VISUAL CENSUS SURVEYS OF REEF FISH

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Long-term Monitoring of the Great Barrier Reef

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CONTENTS

PREFACE

The Australian Institute of Marine Science's Long-term Monitoring Program monitors benthic communities, reef fish abundance, crown-of-thorns starfish populations and water quality parameters on an annual basis. Both reef fish and benthic communities are monitored on selected reefs along permanently marked transects. This Standard Operational Procedure is Volume 3 in an ongoing series, produced by the Long-term Monitoring Program at the Australian Institute of Marine Science. It details the standard procedure used to estimate reef fish abundance along these permanent transects. Training protocols and data management procedures are also detailed.

INTRODUCTION

The method adopted by the Long-term Monitoring Program (LTMP) to survey reef fish populations is a visual census technique. Visual census techniques have been used for many years to assess reef fish populations and are regarded as relatively accurate and cost effective (Sale 1980, Thresher & Gunn 1986). The technique is ideally suited to monitoring the abundance of coral reef fish as it allows for the collection of community level data without the disturbance inherent in other more destructive sampling techniques.

Visual census encompasses many techniques used to quantify reef fish populations (Thresher & Gunn 1986). The more traditional belt transect method, as first described by Brock (1954), has been adopted by the LTMP to assess reef fish populations. This method has been widely used in the past and provides similar estimates of precision and accuracy to other methods (Samoilys & Carlos 1992). In addition, the transect as a sampling unit is easily incorporated into the overall sampling design of the program, readily encompassing the benthic data collection techniques.

In its simplest form the belt transect method for visual census of fish populations involves an observer, equipped with SCUBA gear, estimating the abundance of fish within a given area (the belt transect). A multitude of factors, including fish mobility and habitat complexity, have been shown to effect the precision of the counting technique. Additional errors in abundance estimates are likely to be introduced through observer bias. Therefore, any program using more than one observer must ensure that differences in bias between observers are minimised, to allow comparisons of data collected by different observers.

The following protocol has been adopted by the LTMP as the standard methodology for undertaking visual census. Strict adherence to this protocol, combined with annual inter-observer training and standardisation ensures that the resulting data are of high quality with maximal power to detect change over time.

SAMPLING DESIGN

Reef fish communities are surveyed annually within six sectors of the Great Barrier Reef (Cooktown/Lizard Island, Cairns, Townsville, Whitsunday, Swain and Capricorn Bunker sectors). In each of these sectors (with the exception of the Swain and Capricorn Bunker sectors) three shelf positions (inner, mid and outer) have been identified. Three reefs are nested within each of these shelf position/sector combinations (four in the mid shelf of the Cairns sector). In the Capricorn Bunker sector, only outer shelf reefs are represented, with four reefs being surveyed. In the Swain sector only outer (two reefs) and mid (five reefs) are surveyed. Shelf position is determined by the position of the reef relative to the coast and continental slope, with inner shelf reefs closest to the coast.

A single habitat is surveyed on each reef, typically situated on the north-east flank of the reef. It is described as the first stretch of continuous reef with a slope less than vertical, going in a clockwise direction from the back reef zone towards the front reef. The selection of a common habitat allows comparisons to be made between reefs both within and between sectors. Within this habitat three sites are selected, each containing five, permanently marked, 50 metre long transects, lying approximately parallel to the reef crest.

Transects are set along the middle of the reef slope (usually at a depth between 6 and 9 metres). The centre line of each transect is marked with a star-picket at each end and sections of steel reinforcing rod (10 mm diameter.) at 10 metre intervals. Each star-picket is labelled with an aluminium tag identifying the transects as belonging to AIMS project 221. The star-picket at the beginning of the first transect of each site is marked with a subsurface buoy to aid in locating the site.

Within the original sampling design, transect dimensions were based upon current knowledge of the most effective sizes required to reduce variability and increase precision. Two transect sizes are used to census the reef fish community at each site. Originally the relatively large and mobile fish species were sampled along 50 metre by 10 metre transects and species of the family Pomacentridae were sampled along 50 metre by 2 metre transects. These transect dimensions have been changed after consideration of a detailed report by Mapstone and Ayling (1993) in conjunction with a need to increase diving safety and the lack of applicability of the 10 metre wide transects in turbid coastal water. The Pomacentrids will now be counted on 50 metre by 1 metre transects and all other families on 50 metre by 5 metre transects (Appendix II).

