

A PRELIMINARY REPORT OF ECOLOGICAL STUDY ON SOME INTERTIDAL FISHES OF TAIWAN*

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ABSTRACT

One thousand one hundred and forty five fishes of 63 species belonging to 28 families and one thousand and ninety nine fishes of 62 species belonging to 28 families were collected from Patoutzu and Maopitou respectively. Among them only 7 species of fishes from Patoutzu and 21 species of fishes from Maopitou were considered to be the characteristic species of sub-tropical and tropical species respectively. At these two locations, the tropical species were commonly dominant in distribution.

INTRODUCTION

Many taxonomists have collected and reported upon the fishes of Taiwan (Chen, 1969). Most of their work was based upon collections secured from local markets and sea shores. But there is still no work concerning fish ecology has been done in Taiwan. The geographical situation of Taiwan is such that it is separated into tropical and subtropical regions by the Tropic of Cancer. And, ecologically, it may be a confusing region with the biomass constituting of both the tropical and subtropical species.

This study is made with an attempt to find out some knowledges of the species composition of fishes with its seasonal and regional variations from both of the tropical and subtropical regions of Taiwan.

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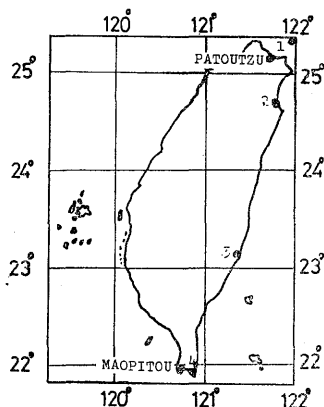


Fig. 1 Map of Taiwan

MATERIALS AND METHODS

Research work was carried out monthly from March to December during 1969 at two selected tidepools in two chosen localities as shown in Fig. 1.

The first locality, Patoutzu, representing subtropical region, is lying on the northernmost coast 5 Km NE of Keelung. The other locality, Maopitou, representing

tropical region, is situated at the southern tip of Taiwan 10 Km S of Hengchun.

The environments of both of the two localities are extremely similar to each other; they are exposed at low tides with tidepools connected with the open sea.

The size of the selected tidepools of the above mentioned localities are approximately the same, about 10 square meters in area and 1 m in depth.

Before sampling, the water temperature, pH value and specific gravity were observed. Fishes were collected in intertidal zone using rotenone. Sampling was conducted for a period of two hours by two workers. All fishes were removed and great care was exercised to insure that all poisoned specimens were collected. Upon capture, they were preserved in 10% formalin and later transferred to the laboratory where they were sorted.

RESULTS

Water temperature, specific gravity and pH value:

As shown in Fig. 2A, during the experimental period, the water temperature varied from 26°C to 23°C at Maopitou and 25°C to 19.8°C at Patoutzu. It showed a slight increase from March through September in both of the two localities,

