Sedimentology in the Southwestern Lagoon of New Caledonia, SW Pacific

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ABSTRACT ∎

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The southwestern lagoon of New Caledonia belongs to a large reef complex. It can be divided into coastal bays and a true coral reef lagoon which includes from the shore to the open sea: a coastal channel, a submerged coral plateau with cay reef flats, and a back reef area limited by a barrier reef line. During each tide the flood enters by the southeast part of the lagoon through the passes, and above the barrier reefs. The passes play a prominent role during the ebb tide. Resulting tidal currents added to the influence of the trade winds are one of the main factors playing on sediment distribution. The color of sediments, their chemical composition and size distribution, and the constitution of bioclasts show that three sedimentary stocks are present in the lagoon. The first one of medium size ($M_d = 0.5$ mm) exists in almost every part of the lagoon. It is replaced by a second one, finer ($M_d = 0.063$ mm) and mostly of continental origin within the coastal bays. This stock is spread out in the coastal channel and the submarine valleys. The last one ($M_d = 0.125$ mm), which can be found near the barrier reef area is poor in large living *Formanifera*. The erosion of the barrier reef during the last 3,000 years might have produced this latter stock.

ADDITIONAL INDEX WORDS: *Sedimentation, lagoon, coral reef, New Caledonia, Pacific.*

INTRODUCTION

Several sedimentological studies have been conducted in the New Caledonian lagoon and especially in the southwestern part of this lagoon (AVIAS, 1953; GAMBINI, 1959; SALVAT, 1965; BALTZER, 1965, 1970; LAUNAY, 1972; DUGAS, 1973, 1974; COUDRAY, 1976). These works have, however, always been limited to restricted areas, mainly to the Bay of St. Vincent.

Sediments were also sampled by the Service Hydrographique et Océanographique de la Marine in New Caledonia during the bathymetric surveys for marine maps. Some of these samples were available and were completed during campaigns aboard *N.O. Vauban*, from the O.R.S.T.O.M., between 1976 and 1979. A large area of the southwestern lagoon (about 3,000 km²) was thus surveyed with a 1-nautical-mile grid. The grain size analysis permitted the drawing of four sedimentological maps

(scale 1:50,000): "Tontouta", "Nouméa", "Mont Dore", "Prony" (DUGAS and DEBENAY, 1978, 1980, 1981, 1982). The purpose of the present work is to expand the more descriptive aspect of maps.

REGIONAL BACKGROUND

The main island of New Caledonia (La Grande Terre) is an elongated island of some 400 km that extends from the northwest to the southeast. It is 50 km wide and has an area of 16,759 km² (Figure 1). The island is mainly constituted by a single mountain range of high plateaux (800 to 1,200 m) that are topped with by summits 1,200 m to 1,600 m high (DOUMENGE, 1966).

New Caledonia is located in the southwestern Pacific (156° to 167° E and 18° to 23° 5' S) and has a tropical-oceanic climate dominated by southeast trade winds. Cyclones and tropical depressions reach the island during summer (December to March) bringing considerable rainfall. River dis-
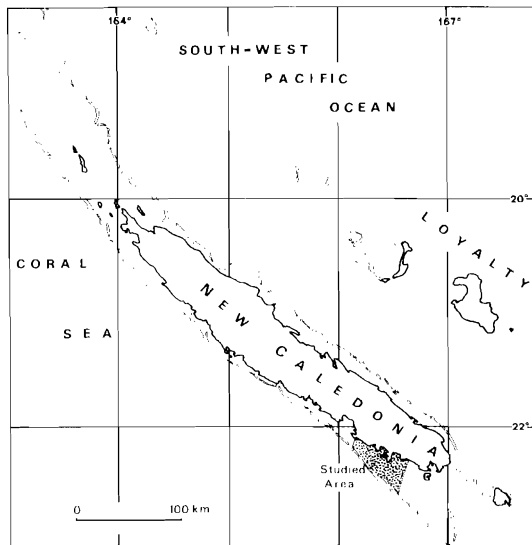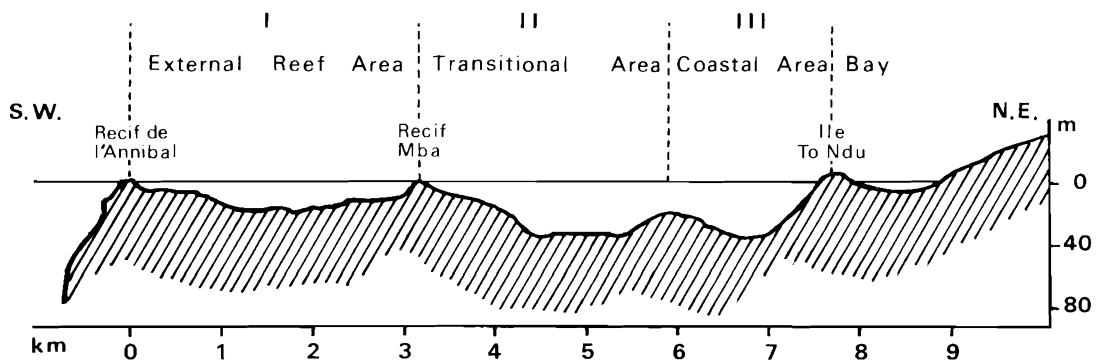
Figure 1.   Location map.

Figure 2.   Morphology of the lagoon (see traverse, Figure 3).

charges are very irregular and depend mainly on climatic conditions, as well as the balance of terrigenous sediments they can carry to the lagoon.

