Survey of Selected Benthic Invertebrates

Author: Tardy, Emmanuel

Source: A Rapid Marine Biodiversity Assessment of the Northeastern Lagoon from Touho to Ponérihouen, Province Nord, New Caledonia: 169

Published By: Conservation International

URL: https://doi.org/10.1896/054.062.0104

Chapter 3

Survey of selected benthic invertebrates

Emmanuel Tardy

SUMMARY

- A total of 334 species were identified at the species level for the most part and only a small portion at the genus level, including: 192 gastropods including 21 opistobranchs, 41 bivalves, 23 holothurians, 15 asteroids and 14 echinoids.
- Eighteen species of sea cucumbers with a commercial potential were observed, with a maximum of eight species on back reef and intermediate reef sites.
- Five clam species from the six present in New Caledonia were observed, two species (*Tridacna derasa* and *Hippopus hippopu*) are at very low abundance levels.
- Trochus, (*Trochus niloticus*), is underrepresented, mainly due to the lack of sites sampled in their habitat type.
- The survey covered a total of 48 sites, depths ranged from one to 35 meters (mainly eight to 25 m).
- In terms of the biodiversity for the selected invertebrates surveyed, the large intermediate reef located east of Ponérihouen, the area of double barrier reef facing Poindimié and areas surrounding the pass east of Touho were the most interesting areas.
- Most of the fringing reefs are largely impacted by terrigenous runoffs, but the benthic fauna present on the drop off sections of these reefs, show in some places, interesting communities.

INTRODUCTION

Coral reef marine invertebrates are of interest for several reasons that include: a) as a fishing activity that provides an important source of protein and income for island populations; b) for their leading roles in the proper functioning of marine ecosystems and; c) as a source of pharmacological substances or as an attraction for some tourist activities such as diving.

In New Caledonia, fishing can be divided into two main activities, subsistence fishing and commercial fishing that are not easily differentiated from one another. The principal commercially exploited invertebrate resources are sea cucumbers for export to Asian markets (mainly China) and trochus shells (*Trochus niloticus*), whose nacre is destined for export to Asian markets and Europe. Sea cucumber export values from the country territory are higher than tuna exports. Other species including mud crabs, crayfishes and clams, are subject also to small scale commercial fishing, but are not destined for export.

Subsistence fishing also includes trochus shells, crustaceans and giant clams, and many other species such as burrowing bivalves, many gastropods such as turbo snails, or even octopi or sea urchins.

Although this study includes an inventory of commercial and subsistence species, the primary focus was on assessing the biodiversity of select groups in the area.

- Holothurians, asteroids and echinoids (Echinoderms)
- Gastropods and bivalves (Molluscs)

The groups studied were chosen for several reasons. The first is the systematic knowledge of these groups by the author and the availability of reference books which will enable other people to repeat this choice for other *in situ* surveys. The second is the important roles these groups have in reef ecosystems and their species richness. This is the first study to look at echinoderms' biodiversity in the area. However, in 1993, the Touho area was the subject of a very thorough dedicated malacological study. This mission, the "Montrouzier" expedition organized by the ORSTOM, brought together 38 participants. The collection effort was 400 person-days prospecting and had covered an area of about 350 km². The area was surveyed by foot (zero-1m), by diving (1-50m) and by dredging (3-120 m). Species richness established from morphospecies * was estimated to be between 2000 and 4000 species in the end of mission report. Hundreds of new species were discovered during the mission (Bouchet 1994).

Although if there is currently no general of the study area for invertebrates, in 2006 the IRD produced a compendium of species recorded in New Caledonia based on publications and the latest studies, thus formalizing the biodiversity knowledge of the country (Payri and Richer de Forges 2007).

This RAP survey is similar in scope to the two previous RAPs undertaken in the province Nord by Conservation International. Both of these RAPs were specifically focused on the main commercial species of marine invertebrates, including sea cucumbers and giant clams and trochus shells. The first one took place in the Mt Panié area (Pouébo to Hienghène) between November 24th and December 15th 2004 (Lindsay and McKenna 2006), the second one in the region between Yandé and Koumac from November 24th to December 15th 2007 (Vieux 2009).

METHODS

Description of the area

The reef structure of the study area is relatively homogeneous in its inner lagoon: a short fringing reef, sometimes almost nonexistent, precedes a relatively deep lagoon, with some underdeveloped intermediate reefs (except in the Ponérihouen area). The external lagoon area includes the barrier reef and the outer reef slope. This one presents an interesting feature in the section between the Fourmi and the Cape Bayes passes to the east of Poindimié, where there is a double barrier reef structure, a rare geomorphological structure. The shallow reef areas suitable for subsistence or commercial invertebrate fishing are relatively small, particularly compared to the West coast.

The lagoon has many habitats, each with distinct environmental characteristics, which have been grouped into five main categories for the study of invertebrates:

- Fringing reefs (8 sites),
- Intermediate reefs (16 sites),
- Back reefs (9 sites),
- Outer reef slopes (7 sites),
- Passes (7 sites).

In the sites sampled in the five main habitats, it should be noted that one site was sampled in a seagrass bed near the mangroves (site 14).

These habitats spread from the coast to ocean and are largely shaped by the terrigenous runoff gradient. Coastal areas where fringing reefs are developed are subject the most to terrigenous runoffs and are most vulnerable to coastal development. Mining, logging and urbanization may generate significant flows of materials that primarily affect areas with fringing reefs.

Intermediate reefs are located in the central part of the lagoon and are surrounded by deeper waters, often with sand and silt bottoms. When the lagoon is wide, intermediate reefs may have varying characteristics, similar to those of fringing reefs when they are close to the coast and similar to those of back reefs when they are closer to the ocean. Here, given the low number of sites sampled, it did not seem necessary to create subclasses.

Back reefs are the areas between the barrier reefs and deep white sandy areas of the lagoon. Surveys on these sites may have been undertaken on the inner reef slopes, coral bommies or even on more or less detrital shallow reef areas behind the barrier reef.

Areas of the outer reef slope are the areas outside the lagoon beyond the surf zone of the barrier reef. For security reasons and to allow enough de-saturation time needed between each dive, their exploration was limited to less than 40 meters.

Finally, the passes are the main areas of water exchanges between the lagoon and the ocean. Currents, sometimes violent require careful diving.

Sampling technique

Both previous Marine RAPs undertaken by Conservation International in New Caledonia had only focused on commercial invertebrate species using a different technique each time. In 2004, the research per unit of time technique was used, whereas in 2007 the transect method was chosen.

**Editors note* – Morphospecies: Term which refers to a type species distinguished solely on the basis of its morphology.

These surveys were done in shallow areas accessible to free diving fishing, mostly from one to three meters and up to 12 meters, and did not include the deeper areas of the lagoon.

In the current RAP, the spectrum of the study was broadened, by including some significant macro-invertebrates groups in terms of biodiversity with the commercial species. To better determine species richness, it was decided to adopt the research per unit of time technique. This technique allows to explore areas which seem most interesting in terms of diversity without being limited to the predetermined area of the transects. Survey areas were also deeper than previously, reaching a maximum of 35 meters.

