FRDC 99/119

WORKSHOP PROCEEDINGS

17 June 2002

Cairns

Sustainable Populations of Black Tiger Prawn (*Penaeus monodon*) for broodstock supply.

FISHERIES RESEARCH & DEVELOPMENT CORPORATION

Queensland Government

Department of Primary Industries

FRDC 99/119

Sustainable populations of Black Tiger Prawn (Penaeus monodon) for broodstock supply.

June 2002 Workshop, Cairns. Proceedings.

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Frontispiece Storting tray of an inshore trawler in the Cairns region showing *P.monodon* catch

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Contents:

Agenda.

Time	Presentation	
8..30	Welcome and Introduction Objective 1. Information Search and Review	Dr Neil Gribble
9.00	Objective 2. Defining the Adult stocks and habitats of *P. monodon*	Jo Langstreth
9.30	Objective 3. Defining the Juvenile stocks and habitats of *P. monodon*	Sarah Kistle
10.00	Objective 4. Seasonal patterns in *P. monodon* Population Dynamics	Jo Langstreth
10.30	MORNING TEA	
11.00	Objective 5. Tag-Release-Recapture of *P. monodon* within North Queensland	Sarah Kistle
11.45	Objective 6. Alternative Capture Techniques.	Mike dredge
12.30	Objective 7. Economic overview of the broodstock collection fishery	Mike Dredge
1.00	LUNCH	
2.00	DISCUSSION	Facilitator: Ian Smith
5.00	FINISH	

The workshop proceedings is set out in two parts:

1. the printed slides from each talk, which are largely self explanatory and will be covered in detail in the final report,
2. the transcript of the discussion, which took up the majority of the afternoon.

Welcome and Introduction
Objective 1. Information Search and Review

The "Monodon project" team would like to acknowledge the contribution, hard work and enthusiasm provided over time by staff who have now moved on to other positions and careers. In particular we would like to thank Chris Stafford, Warren Lee Long, and Glynn Alland.

The literature review, **Objective 1**, was completed and distributed in the first year of the project and will not be dealt with here.

Objective 2. Defining the Adult stocks and habitats of *P. monodon*

Printed slides from this presentation are on the following pages. As with all the presentations there are four slides per page and they should be read from left to right across the top, then left to right across the bottom row. Reading glasses may be required.

Key results:

- **Limited large spatial scale distribution of *P. monodon* – restricted to North Queensland**
- **Within this region, broodstock fishery is concentrated between 4-7 metres in depth**
- **QDPI surveys show that catch quantities are comparable (but not greater) in water depths less than 3 metres to those in depths 4-7 metres**
- **Catch abundance of *P. monodon* is highly seasonal**
- **Peak in catch abundance occurring between February to April outside the estuary**
- **A second seasonal peak in catch abundance later in the year is not strong, but may be significant on an irregular basis**
- **The life cycle timing of *P. monodon* does not coincide well with the timing and demands of aquaculture**

Objective 2.

Define the distribution of Adult *P. monodon* stocks and habitats

Joanne Langstreth

Objective 2. Aims

AIM 1. Define the spatial distribution of adult *P. monodon* stocks and habitats on:

- Large spatial scales ie. In Queensland
- Medium spatial scales ie. Within high-catch areas of North Queensland
- Small spatial scales ie. within fishing closures

Objective 2. Aims

AIM 2. Define the temporal distribution of adult *P. monodon* on:

- Large temporal scales ie. variation over many years
- Medium temporal scales ie. Seasonal variation
- Small temporal scales ie. Day/night variation

Objective 2. Data types

3 Data types used:

1. Commercial Catch Data from the East Coast Trawl Fishery (1988 to 2001)
2. Research Logbooks placed on several commercial broodstock collectors' vessel's.
3. QDPI research surveys within the Trinity Bay closure from False Cape to Simpson Point.

1. Commercial Catch Data – ECTF

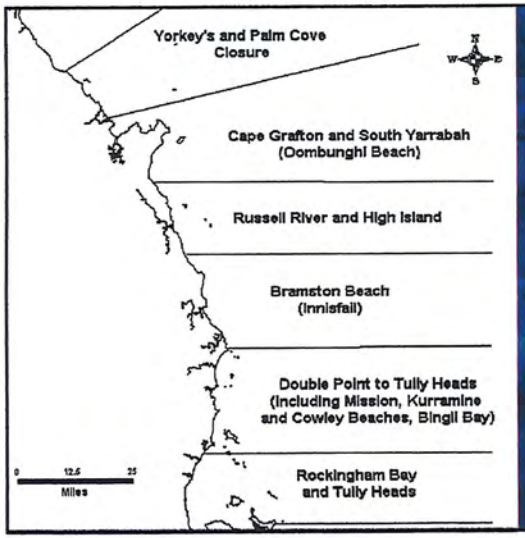
- Fishery-Dependent Information

- Data extracted from the CFISH database (QFS)
- Series of manipulation procedures and checks
- Shot-by-shot information grouped to form one daily catch record per vessel
- 30-minute grid and 6-minute grid references were provided

2. Research Logbooks – ECTF

- Fishery-Dependent Information

- Research Logbooks provided to small number of broodstock collectors
- To collect small spatial and temporal scale data on *P. monodon* distribution and abundance
- Shot-by-shot information
- Summarised information used due to privacy
- Catch Per Unit Area (CPUA) calculated as the number or weight per square nautical mile
- Fishing grounds grouped into regions



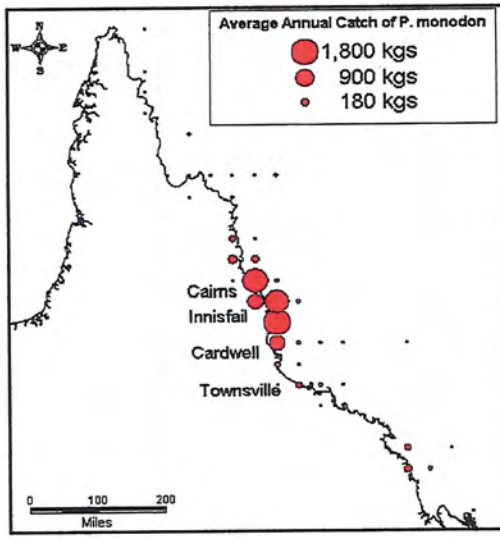
Grouping of research logbook "fishing regions" in North Queensland

3. QDPI Research Surveys

- Fishery-Independent Information

- Research surveys using a 3-metre beam trawl
- Area within the closure sampled
- Fine spatial scales
- Catch and effort data collected
- Catch Per Unit Area (CPUA) calculated as the number per square nautical mile

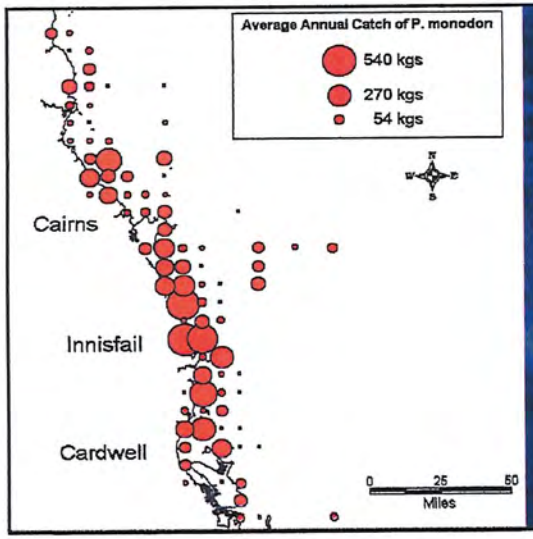
QDPI Research Beam Trawl (3 metre beam)