For both transect dimensions only fishes estimated as belonging to the year 1+ age class are included in counts. The reason for excluding 0+ fish is that recruitment can be highly variable both in space and time. It is also likely that there are high mortality rates as well as considerable repositioning of recruits within the first year. These factors would contribute to the addition of unreasonable variability in abundance estimates of the stocks being monitored.

DATA COLLECTION

Equipment

The following equipment is required for the collection of fish abundance data;

- two complete sets of scuba diving equipment
- underwater slate, pencil and data sheets
- six, 50 metre fibreglass measuring tapes

1. hand held Geographical Positioning System (GPS) to aid in site location

Personnel

A minimum of three people are required for the collection of visual census data using this technique. One person conducts the surveys, while a second person lays a tape measure along the centre line of each transect. The third person remains in the boat as surface support.

Sampling procedure

The following section outlines the procedure for undertaking visual census surveys of a permanent monitoring site.

1. The site is located from the surface using a GPS and/or past knowledge of the surrounding reef topography. On reaching the general area a snorkel diver locates the beginning of the first transect. *The boat is anchored slightly away from the site so that divers entering the water do not swim across transects and disturb fish before the census begins*.

2. Two divers enter the water. The first diver (observer) is equipped with a slate, pencil and data sheets (Appendix I), the second diver (tape layer) carries the tapes. Before reaching the first transect the tape layer runs out 2.5 metres of tape to allow the observer an initial visualisation of the desired transect width.

3. The observer conducts the 50 metre by 5 metre surveys by swimming along the centre line of the transects using the star-pickets and reinforcing rods as guides. The observer counts all fish from the target list (Appendix II) sighted within the area 2.5 metres either side of the centre line.

4. The tape layer follows the observer approximately 15 metres behind, laying a tape measure along the centre line of the transect. The tape is attached to the star-picket at the beginning of the transect then wrapped once around each reinforcing rod and attached to, or as close as possible to, the last star-picket.

5. On completion of the five, 50 metre by 5 metre transects, the observer returns along the same transects (which are now marked with a tape along the centre line) undertaking a census of the family Pomacentridae (Appendix II). All Pomacentrids occurring in a 1 metre wide strip up the reef slope from the tape are surveyed. *When the tape does not contact the substrate an imaginary line is dropped to the substrate directly below the tape and fish counted within a 1 metre belt up-slope and perpendicular to this line.*

6. At the end of every transect the observer calibrates their estimation of the transect width. For the 50 metre by 5 metre transects the observer identifies an object estimated to be 2.5 metres perpendicular to the centre line of the transect. This distance is measured and recorded on the data sheet. The procedure is the same for the 50 metre by 1 metre transects except the distance estimation is for 1 metre. *These data provide the observer with a constant reference to the desired transect boundaries.*

Census technique

A visual census aims at recording an instantaneous estimate of abundance for the target species present within the bounds of the transect. Unfortunately this theoretical goal can never be realised due to factors such as the time taken to count and record each individual, and commonly, the inability to scan the entire transect area at any one time. Consequently there is a need to employ a sampling technique which best approximates this ideal.

Although it is impossible to census the entire transect in a given instant, it is possible to treat the transect as a series of instantaneous counts, such that each portion of the transect area is only viewed once for any given target species. In practice this is achieved by viewing ahead and counting target species in an area of the transect contained well within the bounds of visibility (often the next reinforcing rod serves as an appropriate break point). During the first scan of the section the most mobile target species should be counted and recorded, with progressively less mobile species recorded in consecutive counts. Fish entering the transect during, or after, that area of transect is sampled are not included as they were not present during the initial count. Once the most mobile species have been counted the observer moves along the centre of the transect searching for the more cryptic and slower moving target species, being careful to include individuals of the most mobile species which were obscured from view by the structure of the reef during the initial count of the area.

Timing of census

In an attempt to reduce variability in fish densities (due to diurnal influences on behaviour) sampling excludes the high activity periods of early morning and late afternoon. Sampling has been limited to between 0900 and 1630 hours during winter months and between 0830 and 1700 hours during summer months. This time window also excludes periods of poor visibility caused by low sun angle.