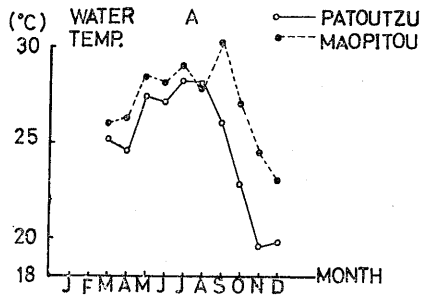


Fig. 2A. Monthly variation of water temperature at Patoutzu and Maopitou

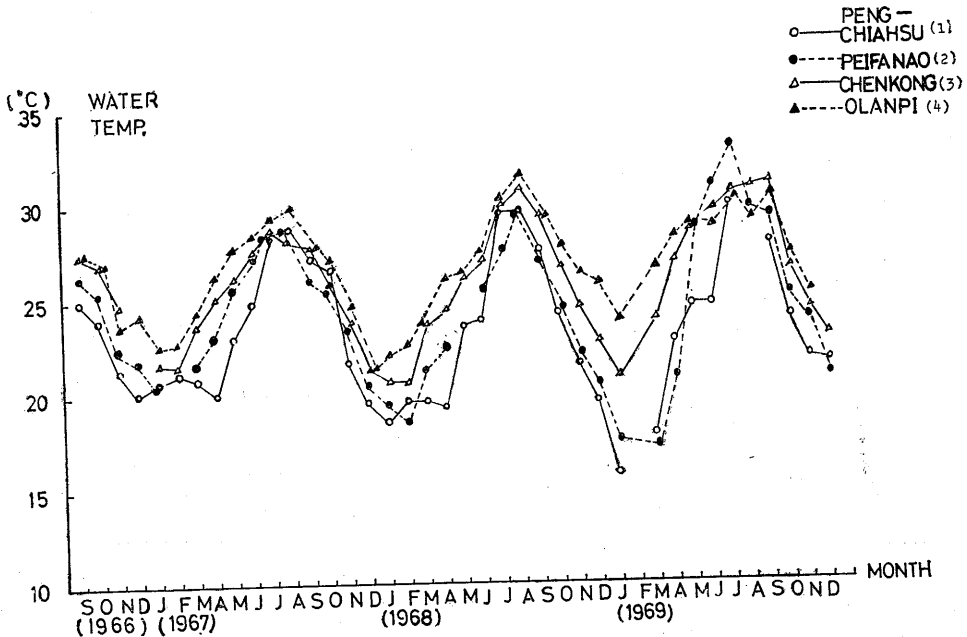


Fig. 2B. Monthly variation of the water temperature at PengchiahSU, PeifanAO, ChenKONG and OlanPI. (After JCRR)

*The number shown the localities correspondance on Fig. 1.

and a sudden drop from October to December was seen in Patoutzu. Although the course of the temperature changes followed the normal pattern, however, the temperature profiles during the summer season were considerably flatter than the usual. This could be due to the fact that the temperature reading at Maopitou in August and at Patoutzu in September were made just after a rainfall. It should be noted

that a similar trend can be seen in other localities during the same period of time according to the data compiled by J. C. R. R. (Fig. 2B). The range of the variation of the specific gravity were 1.020-1.024 at Maopitou and 1.023-1.028 at Patoutzu. The pH values ranged from 7.8-8.3 and from 8.0-8.4 at Maopitou and Patoutzu respectively (Fig. 3).

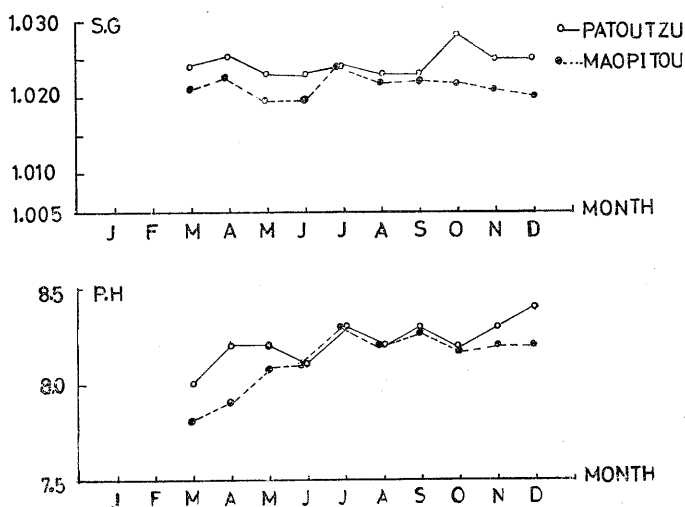


Fig. 3 Monthly variation of Specific gravity and pH value.

Species composition:

One thousand one hundred and forty five fishes of 63 species belonging to 28 families and one thousand and ninety nine

fishes of 62 species belonging to 28 families were collected from Patoutzu and Maopitou respectively as shown in Tables 1 and 2.

TABLE 1
Species compositions of the fishes collected from Patoutzu

Species name	Body length (mm)	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
<i>Echidna polyzona</i>	436			1								1
<i>Gymnothorax fimbriatus</i>	355	1										1
<i>G. meleagris</i>	417			1								1
<i>Fistularia petimba</i>	158-162				2							2
<i>Sphyaena picuda</i>	80				1							1
<i>Atherion elymus</i>	28-58								131	40		171

TABLE 1 (Continued)

