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Crab cryptofauna (Brachyura and Anomura) of Tikehau, Tuamotu Archipelago, French Polynesia

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Abstract. A detailed survey of the carcinological cryptofauna in Tikehau atoll in the Tuamotus, was made: (1) to determine whether Tikehau atoll has a diverse fauna; (2) to compare it with a high island Polynesian reef; (3) to identify the distribution pattern of crabs in relation to depth and to different structures of the atoll; and (4) to compare these results with those obtained in Madagascar, La Réunion and Mauritius. Sixty five species were collected at 13 sites. Cluster analysis based on Sanders' index of affinity revealed one main group of species occurring on outer slopes and another occurring on all reef-flat and lagoonal sites. The crustacean cryptofauna occurring in the atoll appears to be impoverished in comparison to that found on Polynesian high island reefs and on Malagasian reefs. However, all outer reef slope sites at the 3 localities studied share some species in common.

Introduction

Several studies on carcinological cryptofauna have been carried out in the Indo-Pacific (Naim 1980; Monteforte 1984; Odinetz 1983; Peyrot-Clausade 1985), however, all have been restricted to shallow waters. In this study, cryptofaunal communities with special reference to the crabs were examined to depths of 30 m, at Tikehau in the Tuamotu Archipelago. This study was designed to test the hypothesis that the carcinological fauna is reduced in this Polynesian atoll, in comparison to coral reefs in other parts of the world. It has already been established (Salvat 1967; Coudray and Montaggioni 1982; Harmelin-Vivien 1986) that other groups of fauna exhibit very low diversities on Polynesian reefs.

This survey of mobile cryptofauna of Tikehau is part of a major research programme begun in 1982 (Intès 1984).

Materials and methods

Tikehau atoll is situated at Lat. 15° S, Long. 148° W, 300 km north of Tahiti. The atoll is almost circular (Fig. 1), with its widest diameter being the NE-SW axis, approximately 28 km wide. The reef rim is broken by one pass and numerous hoa or channels which cut only superficially into the structure of the reef flat (Harmelin-Vivien 1985).

Thirteen localities were selected (Fig. 1): six sites on the outer slope at 30, 25, 15, 10, 5 and 3 m depth; three sites on the outer reef-flat: algal ridge, "lapiazed (micro-scale eroded surface) flat" and shallow pavement-like reef-flat; one site at a hoa; one site on the inner reef-flat (lagoon side); two sites on a lagoon pinnacle, one on the top and one on the side at a depth of 6 m.

At each site, 3 to 6 replicates of dead coral blocks with numerous cavities were collected and the minimum total volume of each set of replicates was 5 dm^3. Samples were broken up to extract all crabs occurring in holes less than 5 cm in diameter. Results are expressed as numbers per dm^3 of coral substrate.

Sanders' index of affinity was used to compare dominance of common species within replicates and between sites (Sanders 1960).

The comparison of this cryptofauna with that occurring in other biogeographical areas was determined by using Kulczinski (1928) simi-

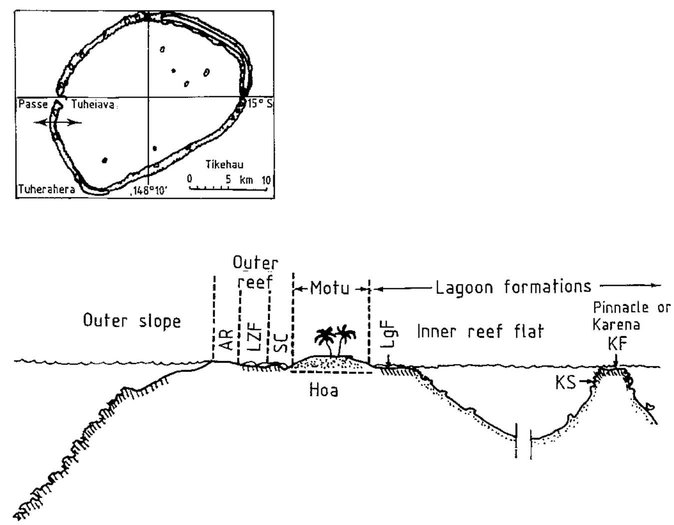

Fig. 1. Schematic transect across the reef rim of Tikehau at the position of the arrows in the insert map. AR = algal ridge; LZF = lapiazed flat; SC = shallow conglomerate; LgF = lagoon flat; KS = (pinnacle) karena slope; KF = (pinnacle) karena flat

larity coefficient: $S_{K2} = {}^1/_2\,[(S/S+U)+(S/S+V)] \times 100$; S = number of species occuring in both biogeographical areas, A and B; U = number of species restricted to area A; V = number of species restricted to area B.