The shore is a submerged coast with drowned valleys that extend through passes in the reef to submarine canyons. The geological structures of the insular plateau forming the lagoon surface forms a steep-sided depression below the barrier reef (226 m at the islet Tenia |COUDRAY, 1971]). This coastal fringe is occupied by a reef complex that is partly isolated from the Coral Sea by the barrier reef along the whole 1,500 km length. The lagoon thus delimited is 65 km wide at its maximum to the southwest, though variable in its width. From the open sea to the shore, four different areas are marked by three reef lines (THOMASSIN, 1984): an external reef area—on its outer part behind the barrier reef lies a hydraulic dune ("fonds blancs"); a transitional area between the first area and a coastal one; a coastal area where the sediments are partly terrigenous; and finally the bays, the main ones being those of St. Vincent, la Dumbéa and du Prony. The coastal and transitional
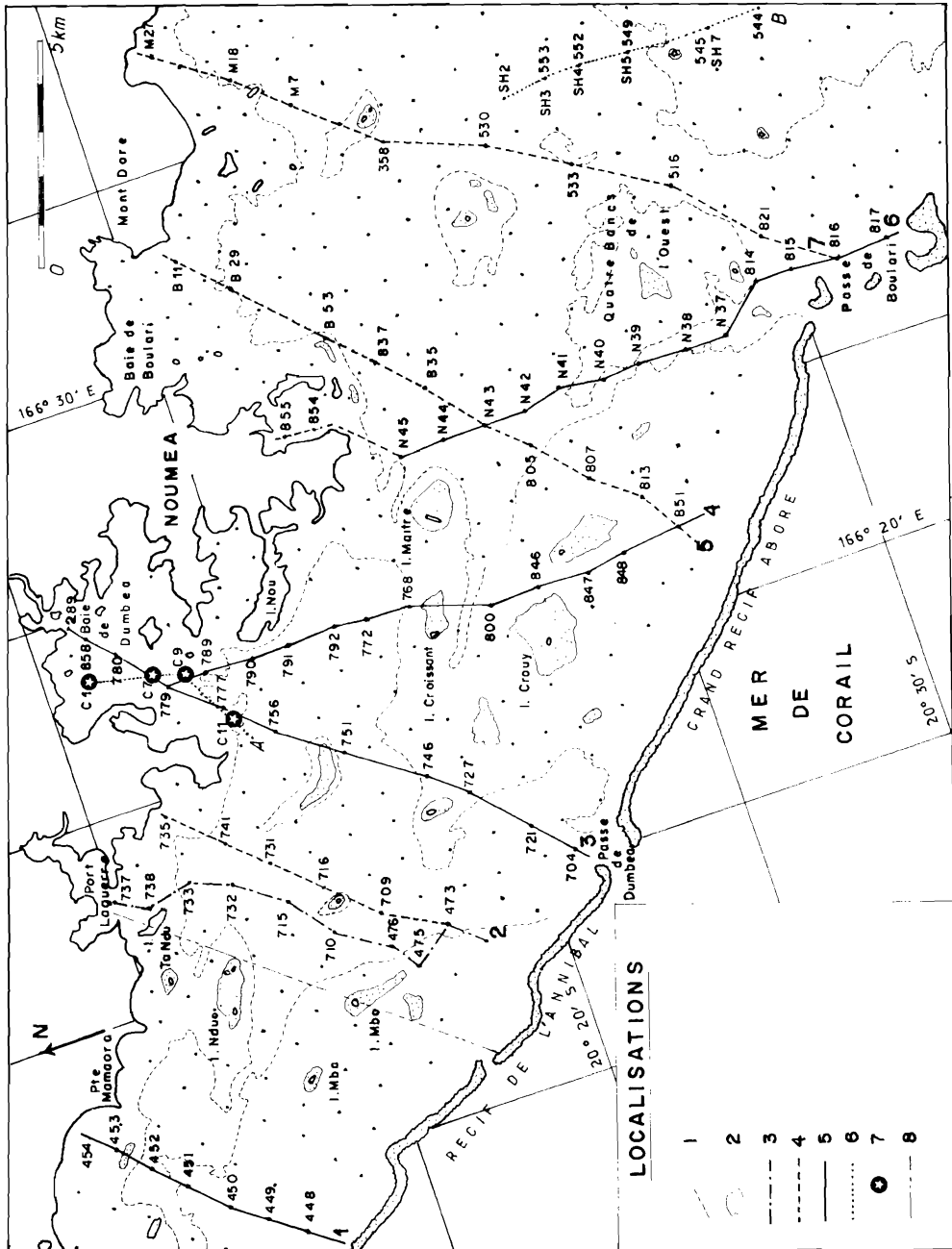
Figure 3. Location of samples and traverses. (1) contour—20 m; (2) coral reef; 3 to 6: traverses (3—frequency curves; 4—cumulative curves; 5— cumulative curves with a probability ordinate scale; 6—chemical analysis); (7) cores; (8) morphological section.
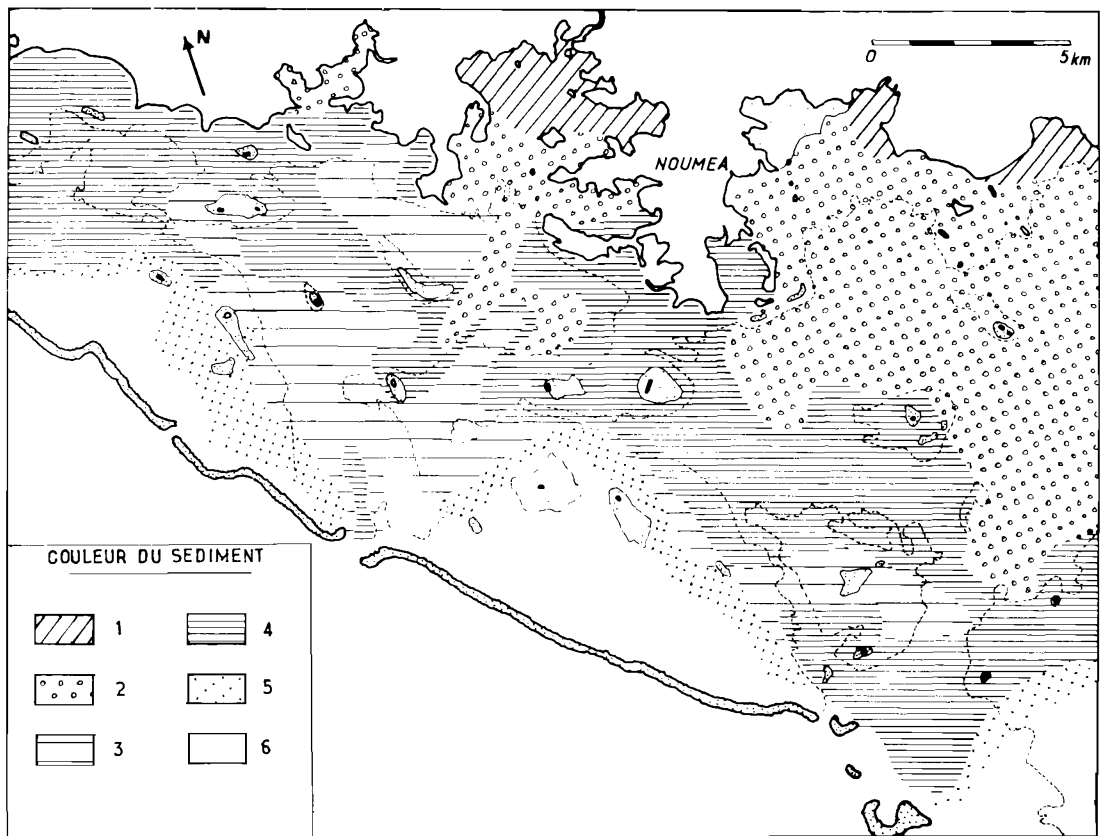
Firgure 4. Prevailing colour of the sediments. (1) white; (2) yellow; (3) light grey; (4) dark grey; (5) ochre; (6) red or brown.

areas appear to be channels, sometimes more than 20 m deep. The layer of recent sediments, usually not very thick, lies upon several levels of hardground (Figure 2).

THE SEDIMENTS

Location of Samples

The maps cover the area from the Bay of St. Vincent to the Bay of Prony. As previously noted, the sediments were sampled during different campaigns. So, to prevent the risk of mistakes due to possible differences in methods, this study is limited to 300 samples by Neyrpic grab sampler from the *N.O. Vauban* or the *Santa Maria* of the O.R.S.T.O.M. (Figure 3).