Data recording

In addition to abundance estimates of target species a number of ambient parameters are recorded which describe the physical environment at the time of census. Before entering the water a number of parameters relating to weather conditions and location are recorded on the data sheets (Appendix I), these are:

Reef

The reef name as shown in the Great Barrier Reef Gazetteer.

Site

The site number, where site 1 is the first site encountered when moving in a clockwise direction around the reef.

Transect
The number of the transect, where transect 1 is the first transect of a site encountered when swimming around the reef in a clockwise direction.

Date
The date of census in the format DD/MM/YY.

Observer
Initials of the observer carrying out the census.

Tide
Tide is recorded as either low, high, falling or rising, determined from the Tide Tables. The tide state is entered as one of the categories shown in table 1.

Table 1. Tide states

State	Description
Low	One hour either side of low water
High	One hour either side of high water
Falling	The period between High and Low water
Rising	The period between Low and High water

Cloud
Measured as the fraction of the sky covered by cloud and expressed in eighths (oktas) eg. 0/8 indicates a cloudless sky, 3/8 indicates approximately three eighths of the sky is obscured by cloud.

Wind
Wind strength is recorded as a category as described in table 2.

Sea state
Sea state is described by a modified Beaufort scale (table 3).

Once in the water, the following data is recorded prior to commencing the survey of each transect.

Depth
Recorded to the nearest metre at the start of each transect.

Start
The time at which the census begins for each transect, recorded in 24 hour notation eg. 3.15 p.m. is recorded as 1515.

Visibility
Recorded in metres distance when the observer first enters the water, prior to census. This is only recorded once unless it changes.

Table 2. Wind strength categories

Category	*Wind strength (knots)*
0	0
1	1-5
2	6-10
3	11-15
4	16-20
5	21-25

Table 3. Sea state description

Sea state	*Description*
Calm	Mirror-like to small ripples
Slight	Large wavelets, crests breaking
Moderate	Many white caps forming
Rough	Large waves, 2-3m, white caps

DATA MANAGEMENT

Due to the large volume of data collected during each survey trip, strict data management procedures must be followed to ensure safe and efficient storage of data.

Equipment

- lap top computer (minimum requirement, IBM compatible 486 with 4Mb RAM and 180 MB Hard Disk loaded with data entry software[1])
- two high density 3.5 inch computer discs for data back-up
- boot disc

Procedure

Field
On the same day data are collected, conduct the following procedure:

1. Rinse data sheets in fresh water and then dry.
2. Assign sample identification numbers[2] to each transect.
3. Enter data onto laptop computer in the ReefMon database. Fish species names are entered in the database as a seven digit fish code. The first 3 letters represent a genus code, and the following four letters represent the species code (eg., DAS.RETI, *Dascyllus reticulatus*, Appendix II)
4. Back-up data to floppy disc.

Office
After the field trip, data are checked and added to the main data base using the following procedure:

1. Print raw data entered at sea and check against field data sheets. *This checking procedure requires two personnel. One person reads out the species and abundance data from the field sheets while the other person checks these values against the print out of field entered data.*
2. Correct any errors in the data and export to disk.
3. Give disk to database manager for inclusion into the ORACLE database.
4. File field data sheets and data printout.

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[1] A user interface to Microsoft Access has been developed for this purpose. For more information contact the Database programmer, LTMP, AIMS.

[2] Sample identification numbers consist of a two letter 'trip code' which is incremented for successive survey trips followed by a unique number for each transect. Census data taken from the 5 metre wide transects are assigned sample identification numbers ranging from 101 (the first transect surveyed during a trip) up to 250 eg. CB101. Census data collected along the 1 metre wide transects are assigned sample identification numbers ranging from 251 to 400 eg. CB251.

TRAINING

The LTMP uses a bipartite program to train personnel in visual census of fish populations. Firstly, new observers are trained, in situ, in the identification of the target species (Appendix II), and in the standard technique for visual census of belt transects. Secondly, experienced observers are continually standardised to minimise inter-observer bias.

Fish Identification

The level of expertise required for identification of reef fish is achieved with the use of reference texts in conjunction with field training. Initial familiarity with the target species is gained by regular perusal of Allen (1991), Myers (1989) and Randall et al. (1990). These texts provide a comprehensive photographic record of the species targeted in the annual reef fish surveys. Identification skills are further enhanced with underwater tuition where an experienced observer points out target species and highlights physical characteristics, habitat preferences and behavioural patterns that will aid in quick and accurate identification.