Results

Sixty five species and 737 individuals of *Brachyura* and *Anomura* were collected at 13 sites on Tikehau (Table 1 a, b, c). The algal ridge contains the most abundant and diverse fauna (18 species and 26 individuals per dm^3; Fig. 2). The outer reef slope sites are apparently richer than the lagoonal sites. No species of crab, however, occurs at all 13 sites sampled.

The site classification dendrogram (Fig. 3) generated by Sanders' index of affinity (according to Sokal and Sneath (1963) method of clustering) clearly shows 2 distinct groups: one formed by all the outer reef sites and the algal ridge; and all other sites. The first group can be further subdivided; the sites at 30, 25 and 15 m combined and the shallower sites.

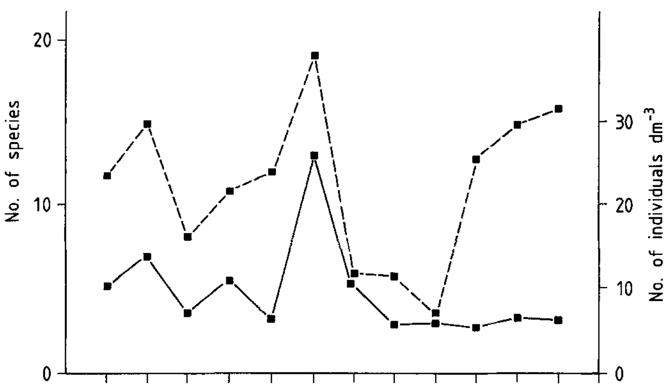

Fig. 2. Species (solid line) and individual abundance (dashed line) of carcinological cryptofauna across the reef of Tikehau; the site codes are on Fig. 1

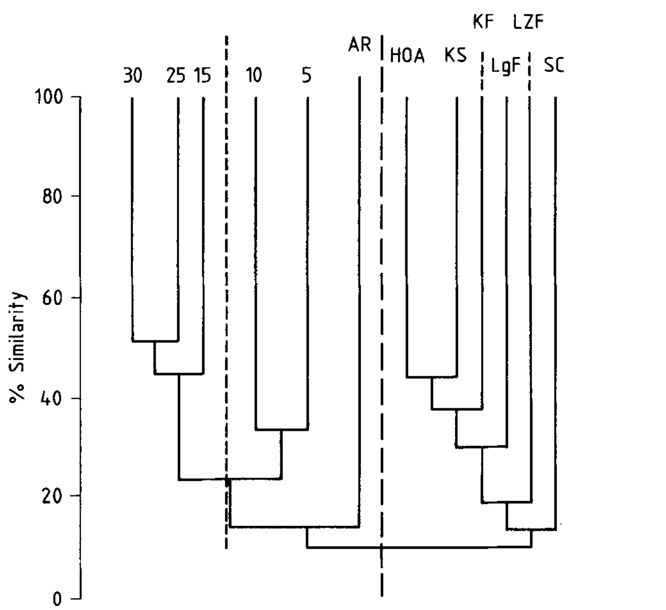

Fig. 3. Site classification dendrogram (Sokal and Sneath 1963) from carcinological cryptofauna of Tikehau atoll revealing one main group of species occuring on outer slopes and another occuring on all reef flat and lagoonal sites

The 30, 25 and 15 m sites on the outer reef slope are characterised by the xanthid *Liocarpilodes armiger* which occurs at all sites from 30 to 10 m where it is replaced by *L. integgerimus* which occurs at the 10, 5, 3 m and algal crest sites. Although *L. integgerimus* is not an abundant species it occurs consistently in low numbers at all these sites. *Pseudoliomera variolosa* occurs at all outer reef sites but is more abundant at 15 m where a density of 7 per dm^3 occurs. The anomurans, *Petrolisthes scabriculus, Galathea algae, Phylliadorynchus serrirostris* and *Sadayoshia miyakei* are also limited to outer reef slope sites. *S. miyakei* like in all the other reef slopes studied (Peyrot-Clausade 1981, 1984 a–c) occurs only at 30 m.

The fauna occurring on the algal ridge is dominated by 3 species, *Globopilumnus globulosus, Lioxanthodes alcocki* and *Paraxanthias notatus.* Two of these species, *G. globulosus* and *L. alcocki* occur only at this site, whereas *P. notatus,* which occurs in high numbers (41% of the total population) on the reef crest, also occurs on the lagoonal reef flat but always in low numbers (a single specimen was found on the inner back-reef-flat of the outer reef). The grapsid *Pachygrapsus minutus* occurs both in the emerged zone (lapiazed zone) and on the algal ridge, whereas the xanthid *Pilodius scabriculus* is found in the emerged zone and on the shallow conglomerate region of the reef. The greatest density of *Galathea affinis* (7 indiv/dm^3) occurs on the emerged zone where it is also the most common species.