Methods

The sediments are mainly of biodetritical origin and except for those sampled in the bays they are

poor in the finest fractions. Although these fractions have not been studied in detail, they are considered as a fractional part of the total sediment. The grain-size analyses were conducted by wet sieving according to A.F.N.O.R. standards. In addition to granulometrical characteristics, other properties were considered, especially the colour, which is of particular interest.

Colour of the Sediments

The samples have been classified into 6 categories according to their prevailing colour: white, yellow, light grey, deep grey, ochre, red or brown, which enabled the drawing of a map (Figure 4). DUGAS (1974) and COUDRAY (1976) have noted some variations in the colour of the sediments but they have only taken them into account in localized traverses.

The distribution of these main types of sediments is shown on maps. An initial observation shows that the lagoon is divided into three main areas that lie roughly parallel to the coast and the barrier reef. From the coast to the reef, they are: an area where red or ochre predominate, an area where grey predominates, and a white area edged with a yellow margin along its internal side. This last area is linked with the hydraulic dune behind the reef and coincides with shallow bottoms (generally less than 10 m deep).

The chemical analysis of samples taken along A (LAUNAY, 1972) and B (DUGAS, 1973) traverses are shown in Figure 5. It is noted that the metallic oxide content becomes less important from the estuaries to the reef. Apparently it is possible to draw a parallel between the variations in Fe_2O_3 percentage (Figure 5) and those of the colour of the

Figure 5. Chemical analysis.

sediments (Figure 4). The deposits of Fe_2O_3 (of continental origin) by the rivers, especially after cyclonic downpours, must be taken into account to explain this distribution. The Fe_2O_3 precipitates in large quantities at the mouths of rivers where it colours the sediments red, providing the oxide content of the sediments is greater than 8%. The Fe_2O_3 is also carried away from the coast into the channel of the lagoon where it colours the sediments ochre if it constitutes more than 2% of the chemical components of the sediment. Thus, the map of sediment colouring shows the precise Fe_2O_3 percentage and also points out the importance and wide-ranging distribution of terrigenous deposits (Figure 4).

In the deepest parts of the lagoon the organogenous deposits are frequently iron stained, which imparts a grey colour to all of the sediments. This iron staining of bioclasts has also been reported to occur in the Bahamas (ILLING, 1954), in the Persian Gulf (SUDGEN, 1966) and in the southern part of Australia's Great Barrier Reef (MAIKLEM, 1967).

According to ILLING (1954), these stained sands are residual deposits where the calcium carbonate has been removed in solution by percolating rain water. This occurrence is not a similar case. MAIKLEM's explanations seem to be better adapted to New Caledonian conditions when the iron of terrigenous origin is adsorbed by clay-sized particles or, in colloidal form, it is carried by rivers. When it settles into sediments where conditions are highly reducing, it is changed into iron pyrites by sulpho-reducing bacteria. MAIKLEM (1967) notes that the tests of Foraminifera are more frequently coloured by iron pyrites produced in this way than other bioclasts; this selective colouring is proportioned relative to the persistence of organic material acting as nuclei in the precipitation of iron sulphide. As far as the New Caledonia lagoon is concerned, this seems doubtful because other bioclasts, as well as the tests of Foraminifera, are also coloured. Anyway, as MAIKLEM (1967) suggests, a high percentage of stained grains in the surface of sedimentary deposits means that the reducing area is near the sediment surface and that this zone is constantly reworked by the burrowing organisms. MAXWELL (1968) believes that these stained sands resemble relict sediments; dates from two samples on the Great Barrier Reef show ages of 4,950 and 2,970 years B.P.

When bottoms shore up near hydraulic dunes behind the reef, a yellow colour prevails. Inspection of bioclasts shows that this colour is due, on the one
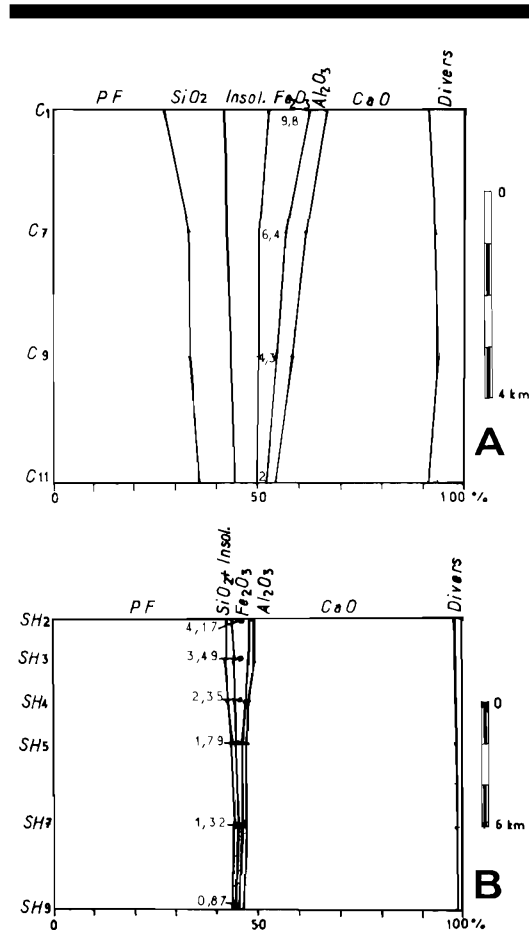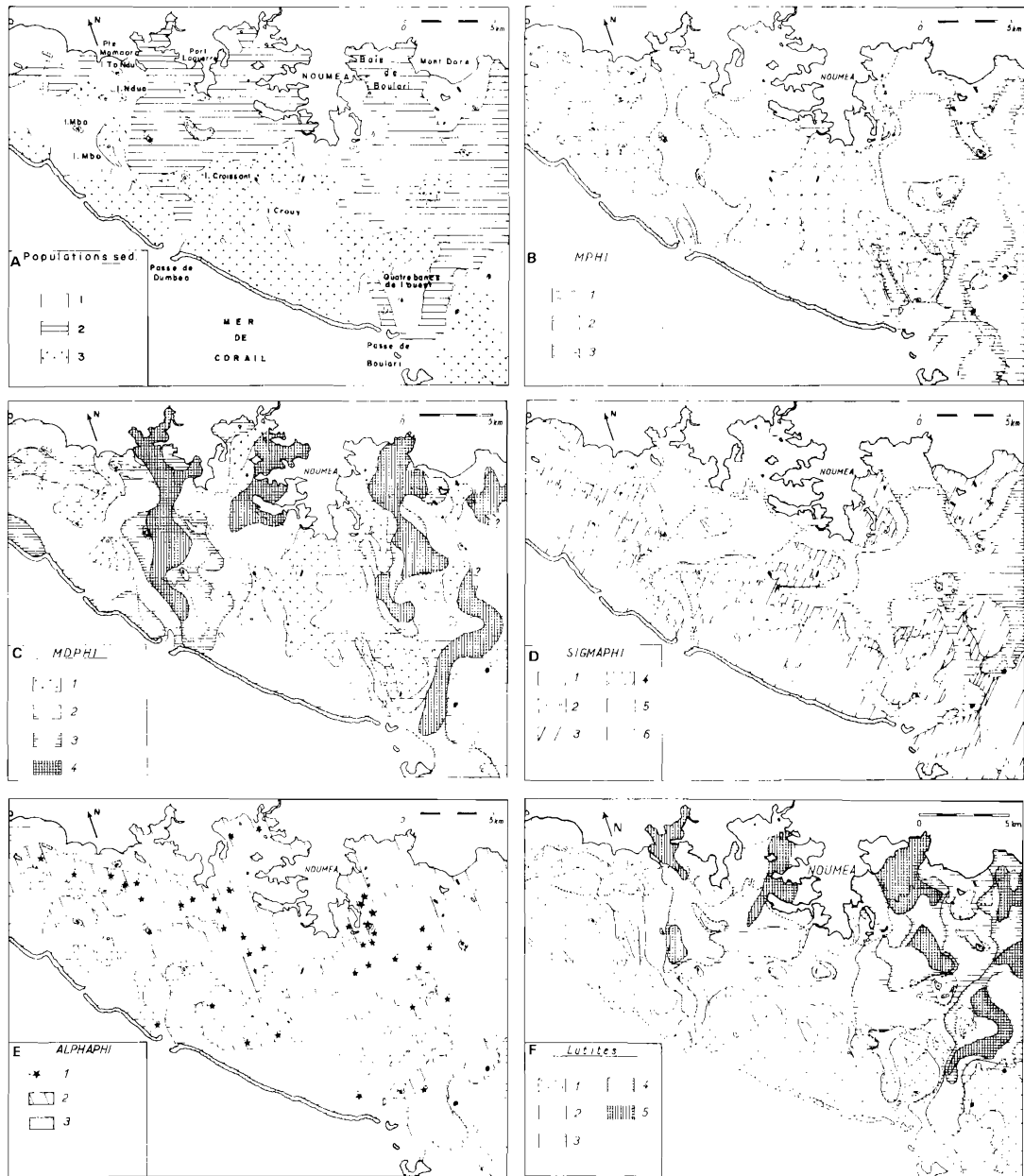
Figure 6.   **A**—Distribution of sedimentary populations II and III. (1) Lack of populations II and III; (2) Population III; (3) Population II.
B—Isopleth Map of Mean Diameter. (1) $M\varphi < 1$; (2) $1 < M\varphi < 2$; (3) $M\varphi > 2$. **C**—Isopleth Map of Median Diameter. (1) coral reef;
(2) $Md\varphi < 1$; (3) $1 < Md\varphi < 2$; (4) $Md\varphi > 3$. **D**—Isopleth Map of Dispersion. (1) coral reef; (2) $\sigma\varphi < 1$; (3) $1 < \sigma\varphi < 1.5$; (4) $1.5 < \sigma\varphi < 2$;
(5) $2 < \sigma\varphi < 2.5$; (6) $\sigma\varphi > 2.5$. **E**—Isopleth Map of Skewness. (1) $\alpha\varphi > 0$; (2) $-0.10 < \alpha\varphi < 0$; (3) $\alpha\varphi < -0.10$. **F**—Isopleth Map of Silt
and Clay. (1) $< 5\%$; (2) $5 << 25\%$; (3) $25 << 50\%$; (4) $50 << 75\%$; (5) $> 75\%$.