Survey Technique

Training of observers in the visual census technique involves an experienced observer and trainee undertaking concurrent surveys using the census procedure outlined previously. At the end of each site, data are compared and possible sources of discrepancy discussed. For 50 metre by 5 metre transects, the trainee and experienced observer swim side by side down the centre line of the transects. At the end of each transect they swap sides to control for any position related bias. As the 50 metre by 1 metre transects are too narrow for observers to swim abreast, they swim in single file. The observers swim approximately 10 metres apart and swap positions at the end of each transect, again to control for any position related bias. These surveys are undertaken until the trainee's abundance estimates when compared to those of the experienced observer are not different at the 0.05 significance level.

Inter-observer standardisation

Observers undertake annual standardisation exercises to maintain significantly ($\alpha = 0.05$) close concordance in their counts. The procedure used for inter-observer standardisation is identical to that outlined above for the training of observers in the visual census technique.

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APPENDIX

APPENDIX 1
Data sheets

Figure 1.1 50 metre by 5 metre transect data sheet

LONG TERM REEF FISH MONITORING (*50m x 5m*)

Reef: Site: Transect: Date: Observer:

Depth: Start time: Vis:

Acanthurus		Cheilinus		Plec. leop.	
				P. laevis	
		Choer. fasc.			
		Coris gaim.		Scarus	
		Epibulus			
		Gomphosus			
		Hal. hort.			
		Hem. fasc.			
Ctenochaet.		Hem. melt.			
Zeb. scopas		Lutjanus			
Z. veliferum					
Chaetodon					
		Lethrinus		Siganus	
				Zanclus	
				Dist. Est.	

Tide: Wind: Cloud: Sea:

Figure 1.1 50 metre by 1 metre transect data sheet

LONG TERM REEF FISH MONITORING (*50m x 1m*)

Reef: Site: Transect: Date: Observer:

Depth: Start time: Vis:

Acanthochromis		Neopomacentrus	
Amblygly. curacao			
Amblygly.leucogaster		Neoglyph. melas	
Amphiprion		Neoglyph.nigroris	
		Plectroglyph. lacrym	
Chromis			
		Pomacentrus	
Chrysiptera			
Dascyllus			
Dischistodus		Stegastes	
		Distance Est.	

Tide: Wind: Cloud: Sea:

APPENDIX II
Transect species list

Table II.1 50 metre by 5 metre transect species list grouped by family

Fish code	*Fish species*
ACANTHURIDAE	
ACA.ALBI	Acanthurus albipectoralis
ACA.BLOC	Acanthurus blochii
ACA.DUSS	Acanthurus dussumieri
ACA.GRAM	Acanthurus grammoptilus
ACA.LINE	Acanthurus lineatus
ACA.MATA	Acanthurus mata
ACA.NANS	Acanthurus nigricans
ACA.NUDA	Acanthurus nigricauda
ACA.NCUS	Acanthurus nigrofuscus
ACA.OLIV	Acanthurus olivaceus
ACA.PYRO	Acanthurus pyropherus
ACA.THOM	Acanthurus thompsoni
ACA.TRIO	Acanthurus triostegus
ACA.XANT	Acanthurus xanthopterus
CTE.GROP	Ctenochaetus spp. (grouped)
NAS.LITU	Naso lituratus
NAS.TUBE	Naso tuberosus
NAS.UNIC	Naso unicornus
PCT.HEPA	Paracanthurus hepatus
ZEB.SCOP	Zebrasoma scopas
ZEB.VELI	Zebrasoma veliferum
CHAETODONTIDAE	
CHA.AFAS	Chaetodon aureofasciatus
CHA.AURI	Chaetodon auriga
CHA.BARO	Chaetodon baronessa
CHA.BENN	Chaetodon bennetti
CHA.CITR	Chaetodon citrinellus
CHA.EPHI	Chaetodon ephippium
CHA.FLAV	Chaetodon flavirostris
CHA.GUEN	Chaetodon guentheri
CHA.KLEI	Chaetodon kleinii
CHA.LINE	Chaetodon lineolatus
CHA.LUNU	Chaetodon lunula
CHA.MELO	Chaetodon melannotus
CHA.MEYE	Chaetodon meyeri
CHA.ORNA	Chaetodon ornatissimus
CHA.PELW	Chaetodon pelewensis
CHA.PLEB	Chaetodon plebeius
CHA.PUNC	Chaetodon punctatofasciatus
CHA.RAFF	Chaetodon rafflesi
CHA.RAIN	Chaetodon rainfordi