Each dive was split into three 10 minutes replicates. During the dive, replicates were done from deepest areas to the shallowest areas. This allowed covering areas not appraised during previous RAPs, while allowing for safe de-saturation diving.

Overall, each site is comparable to others because the survey time is the same even if the sampled area may be different. However, for medical reasons, sites 13, 14, 15, 16, 17 and 18 were not surveyed by the author, but by the coral reef fish expert (P. Laboute) who was not able to apply the same rigor and time to the survey. Results from these six sites have not been taken into account in the various biodiversity measurements and calculations.

Many recordings were made only from freshly dead gastropod shells (shell debris left by predators or whole shells fresh enough not to have been displaced from their habitat). All sizes of individuals were measured using a caliper attached to the note board.

RESULTS AND DISCUSSION

Number of species surveyed

The number of invertebrate species identified during this survey amounts to 334 species, generally determined to the species level and sometimes only to the genus level (see list of species by zoological group in Appendix 3). Some species, which could not be identified beyond the family, were not entered into the database. They are considered not part of the inventory and involved one to two dozen species.

Survey quality is directly related to the expert's fields of specialty. It would have been presumptuous to try to identify all groups of invertebrates, as such, the author focused on the following groups for which knowledge is the most popular and most accessible in order to reproduce this study and to compare its results with further works.

The main groups studied during this survey are:

- Holothurians,
- Gastropods and bivalves,
- Asteroids
- Echinoids.

Their study was conducted in the most comprehensive manner and the mapping of their presence is shown below (see Figures 3.1 to 3.6).

Due to lack of time and insufficient specific knowledge, some groups such as sponges, cnidarians, crustaceans, sea fans, brittle stars, feather stars, bryozoans or ascidians were not systematically surveyed, although they were very abundant in this region. Species from these groups known to have an important role in the ecosystem, or readily identifiable were nevertheless listed as a guide.

Holothurians: Twenty-three species were observed, including 18 species used in the preparation of bêche-de-mer, comprising the rare *Actinopyga albonigra* and *Bohadschia maculisparsa* . The number of species per site ranged from zero to eight with a mean of 3.64 species per site. The internal zones (intermediate reefs in this particular case) are generally the richest sea cucumber areas. However this was not very evident in the study area, due to the absence of large reef flats. Holothurians mainly live in sedimentary areas rich of organic matter upon which they feed. Sea cucumbers are for most part filtering animals scavenging organic particles in the sediments. In New Caledonia, 55 holothurian species have been recorded in coastal areas from zero to 100 m (Guile et al. 1986).

The RAP conducted in the Mt Panié area (2004) had recorded 18 species while the RAP conducted in the Yandé to Koumac area (2007) had only listed 13 species, but where prospecting was carried out only between zero and three meters mainly and on sites of lower surface.

Gastropods: One-hundred-ninety-two species were identified including 22 opistobranchs species. Among them, two nacreous species *Trochus niloticus* (trochus shell) and *Tectus pyramis*, five strombidae species commonly called spider conchs and jumpers (*Lambis lambis*, *L. chiragra*, *L. scorpio*, *L. truncata* and *Strombus luhuhanus*) and five turbinidae species commonly called periwinkles (*Turbo argyrostomus*, *T. chrysostomus*, *T. crassus*, *T. petholatus* and *T. sp* .) which are locally consumed. The number of species per site ranged from two to 25, with a mean of 9.02. The diversity for gastropods possessing shells was higher in areas under strong oceanic influence.

Bivalves: Fourty-one species were identified with some only to the genus level. Among them, five clam species and two nacreous shells' species. The number of species per site ranged from zero to 10, with a mean of 4.54. Most of the inventory is composed of non-burrowing species.

Asteroids: Fifteen species were identified. The number of species per site ranged from zero to five, with a mean of 1.53. This figure needs to be put into perspective with the 54 species of starfish surveyed in coastal areas of New Caledonia from zero to 100 m (Guille et al. 1986).

Echinoids: Fourteen species were identified. The number of species per site ranged from zero to five with a mean of 1.53. In comparison, there is a total of 43 sea urchin species recorded in New Caledonian coastal areas from zero to 100 m (Guille et al. 1986).

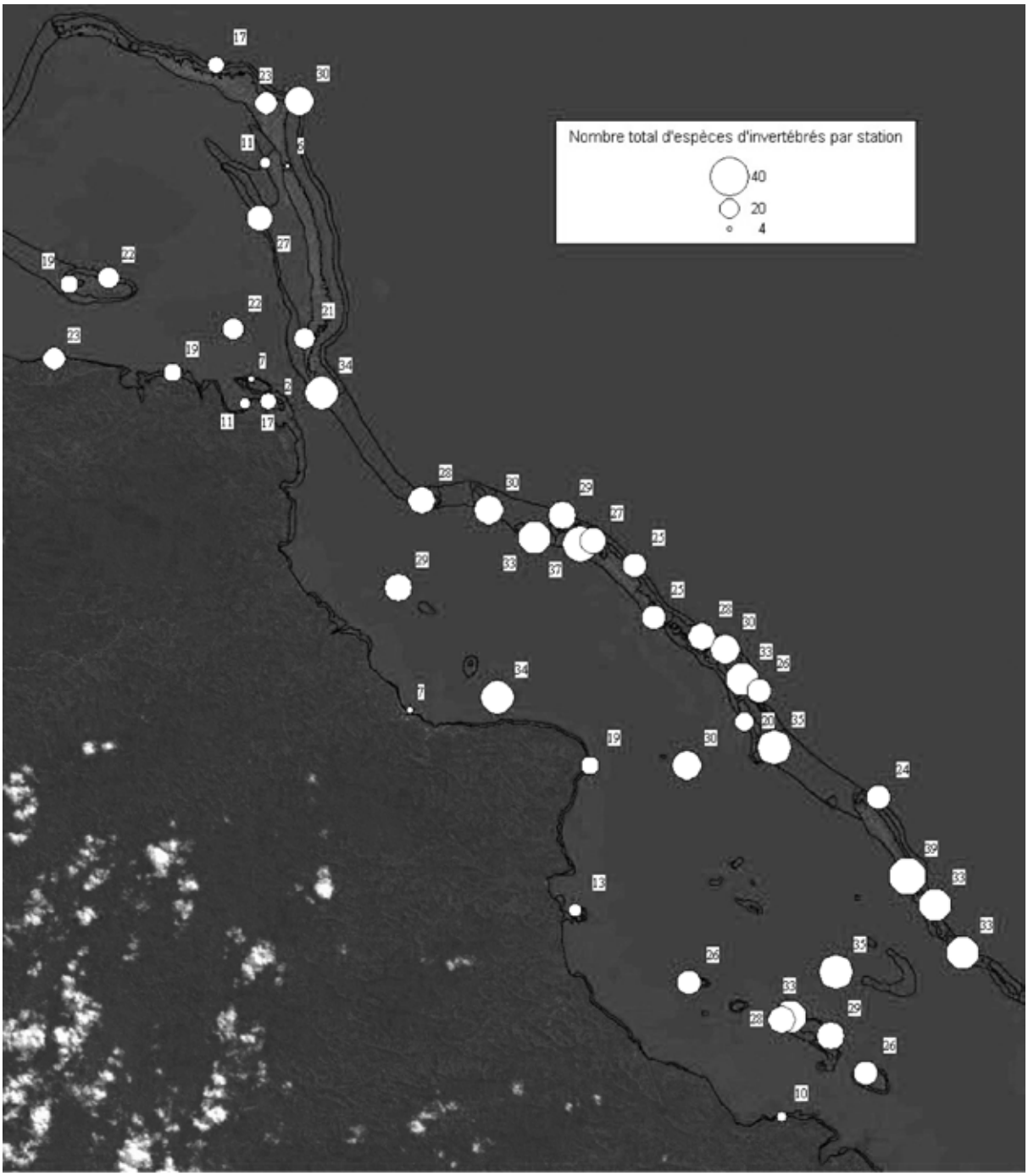

Figure 3.1. Total number of species observed per site (main groups and annex species).