Species name	Body length (mm)	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
<i>Liza macrolepis</i>	35-103	1		2								3
<i>L. parva</i>	28-34			7								7
<i>L. pescadorensis</i>	50-65						3					3
<i>Crenimugil crenilabis</i>	26-42			18		1				10	1	30
<i>Girella melanichthys</i>	22-52		58	32	1	1						92
<i>G. mezina</i>	50-73			2							1	3
<i>Upeneus sulphureus</i>	27-46			6	2							8
<i>Apogon doederleini</i>	21-44				4	9	3					16
<i>A. lineatus</i>	27-43						3					3
<i>Pempheris sp.</i>	26-37				9							9
<i>Epinephelus caeruleopunctatus</i>	20-160		2	2		1	34	1				40
<i>E. merra</i>	31-112					1	1					2
<i>E. fario</i>	162-215				2							2
<i>Plectropomus maculatus</i>	74						1					1
<i>Lutjanus vitta</i>	22			1	1							2
<i>L. russelli</i>	16-76					2	25					27
<i>Therapon jarbua</i>	31				1							1
<i>Abudefduf saxatilis</i>	12-57	1	2	2	38	53	45	2		12	4	159
<i>A. sordidus</i>	14-55		1	8	15	1	9				2	36
<i>A. septemfasciatus</i>	19-46		1		4		5					10
<i>A. sexfasciatus</i>	22-23				2							2
<i>Pomacentrus coelestis</i>	19-29				7	2						9
<i>Stethojulis strigiventer</i>	18-63	2		6		20	2					30
<i>S. kalosoma</i>	35-72	1					6	4	6	3	1	21
<i>S. phekadopleura</i>	42					1						1
<i>Halichoeres melanochir</i>	26-70		2		1		3					6
<i>H. marginatus</i>	61						1					1
<i>Platax orbicularis</i>	26-34				1	1						2
<i>Chaetodon vagabundus</i>	20-23				2		1			1		4
<i>C. auriga</i>	26-30				1	1						2
<i>C. collare</i>	42-72	1							1			2
<i>Microcanthus strigatus</i>	17-46			76	24							100
<i>Pomacanthus semicirculatus</i>	13-41				2	1	9		1			13
<i>Acanthurus triostegus</i>	44						1					1
<i>Prionurus microlepis</i>	29-45				7							7
<i>Asterropteryx semipunctatus</i>	18-57	61	15	10		2	5	6	3		1	103
<i>Eviota abax</i>	21-32		1	1	1		1		1		1	6

TABLE 1 (Continued)

Species name	Body length (mm)	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
<i>Zonogobius semidoliatus</i>	18-23	2					1		1		1	5
<i>Bathygobius fuscus</i>	26-77	17		21	7		15	2	5		2	69
* <i>Pipidonia arenarius</i>	30-37	5	1	1				1	1			9
<i>Acentrogobius campbelli</i>	39-74	15			1		3		2	2	2	25
* <i>Gnatholepis knighti</i>	37-50	2					1					3
<i>Bothus pantherinus</i>	65	1										1
<i>Tripterygion etheostoma</i>	30-44	7			4		1	1			2	15
* <i>T. minutus</i>	20	1										1
<i>Omobranchus trossulus</i>	25-47				1		3					4
* <i>O. sp.</i>	27-58	4	8	3			3	2		1		21
<i>Istiblennius edentulus</i>	63		1									1
<i>Halmablennius striatamaculatus</i>	48-68			5								5
<i>Arothron hispidus</i>	13-66				2	3	18					23
<i>A. stellatus</i>	19				1							1
<i>A. immaculatus</i>	21						1					1
<i>Diodon holacanthus</i>	97-183		2	2	1							5
<i>Ostracion tuberculatus</i>	46							1				1
<i>Aspasma misakia</i>	43-71	3		1	4							8
<i>A. ciconiae</i>	61						1					1
<i>Histrio histrio</i>	11-16		1	2	2							5
Total		125	95	210	151	103	202	20	152	69	18	1145

Note: * new to Taiwan

TABLE 2

Species compositions of the fishes collected from Maopitou

Species name	Body length (mm)	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
<i>Echidna nebulosa</i>	91-356			1	2	1	2	1		1		8
<i>E. zebra</i>	650								1			1
<i>Gymnothorax fimbriatus</i>	141-154				1			1				2
<i>G. flavimarginatus</i>	185-478		2		1		2					5
<i>Moringua abbreviata</i>	358				1							1
<i>Conger cinereus</i>	128						1					1
<i>Hippichthys nox</i>	56			1								1
<i>Atherion elymus</i>	17-40	2	9	4	19	4		3	63	22	11	137
<i>Atherina woodwardi</i>	78								1			1

TABLE 2 (Continued)