Large Spatial Scale Patterns

Distribution of reported commercial catch within the ECTF –

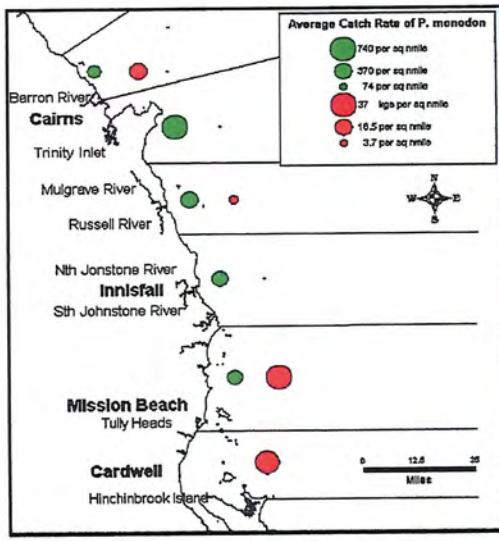
30 minute grids



Medium Spatial Scale Patterns

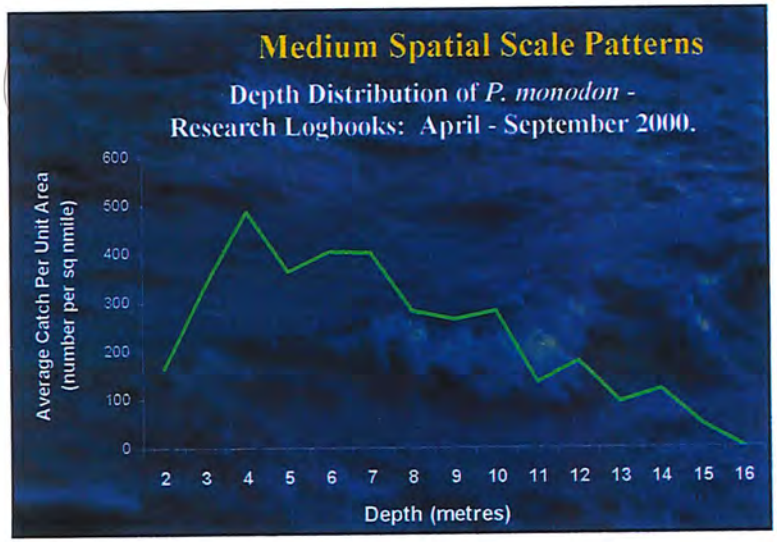
Distribution of reported commercial catch within the ECTF –

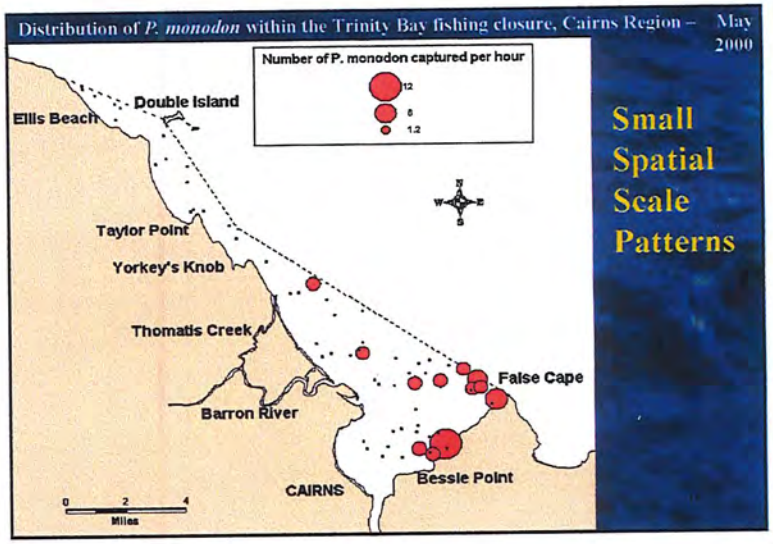
6 minute grids

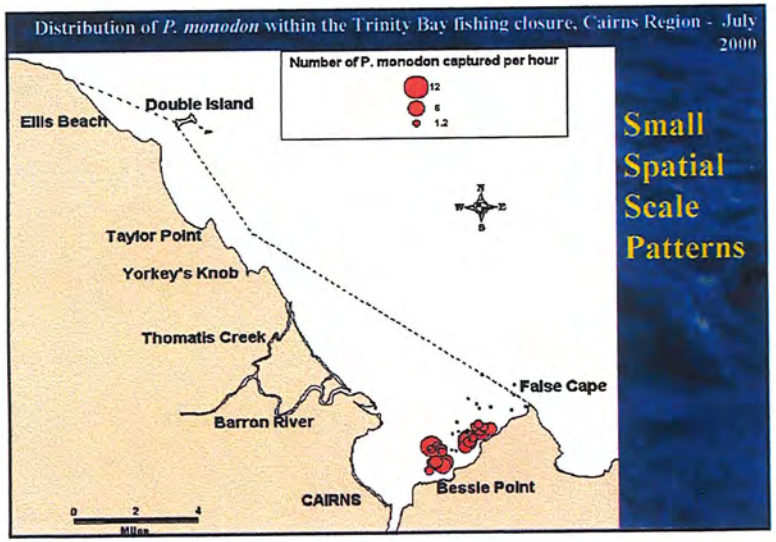


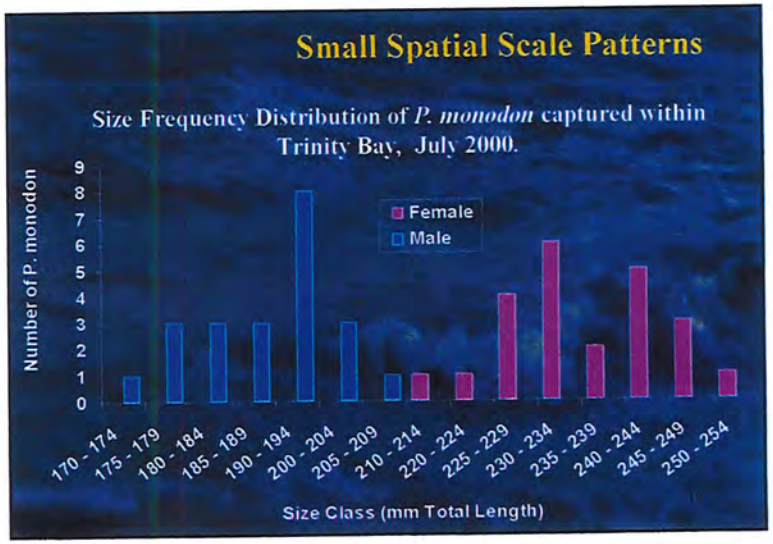
Medium Spatial Scale Patterns

Distribution of broodstock collector Catch Per Unit Area (CPUA) within the ECTF


Medium Spatial Scale Patterns
Depth Distribution of P. monodon -
Research Logbooks: April - September 2000.
Average Catch Per Unit Area (number per sq nmile)
600
500
400
300
200
100
0
2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Depth (metres)


Distribution of P. monodon within the Trinity Bay fishing closure, Cairns Region – May 2000
Number of P. monodon captured per hour
12
6
1.2
Ellis Beach
Double Island
Taylor Point
Yorkey's Knob
Thomatis Creek
Barron River
False Cape
Bessie Point
CAIRNS
0 2 4
Miles
Small Spatial Scale Patterns