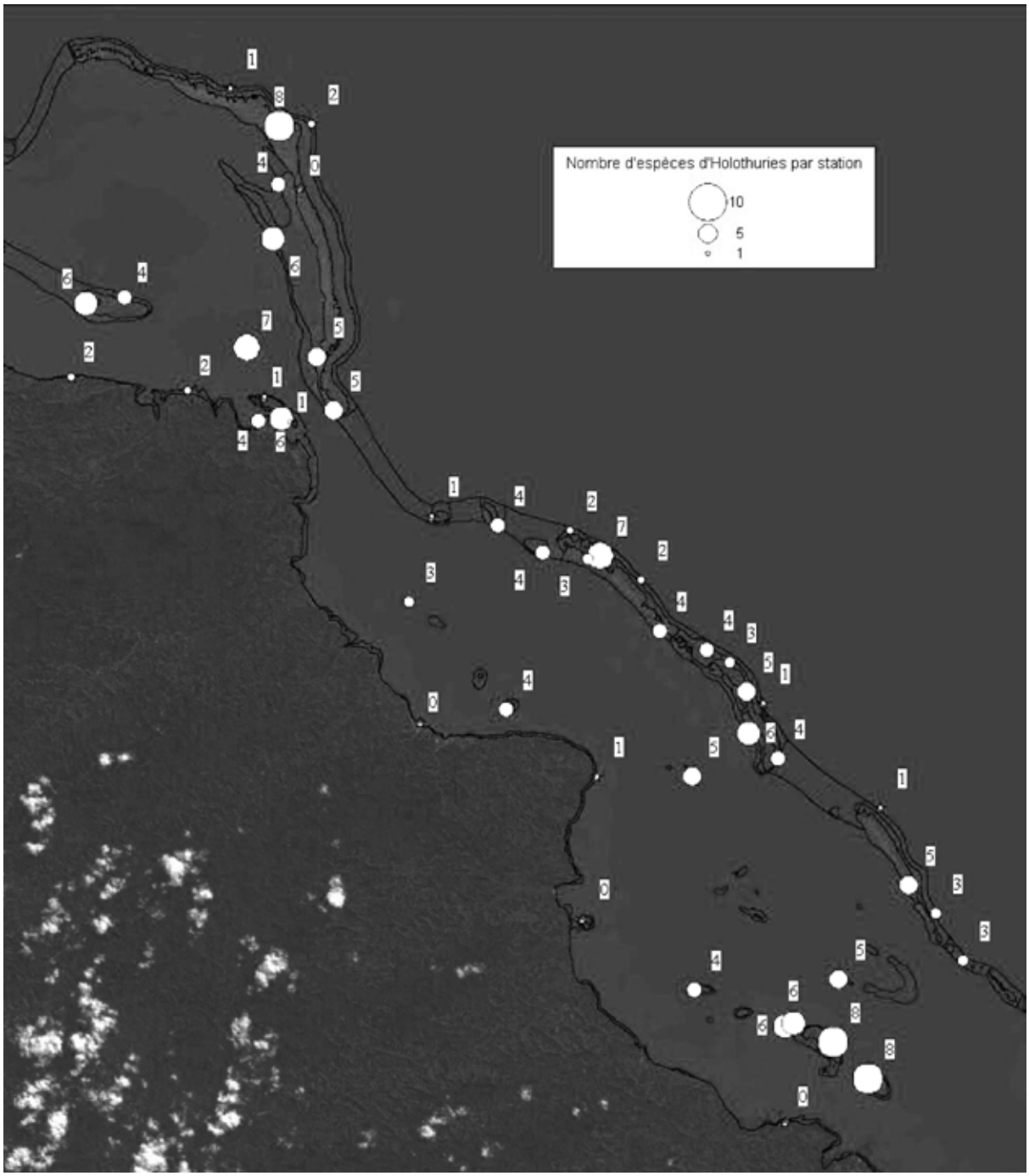

Figure 3.2. Number of holothurians per site.