Species name	Body length (mm)	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
<i>Mugil kelaartii</i>	60	1										1
<i>M. tade</i>	16-45		4	35								39
<i>Liza macrolepis</i>	18-114				64	77	15		22	41	10	229
<i>L. parva</i>	17-34							8				8
<i>Crenimugil crenilabis</i>	28-72				11	5		2	6	4	2	30
<i>Upeneus sulphureus</i>	42-45				2							2
<i>Apogon doederleini</i>	15-80	2		2	6	2	5	5		2	3	27
<i>Pempheris sp.</i>	16-50				92	9	3					104
<i>Epinephelus caeruleopunctatus</i>	80		1									1
<i>E. merra</i>	81				1							1
<i>Grammistes sexlineatus</i>	29-71			1	1							2
<i>Plesiops melas</i>	34-67		1	1	1		1	2				6
<i>Dampiera spiloptera</i>	34-54			3	2	1						6
<i>Ambassis gymnocephalus</i>	44						1					1
<i>Gerres oblongus</i>	40								1			1
<i>Lutjanus russelli</i>	115-118								1		1	2
<i>Scolopsis cancellatus</i>	19-64				2				1		1	4
<i>Abudefduf saxatilis</i>	15-53	1		8	23	8	10	3	2	1	14	70
<i>A. sordidus</i>	16-59	4		4	6			1		1		16
<i>A. septemfasciatus</i>	18-84	4	1	5		4	1		1		10	26
<i>A. sexfasciatus</i>	18-57	1		2	1		2					6
<i>A. biocellatus</i>	15-65	7	1	1			16	3	5	1		34
<i>Stethojulis axillaris</i>	31-72	2			13				3			18
<i>S. strigiventer</i>	21-43	2					6	2				10
<i>S. phekadopleura</i>	18-95			1	3	1	16	1	4	5	5	36
<i>Halichoeres marginatus</i>	63	1										1
<i>H. margaritaceus</i>	30-36			4								4
<i>H. trimaculatus</i>	68-95					1		1				2
<i>Thalassoma hardwicke</i>	94					1						1
<i>Hemigymus fasciatus</i>	33						1					1
<i>Leptoscarus vaigiensis</i>	57-122				4	1						5
<i>Chaetodon lunula</i>	40	1										1
<i>C. vagabundus</i>	30-45				1	1		1			1	4
<i>Pomacanthus semicirculatus</i>	62				1							1
<i>Acanthurus triostegus</i>	21-33						2		1	1	2	6
<i>Scorpaenodes guamensis</i>	29-93	7	14	2	3		2		2	1		31
<i>Synanceia verrucosa</i>	71-84		1		2							3

TABLE 2 (Continued)

Species name	Body length (mm)	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
<i>Eleotris fusca</i>	21-27		4									4
<i>Asterropteryx semipunctatus</i>	18-40		16		5	1		23	2		1	48
<i>Eviota abax</i>	19		1									1
<i>Parioglossus dotui</i>	22-29		1					2				3
<i>Zonogobius semidoliatus</i>	23-32		2		1			1				4
<i>Bathygobius fuscus</i>	19-62		13	5	26	6	9	12	2	4		77
<i>Acentrogobius ornatus</i>	21-56		1				1	3		1	1	7
<i>Istiblennius edentulus</i>	50-108	8	7	2								17
<i>I. andamanensis</i>	57-83		1	1								2
<i>Halmablennius lineatus</i>	36-94		5	2	3	1	2	2	2		1	18
<i>Arothron hispidus</i>	29-70		1		1							2
<i>A. meleagris</i>	11-17							9				9
<i>Canthigaster margaritatus</i>	17							1				1
<i>C. valentini</i>	22-31			2								2
<i>Rhineacanthus aculeatus</i>	26-53							2				2
<i>Histrio histrio</i>	12-20			2	2	1						5
Total		43	86	89	301	125	110	77	120	85	63	1099

All of the fishes found at the two localities are shown together with their frequency of appearance in Table 3. Most of these fishes are damsel fishes, wrasses, gobies and butterfly fishes. Among them, 28 dominant tropical species appeared in both of the two regions.