Distribution of P. monodon within the Trinity Bay fishing closure, Cairns Region - July 2000
Number of P. monodon captured per hour
12
6
1.2
Ellis Beach
Double Island
Taylor Point
Yorkey's Knob
Thomatis Creek
Barron River
False Cape
Bessie Point
CAIRNS
0 2 4
Miles
Small Spatial Scale Patterns

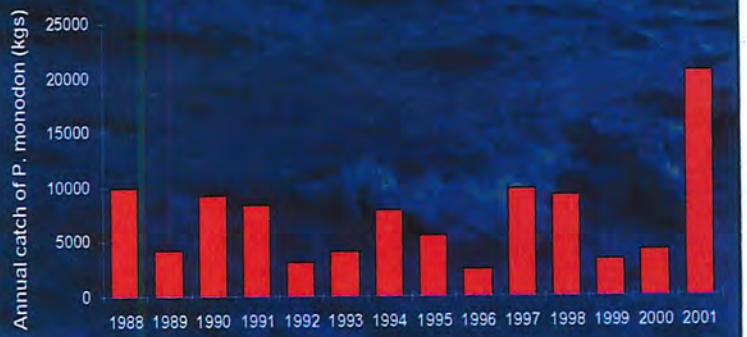

Small Spatial Scale Patterns
Size Frequency Distribution of P. monodon captured within Trinity Bay, July 2000.
Number of P. monodon
9
8
7
6
5
4
3
2
1
0
Female
Male
170 - 174
175 - 179
180 - 184
185 - 189
190 - 194
200 - 204
205 - 209
210 - 214
220 - 224
225 - 229
230 - 234
235 - 239
240 - 244
245 - 249
250 - 254
Size Class (mm Total Length)

Spatial Scale Patterns...

- Limited large scale spatial distribution – Cairns to Cardwell
- Medium scale distribution is variable – some hotspots
- Commercial Broodstock fishery is largely 4-7 metres depth range
- Small spatial scale distribution demonstrates that adult stocks can also inhabit very shallow inshore waters (>3 metres depth)

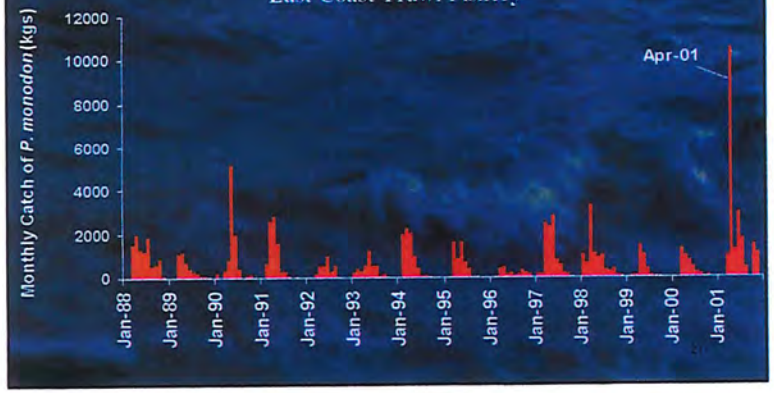
Large Temporal Scale Patterns

Annual reported Commercial Catch of *P. monodon* within the East Coast Trawl Fishery



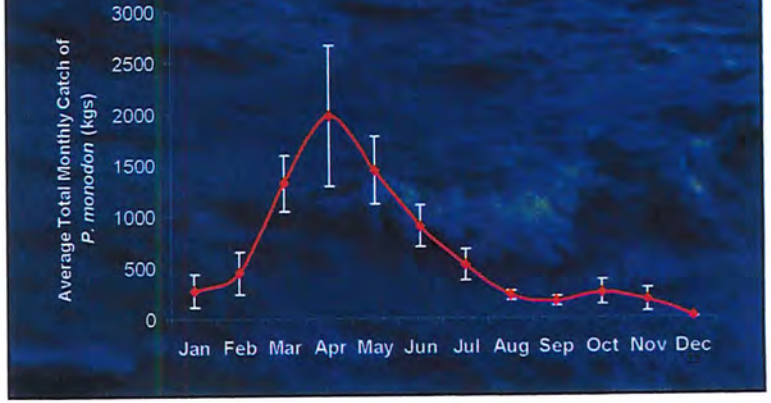
Large Temporal Scale Patterns

Monthly Reported Commercial Catch of *P. monodon* within the East Coast Trawl Fishery



Medium Temporal Scale Patterns

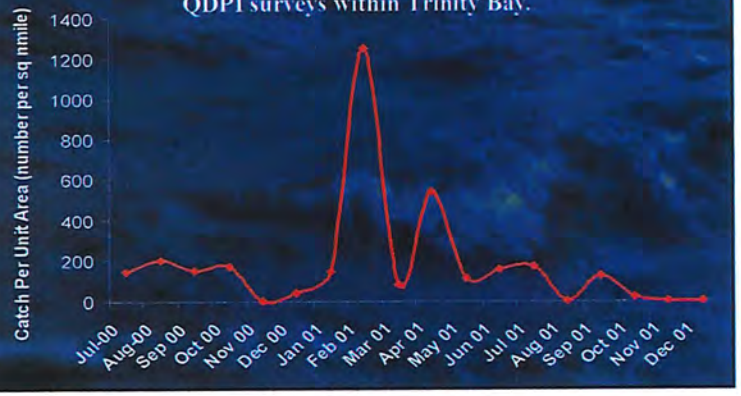
Average Monthly Catch of *P. monodon* in the ECTF



Medium Temporal Scale Patterns

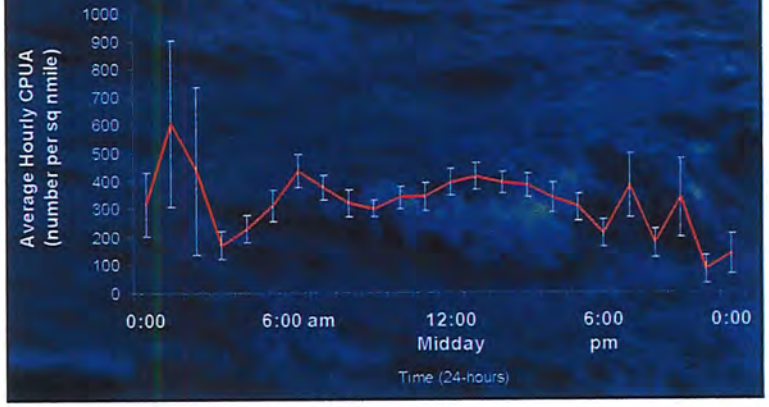
Average Monthly Catch of *P. monodon* -

QDPI surveys within Trinity Bay.