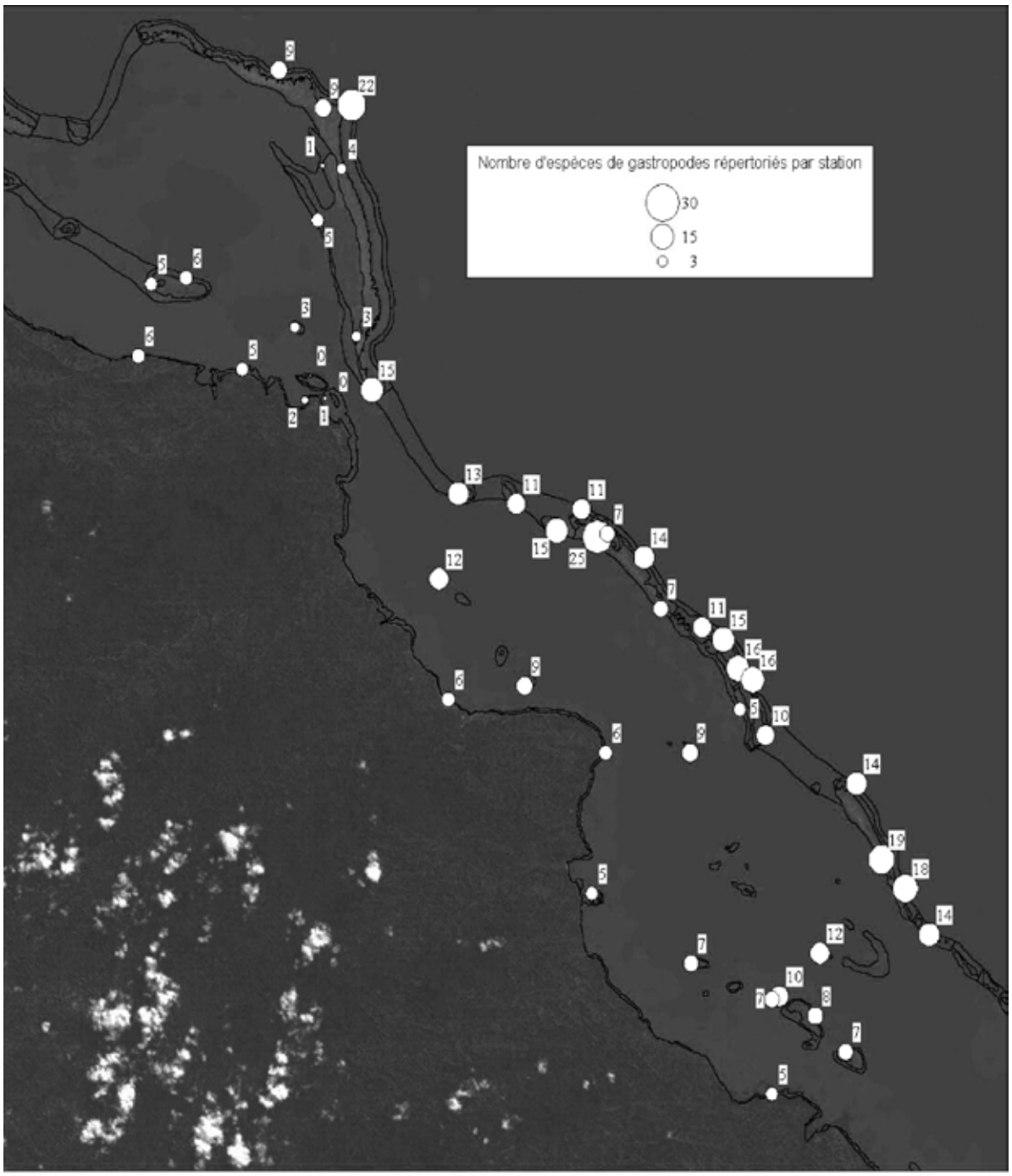

Figure 3.3. Number of shelled gastropods per site.

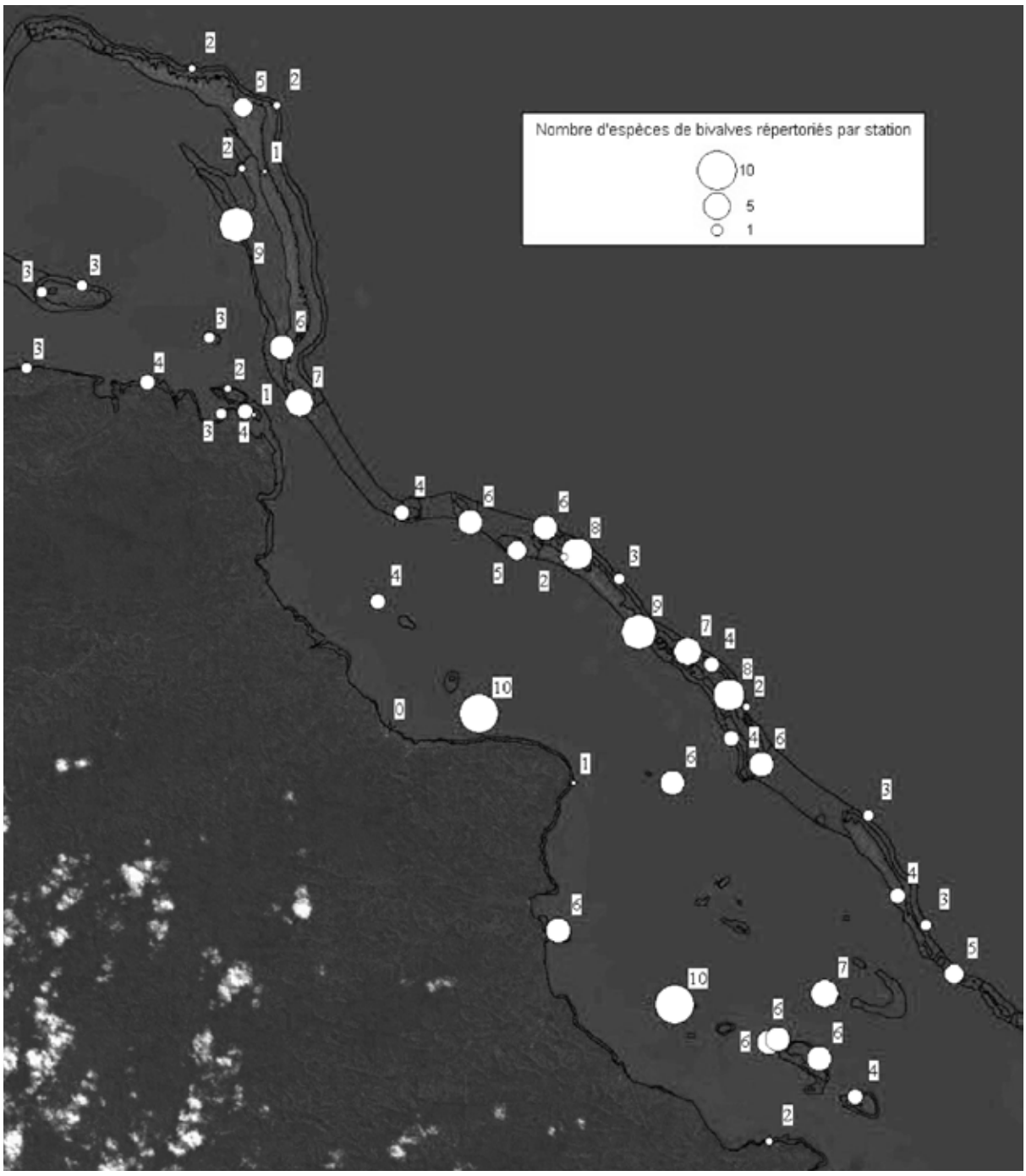

Figure 3.4. Number of bivalve species per site.