hand, to pigmentation preserved on certain bioclasts and, on the other hand, to the presence of many coloured (brown, orange or yellow) grains. Apparently the mechanisms proposed by MAIKLEM (1967) to account for this colouring describe New Caledonian conditions, viz.: the bioclasts previously enriched with iron sulphides are returned to an oxidating zone, either through a slow reworking of sediments by organisms or through erosion of surface sediments. The iron is then oxidized to brown-coloured oxides and hydroxides. As the yellow-coloured sediments are situated behind the hydraulic dunes, in an area where the hydrodynamic activity is quite strong, the second process takes place here.

Behind the reef the bioclasts are totally colourless, possibly because there are few terrigenous iron deposits and because under strong oxidizing conditions the percentage of dissolved oxygen is frequently higher than the normal saturation percentage (ROUGERIE pers. comm.). This explains the name of "fonds blancs" (white bottoms) given to these sediments.

Part of the "white bottoms" could be relict. Indeed, relative sea level in this region was lowered 1.5 m during the last three thousand years (AVIAS, 1953; LAUNAY and RECY, 1972; COUDRAY and DELIBRIAS, 1972; COUDRAY, 1976). Erosion of the barrier reef flat during this period could have produced a large quantity of bioclasts.

Grain-Size

Grain-size Frequency Curves

These curves don't allow calculation of the sedimentological parameters; yet they are convenient to visualize the relative importance of the different stocks constituting the sediment (BULLER and MCMANUS, 1979). Thus, the frequency curves show (if coral blocks and big shell fragments are excepted) that the lagoonal sediments are organized into three main stocks:

stock I with a mode between $\varphi = 1$ and $\varphi = 2$ (0.5 and 0.25 mm);

stock II with a mode equal to $\varphi = 3$ (0.125 mm); and

stock III with a mode equal to or above $\varphi = 4$ (0.063 mm).

These stock arise at various stages in the constitution of the total sediment. Their relative importance varies from one area of the lagoon to another, and they can be totally missing. Several

general features can be shown (Figure 6) when using the frequency curves.

Stock I exists in the greatest part of the lagoon. It only disappears close to the barrier reef and near some reefs, in the lowest part of the submarine valleys, and sometimes in coastal bays. Stock II is localized within the same reef areas, either near the barrier reef itself or near patch reefs in the lagoon where it tends to replace stock I. Stock III is localized in the lagoonal depressions in front of the mouths of the main rivers, in coastal bays, and in submarine valleys. In the bays, it takes the place of stock I and is partly of continental origin. The traverse between the bay of Port Laguerre and the barrier reef (Figure 3) clearly shows the evolution of these three stocks from the terrigenous area to the barrier reef (Figure 7).

Textural Parameters of the Sediments

The calculations have been worked out for all the samples which did not contain too many fine or coarse fractions.
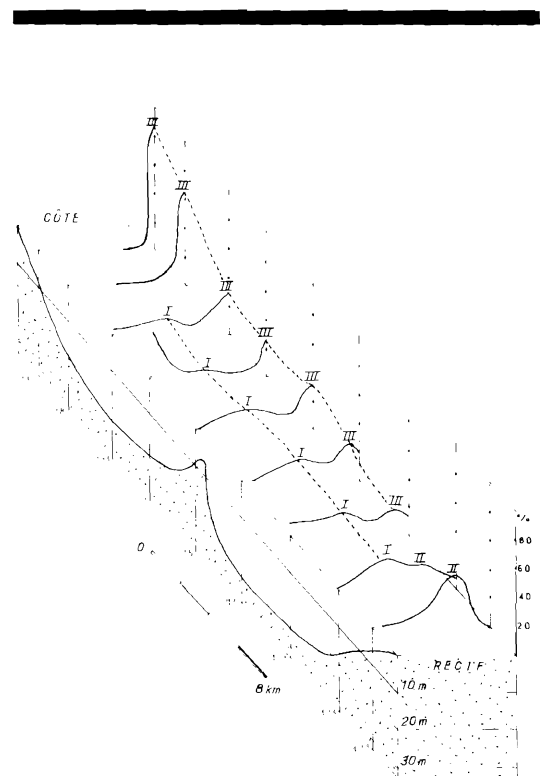

Figure 7. Traverse Port-Laguerre/Récif de l'Annibal: frequency curves.