The following 11 species constituted 61.5% of the collected fishes of Patoutzu: *Atherion elymus*, *Abudefduf saxatilis*, *Asterropteryx semipunctatus*, *Bathygobius fuscus*, *Epinephelus caeruleopunctatus*,

Abudefduf sordidus, *Crenimugil crenilabis*, *Stethojulis strigiventer*, *Lutjanus russelli*, *Arothron hispidus* and *Apogon doederleini*. On the other hand, the following 12 species constituted 74.3% of the collected fishes of Maopitou: *Liza macrolepis*, *Atherion elymus*, *Pempheris sp.*, *Bathygobius fuscus*, *Abudefduf saxatilis*, *Asterropteryx semipunctatus*, *Stethojulis phkadopleura*, *Crenimugil crenilabis*, *Apogon doederleini*, *Abudefduf septemfasciatus*, *Istiblennius edentulus* and *Abudefduf sordidus*.

TABLE 3

Main different species compositions of Patoutzu and Maopitou. during 1969

Species name	Localities	Patoutzu	Maopitou
<i>Echidna polyzona</i>		+	-
<i>E. nebulosa</i>		-	+
<i>E. zebra</i>		-	+
<i>Gymnothorax fimbriatus</i>		+	+
<i>G. meleagris</i>		+	-
<i>G. flavimarginatus</i>		-	+
<i>Moringua abbreviata</i>		-	+
<i>Conger cinereus</i>		-	+
<i>Fistularia petimba</i>		+	-
<i>Hippichthys nox</i>		-	+
<i>Sphyaena picuda</i>		+	-
<i>Atherion elymus</i>		+++	+++
<i>Atherina woodwardi</i>		-	+
<i>Mugil kelaartii</i>		-	+
<i>M. tade</i>		-	+
<i>Liza macrolepis</i>		+	+++
<i>L. parva</i>		+	+
<i>L. pescadorensis</i>		+	-
<i>Crenimugil crenilabis</i>		+	+
<i>Girella melanichthys</i>		++	-
<i>G. mezinga</i>		+	-
<i>Upeneus sulphureus</i>		+	+
<i>Apogon doederleini</i>		+	+
<i>A. lineatus</i>		+	-
<i>Pempheris sp.</i>		+	+++
<i>Epinephelus caeruleopunctatus</i>		+	+
<i>E. merra</i>		+	+
<i>E. fario</i>		+	-
<i>Grammistes sexlineatus</i>		-	+
<i>Plectropomus maculatus</i>		+	-
<i>Plesiops melas</i>		-	+
<i>Dampiera spiloptera</i>		-	+
<i>Ambassis gymnocephalus</i>		-	+
<i>Gerres oblongus</i>		-	+
<i>Lutjanus vitta</i>		+	-
<i>L. russelli</i>		+	+

TABLE 3 (Continued)

Species name	Localities	Patoutzu	Maopitou
<i>Scolopsis cancellatus</i>		-	+
<i>Therapon jarbua</i>		+	-
<i>Abudefduf saxatilis</i>		+++	++
<i>A. sordidus</i>		+	+
<i>A. septemfasciatus</i>		+	+
<i>A. sexfasciatus</i>		+	+
<i>A. biocellatus</i>		-	+
<i>Pomacentrus coelestis</i>		+	-
<i>Stethojulis axillaris</i>		-	+
<i>S. strigiventer</i>		+	+
<i>S. kalosoma</i>		+	-
<i>S. phkadopleura</i>		+	+
<i>Halichoeres melanochir</i>		+	-
<i>H. marginatus</i>		+	+
<i>H. margaritaceus</i>		-	+
<i>H. trimaculatus</i>		-	+
<i>Thalassoma hardwicke</i>		-	+
<i>Hemigymnus fasciatus</i>		-	+
<i>Leptoscarus vaigiensis</i>		-	+
<i>Platax orbicularis</i>		+	--
<i>Chaetodon lunula</i>		-	+
<i>C. vagabundus</i>		+	+
<i>C. auriga</i>		+	-
<i>C. collare</i>		+	--
<i>Microcanthus strigatus</i>		+	--
<i>Pomacanthus semicirculatus</i>		+	+
<i>Acanthurus triostegus</i>		+	+
<i>Prionurus microlepis</i>		+	-
<i>Scorpaenodes guamensis</i>		-	+
<i>Synanceia verrucosa</i>		-	+
<i>Eleotris fusca</i>		-	+
<i>Asterropteryx semipunctatus</i>		+++	+
<i>Eviota abax</i>		+	+
<i>Parioglossus dotui</i>		-	+
<i>Zonogobius semidoliatus</i>		+	+
<i>Bathygobius fuscus</i>		++	++
<i>Pipidonia arenarius</i>		+	-