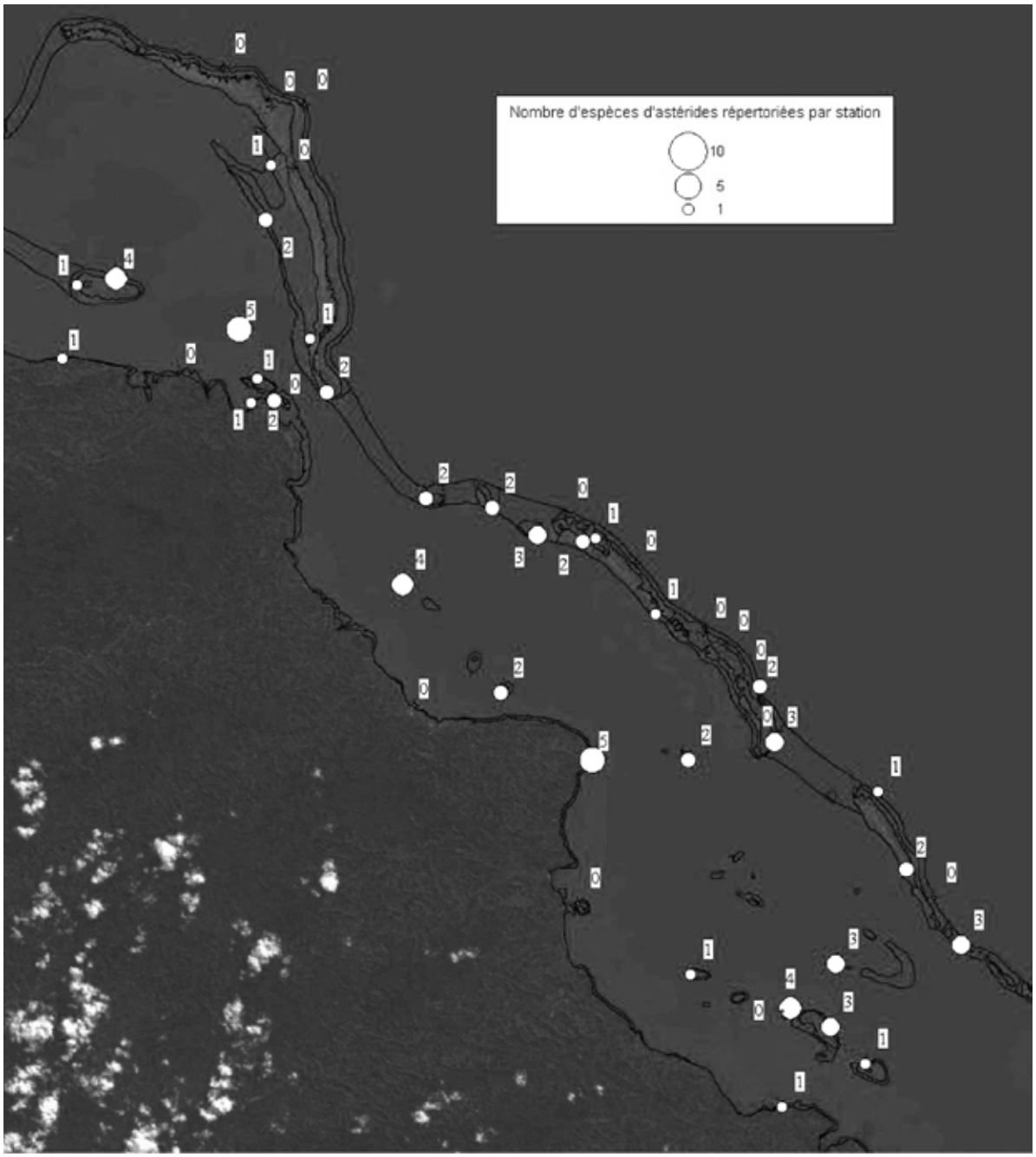

Figure 3.5. Number of asteroid species per site.

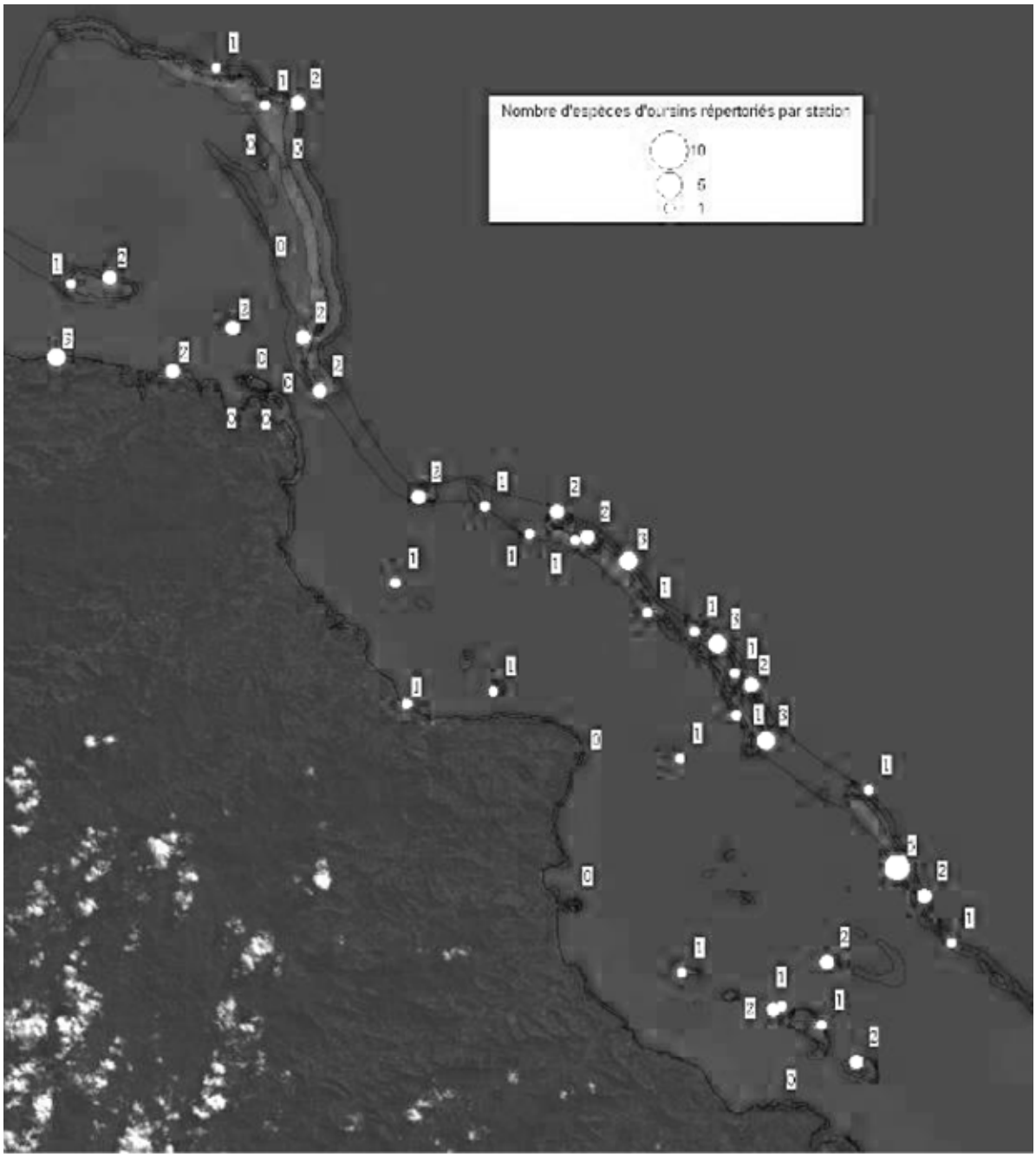

Figure 3.6. Number of echinoid species per site.

Number of species recorded per habitat

The total number of species observed per habitat varied from 86 to 158, for sampling efforts ranging from seven to 14 sites per habitat. The habitat with the greatest number of species observed during the survey was the intermediate reef (with an absolute total of 158 species), followed by the back reef (148), followed by the passes (114) and the outer reef slope (111). Finally the habitat in which the least number of species observed during the survey was the fringing reef (86); (see Table 3.1 and Figure 3.7).

The number of recorded species by habitat is proportional to the sampling effort, which tends to suggests that the number of surveyed sites is insufficient to provide an actual discrimination of habitats by their species richness, although relative to the fringing and intermediate reef, the back reef appears significantly richer.

Habitat distribution of the main zoological groups

Habitat ranking in relation to number of recorded species varies depending on the main zoological groups considered. The special habitat affinities of some zoological groups affect this ranking. A majority of sea cucumbers prefer quiet and detrital lagoon areas. It is not surprising to find only six sea cucumbers species on the very slightly impacted reef slopes whereas eight are found on the very small size and degraded fringing reefs. Also, there are more gastropods with shells on the outer reef slope than in the passes and intermediate reef habitats although this habitat has a lower total number of species. Similarly, there are more asteroids on the fringing reef than on other habitats except for intermediate reefs (Table 3.2).