The parameters used in this study are:

phi median diameter: Mdφ = φ50

phi mean diameter: Mφ = (φ16 + φ84) /2

phi skewness measure: $\alpha\varphi$ = Mφ − Mdφ

phi deviation measure: $\sigma\varphi$ = (φ84 − φ16) /2

Firstly, the values of these parameters have been written down on maps so that their repartition in the lagoon would be seen as a whole.

Repartition of the Values of Mφ and Mdφ

The two maps (Figure 6 B, C) show that the lagoon is divided into areas roughly perpendicular to the coast and the reef.

The finest sediments extend between the mouths of the rivers and the passes. This description supports statements that were previously established about the colour of the sediments and observations of frequency curves, i.e., the finest sediments are partly of continental origin. The concentration of the finest sediments in the submarine valleys is linked with bathymetry. But it must be noted that after heavy downpours, rivers carry large loads, e.g. 12,000 tons of silt and clay-sized particles for the Dumbéa River after Cyclone Brenda (BALTZER and TRESCASES, 1971). Turbidity measurements would ascertain whether river waters, becoming denser, use their old submarine valleys.

Except in fine sediments that have accumulated in the submarine valleys, Mφ and Mdφ are most often between 1 and 2. Lower numbers can be found close to the patch reefs in the lagoon and also along two narrow strips perpendicular to the coast. In the first case, low values are associated with deposits of bioclasts from adjoining reefs and by a shallower depth which makes the action of waves noticeable, i.e. the finest parts cannot settle. This phenomenon has also been noted near patch reefs in Australia's Great Barrier Reef where the sediments are much coarser than in the rest of the lagoon and mainly composed of organogenous material (coral remains) (FRITH, 1983). MAIKLEM (1970) remarks that because of their large grain size and density (2.7 to 2.8) these coral remains can hardly be moved, hence their slight dispersion.

The second case can be explained by hydrodynamic conditions within the lagoon. During each tidal cycle the mass of water moving parallel to the coast in the inner part of the lagoon (ROUGERIE, under press) passes two coral patch reefs which interfere with its circulation (groups of reefs Maître–Croissant and Ndué). Because the passable part of the channel is narrow, water moves more quickly; between the reef Maître and the peninsula of Nouméa, the current may reach 1 m/sec, preventing the finest parts from settling (ROUGERIE in DUGAS and DEBENAY, 1981).

The isopleth map of Mφ shows that near the passes the fine sediments drift southeastwards. The coarser sediments (Mφ < 1) spread from the passes along an oblique line with regard to the coast and are directed from south to north. This distribution follows the general direction of tidal currents (ROUGERIE, ibid.). Thus, both the circulation of the tidal currents and values of the central textural parameters of the sediments correspond.

Isopleth maps of Mdφ also show a sedimentological continuity between the bay of Port Laguerre and the pass of Dumbéa. This continuity does not exist between this pass and the Dumbéa River mouth. This is the only river that shows coarse sediments in its

mouth. Thus, it may be concluded that most fine terrigenous particles settle out in the bay and do not reach the lagoon.

Isopleth Map of $\sigma\varphi$ (Dispersion). Figure 6D shows how the index of dispersion $\sigma\varphi$ is distributed, by using the limiting values of 1, 1.5, 2 and 2.5. This map clearly shows that the limiting value $\sigma\varphi$ = 1.5 coincides with the 20 m external contour. The sediments in areas II and III are very badly sorted in the deepest parts ($\sigma\varphi$ < 2.5) and less so in the narrow parts. Those in area I are better sorted. On shoals surrounding the inner reefs of the lagoon, the sediments are very well sorted under the effect of the waves (orbital currents.)

In the narrow parts of the lagoon the moderate sorting is due to tidal flows, thus resulting from alternative amounts and from variable energy. On the shallower plateau of area I, tidal currents are effective but two additional phenomena occur: (a) a northeast drift occurs during the flood tide of the mass of water pushed by the prevailing southeast trade winds, and (b) the flow of water over the barrier reef with each breaking wave and even when the weather is calm (GOIRAN in GUILCHER, 1965). This second intermittent phenomenon, which causes alternating flows of the water mass behind the reef, is especially pronounced between the high mid-tide and the low mid-tide. The combined effects of these three hydrodynamic agents lead to continual winnowing of the sediment, which explains its rather good sorting.

Isopleth Map of $\alpha\varphi$ (Skewness). On Figure 6E the positive values have been distinguished from the negative values, as well as the ones over −0.1 from the ones under −0.1. It is clear that most

sediments of the lagoon have a negative $\alpha\varphi$. The positive values only appear in the deeper part of the channel on the east side of the map, and in front of Dumbéa Bay. On the whole, in the lagoon, the coarser fractions predominate over finer ones.

Many sedimentologists, as pointed out by BULLER and MCMANUS (1979), note that a negative $\alpha\varphi$ is mostly associated with sedimentary deposits where waves or strong currents are frequent. If we adhere to this concept, it can be concluded that the lagoon seems an unlikely site for active deposition. This is confirmed by the fact that an increasing $M\varphi$ is never found (except in silted bays) together with an increasing $\sigma\varphi$, which is typical of active sedimentation. The meaning of $\alpha\varphi$ must, however, be interpreted cautiously because of the mainly organogenous origin of the sediments. Shells, tests and skeletons of living organisms, which contribute a coarse fraction which combines with the sediment without being carried away or broken up by eroding agents, alters the value of $\alpha\varphi$. The limit $\alpha\varphi = -0.1$ seems to be associated more with a change in the settling conditions than $\alpha\varphi = 0$.

Yet the thinness of the sediments which cover the hardgrounds (THOMASSIN and COUDRAY, 1981) confirms a low rate of sedimentation. MAXWELL and SWINCHATTE (1970) have verified the same phenomenon on the Australia's Great Barrier Reef. They think the sedimentation rate, except for some special areas (back reef, silted bays) will remain low until the advent of a new regression in sea-level.

Percentage of terrigenous and calcareous silt and clay-sized sediment (Figure 6F). Muds play an important role in the distribution of benthic populations because they fill pores in bottom sediments and because they adsorb organic molecules which help facilitate the development of microorganisms. There are two important reasons for our special study of this fraction.