Pilodius pugil is the only species well represented at the hoa site, where cavities are sparse and the species diversity is very low, probably because of the very hard nature of the substrate, the presence of strong currents and high temperatures. This result is corroborated by Monteforte (1984).

Table 1 c shows the species shared by lagoonal sites: *Actaeodes hirsutissima, Pilodius pugil, Galathea affinis* and *Menaethius monoceros.* In addition, *Chlorodiella barbata, Platypodia anaglypta* and *Coralliogalathea humilis* occur on the pinnacle sites. These lagoonal sites have similar composition but are different in number of individuals, probably due to local factors such as presence of algae.

The trophic structure of the carcinological fauna on Tikehau consists of 4 major feeding groups (Gore et al. 1978). These are: filter feeding species, including members of the families Porcellanidae and Galatheidae; omnivorous carnivores like species of *Liocarpilodes, Liomera, Actaea, Actaeodes, Paraxanthias, Globopilumnus,* omnivorous herbivores such as species of *Chlorodiella, Pilodius, Phymodius,* and detritivores such as *Pachygrapsus.* Two trends in this trophic structure are apparent on the outer slope (Fig. 4). One is that filter feeders constitute about 20% of the individuals sampled, and the other trend is that with increasing depth, the number of carnivores increases and the number of herbivores decreases.

Table 1a. The mean number of individuals dm^{-3} of cryptofaunal crabs on Tikehau and Moorea reefs in samples of approx. 5 dm^2. SD = standard deviation

Site	Tikehau											
	AR	LZ.F	SC	HOA	LGF	KF	KS	−30	−25	−15	−10	−5
Mean abundance ±SD	26±2.0	6.5±4.9	6.7±4.7	7.0±6.6	6.0±2.4	7.6±7.6	7.7±5.3	10±2.2	13.5±5.4	7±2.1	11±4.2	6.3±1.5
Number of samples	4	3	3	3	6	5	4	3	3	3	3	3

Site	Moorea			
	−30 m	−22 mm	−12 m	−3 m
Mean abundance ± SD	16.0±5.3	9.6±0.9	13.8±2.0	44.0±7.8
Number of samples	3	3	3	3

Table 1b. Crab cryptofauna of outer slope of Tikehau atoll expressed per dm^3. a = abundance; d = dominance (%)

	Outer slope									
	−30 m		−25 m		−15 m		−10 m		−5 m	
	a	d	a	d	a	d	a	d	a	d
Dromiidae	0.5	4.9								
Dynomenidae										
Dynomene hispida									0.1	2.2
Xanthidae										
Actaea aff. glandifera			0.1	1.0						
Actaeodes hirsutissima										
Chlorodiella barbata										
Chlorodiella cytherea										
Chlorodiella laevissima	0.2	2.4					0.8	7.3	0.3	4.4
Chlorodiella juv.	0.5	4.9	0.1	1.0	0.3	4.2				
Daira perlata										
Domecia glabra	1.2	12.2								
Domecia hispida							0.6	5.4	0.6	8.9
Globopilumnus globulosus										
Heteropanope sp.										
Liocarpilopes armiger	2.4	24.4	3.1	22.7	3.4	50.0	0.4	3.6		
Liocarpilopes integerrimus							0.2	1.8	1.0	15.6
Liomera bella										
Liomera rugata										
Liomera juv.										
Lioxanthodes alcocki										
Lybia plumulosa										
Paramedaeus sp.										
Paraxanthias notatus										
Phymodius nitidus										
Phymodius ungulatus										
Phymodius juv.										
Pilodius aberrans			0.7	5.2						
Pilodius flavus									1.1	17.8
Pilodius paumotensis										
Pilodius pugil										
Pilodius scabriculus										
Pilodius juv.					0.3	4.2	0.6	5.4		
Pilumnus tahitensis	0.5	4.9								
Pilumnus juv.	0.5	4.9	0.1	1.0			0.2	1.8		
Platypodia anaglypta										
Psaumis cavipes										
Pseudoliomera variolosa	1.0	9.8	1.3	9.2	1.4	21.0	0.6	5.4	0.6	8.9
Tetralia glaberrima									0.3	4.4
Trapezia guttata			1.4	10.3						

Table 1b (continued)