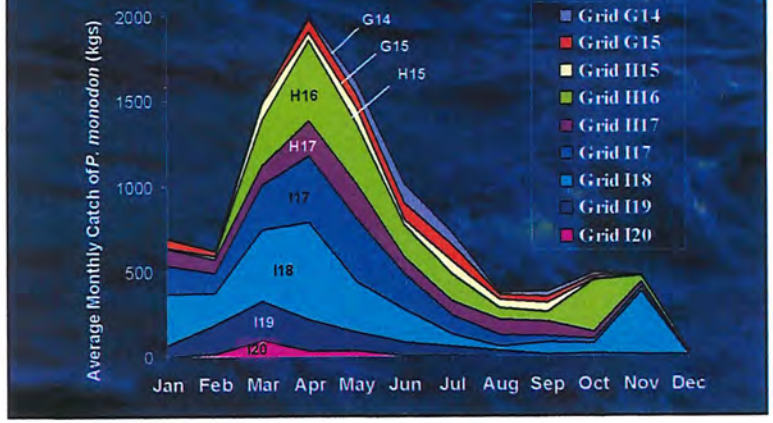
Small Temporal Scale Patterns

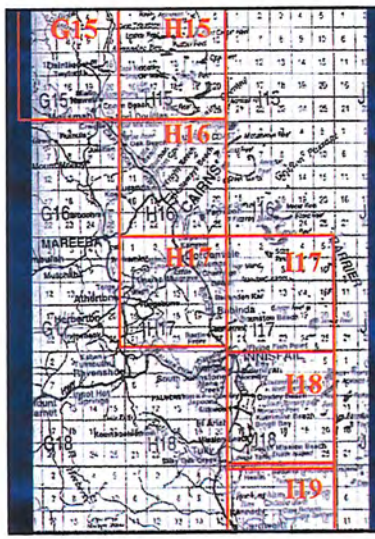
Average Hourly Catch of *P. monodon* - Research Logbooks



Spatio-Temporal Patterns

Average Monthly Reported Commercial Catch per 30-minute grid - ECTF





Commercial Catch Reporting Grids

30 – minute Grids

Temporal Scale Patterns...

- Large "between-year" variation in commercial catch
- Strong seasonal peak in catch:
  - February – foreshore habitats
  - April – inshore commercial fishery
- Weak second peak in catch in September, October & November
- No strong change in catch between day and night

Conclusions:

- Limited large spatial scale distribution of *P. monodon* – restricted to North Queensland
- Within this region, broodstock fishery is concentrated between 4-7 metres depth
- QDPI surveys show that catch quantities are comparable but not greater in water depths less than 3 metres to those in depths 4-7 metres

Conclusions:

- Catch abundance of *P. monodon* is highly seasonal
- Peak in catch abundance occurring between February to April outside the estuary
- A second seasonal peak in catch abundance later in the year is not strong, but may be significant on an irregular basis
- The life cycle timing of *P. monodon* does not coincide well with the timing and demands of aquaculture

Thankyou for your attention

QUESTIONS & COMMENTS

Objective 3. Defining the Juvenile stocks and habitats of *P. monodon*

Key results:

- **Monodon juveniles prefer vegetated flats/banks and can occupy a range of water quality**
- **Abundance is naturally low in any habitat, giving low catch rates**
- **Population structure has been described for post-larvae to sub adult**
- **Recruitment occurred over the summer months (Oct to March)**

Juvenile *P. monodon* Distribution and Abundance

By Sarah Kistle

OBJECTIVE 3: Survey juvenile *P. monodon* nursery habitats

- **Define:**
  - Distribution and abundance
  - Population - age and size structure
  - Recruitment with seasonality

OBJECTIVE 3: Survey juvenile *P. monodon* nursery habitats

- **Methods:**
  - Spatially - surveys to determine distribution and abundance
  - Alternate Gear Types – to establish size structure
  - Seasonally - Monthly monitoring by cast net surveys to determine recruitment

Spatially - Pilot cast net surveys to determine distribution and abundance (small to medium)

Plate 1. Cast netting surveys in estuaries

Juvenile P. monodon distribution and abundance

Spatially - Pilot cast net surveys to determine distribution and abundance (small to medium)

Map 1: Juvenile P.mondon.ppt

OBJECTIVE 3: Survey juvenile *P. monodon* nursery habitats

- Methods:
- Spatially - Pilot cast net surveys to determine distribution and abundance
- Alternate Gear Types – to establish size structure with habitat
- Seasonally - Monthly monitoring by cast net surveys to determine recruitment

Alternate Gear Types – to establish size structure with habitat

Plate 2: Boat electrofisher

Plate 3: Back pack electrofisher

Alternate Gear Types – to establish size structure with habitat (Fyke Net)

Plate 4: Fyke net (normal operations)

Plate 5: Fyke net (wind effected)

Juvenile P. monodon distribution and abundance

Alternate Gear Types – to establish size structure with habitat (Hand Scoop)

Plate 6 Deployment of Hand scoop net

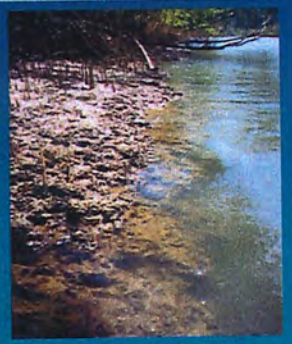


Plate 7 Habitat surveyed by hand scoop

OBJECTIVE 3: Survey juvenile *P. monodon* nursery habitats

- Methods:
  - Spatially - Pilot cast net surveys to determine distribution and abundance
  - Alternate Gear Types – to establish size structure with habitat
  - Seasonally - Monthly monitoring by cast net surveys to determine recruitment

Seasonally - Monthly monitoring by cast net surveys to determine recruitment

Map 2: Barron and Hills.ppt

OBJECTIVE 3: Survey juvenile *P. monodon* nursery habitats

- Results:
  - Distribution and Abundance – large (QLD), medium (Cairns-Innisfail) and small (habitat) scale
  - Size structure – use of estuary reach by size
  - Recruitment – abundance over time/seasonally

Juvenile P. monodon distribution and abundance

Distribution and Abundance – Large (QLD)

Map 3: QLD Juvenile P.mondon.ppt

Distribution and Abundance – Medium (Cairns)

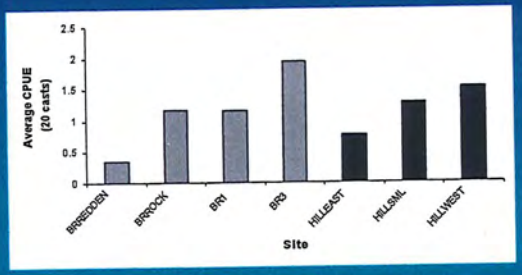


Figure 1: Average catch (per 20 cast throws) of juvenile *P. monodon* at monthly monitored sites

Distribution and Abundance – Small (habitat)

Table 1: Water Quality of Juvenile *P. monodon* in estuaries

Parameter	*Site*	*Average*	*Minimum*	*Maximum*
pH	Barron & Hills	7.4	6.0	8.5
Conductivity (mg L^{-1})	Barron	21.57	16.45	28.23
	Hills	41.66	37.71	45.66
Salinity (p.p.t.)	Barron	13.6	0.0	29.9
	Hills	26.6	0.9	35.9
Temperature (°C)	Barron & Hills	26.65	22.2	33.0
Dissolved Oxygen (mg L^{-1})	Barron	7.12	5.73	10.10
	Hills	5.03	3.60	7.20
Turbidity (n.t.u)	Barron	35	4	241
	Hills	54	3	277

Distribution and Abundance – small (habitat)

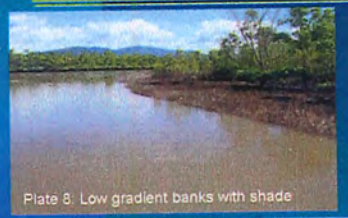


Plate 8: Low gradient banks with shade

Plate 9: Mangrove peg roots

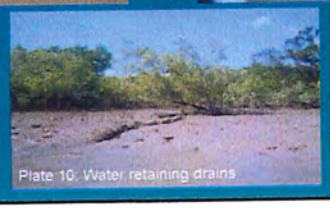


Plate 10: Water retaining drains

Juvenile P. monodon distribution and abundance

OBJECTIVE 3: Survey juvenile *P. monodon* nursery habitats

- Results:
  - Distribution and Abundance – large (QLD), medium (Cairns-Innisfail) and small (habitat) scale
  - Size structure – use of estuary reach by size
  - Recruitment – abundance over time/seasonally