Table 3.1. Total number of species recorded per habitat (*in between brackets: results including the six sites not surveyed by the author, but recorded by another observer not dedicated to invertebrates - NB: The same notation is used in other tables).

Habitat types	No of sites	Total No of species *
Pass	7	114
Outer reef slope	7	111
Back reef	8 (9)	146 (148)
Intermediate reef	14 (16)	156 (158)
Fringing reef	6 (9)	73 (86)

Mean species richness per site and habitat

Mean species richness is highest in the passes, but the back reefs, intermediate reefs and outer reef slopes are not significantly poorer. In contrast, mean species richness on fringing reefs is well below the mean species richness than other habitats (Table 3.3). This is largely due to the fact that the fringing reefs in the study area are extremely short and do not present the usual variety of micro-habitats allowing for a high biodiversity. In addition, fringing reefs are globally relatively degraded by terrigenous runoffs and it is likely that many species have had their abundance decrease perhaps to zero in certain areas.

Progression of the number of species recorded for two main groups according to sampling effort

The progression in total number of species recorded is noteworthy for different target groups. This progression allows assessing whether the produced sampling effort reflects the actual biodiversity of the study site.

For the holothurians group, the progression curve rapidly reaches a plateau and the sampling effort needed to increase the number of species becomes relatively important, especially if we compare this progression with the group of gastropods possessing shells. The number of holothurians surveyed is probably fairly close to the total number of holothurians species present on the study site (Figure 3.8). Moreover, this progression could have been faster and reached the plateau faster if better developed fringing reefs had been available as they typically harbor a majority of sea cucumber species which share the same habitat.

In the case of gastropods with shells, the progression in the number of species is relatively linear; indicating that the figure of 171 species recorded is relatively far from the actual number of gastropods with shells present in the area. There are also irregularities in the progression; these result from surveys undertaken in new habitats or niches which harbor species showing reduced distribution ranges (Figure 3.9).

Mean sizes observed

The sizes of the species were measured regularly, especially for commercial species (Appendix 3). Sea cucumbers, giant clams and trochus shells are the three main groups of species fished commercially and for subsistence. The comparison of their sizes with what has been observed elsewhere in

Table 3.2. Number of species in each main invertebrate group listed by habitat type.

Habitat types/ zoological group	Holothurians *(including bêches-de-mer)*	Bivalves *(including giant clams)*	Shelled gastropods	Nudibranchs	Asteroids	Sea urchins	Total
Pass	10 *(9)*	12 *(2)*	53	10	7	5	**97**
Outer reef slpoe	6 *(6)*	8 *(2)*	67	4	3	6	**94**
Back reef	17 *(15)*	22 *(5)*	74	6	5	7	**131**
Intermediate reef	15 *(14)*	25 *(4)*	62	12	12	6	**132**
Fringing reef	8 *(8)*	17 *(2)*	24	8	8	4	**69**

New Caledonia and in the Pacific is useful information that allows to partially assess the status of certain resources.Such information is however still insufficient for making fisheries management decisions. Dedicated studies would be needed to properly assess the status of resources for commercial exploitation.

Holothurians

The most commonly caught species in New Caledonia and those recorded in this RAP survey have similar or higher mean sizes in comparison to those observed in other sites in New Caledonia through the SPC's PROCFish program but overall remain much higher than those found throughout the Pacific (Table 3.4).

The observation of larger means sizes in New Caledonia may result from various factors. First, New Caledonia, at the Pacific scale, is a country whose sea cucumbers resources have been relatively unaffected by fishing pressure compared to many island states plundered relentlessly for decades. On the other hand, during the entire mission of the Touho-Ponérihouen area, surveys were conducted using SCUBA, at depths greater than the depths of other sites of previous RAPs where free diving was employed for sampling.

The size data are essentially collected at depths beyond the usual reach of bêche-de-mer fishermen. As fishing preferably targets larger sized individuals at shallower depths, the deeper areas usually contain populations of larger sized individuals that have been spared from fishing. Another element to consider in a comparison of sizes across the Pacific is the availability of nutrients. In New Caledonia a vast land area supplies in profusion a wide lagoon which receives the terrigenous organic elements. Such an environment is very favorable to the growth of sea cucumbers. So they reach maximum sizes greater than what can be observed in areas with less terrigenous input such as some atolls or habitats of some extremely limited high isolated islands in Southern Polynesia with only short ocean fringing reefs.

Overall, size information collected shows that stocks, although they are likely to be relatively limited given the small area of preferred habitat for the majority of commercial species, are in relatively good health.

Sea cucumber sizes were not measured during the 2004 and 2007 RAPs.

Giant clams

Five species of giant clams were been surveyed in the area: *Tridacna maxima*, *T. crocea*, *T. squamosa*, *T. derasa* and *Hippopus hippopus*. The very rare *Tridacna tevoroa* was not

Table 3.3. Mean species richness per habitat.

Habitat	Mean number of species per site	Standard error
Pass	31.0	1.1
Outer reef slope	26.3	1.9
Back reef	29.9	2.2
Intermediate reef	27.9	1.4
Fringing reef	15.2	2.7

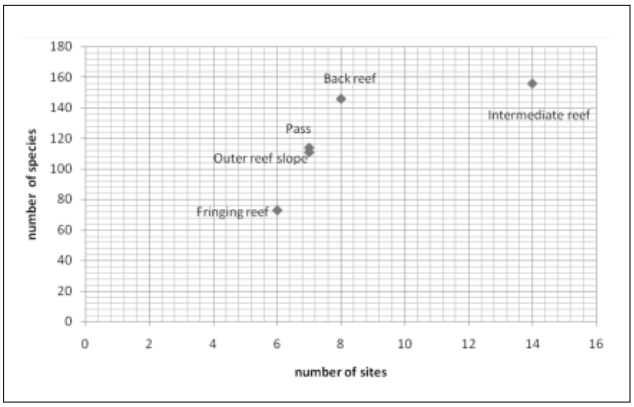

Figure 3.7. Number of species recorded by habitat type (only based on the sites sampled by the author).

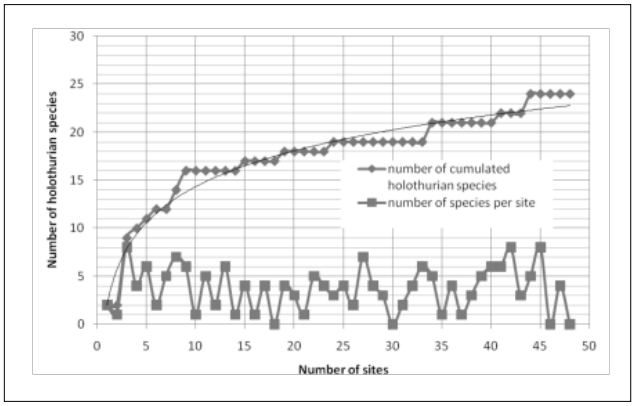

Figure 3.8. Progression of the number of holothurian species recorded.