	Outer slope									
	−30 m		−25 m		−15 m		−10 m		−5 m	
	a	d	a	d	a	d	a	d	a	d
Trapezia rufopunctata							0.4	3.6		
Trapezia juv.							0.8	7.3		
Tweedieia laysani					0.3	4.2	0.6	5.4		
Xanthias lamarckii										
Xanthias sp.			0.1	1.0			0.4	3.6		
Zozymoïdes xanthoïdes										
Xanthidae juv.			1.3	9.2	0.6	8.4			1.0	15.6
Grapsidae										
Percnon planissimus										
Pachygrapsus minutus										
Portunidae										
Lissocarcinus orbicularis										
Thalamita sp. juv.							1.2	10.9		
Thalamitoïdes aff. bouvieri										
Oxyrhyncha										
Elamena mathaei										
Heteronuccia venusta										
Menaethius monoceros	0.8	7.3	0.4	3.1	0.3	4.2				
Miccipa margaritifera			0.1	1.0						
Perinea tumida							0.6	5.4	0.3	4.4
Raninidae			0.1	1.0						
Typhocarcinops ind.									0.1	2.2
Anomura										
Pachycheles pisoïdes										
Petrolisthes scabriculus			0.4	3.1			0.6	5.4		
Petrolisthes sp.									0.1	2.2
Coralliogalathea humilis										
Galathea affinis							2.0	18.2	0.9	13.3
Galathea algae			1.0	7.2	0.3	4.2				
Phylliadorhynchus serrisrostris	1.5	14.6	3.3	23.7			1.0	9.0		
Sadayoshia miyakei	0.5	2.4								
Galatheidae juv.	0.8	7.3								
Total (ind dm^{-3})	9.9	100	13.5	99.7	6.9	100	11	99.7	6.4	99.9
Number of species	12		15		8		16		12	
Shannon's index diversity =	3.26		3.14		2.23		3.69		3.24	

Table 1c. Crab cryptofauna of reef flats of Tikehau atoll. a = abundance; d = dominance (%)

	Outer reef flat						Hoa		Lagoon formations					
	AR		LZ.F		SC				LGF		KF		KS	
	a	d	a	d	a	d	a	d	a	d	a	d	a	d
Dynomenidae														
Dynomene hispida														
Xanthidae														
Actaea aff. glandifera														
Actaeodes hirsutissima									0.1	1.7	0.1	1.3	0.1	1.3
Chlorodiella barbata											0.3	3.9	0.6	7.8
Chlorodiella cytherea			0.9	8.0										
Chlorodiella laevissima	0.1	0.4							0.4	6.7				
Chlorodiella juv.	0.5	1.9											0.1	1.3
Daira perlata	0.1	0.4												
Domecia glabra														
Domecia hispida														

Table 1c (continued)

	Outer reef flat						Hoa		Lagoon formations					
	AR		LZ.F		SC				LGF		KF		KS	
	a	d	a	d	a	d	a	d	a	d	a	d	a	d
Globopilumnus globulosus	5.3	20.2												
Heteropanope sp.					0.2	3.0								
Liocarpilopes armiger														
Liocarpilopes integerrimus	1.6	6.1												
Liomera bella														
Liomera rugata	0.8	3.1											0.3	3.9
Liomera juv.			0.3	2.7					0.1	1.7	0.1	1.3		
Lioxanthodes alcocki	2.6	9.9												
Lybia plumulosa					0.4	6.2								
Paramedaeus sp.	0.2	0.8												
Paraxanthias notatus	11.3	43.1			0.2	3.0			0.4	6.7				
Phymodius nitidus									0.1	1.7				
Phymodius ungulatus									0.4	6.7				
Phymodius juv.							0.2	2.9			0.1	1.3	0.3	3.9
Pilodius aberrans														
Pilodius flavus														
Pilodius paumotensis	0.2	0.8												
Pilodius pugil							6.0	86.9	1.2	20.6	0.3	3.9	3.0	39.0
Pilodius scabriculus			1.7	15.1	4.4	67.7					0.1	1.3		
Pilodius juv.									0.1	1.7				
Pilumnus tahitensis														
Pilumnus juv.	0.2	0.8									3.1	40.2	1.1	14.3
Platypodia anaglypta											0.2	2.7	0.2	2.6
Psaumis cavipes	0.1	0.4												
Pseudoliomera variolosa											0.1	1.3	0.1	1.3
Tetralia glaberrima														
Trapezia guttata														
Trapezia rufopunctata														
Trapezia juv.														
Tweedieia laysani														
Xanthias lamarckii					0.4	6.2								
Xanthias sp.														
Zozymoïdes xanthoïdes											0.1	1.3		
Xanthidae juv.	1.1	4.2	0.3	2.7	0.9	13.8			2.0	33.3	0.1	1.3	0.1	1.3
Grapsidae														
Percnon planissimus	0.5	1.9												
Pachygrapsus minutus	0.1	0.4	1.0	8.9			0.5	7.2						
Portunidae														
Lissocarcinus orbicularis									0.2	3.3				
Thalamita sp. juv.	0.1	0.4							0.2	3.3			0.1	1.3
Thalamitoïdes aff. bouvieri													0.1	1.3
Oxyrhyncha														
Elamena mathaei													0.1	1.3
Heteronuccia venusta											0.1	1.3		
Menaethius monoceros							0.2	2.9	0.5	8.3	1.8	23.0	0.1	1.3
Miccipa margaritifera														
Perinea tumida	0.1	0.4												
Raninidae														
Typhocarcinops ind.														
Anomura														
Pachycheles pisoïdes	0.8	3.1												
Petrolisthes scabriculus														
Petrolisthes sp.	0.5	1.9												
Coralliogalathea humilis											0.9	11.6	0.3	3.9
Galathea affinis			7.0	62.5					0.3	5.0	0.3	3.9	1.1	14.3
Galathea algae														
Total (ind dm^3)	26.2	100	11.2	99.9	6.5	99.9	6.9	99.9	6.0	100	7.7	99.6	7.7	100
Number of species	19		6		6		4		13		15		16	
Shannon's index diversity =	2.61		1.85		1.62		0.71		3.01		2.71		2.95	