Size structure – in nursery habitat (estuaries)

OBJECTIVE 3: Survey juvenile *P. monodon* nursery habitats

- Results:
  - Distribution and Abundance – large (QLD), medium (Cairns-Innisfail) and small (habitat) scale
  - Size structure – use of estuary reach by size
  - Recruitment – abundance over time/seasonally

Recruitment – abundance over time/seasonally

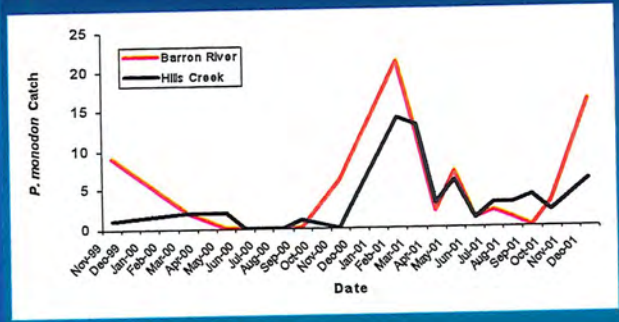


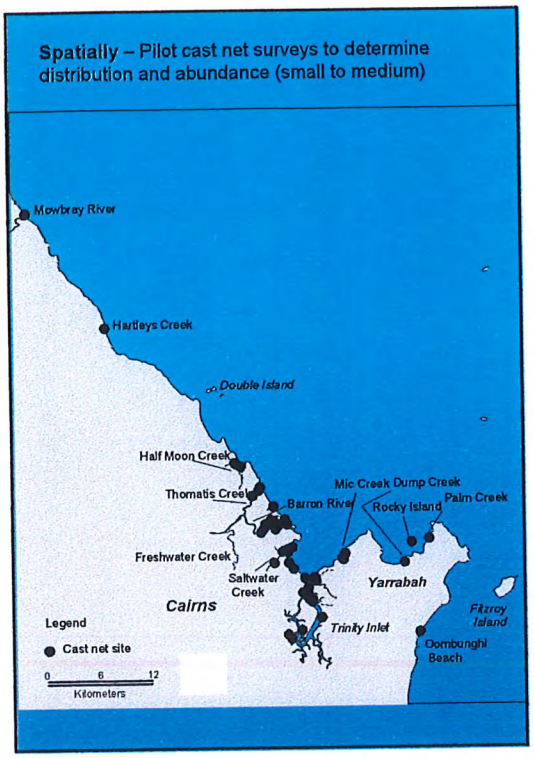
Figure 2: Seasonal juvenile *P. monodon* catch

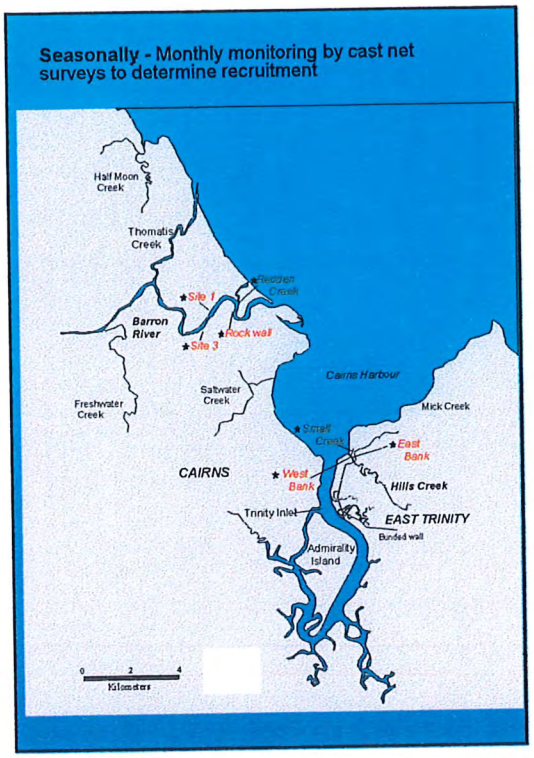
Juvenile P. monodon distribution and abundance

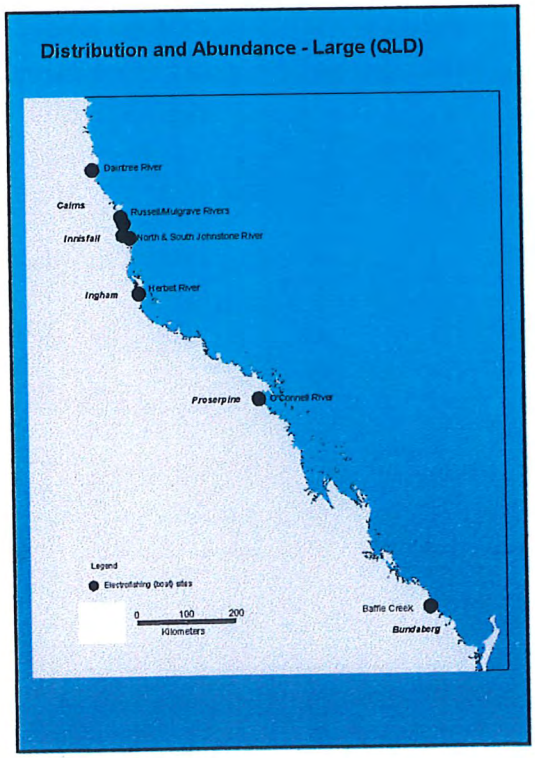
Summary – Major Outcomes

- ✓ Distribution
  prefer vegetated flat banks
  range of water quality
- ✓ Abundance
  low catch rates
- ✓ Population structure
  post larvae to sub adult
- ✓ Recruitment
  summer months (Oct to March)

Questions & Comments


Spatially – Pilot cast net surveys to determine distribution and abundance (small to medium)
Mowbray River
Hartleys Creek
Double Island
Half Moon Creek
Thomatis Creek
Barron River
Mic Creek Dump Creek
Rocky Island
Palm Creek
Freshwater Creek
Saltwater Creek
Yarrabah
Cairns
Trinity Inlet
Fitzroy Island
Dombunghi Beach
Legend
Cast net site
0 6 12
Kilometers


Seasonally - Monthly monitoring by cast net surveys to determine recruitment
Half Moon Creek
Thomatis Creek
Site 1
Barron River
Site 3
Rock wall
Freshwater Creek
Saltwater Creek
Cairns Harbour
Mick Creek
Site 2
East Bank
CAIRNS
West Bank
Hills Creek
Trinity Inlet
EAST TRINITY
Bunded wall
Admiralty Island
0 2 4
Kilometers


Distribution and Abundance - Large (QLD)
Daintree River
Cairns
Russell/Mulgrave Rivers
Innisfail
North & South Johnstone River
Ingham
Herbert River
Proserpine
O'Connell River
Legend
Electrofishing (boat) sites
0 100 200
Kilometers
Baffle Creek
Bundaberg

- **Objective 4. Seasonal patterns in *P. monodon* Population Dynamics**

Key results:

Large scale spatial patten

- **During most years, both water flow and catch is highly seasonal, with short peaks in both during each year.**
- **Peak in water flow occurs during February to March**
- **Peak in commercial catch of P. monodon occurs in April to May**
- **An average lag of 2 months occurs between the peak in waterflow within the Barron River and North Johnstone River, and the catch on adjacent commercial grounds**
- **Although there was some correlation between commercial catch of P. monodon and the magnitude and timing of waterflow within adjacent large rivers, there is little basis for using waterflow as a predictor of catch (given current catch data quality).**

Small scale spatial pattern

- **Rainfall and Water flow within the Cairns Region was strongly seasonal with peaks in both occuring during February and March**
- **Water temperature was also strongly seasonal following typical wet- and dry-season changes**
- **Salinity was more variable within each season and may be more affected by local conditions such as localised rainfall runoff**
- **Catch was strongly seasonal with large peaks in catch**
- **Estuarine habitats – peaks recorded in December to January**
- **Foreshore habitats – peaks recorded between January to April**
- **The timing of the peaks in catch abundance were close within lower estuarine and foreshore habitats of Trinity Bay**
- **A difference in catch was observed between years, with higher catch rates recorded during 2001**
- **The timing of catch abundances between estuarine and foreshore habitats is similar to the timing of rainfall and peaks in waterflow**

Objective 4.