Fine particles (< 0.063 mm) make up less than 5% of the whole sediment in the sandy area behind the reef and in the greatest part of area I as well as the shallow areas (Reef Maître–Croissant, Quatre Bancs du Nord) and on the windward slope of some coasts or islands (southeast head of the Nouméa peninsula, islets Porc–Epic and Bailly) A fringe of slightly muddy sediments (5 to 10%) lies along area I and follows its inner slope. Such sediments can also be found along the northwest coast (islet Tu Ndu, Cape Mamaroa) and between the reef Maître and the Nouméa peninsula where the bottoms rise up to form a shelf.
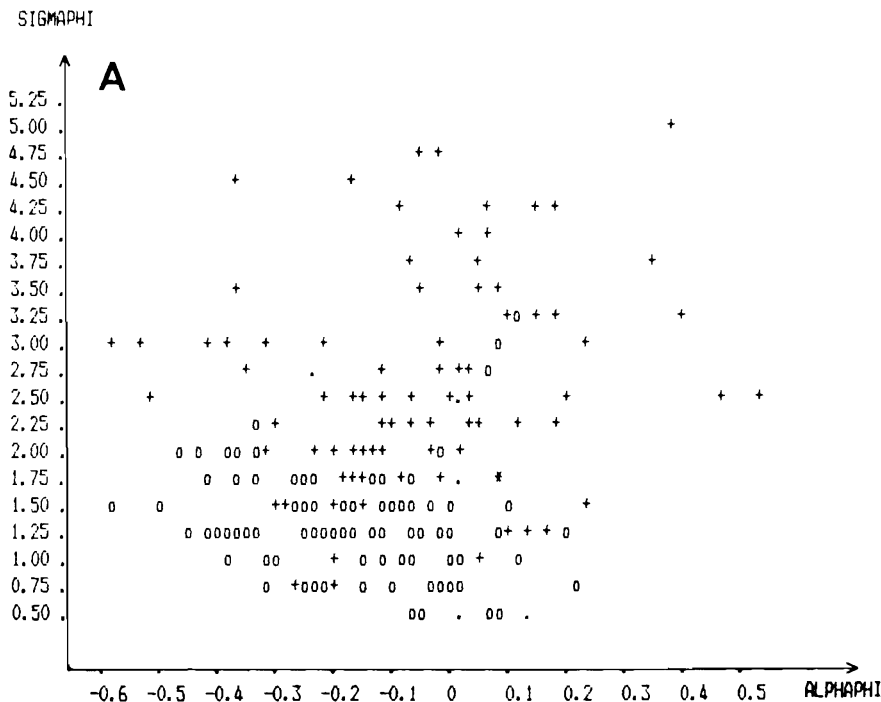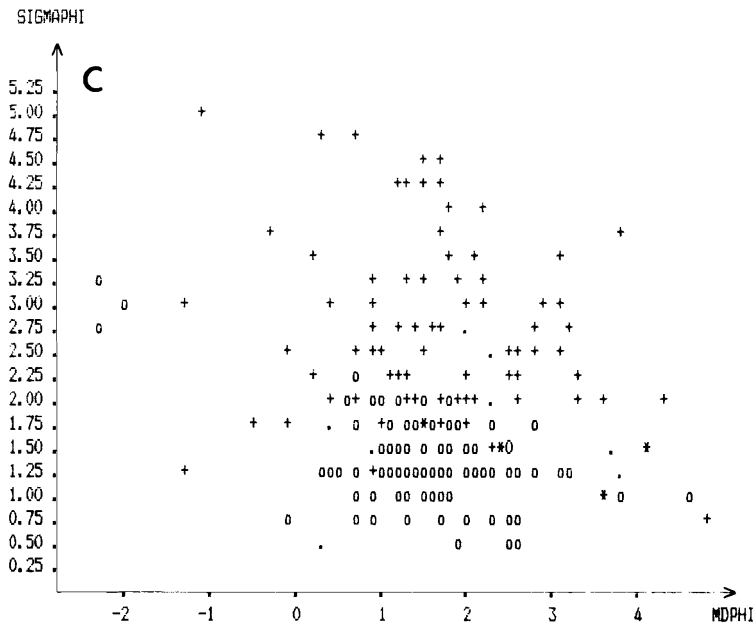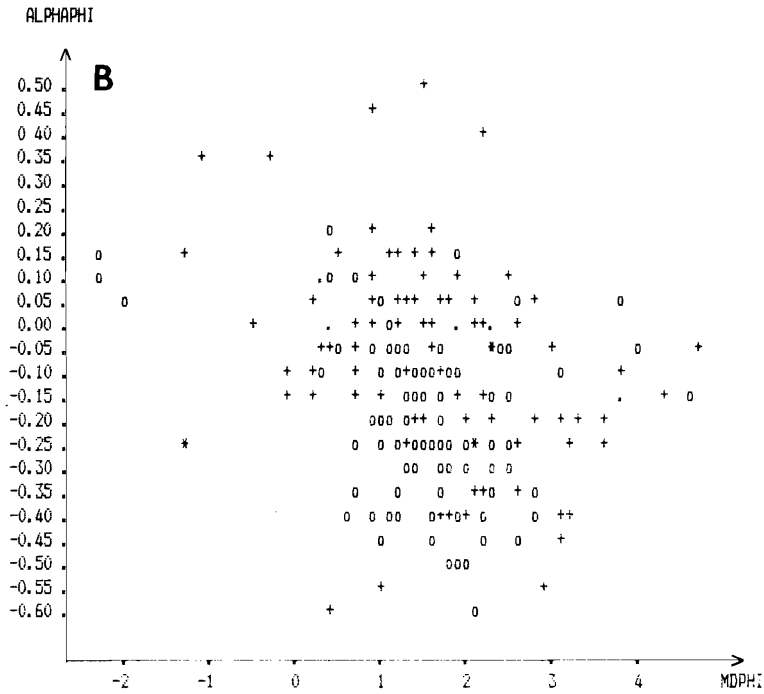

Figure 8A. $\sigma\varphi$ plotted against $\alpha\varphi$.