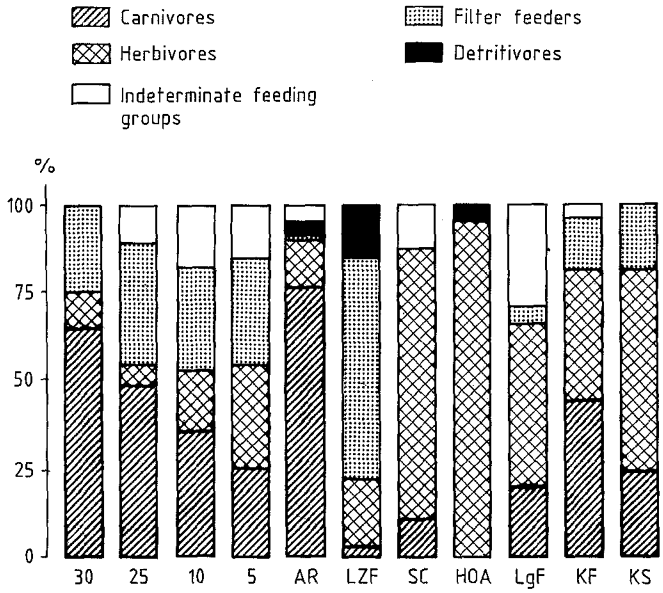

Fig. 4. Distribution of the 3 major feeding groups of decapod cryptofauna on Tikehau atoll

This is related to the decline in algal cover with depth. Carnivorous species dominate the algal ridge site, however, at all other sites, omnivorous herbivores are the dominant feeding type present.

Dominance of herbivores in the lagoon correlates with algal domination at these sites.

In order to compare these assemblages on the atoll of Tikehau with those present on the reefs of Moorea, a high island, the results of Peyrot-Clausade (1977a, b, 1979, 1981, 1982, 1984a–c, 1985) from the outer reef slope collected from 3–30 m depth are used (Table 2). At the Moorea sites, 66 species were present with the richest site at 3 m depth, with 30 species and an average abundance of 44 dm^{-3}. There is a decrease in species abundance with increasing depth, except for 2 species of Anomura, *Phylliadorhynchus serrirostris* and *Petrolisthes scabriculus* which are extremely abundant at 30 m.

Discussion

The maximum diversity of cryptofaunal crustaceans occurs on the algal ridge at Tikehau and on the outer reef flat at Moorea whereas the greatest differences occur on the reef-flats, with 50 ind/dm^{-3} on Moorea but only 11 ind/dm^{-3}on Tikehau. These differences become less marked on the outer slopes where the density on the high island is only twice that on the atoll. Seventy four percent of species are common to both reefs and the remaining species are never represented by more than one individual per sample.

This survey permits some comments to be made on the distribution of species within Polynesian reef complexes. The genus *Pilodius* is represented by a suite of species which occur in different habitats within the reef, *P. aberrans* is found on the outer slope at depths of 25 m, and is replaced by *P. flavus* on the upper slope. *Pilodius paumotensis* occurs only on the algal ridge. In contrast *P. scabriculus* occurs on the outer reef of an atoll or on the barrier reef flat of a high island, and this species is replaced by *P. pugil* in the hoa and lagoonal situations in the atoll and on the flat of the fringing reef on the high island. Monteforte (1984) found *P. areolatus* in the lagoon of Mataiva atoll where he also found that individuals occurring on atolls generally belong to large species groups whereas on high atolls the same niches are occupied by individuals of small species groups.