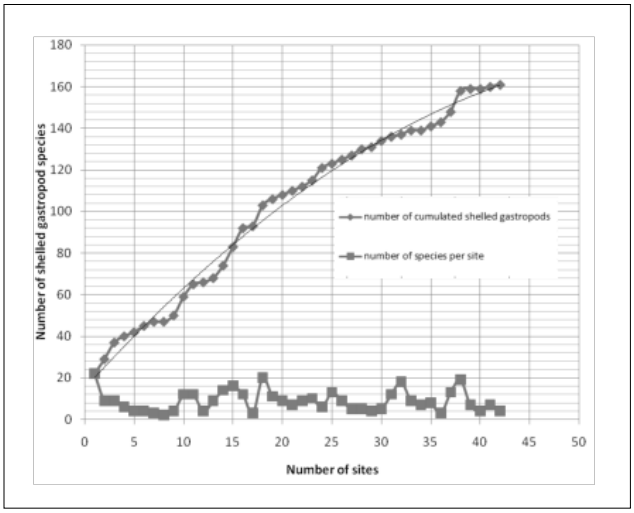

Figure 3.9. Progression of the number of gastropod species with shells recorded.

Table 3.4. Mean sizes (cm) of the main commercial sea cucumbers species on the sites of New Caledonia and throughout the Pacific (data covering 17 Pacific countries and territories, database of the Reef Fisheries Observatory, SPC).

Genus species	Site	Size in cm	Standard error	No of specimens measured	Total No of specimens
Actinopyga lecanora	Touho-Ponérihouen	20.0	0	2	3
	Ouasse	19.0	1.0	2	11
	Thio	18.3	0.3	3	15
	Oundjo	18.0		1	2
	Pacific	18.4	0.5	38	
Actinopyga palauensis	Ouasse	35.0	0	6	12
	Oundjo	31.0	11.0	2	29
	Touho-Ponérihouen	27.4	1.0	10	13
	Thio			0	6
	Pacific	23.8	6.2	4	
Bohadschia argus	Luengoni	38.0	1.3	39	43
	Touho-Ponérihouen	38.0	1,1	17	23
	Oundjo	33.7	0,6	97	122
	Ouasse	33.5	0.4	143	187
	Moindou	31.4	0.8	19	106
	Thio	31.1	0.6	50	63
	Pacific	28.7	0.2	1104	
Bohadschia graeffei	Thio	37.7	2.4	10	364
	Ouasse	30.8	1.4	14	710
	Touho-Ponérihouen	29.1	0.7	58	126
	Pacific	28.0	0.5	230	
Holothuria atra	Touho-Ponérihouen	37.6	2.5	33	75
	Luengoni	35.0	3.0	12	281
	Thio	20.5	0.7	79	493
	Moindou	19.6	1.7	19	51
	Ouasse	17.9	0.7	70	214
	Oundjo	16.5	0.2	276	791
	Pacific	15.3	0.1	11201	
Holothuria edulis	Touho-Ponérihouen	22.3	1.2	37	112
	Thio	21.3	0.9	12	245
	Ouasse	19.5	0.7	26	256
	Oundjo	16.0	2.0	3	18
	Moindou			0	28
	Pacific	17.2	0.2	895	
Holothuria fuscogilva	Thio	36.0		1	1
	Touho-Ponérihouen	35.0	3.8	4	4
	Moindou	31.0	0.8	15	16
	Ouasse	23.0		1	1
	Pacific	33.7	0.3	443	
Holothuria fuscopunctata	Luengoni	44.4	3.1	5	5
	Oundjo	41.1	2.5	7	10
	Thio	38.3	1.0	26	128
	Touho-Ponérihouen	37.8	1.1	39	59
	Ouasse	37.2	1.0	33	38
	Moindou	28.2	3.0	4	10
	Pacific	37.5	0.9	114	

Genus species	Site	Size in cm	Standard error	No of specimens measured	Total No of specimens
Holothuria nobilis	Oundjo	32.7	0.8	30	30
	Thio	30.0	2.4	5	5
	Luengoni	29.9	0.7	77	91
	Touho-Ponérihouen	29.6	2.1	6	12
	Moindou	29.2	0.9	27	31
	Ouasse	28.8	0.6	26	26
	Pacific	28.1	0.2	590	
Stichopus chloronotus	Thio	18.3	0.3	186	2206
	Touho-Ponérihouen	17.8	3.1	8	234
	Oundjo	16.7	0.3	139	297
	Ouasse	16.7	0.3	153	561
	Moindou	11.5	1.2	12	26
	Pacific	16.5	0.1	3626	
Stichopus hermanni	Touho-Ponérihouen	52.8	2.5	3	6
	Thio	45.0	5.2	6	6
	Ouasse	37.2	3.8	6	6
	Oundjo	31.8	4.6	4	4
	Moindou	31.5	3.5	4	6
	Pacific	21.6	1.0	167	
Thelenota ananas	Touho-Ponérihouen	45.0	2.1	24	25
	Luengoni	45.0	3.3	4	4
	Thio	41.7	1.3	11	19
	Ouasse	39.0	1.0	2	2
	Moindou	38.0		1	7
	Oundjo	37.5	7.5	2	2
	Pacific	41.3	0,4	500	
Thelenota anax	Moindou	59.3	9.8	4	4
	Touho-Ponérihouen	56.0	2.4	15	16
	Ouasse	52.0	0	2	2
	Pacific	51.5	0.5	296	

observed. The most common species were *Tridacna maxima* (112 specimens identified), followed by *T. crocea*, found in calm coastal areas and relatively underrepresented because of the narrowness of the fringing reefs (37 specimens) and *T. squamosa* (34 specimens). *Tridacna derasa* is relatively uncommon (6 specimens) and *Hippopus hippopus* rare (one specimen found alive). These last two species should be given special attention; their density being low to ensure proper stock recruitment.

The mean sizes observed in the Touho-Ponérihouen area are close and comparable with the mean sizes observed across the Pacific (Table 3.5). At the local level, the mean sizes measured in the Touho to Ponérihouen area are within the mean sizes found on other sites in New Caledonia, except for *Tridacna maxima*, the most common species. Indeed it is in the Touho-Ponérihouen area that the mean size is definitely the smallest as it is lower by almost 50% compared to the size observed in Luengoni (Lifou Island) and by 33% compared to the site in Thio, which is near the study area. However, the study of the length frequency of *T. maxima* allows us to be confident regarding the health of this species (Figure 3.10). Indeed all size classes are observed from one to 23 cm, with a large fraction of young individuals indicating recent recruitment. Nevertheless, it is true that very large individuals with high recruits production potential are missing, the largest measuring 23.5 cm. The maximum size this species can reach is about 40.0 cm.

Table 3.5. Mean sizes (cm) of giant clam species observed on the sites of New Caledonia and throughout the Pacific (data covering 17 Pacific countries and territories, database of the Reef Fisheries Observatory, SPC).