Seasonality in the Population Dynamics of *Penaeus monodon* in North Queensland

Joanne Langstreth

Aims of Objective 4.

Determine seasonal patterns in *P. monodon* population dynamics to identify abundance and population structure.

- Determine seasonal changes in the abiotic environment of *P. monodon* habitats
- Determine the seasonal changes in *P. monodon* abundance and size within estuarine, foreshore and inshore habitats
- Identify the timing of recruitment periods when *P. monodon* emigrate out from estuarine to foreshore and inshore habitats

Methodology

Seasonal changes in the abiotic environment were described using:

- Rainfall data – soureed from DPI Climate Centre database
- Water flow data – sourced from DNR database
- Water Temperature
- Salinity
- Turbidity
- pH
- Dissolved Oxygen
- Conductivity

Methodology

Seasonal changes in the abiotic environment were described using:

- Rainfall data – soureed from DPI Climate Centre database
- Water flow data – soureed from DNR database
- Water Temperature
- Salinity
- Turbidity
- pH
- Dissolved Oxygen
- Conductivity

Methodology

Seasonal changes in the abundance and size of *P. monodon* was described using:

Abundance:

- Commercial catch data from the ECTF
- Catch and effort data from broodstock collector's
- Catch and effort data collected during QDPI monthly surveys of mid- to lower estuarine and foreshore habitats.

Size:

- QDPI monthly surveys of *P. monodon* stocks within, mid- to lower estuarine and foreshore habitats.

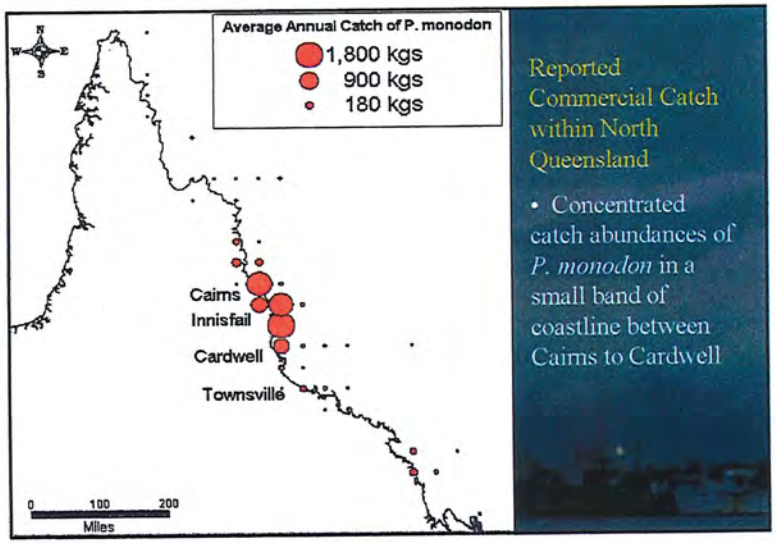
Results…

A. Large Spatial Scale - The seasonality in the:

- **Abiotic environment within North Queensland**
- **Commercial catch abundance of *P. monodon* within North Queensland**

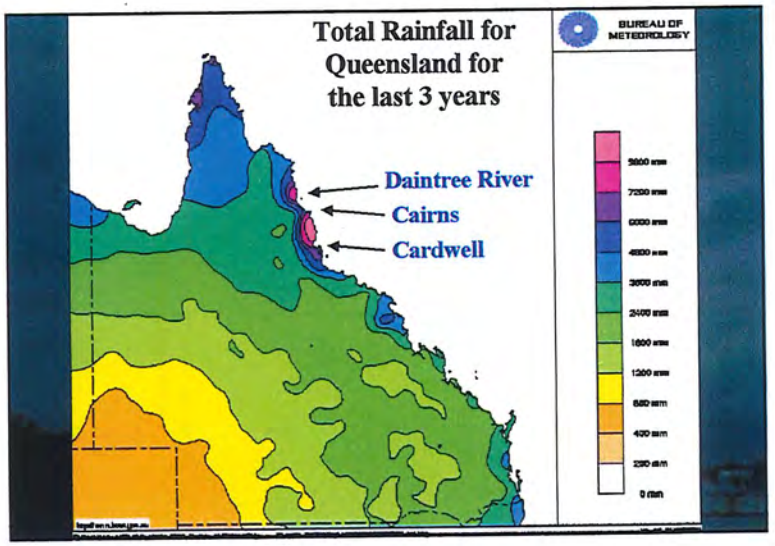
B. Small Spatial Scale – The seasonality in the:

- **Abiotic environment within the Cairns region**
- **Catch abundance and size of *P. monodon* within estuarine and foreshore habitats within the Cairns region (QDPI Research Surveys)**

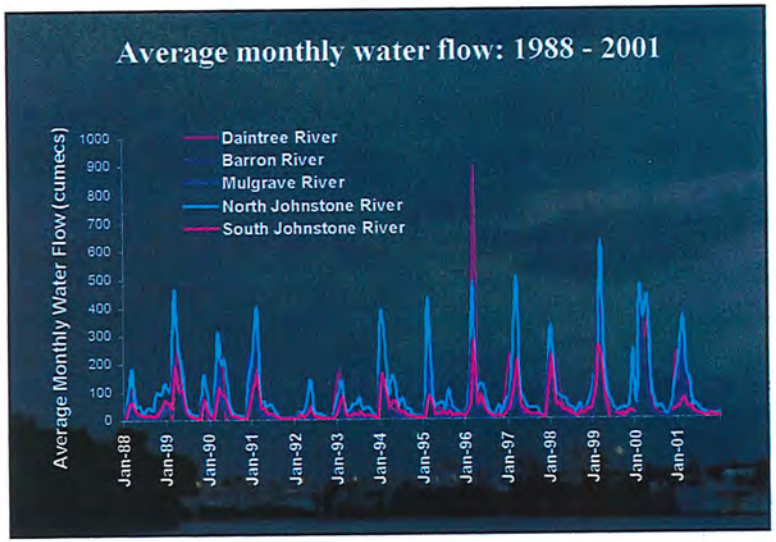


Reported Commercial Catch within North Queensland

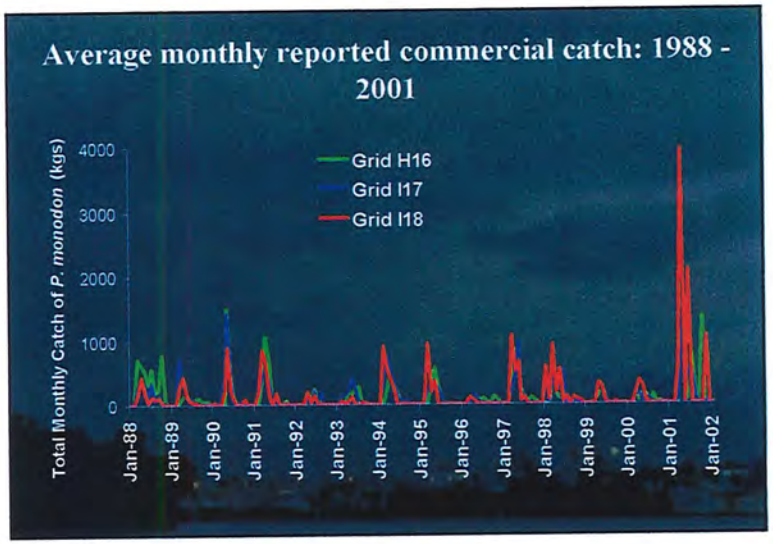
- Concentrated catch abundances of *P. monodon* in a small band of coastline between Cairns to Cardwell