CHA.RETI	Chaetodon reticulatus
CHA.SEME	Chaetodon semeion
CHA.SPEC	Chaetodon speculum
CHA.TLIS	Chaetodon trifascialis
CHA.TTUS	Chaetodon trifasciatus
CHA.ULIE	Chaetodon ulietensis
CHA.UNIM	Chaetodon unimaculatus
CHA.VAGA	Chaetodon vagabundus
CHM.ROST	Chelmon rostratus
FOR.FLAV	Forcipiger flavissimus
FOR.LONG	Forcipiger longirostrus
HYS.POLY	Hemitaurichthys polylepis

LABRIDAE

CHE.FASC	Cheilinus fasciatus
CHE.UNDU	Cheilinus undulatus
CHO.FASC	Choerodon fasciatus
COR.GAIM	Coris gaimard
EPB.INSI	Epibulus insidiator
GOM.VARI	Gomphosus varius
HAL.HORT	Halichoeres hortulanus
HEM.FASC	Hemigymnus fasciatus
HEM.MELT	Hemigymnus melapterus

LETHRINIDAE

LET.ATKI	Lethrinus atkinsoni
LET.ERYT	Lethrinus erythracanthus
LET.HARA	Lethrinus harak
LET.MINI	Lethrinus miniatus
LET.NEBU	Lethrinus nebulosus
LET.OBSO	Lethrinus obsoletus
LET.OLIV	Lethrinus olivaceus
LET.RUBR	Lethrinus rubrioperculatus
LET.XANT	Lethrinus xanthochilus
MON.GRAN	Monotaxis grandoculis

LUTJANIDAE

LUT.ADET	Lutjanus adetti
LUT.ARGE	Lutjanus argentimaculatus
LUT.BOHA	Lutjanus bohar
LUT.CARP	Lutjanus carponotatus
LUT.FLMA	Lutjanus fulviflamma
LUT.GIBB	Lutjanus gibbus
LUT.KASM	Lutjanus kasmira
LUT.LUTJ	Lutjanus lutjanus
LUT.QUIN	Lutjanus quinquelineatus
LUT.RIVU	Lutjanus rivulatus
LUT.RUSS	Lutjanus russelli
LUT.SEBA	Lutjanus sebae
LUT.SEMI	Lutjanus semicinctus

LUT.VITT	Lutjanus vitta
MCR.GROP	Macolor spp. (grouped)

SCARIDAE

BOL.MURI	Bolbometapon muricatum
CET.BICO	Cetoscarus bicolor
HIP.LONG	Hipposcarus longiceps
SCA.ALTI	Scarus altipinnis
CHS.BLEE	Chlorurus bleekeri
SCA.CHAM	Scarus chameleon
SCA.DIMI	Scarus dimidiatus
SCA.FLAV	Scarus flavipectoralis
SCA.FORS	Scarus forsteni
SCA.FREN	Scarus frenatus
SCA.GHOB	Scarus ghobban
SCA.GLOB	Scarus globiceps
CHS.MICR	Chlorurus microrhinos
SCA.NIGR	Scarus niger
SCA.OVIC	Scarus oviceps
SCA.PSIT	Scarus psittacus
CHS.JAPA	Chlorurus jananesis
SCA.RIVU	Scarus rivulatus
SCA.RUBR	Scarus rubroviolaceus
SCA.SCHL	Scarus schlegeli
CHS.SORD	Chlorurus sordidus
SCA.SPIN	Scarus spinus

SERRANIDAE

PMS.AREO	Plectropomus areolatus
PMS.LAEV	Plectropomus laevis
PMS.LEOP	Plectropomus leopardus
PMS.MACU	Plectropomus maculatus
PMS.OLIG	Plectropomus oligacanthus
VAR.ALBI	Variola albimarginata
VAR.LOUT	Variola louti

SIGANIDAE

SIG.ARGE	Siganus argenteus
SIG.CORA	Siganus corallinus
SIG.DOLI	Siganus doliatus
SIG.JAVU	Siganus javus
SIG.LINE	Siganus lineatus
SIG.PUEL	Siganus puellus
SIG.PMUS	Siganus punctatissimus
SIG.PTUS	Siganus punctatus
SIG.SPIN	Siganus spinus
SIG.VULP	Siganus vulpinus