There is a low species diversity of gastropods on atolls in contrast to high islands (Richard 1982). This confirms Salvat's (1967) findings that the diversity of Polynesian mollusc fauna is very low and particularly low on the atolls. The low diversity and abundance of cryptofaunal species found on the atolls can perhaps be explained by low run-off of surface nutrients from the atoll into the nearby waters and the poor development of cavities suitable for colonisation by cryptofauna in coral habitats on the flat in contrast to the reef flat situation of high islands. The only habitat on an atoll where numerous cavities develop occurs on the algal ridge, where the maximum diversity of cryptofauna occurs.

Table 2. Carcinological cryptofauna of the reef outer slope of Moorea per 1 dm^3 of substratum. a = abundance; d = dominance (%)

	−30 m		−22 m		−12 m		−3 m	
	a	d	a	d	a	d	a	d
Dromiidae	0.1	0.63	0.3	3.16				
Dynomenidae								
Dynomene hispida					0.1	0.73		
Xanthidae								
Actaea aff. glandifera			0.3	3.16				
Actaea polyacantha			0.3	3.16				
Actaea juv.	0.1	0.63			0.1	0.73		
Actaeodes consobrina	0.3	1.90						
Chlorodiella laevissima	3.9	24.68	1.5	15.79	4.5	32.60	7.2	16.36
Chlorodiella juv.	0.4	2.53	1.5	15.79	0.1	0.73	0.9	2.04

Table 2 (continued)

	−30 m		−22 m		−12 m		−3 m	
	a	d	a	d	a	d	a	d
Daira perlata							0.9	2.04
Aff. galliardellus	0.3	1.90						
Heteropilumnus ind.							0.1	0.22
Liocarpilodes armiger			0.3	3.16	0.6	4.34		
Liocarpilodes integerrimus							11.2	25.45
Liocarpilodes juv.							0.3	0.68
Liomera monticulosa	0.1	0.63						
Liomera rugata							0.1	0.22
Liomera stimpsoni					0.4	2.90		
Liomera juv.							0.1	0.22
Medaeus ind.	0.1	0.63						
Neoliomera demani					0.1	0.73		
Neoliomera juv.	0.1	0.63						
Paractaea quadriaerolata							0.1	0.22
Paractaea retusa f. hippocrepica							0.5	1.13
Paraxanthias notatus							0.8	1.81
Pilodus aberrans	1.5	9.49						
Pilodus flavus					0.1	0.73	0.1	0.22
Pilodus juv.					0.8	5.79	0.8	1.81
Pilumnus tahitensis	0.3	1.90	0.3	3.16				
Pilumnus juv.					0.3	2.17	0.4	0.91
Platypodia anaglypta							0.4	0.91
Platypodia semigranosa			0.3	3.16	0.1	0.73		
Platypodia juv.	0.1	0.63						
Pseudoliomera lata							0.7	1.59
Pseudoliomera variolosa					0.4	2.90		
Pseudoliomera juv.							0.3	0.68
Tetralia ind.			0.3	3.16				
Trapezia ferruginea			0.3	3.16				
Trapezia juv.	0.4	2.53			0.1	0.73	0.3	0.68
Viaderiana ind.							0.1	0.22
Xanthias sp. 1					0.1	0.73		
Xanthidae juv.					0.1	0.73	5.1	11.59
Portunidae								
Thalamita pryma					0.3	2.17	0.1	0.22
Thalamita sp. 1					0.1	0.73	1.1	2.50
Thalamita sp. 2							0.1	0.22
Thalamita juv.	0.4	2.53					0.1	0.22
Portunidae ind.					0.1	0.73		
Oxyrhyncha								
Hyastenus aff. borradaeilli					0.1	0.73		
Menaethuis monoceros	1.3	8.23	0.3	3.16	0.3	2.17		
Perinea tumida			0.5	5.26	0.1	0.73	3.7	8.40
Pisinidae ind.			0.3	3.16				
Raninidae ind.							0.1	0.22
Oxyrhynque ind.					0.3	2.17		
Anomura								
Coralliogalathea humilis			0.3	3.16	0.4	2.90		
Galathea affinis	0.1	0.63			0.5	3.62	5.1	11.59
Galathea algae	0.7	4.43	0.8	8.42	0.9	6.52		
Galathea aff. amamiensis	0.1	0.63						
Galathea sp. 5	1.1	6.96						
Galathea ind. juv.	0.8	5.06	0.3	3.16	0.4	2.90		
Phylliadorhynchus serrirostris	1.6	10.13	0.8	8.42	1.3	9.42	0.3	0.68
Sadayoshia miyakei	0.5	3.16	0.5	5.26	0.3	2.40		
Pachycheles sculptus							2.7	6.13
Petrolisthes elegans							0.3	0.68
Petrolisthes scabriculus	1.5	9.49			0.8	5.79		
Petrolisthes juv.			0.3	3.16				
Total	15.8	99.96	9.5	100.00	13.8	100.00	44.00	99.86
Number of species	23		19		29		30	
Shannon's index diversity	3.82		3.72		3.86		3.48	