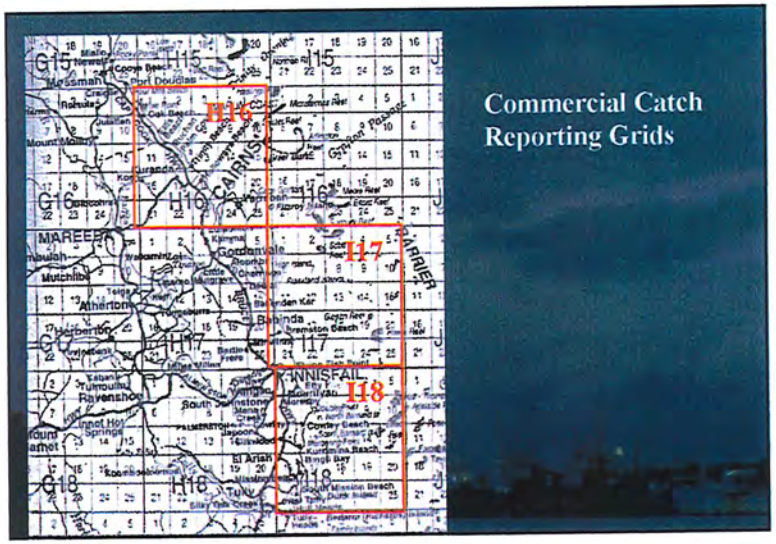


Average monthly water flow: 1988 - 2001

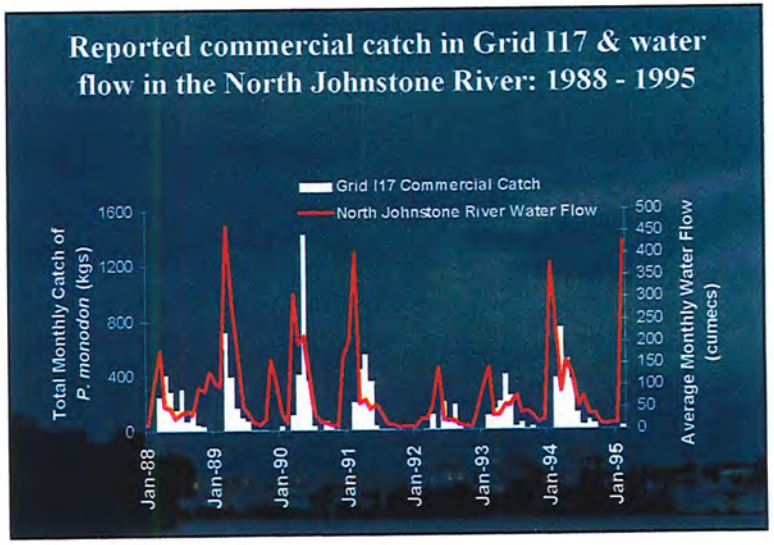


Average monthly reported commercial catch: 1988 - 2001

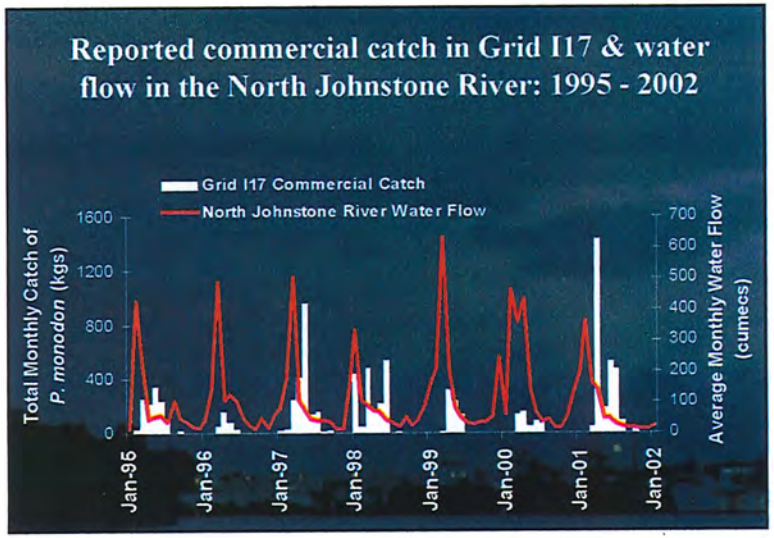




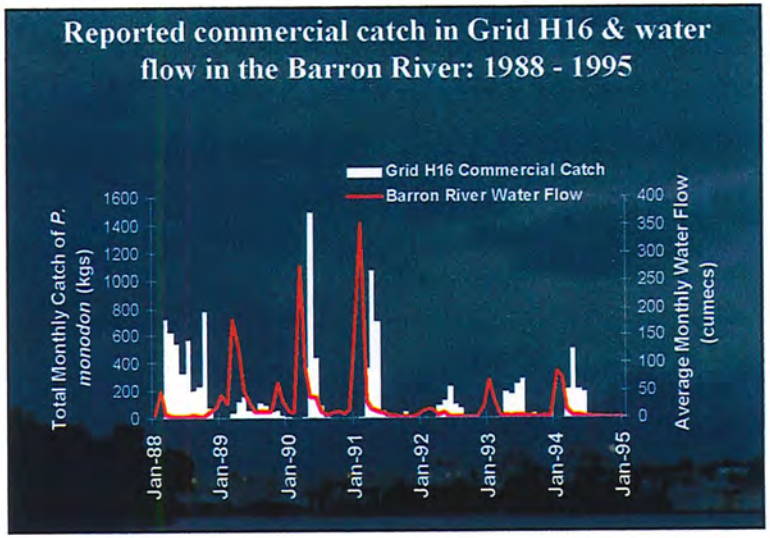
Reported commercial catch in Grid I17 & water flow in the North Johnstone River: 1988 - 1995



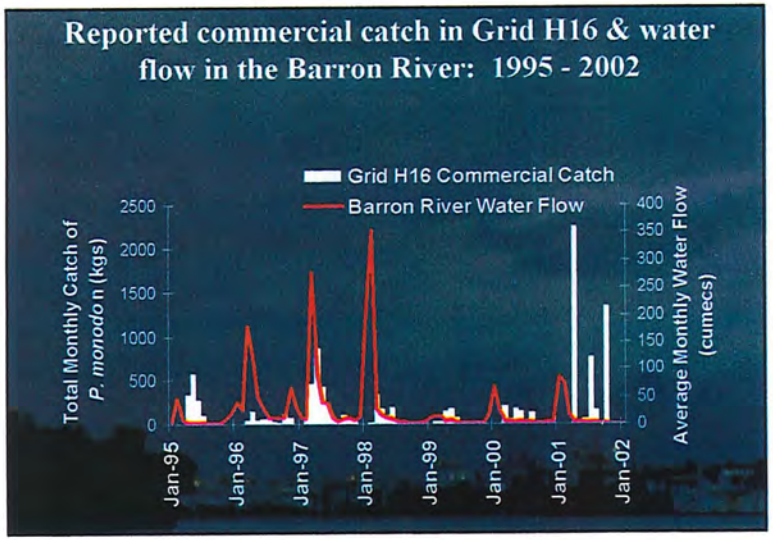
Reported commercial catch in Grid I17 & water flow in the North Johnstone River: 1995 - 2002