TABLE 3 (Continued)

Species name	Localities	Patoutzu	Maopitou
<i>Acentrogobius campbelli</i>		+	-
<i>A. ornatus</i>		-	+
<i>Gnatholepis knighti</i>		+	-
<i>Bothus pantherinus</i>		+	-
<i>Tripterygion etheostoma</i>		+	-
<i>T. minutus</i>		+	-
<i>Omobranchus trossulus</i>		+	-
<i>O. sp.</i>		+	-
<i>Istioblennius edentulus</i>		+	+
<i>I. andamanensis</i>		-	+
<i>Halmablennius lineatus</i>		-	+
<i>H. striatamaculatus</i>		+	-
<i>Arothron hispidus</i>		+	+
<i>A. stellatus</i>		+	-
<i>A. immaculatus</i>		+	-
<i>A. meleagris</i>		-	+
<i>Canthigaster margaritatus</i>		-	+
<i>C. valentini</i>		-	+
<i>Diodon holacanthus</i>		+	-
<i>Ostracion tuberculatus</i>		+	-
<i>Rhineacanthus aculeatus</i>		-	+
<i>Aspasma misakia</i>		+	-
<i>A. ciconiae</i>		+	-
<i>Histrio histrio</i>		+	+

"+" Less than 50 specimens; "++" 50-100 specimens; "+++" more than 100 specimens

Almost all of the species found at Patoutzu (Table 3) have been reported to occur in the tropical regions by other workers, and some of the species of Maopitou have also been found in the subtropical region (Chen, 1969). Taking all of these into account, the following 7 species of Patoutzu and 21 species of Maopitou may be considered as the characteristic subtropical and tropical species respectively.

PATOUTZU

Girella melanichthys

Prionurus microlepis

Pipidonia arenarius

Gnatholepis knighti

Tripterygion minutus

Omobranchus sp.

Halmablennius striatamaculatus

MAOPITOU

Gymnothorax flavimarginatus

Echidna zebra

Moringua abbreviata

Conger cinereus

Hippichthys nox

Atherina woodwardi

Mugil kelaartii

Plesiops melas
Dampiera spilopectera
Gerres oblongus
Abudefduf biocellatus
Halichoeres marginatus
Halichoeres trimaculatus
Thalassoma hardwicke
Leptoscarus vaigiensis
Chaetodon lunula
Acentrogobius ornatus
Halmablennius lineatus
Canthigaster margaritatus
Canthigaster valentini
Rhineanthus aculeatus

Among these, *Pipidonia arenarius*, *Gnatholepis knighti*, and *Tripterygion minutus* are first recorded from Taiwan.

DISCUSSION

Some coastal fishes such as mullets

appeared abundantly from June through December at Maopitou; they measured 29-40 mm in body length in June and 100-114 mm in October. It has been shown that the young fishes of mullets stay around the seashore throughout their growing stage. They then disappear from the coastal line and migrate toward the off-shore to spend their adult life there.

The number of the species found monthly at Patoutzu was somewhat larger than that of Maopitou before August (Fig. 4). After that, however, it decreased at Patoutzu. It seems that this is due to the sudden drop of water temperature at Patoutzu (Fig. 2A).



Fig. 4 Monthly variation of the number of the species found in Patoutzu and Maopitou.

No significant monthly variation in the number of species (regardless of the species composition) between Patoutzu and Maopitou was found. Difference in the species composition of the fishes found in both of the two regions was not significant throughout the research period. This may be due to: (a). the constancy of water temperature (24°C-28°C) throughout the experimental period; this range of water temperature may be considered as suitable for most of the tropical reef and shore fishes, especially their juveniles, (b).

inadequate data so far gathered because of the limited research period, (c). that almost all of the investigated fishes are dominant tropical fishes and they are widespread over not only in tropical regions but also in subtropical regions, and, (d). that the species living under stones or clefts are difficult to be caught. Therefore it is difficult to get a more detailed information of the seasonal and regional variation of the species composition. Certainly, a long period research is being planned. It is noteworthy that pH value and the specific

gravity of the sea water showed no evident influence on the species composition in this study.

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