ALPHAPHI

SIGMAPHI

Figure 8B. $\alpha\varphi$ plotted against Mdφ. Figure 8C. $\sigma\varphi$ plotted against Mdφ.
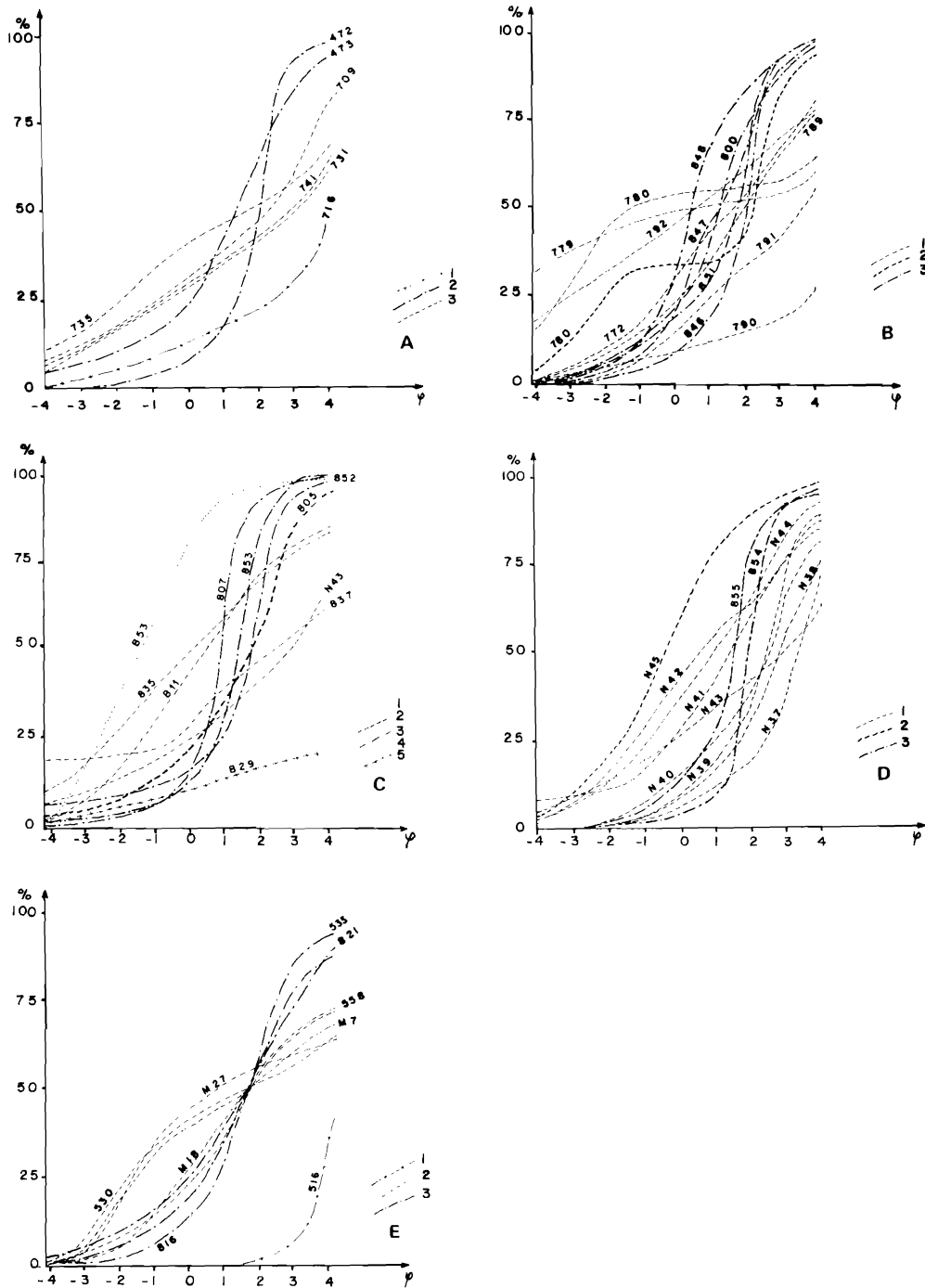
Figure 9. Traverses; cumulative curves. **A.** Traverse 2: (1) submarine valley; (2) external reef area; (3) channel. **B.** Traverse 4: (1) channel; (2) outer part of channel; (3) external reef area. **C.** Traverse 5: (1) channel; (2) outer part of channel; (3) external reef area; (4) windward slope of a patch reef; (5) coastal bay. **D.** Traverse 6: (1) channel; (2) shallow area; (3) coastal bay. **E.** Traverse 7: (1) coastal bay; (2) channel; (3) external reef area.

In the deeper parts of areas II and II, the sediments always contain more than 10% fines, the proportion increasing to 30% in the deeper zones and even to 50% in the submarine valleys (except close to the channels). Muddy deposits in the submarine valleys seem to be connected to those of coastal bays.

These established facts, complementing those given above, enable us to identify the hydrodynamics of the lagoon. Winnowing, which eliminates the fine fractions, occurs in the back reef throughout area I. Stronger currents in parts of the lagoon obstructed by reefs or shallow bottoms also restrict deposition of muds. On the other hand, it seems clear that rather large quantitites of fine sediments settle in areas II and III.

Relationship between the textural parameters

The diagrams shown in Figure 8 were obtained by plotting Mdφ against $\alpha\varphi$, Mdφ against $\sigma\varphi$ and $\alpha\varphi$ against $\sigma\varphi$. They show that only $\sigma\varphi$ varies significantly between area I and areas II and III.

The dispersion of the dots and the values of the correlation coefficients (R = -0.273 for Mdφ and $\alpha\varphi$, R = 0.246 for $\sigma\varphi$ and $\alpha\varphi$, and R = -0.178 for Mdφ and $\sigma\varphi$) show there is no significant connection between these parameters. Yet some general tendencies can be inferred. It can be noted that the sediments of area I are less well sorted ($\sigma\varphi$ increases) when they are coarser (Mφ decreases) and when the coarse fraction becomes dominant ($\alpha\varphi$ decreases). This corresponds to an imbalance caused by shells
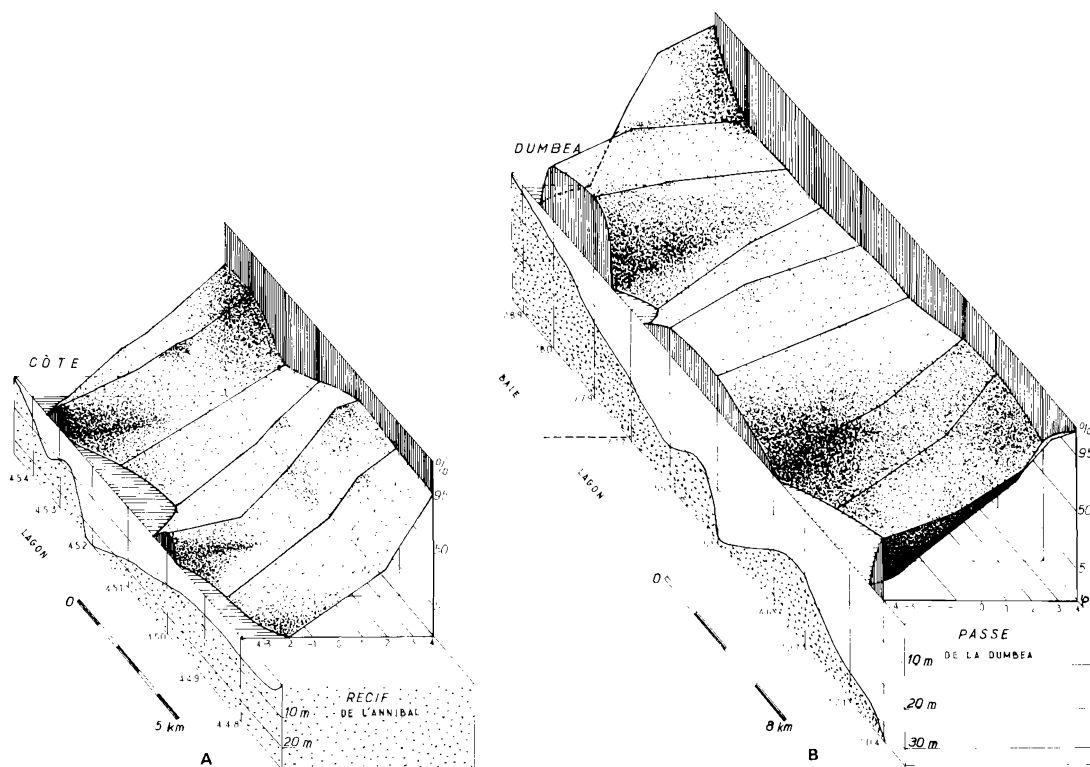

Figure 10.   Traverses: cumulative curves with a probability ordinate scale. **A.** Traverse 1; **B.** Traverse 3.

and other large organogenous fragments in the sediment. In contrast, the sediments in areas II and III are less well sorted ($\sigma\varphi$ increases) when the fine fraction is dominant ($\alpha\varphi$ increases). The deposition of fine particles of continental origin seem to be responsible for this relationship.