Table 3. Comparison between carcinological cryptofauna of Tuléar, Reunion, Mauritius and Polynesian reefs (Tikehau and Moorea)

	Tikehau	Moorea	Reunion	Mauritius	Tuléar
Total number	65	83	70	96	172
Number of species on outer slope	36	66	54	70	120
Number of individuals dm^{-3}	10	35	30	58	18

Table 4. Comparison between the different cryptofaunal reef crabs showing a considerable similarity within Indo-Pacific reefs

	Moorea	Reunion	Mauritius	Tuléar
Tikehau	63	37	43	44
Values of Kulczinski's index between Tikehau and other reefs				
Tikehau	48	25	33	42
Number of cryptofaunal decapods of Tikehau in common with other reefs				

Table 5. Comparison between carcinological cryptofauna of different outer slope reefs in Moorea and Tikehau (French Polynesia) and Tuléar (Madagascar)

	Moorea	Tuléar	
Tikehau	30	26	Number of species in common
Tikehau	64	47	Kulczinski's index

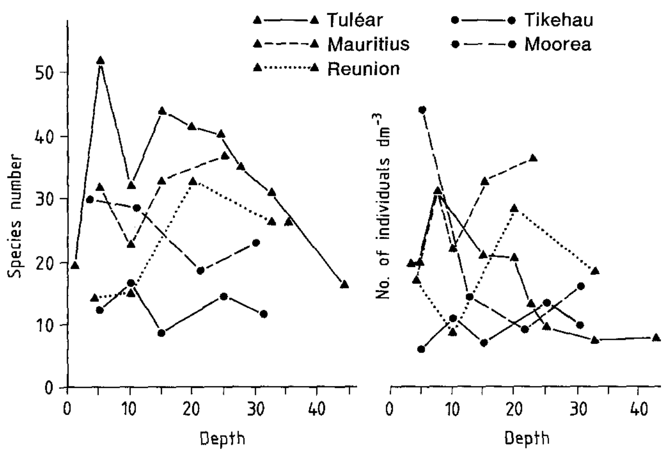

Fig. 5. A comparison between carcinological cryptofauna of outer reef slopes of Indo-Pacific reefs

This study complements a similar investigation carried out in the Indian Ocean on Tuléar Reefs (Peyrot-Clausade 1981, 1982, 1985) and in Mauritius and Réunion (Peyrot-Clausade 1979, 1981, 1982, 1984a–c). In these studies, 225 species of *Brachyura* and *Anomura* were collected in contrast to the 65 species found in Tikehau and 83 species in Moorea (Table 3).

The number of species shared between Tikehau and other reefs studied, using the Kulczinski index indicates that a considerable similarity of fauna exists within Indo-Pacific reefs (see Table 4). For example, 74% of the crabs present in Tikehau are also found on Moorea, 64% are found in Madagascar, 51% in Mauritius and 39% in Réunion.

If the Malagasy and Polynesian outer slope decapod communities are compared using the Kulczinski index and % of common species (Fig. 5), 83% of the species present on the outer slope of Tikehau also occur on Moorea and 71% of these species are found in Madagascar (Table 5). The similarity of the outer reef slope decapod communities can be explained by the stability of the environment in this biotope in contrast to the fluctuations on the reef flat (Vasseur 1981).

A similar pattern of low diversity on Central Pacific reefs is exhibited by the mollusc fauna (Salvat 1967), fish communities (Harmelin-Vivien 1986), corals (Coudray and Montaggioni 1982), and decapod fauna (Forest and Guinot 1962). Different hypotheses have been put forward to explain this low diversity. Among the most recent are those of Coudray and Montaggioni (1982) who have postulated that Central Pacific coral fauna represent a relict, impoverished fauna, with the degree of impoverishment increasing in the direction of West to East. McCoy and Heck (1976) considered that the Indonesian centre of dispersion represents the remnants of a previously widely distributed fauna; they suggest that "Biogeographical patterns are better explained by the existence of a previously widely-distributed biota which have since been modified by tectonic events, speciation, and extinction ...". Potts (1983), however, suggests that "these evolutionary disturbance did not cause faunal changes". The data presented here on the carcinological fauna would tend to support the hypotheses of McCoy and Heck (1976) and Coudray and Montaggioni (1982).