ZANCLIDAE

ZAN.CORN	Zanclus cornutus

Table II.2 50 metre by 1 metre transect species list grouped by family

Fish code	*Fish species*
ACANTHOCHROMIS	
ACN.POLY	Acanthochromis polyacanthus
AMBLYGLYPHIDODON	
AMB.AURE	Amblyglyphidodon aureus
AMB.CURA	Amblyglyphidodon curacao
AMB.LEUC	Amblyglyphidodon leucogaster
AMPHIPRION	
AMP.AKIN	Amphiprion akindynos
AMP.CHRY	Amphiprion chrysopterus
AMP.CLAR	Amphiprion clarkii
AMP.MELA	Amphiprion melanopus
AMP.PERC	Amphiprion percula
AMP.PERI	Amphiprion perideraion
CHROMIS	
CHR.ACAR	Chromis acares
CHR.AGIL	Chromis agilis
CHR.ALIS	Chromis atripectoralis
CHR.AMBO	Chromis amboinensis
CHR.APES	Chromis atripes
CHR.CHRY	Chromis chrysura
CHR.FUME	Chromis fumea
CHR.IOME	Chromis iomelas
CHR.LEPI	Chromis lepidolepis
CHR.MARG	Chromis margaritifer
CHR.NITI	Chromis nitida
CHR.RETR	Chromis retrofasciatus
CHR.TERN	Chromis ternatensis
CHR.VAND	Chromis vanderbilti
CHR.VIRI	Chromis viridis
CHR.WEBE	Chromis weberi
CHR.XANT	Chromis xanthura
CHRYSIPTERA	
CHY.BIOC	Chrysiptera biocellata
CHY.CYAN	Chrysiptera cyanea
CHY.FLAV	Chrysiptera flavipinnis
CHY.REX	Chrysiptera rex
CHY.ROLL	Chrysiptera rollandi
CHY.TALB	Chrysiptera talboti
DASCYLLUS	
DAS.ARUA	Dascyllus aruanus
DAS.MELA	Dascyllus melanurus

DAS.RETI	Dascyllus reticulatus
DAS.TRIM	Dascyllus trimaculatus

DISCHISTODUS

DIS.MELA	Dischistodus melanotus
DIS.PERS	Dischistodus perspicillatus
DIS.PROS	Dischistodus prosopotaenia
DIS.PSEU	Dischistodus pseudochrysopocilus

HEMIGLYPHIDODON

HGY.PLAG	Hemiglyphidodon plagiometopon

NEOGLYPHIDODON

NEG.MELA	Neoglyphidodon melas
NEG.NIGR	Neoglyphidodon nigroris
NEG.POLY	Neoglyphidodon polyacanthus

NEOPOMACENTRUS

NEO.AZYS	Neopomacentrus azysron
NEO.BANK	Neopomacentrus bankieri
NEO.CYAN	Neopomacentrus cyanomos

PLECTROGLYPHIDODON

PGY.DICK	Plectroglyphidodon dickii
PGY.JOHN	Plectroglyphidodon johnstonianus
PGY.LACR	Plectroglyphidodon lacrymatus

POMACENTRUS

POM.ADEL	Pomacentrus adelus
POM.AMBO	Pomacentrus amboinensis
POM.AUST	Pomacentrus australis
POM.BANK	Pomacentrus bankanensis
POM.BRAC	Pomacentrus brachialis
POM.CHRY	Pomacentrus chrysurus
POM.COEL	Pomacentrus coelestis
POM.GRAM	Pomacentrus grammnorhyncus
POM.LEPI	Pomacentrus lepidogenys
POM.MOLU	Pomacentrus moluccensis
POM.NAGA	Pomacentrus nagasakiensis
POM.PHIL	Pomacentrus philippinus
POM.TRIP	Pomacentrus tripunctatus
POM.VAIU	Pomacentrus vaiuli
POM.WARD	Pomacentrus wardi

POMACHROMIS

PCH.RICH	Pomachromis richardsoni

PREMNAS

PRE.BIAC	Premnas biaculeatus

STEGASTES

STE.APIC	Stegastes apicalis
STE.FASC	Stegastes fasciolatus
STE.NIGR	Stegastes nigricans
STE.GASC	Stegastes gascoynei