Genus species	Site	Size in cm	Standard error	No of specimens measured	Total No of specimens
Hippopus hippopus	Luengoni	35.0	0	1	1
	Ouasse	29.4	2.4	9	9
	Touho- Ponérihouen RAP	24.0	0	1	1
	2004 Mt Panié RAP	23.8	?	7	7
	Oundjo	22.4	2.0	11	11
	Moindou	21.8	2.4	12	12
	Thio	17.0	1.0	2	2
	2007 Yandé-Koumac RAP	-	-	-	-
	Pacific	21.9	0.3	584	?
Tridacna crocea	2007 Yandé-Koumac RAP	11.4	?	467	467
	Ouasse	10.8	0.1	781	12245
	Touho- Ponérihouen RAP	10.3	0.8	7	37
	Thio	9,0	0.2	450	7407
	2004 Mt Panié RAP	7.7	?	248	248
	Oundjo	0	0	0	1
	Pacific	7,7	0.1	4918	?
Tridacna derasa	2004 Mt Panié RAP	47.5	?	6	6
	Moindou	37.9	2.0	9	9
	Touho- Ponérihouen RAP	35.6	3.2	6	6
	Thio	33.7	1.7	7	7
	Oundjo	26.7	3.2	10	10
	2007 Yandé-Koumac RAP	-	-	-	-
	Pacific	32.3	1.0	108	?
Tridacna maxima	Luengoni	18.2	0.6	95	95
	Thio	16.5	0.4	167	185
	Ouasse	14.9	0.6	80	80
	2004 Mt Panié RAP	14.8	?	557	557
	Moindou	14.6	0.3	372	1524
	Oundjo	14.1	0.2	585	868
	2007 Yandé-Koumac RAP	13.6	?	?	?
	Touho- Ponérihouen RAP	12.2	0.6	73	112
	Pacific	11.8	0.0	17830	
Tridacna squamosa	Ouasse	29.3	2.7	13	13
	Oundjo	27.7	2.2	6	6
	2004 Mt Panié RAP	25.8	?	83	83
	Thio	24.4	2.5	11	11
	Touho- Ponérihouen RAP	24.0	1.8	30	32
	Moindou	24.0	1.6	7	7
	Luengoni	23.7	3.0	3	3
	2007 Yandé-Koumac RAP	21.2	?	?	?
	Pacific	24.4	0.4	588	?

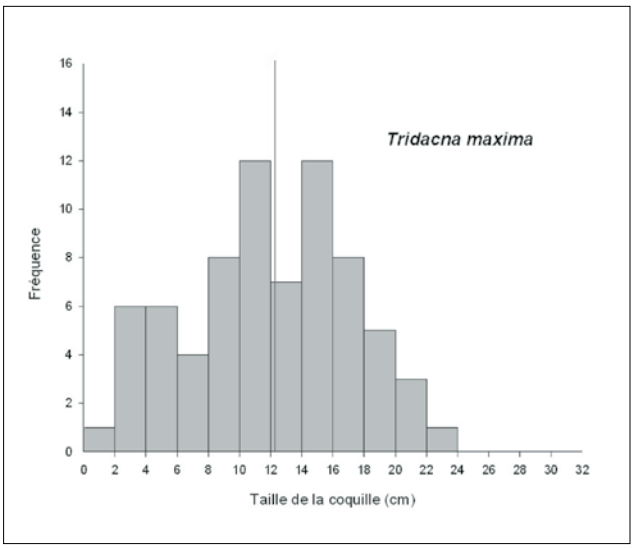

Figure 3.10. *Tridacna maxima* size frequency in the Touho- Ponérihouen area. Legend: Taille de la coquille: *Shell size.*

Trochus niclotus

Due to the nature of the mission, which targeted a maximum of habitats to study biodiversity, trochus did not undergo a proper study. Trochus mainly live in shallow reef areas (mostly less than 10 meters). The preferred areas of adult trochus are the areas of where waves break on the barrier reef, and when the conditions are right, the shallow areas bordering intermediate or fringing reefs. Trochus juveniles are cryptic, typically live in shallow back reef areas that can be exposed at low tide where they hide in crevices and rubbles. It is rare to encounter them before they reach 50 mm unless their habitat is systematically searched.

During this mission, only six trochus were observed. All six were wide sized adult trochus (126 to 147 mm in diameter at the base) with a mean size of 138 mm. The reproductive capacity of trochus increases exponentially with their size and the presence of very large individuals is an asset for future recruitments.

The RAPs previously conducted in the province Nord area targeted the resource more precisely, thus size as well as density data are hardly comparable.

CONCLUSION

The faunistic survey conducted here, although accounting more than 330 species is of course incomplete. Within the context of rapid comparative studies across of New Caledonia, these overall data appear to be a valuable tool for assessing relative species richness. This inventory is also a base line for the area (with regards to the three echinoderms groups studied), which will be a reference for future studies. Commercial species diversity is relatively well estimated and is relatively high, both for sea cucumbers (18 species out of the 26 to 30 observed that in New Caledonia) for clams (five out of the six species known to New Caledonia) but their abundances appear to be relatively limited. If required, it would be necessary to initiate studies devoted to assessing the commercial potential of these species and that of trochus.

Giant clams are a traditional food source, but some species have become rare, particularly *Hippopus hippopus* (bear paw clam) and *Tridacna derasa*. For the biodiversity of invertebrates observed, the vast intermediate reef located to the east of Ponérihouen, the area of double barrier reef in front of Poindimié and areas surrounding the pass east of Touho are interesting areas in terms of richness and abundance. In the study area, most of the fringing reefs are largely impacted by terrigenous runoffs, but the benthic fauna of these drop-offs, present in some places has interesting differences with what is found in areas far away from the coast.

REFERENCES

Atelier Biodiversite Recifale. *Expédition Montrouzier.* TOUHO - KOUMAC, Nouvelle-Calédonie. 23 août - 5 novembre 1993, Nouméa : ORSTOM. Février 1994.63 p.

Base de données RFID, PROCFISH, Observatoire des pêches récifales, Secrétariat General de la Communauté du Pacifique.

English, S., C. Wilkinson, and V. Baker (eds.). 1997. Survey Manual of Tropical Marine Resources, 2nd Edition. Australian Institute of Marine Science. Townsville, Australia.

Guille, A.P Laboute, J.L. Menou, 1986. Guide des étoiles de mer, oursins et autres échinodermes du lagon de Nouvelle-Calédonie 239p. Editions de l'ORSTOM, Nouméa, Nouvelle Calédonie.

Lindsay, S. and S.A. McKenna 2006. L'évaluation d'espèces marine macro-invertébrées exploitées. *In*: McKenna S.A., N. Baillon, H. Blaffart, and G. Abrusci (eds.). Une évaluation rapide de la biodiversité marine des récifs coralliens du Mont-Panié, Province Nord, Nouvelle-Calédonie. Bulletin PER d'évaluation biologique numéro quarante-deux. Conservation International.

Payri, C.E. and B. Richer de Forges (eds). 2007. Compendium of marine species of New Caledonia, Doc. Sci. tech. 117. Seconde edition. IRD Nouméa.

Vieux C. 2009. L'évaluation d'espèces marine macro-invertébrées exploitées. *In*: McKenna S.A., N. Baillon et J. Spaggiari (eds.). Une évaluation rapide de la biodiversité marine des récifs coralliens du Lagon Nord Ouest entre Koumac et Yandé, Province Nord, Nouvelle-Calédonie. Bulletin PER d'évaluation biologique numéro cinquante-trois. Conservation International.