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References

Coudray J, Montaggioni L (1982) Coraux et récifs coralliens de la province Indo-Pacifique: répartition géographique et altitudinale en relation avec la tectonique globale. Bull Soc Géol Fr 24:981–993

Forest, J, Guinot D (1962) Remarques biogéographiques sur les crabes des Archipels de la Société et des Tuamotu. Cah Pacif 4:41–57

Gore RH, Scotto LE, Becker LJ (1978) Studies on the decapod Crustacea from the Indian River Florida. IV Community composition, stability and trophic partitioning in decapod crustaceans inhabiting some subtropical sabillariid worm reefs. Bull Mar Sci 28:221–248

Harmelin-Vivien M (1985) Tikehau Atoll, Tuamotu archipelago. Proc 5th Int Coral Reef Symp 1:211–268

Harmelin-Vivien ML (1986) Reef fish community structure: an Indo-Pacific comparison. In: Harmelin-Vivien ML, Boulière F (eds) Vertebrates in complex tropical systems. Springer, Berlin Heidelberg New York, p 200

Intès A (1984) L'atoll de Tikehau: généralités. In: L'atoll de Tikehau (Archipel des Tuamotu, Polynésie française) premiers résultats. ORSTOM Tahiti, Notes Doc Océanogr 22:108–136

Kulczinski S (1928) Die Pflanzenassoziationen der Pienien. Bull Int Acad Polonaise Sci Lett Ser B 2:57–203

McCoy E, Heck K (1976) Biogeography of corals, seagrasses and mangroves: an alternative to the center of origin concept. Syst Zool 25:201–210

Monteforte M (1984) Etude des peuplements de Crustacés Décapodes Reptantia et Stomatopodes de Polynésie française. Unpublished thesis, University of Paris 6, p 148

Naïm O (1980) Etude qualitative et quantiative de la faune mobile associée aux algues du lagon de Tiahura (Moorea). Unpublished thesis, University of Paris 6, p 178

Odinetz O (1983) Ecologie et structure des peuplements de Crustacés Décapodes associés aux coraux du genre *Pocillopora* en Polynésie française et en Micronésie (Guam). Unpublished thesis, University of Paris 6, p 221

Peyrot-Clausade M (1977a) Decapodes Brachyoures et Anomoures (à l'exclusion des Paguridae) de la cryptofaune du récif de Tiahura (Moorea). Cah Pacif 20:211–222

Peyrot-Clausade M (1977b) Faune cavitaire mobile des platiers coralliens de la région de Tuléar (S. O. de Madagascar). Thèse d'etat, Aix-Marseille II, p 187 and Annexe

Peyrot-Clausade M (1979) Cryptofauna annélidienne et carcinologique des récifs de l'Ile de la Réunion et de l'Ile Maurice. Mauritius Inst Bull 8:1–41

Peyrot-Clausade M (1981) Distribution of Decapods Brachyura and Anomura (excluding Paguridae) of the cryptofauna in the reefs near Tulear. Atoll Res Bull 255:101–115

Peyrot-Clausade M (1982) Motile cryptofauna of Tulear Great Reef outer slope: Brachyura and Anomura distribution. Proc 4th Int Coral Reef Symp 2:745–754

Peyrot-Clausade M (1984a) Cryptofaune carcinologique des vasques et des formations construites de lagon du Grand Récif de Tuléar (S. W. de Madagascar). Ann Inst Oceanogr Paris 60:29–41

Peyrot-Clausade M (1984b) Cryptofaune mobile et macroforeurs des formations récifales de l'atoll de Tikehau: étude quantitative préliminaire. ORSTOM Tahiti, Notes Doc Océanogr 22:127–146

Peyrot-Clausade M (1984c) Cryptofaune carcinologique des pentes externes des récifs de l'Ile Maurice et de l'Ile de la Réunion. Mauritius Inst Bull 10:103–121

Peyrot-Clausade M (1985) Motile cryptofauna modifications related to coral degradations on Tiahura coral reef flat (Moorea-Polynesia). Proc 5th Coral Reef Symp 6:459–464

Potts DC (1983) Evolutionary disequilibrium among Indo-Pacific corals. Bull Mar Sci 33:619–632

Richard G (1982) Mollusques lagonaires et récifaux de Polynésie française: inventaire faunistique, bionomie, bilan quantitatif, croissance, production. Thèse d'etat, Paris 6, p 313

Salvat B (1967) Importance de la faune malacologique dans les atolls polynésiens. Cah Pacif 11:7–49

Sanders H (1960) Benthic studies in Buzzards Bay. III The structure of soft bottom community. Limnol Oceanogr 5:138–153

Sokal RR, Sneath PHA (1963) Principles of numerical taxonomy. Freeman, San Francisco, p 776

Vasseur P (1981) Recherches sur les peuplements sciaphiles des récifs coralliens de la région de Tuléar (S. W. de Madagascar). Thèse d'etat, Aix-Marseille II, p 348