.

Recently, the Chilean Navy have completely restructured its educational system, with special stress in the training of officers. High priority has been given to the course "Hydrography and Oceanography for Officers", lasting two years and including a comprehensive education in both the hydrography and oceanography fields. At the same time, a complete study course on "Coastal Zone Management" has been developed in conjunction with the maritime university of Chile. This course is mainly intended for civilians and was submitted to the FIG/IHO Advisory Board in March 1994, obtaining Academic recognition in category "B", with Specialism "Coastal Zone Management".

4. Upgrading of the Photogrammetric Capabilities.

In order to speed up the production of digital data to be supplied to the computer assisted cartography system and the electronic charting system, the photogrammetric capabilities will be upgraded and improved during the present year.

5. Development of the Electronic Charting Capabilities.

Finally, and as a 5th step of the modernization, and considering that the IHO is in the final stage of approving and promulgating the standardized technical specifications for the electronic chart production,

the SHOA has started the development of capabilities to produce official electronic charts, to be employed on board by means of an ECDIS, optimizing significantly the safety of shipping in all the national waters, specially in international traffic routes, congested areas, narrow and intricate passages and the access to the main ports.

As a result of its historical development and its planned modernization, as described above, the Chilean Hydrographic and Oceanographic Service will set a course to continue to serve the Chilean people and in so doing make a sound contribution to the safety of navigation.