Changes in the Sediments from the Coast to the Barrier Reef

In an effort to complete the information obtained by previous methods, it seemed useful to make seven traverses from north to south or perpendicular to the lagoon. Five of these traverses are represented by cumulative curves, two of them with a probability ordinate scale (in this case it is easier to visualize the changes in the sediments from the coast to the barrier reef with a three dimensional representation).

The first five traverses (see Figure 3) showed badly sorted sediments in areas II and III, with better sorting in area I. A transition can be observed between these two types of sediments whereas those influenced by waves or currents are better sorted (Figure 9). These results correspond with those given by the φ-deviation measure.

Traverses 1 and 3, represented by probability curves, are described in detail.

Traverse 1, placed northwest of the study area, crosses the narrowest part (13 km) of the lagoon. It begins close to the coast, runs near a patch reef (Reef Nau), cuts across the channel and reaches area I, then the area behind the reef.

Traverse 3 begins at the Dumbéa River mouth, cuts across Dumbéa Bay, a channel containing Prony Reef, an inner part of area I, and then into the submarine valley ending close to the pass of the Dumbéa (Figure 10).

According to the limits described by THOMASSIN (1978) the sedimentary units defined by the frequency curves are respectively classified in the traction subpopulation for stock I, in the saltation subpopulation for stock II and in the suspension subpopulation for stock III. These subpopulations are found again on the two traverses where less and less fine fractions (stock III) can gradually be noted when drawing near the reef or the pass, whereas a specified saltation subpopulation appears and is limited by a break point close to 2 φ (stock II). The meaning of these units or stocks have already been noted.

Besides, the probability curves show that occasionally or exceptionally moving subpopulations can be located in Dumbéa Bay near the reefs or the pass. They correspond with large organogenous fragments. The coral fragments abound near the reefs and even in Dumbéa Bay (LAUNAY, 1972).

CONCLUSION

In the southwestern lagoon of New Caledonia there is a two-fold sedimentary deposit: a terrigenous deposit of continental origin and an organogenous deposit of marine origin. The chemical analyses, in connection with the observation of sedimentary colours, show that the terrigenous deposit is only stocked very close to the mouths of the rivers and in the bays. It is diluted in areas II and III where it forms a finely graded deposit (0.063 mm). It remains rather important only in submarine valleys, viz. 20% of terrigenous material near the pass of St. Vincent (COUDRAY, 1976).

The distribution of sediments depends on morphology and hydrodynamical agents. In coastal bays muds are abundant with minor inclusions of coarse bioclastic deposits. The lagoon is largely filled with calcarenites (equal to $\varphi = 1$ to 2). Calcareous and terrigenous silts and clays occur in a large part of the channel. Sands become finer ($\varphi = 3$) near the barrier reef.

Sediments in area I and behind the reef are better sorted than those in the channel. They might have been partly derived from the abrasion of the reef complex when relative sea-level was lowered 1.5 m 3-4,000 years ago. These sediments lack any interstitial fractions due to a constant winnowing.

The central textural parameters of the sediments permit the interpretation of high energy areas located in shallows under wave action and in the parts of the lagoon exposed to the action of tidal currents. The tidal currents are most effective north of the passes and in parts of the channel narrowed by patch reefs. Near the passes, the current is strong enough to keep any sediment from depositing and to uncover the deep hardgrounds.

The main source of bioclastic material are *Foraminifera* and molluscs (the corals are impor tant only very close to the reefs). It is to be noted that, in spite of this abundant fauna, the sedimentation in the lagoon does not seem to be very active. The use of *Foraminifera* as tracers of bioclast movement will promise a better understanding of sedimentary hydrodynamics in the lagoon.

script and offered helpful suggestions for its improvement.

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□ RESUMEN □

La laguna suroeste de Nueva Caledonia pertenece a un sistema de arrecifes. Puede dividirse en bahias y laguna de arrecifes coralinos que incluye desde tierra hacia el mar, canal, plataforma sumergida de coral y una linea de arrecifes. Las corrientes inducidas por la marea asi como la influencia de los vientos reinantes son uno de los principales factores en la distribución del sedimento. Se distinguen tres grupos sedimentarios en la laguna, caracterizados por su color, composición quimica y tamaños. El sedimento de tamaño medio (M_d = 0.5 mm) está presente prácticamente en

toda la laguna; éste es reemplazado en la bahia por un sedimento más fino ($M_d = 0.063$ mm) cuyo origen es principalmente continental. Este material se dispersa en el canal y el valle submarino. El otro grupo sedimentario ($M_d = 0.125$ mm) se puede encontrar en las proximidades del arrecife y es pobre en Foraminiferas. El origen de este material podria estar en la erosión del arrecife ocurrido durante los últimos tres mil años.

□ ZUSAMMENFASSUNG □

Die Südwestlagune Neucaledonies gehört zu einem grossen Korallenriffkomplex. Es wird in Küstenbuchten und ein echte Korallienriff verteilen können, das einen Küstenkanal, ein unter Wasser setzende Korallienplateau mit Riffbänke, und ein von einer Wallrifflinie begrenzte Rückriffgebiet einschliesst. Während jeder Tide steigt die Flut durch den Südostteil der Lagune hinein; sie strömt dann durch die Durchfahrten und über das Wallriffe. Während der Ebbe spielten die Durchfahrten eine vorwiegende Rolle. Die folgende Flutströmen, zusammen mit der Einflüsse den Passatwinde, sind eine von die wichtigste Faktoren der Sedimentverteilung. Die Farben, die chemische Zusammensetzung, und die Kerngrössenverteilung der Sedimente, sowie der Bioklastzusammensetzung, zeigen es, dass drei Sedimentbestände in der Lagune vorhanden sind. Der erste Bestand, der von mittlerer Grösse ($M_d = 0.5$ mm) ist, ist in fast jedem Gebiet der Lagune vorhanden. Er ist in der Küstenbuchten durch den zweiten Bestand ersetzt, den von kleinerer Grösse ($M_d = 0.063$ mm) und von kontinentalem Ursprung ist. Dieser Bestand ist in dem Küstenkanal und die Unterseetäler ausgebreitet. Der letzer Bestand ($M_d = 0.125$ mm) ist in der Nähe des Wallriffes vorhanden und ist arm an grosser, lebendiger *Foraminifera*. Die Auswaschung des Wallriffes in Lauf dem letzte 3,000 Jahre könnte diesen dritte Bestand erschöpft haben.