Reported commercial catch in Grid H16 & water flow in the Barron River: 1988 - 1995



Reported commercial catch in Grid H16 & water flow in the Barron River: 1995 - 2002



Large Spatial Scale Patterns in Seasonality

- During most years, both water flow and catch is highly seasonal, with short peaks in both during each year.
- Peak in water flow occurs during **February to March**
- Peak in commercial catch of *P. monodon* occurs in **April to May**

Large Spatial Scale Patterns in Seasonality

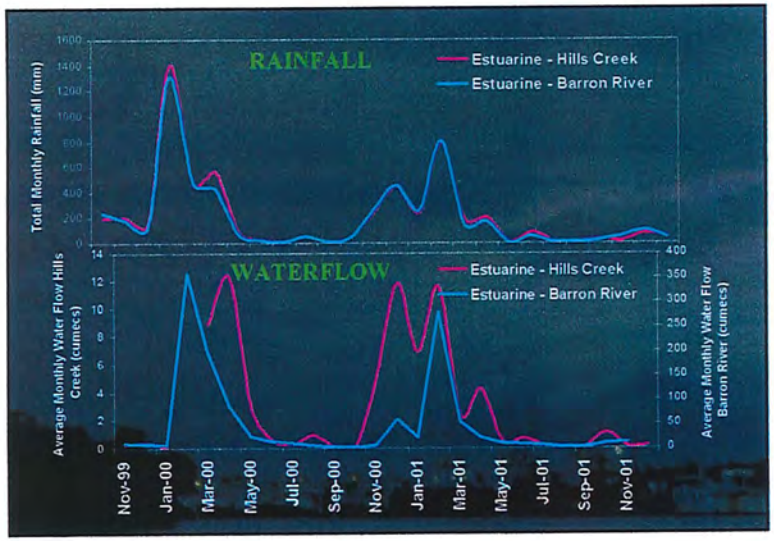
- An average lag of 2 months occurs between the peak in waterflow within the Barron River and North Johnstone River, and the catch on adjacent commercial grounds

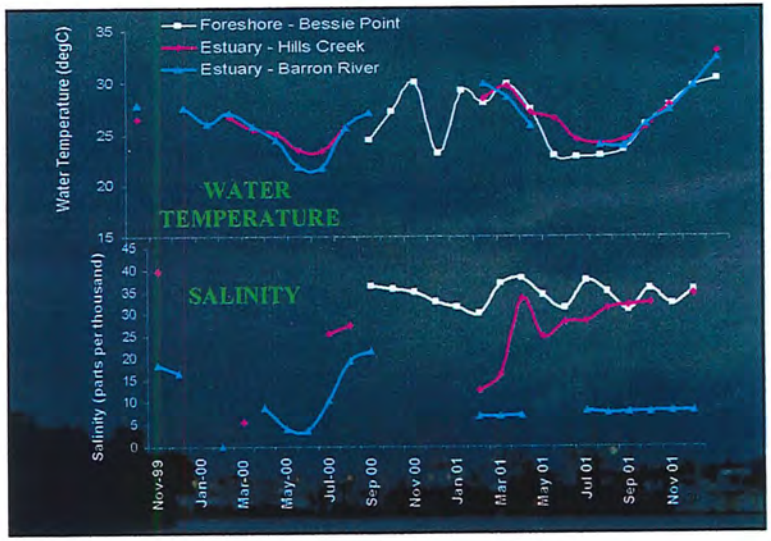
- Although there was some correlation between commercial catch of *P. monodon* and the magnitude and timing of waterflow within adjacent large rivers, there is little basis for using waterflow as a predictor of catch (given current catch data quality).

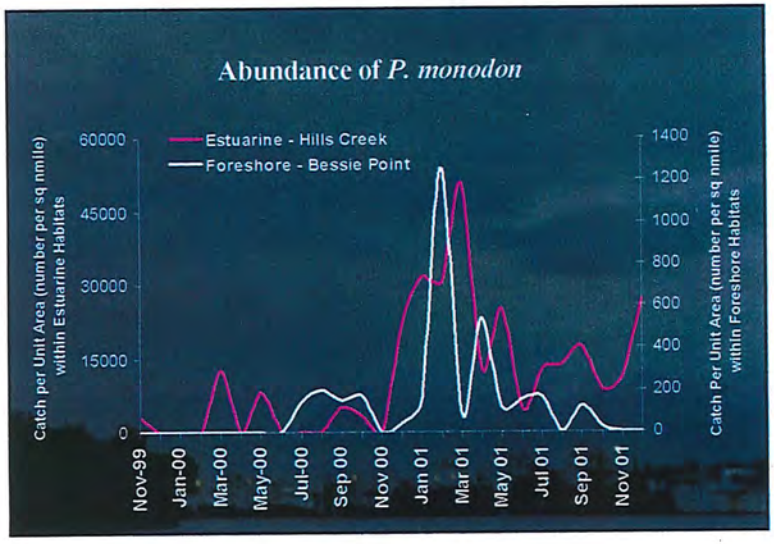
Small Spatial Scale (Cairns Region)

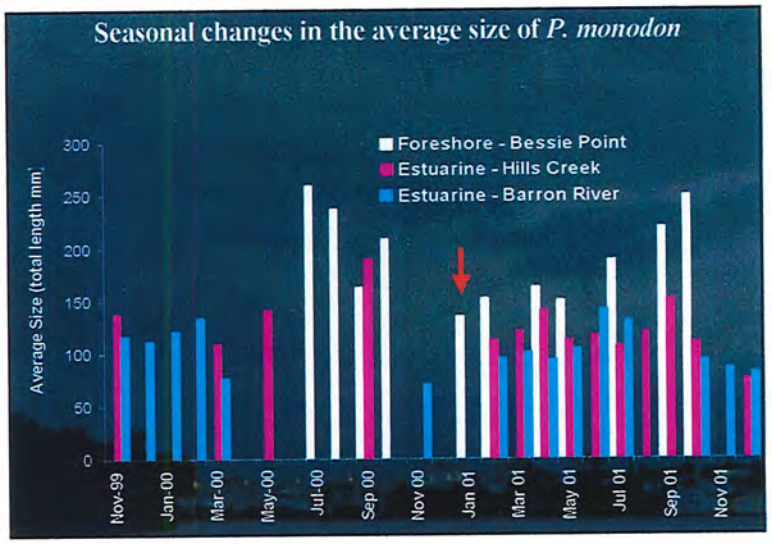
- Abiotic environment
  - Rainfall
  - Waterflow
  - Water Quality

- Biotic environment
  - *P. monodon* catch abundance
  - Size of *P. monodon*









Small Spatial Scale Patterns in Seasonality

- Rainfall and Water flow within the Cairns Region was strongly seasonal with peaks in both occuring during February and March
- Water temperature was also strongly seasonal following typical wet- and dry- season changes
- Salinity was more variable within each season and may be more affected by local conditions such as localised rainfall runoff

Small Spatial Scale Patterns in Seasonality

- Catch was strongly seasonal with large peaks in catch:
  - **Estuarine habitats** – peaks recorded in December to January
  - **Foreshore habitats** – peaks recorded between January to April
- A second peak in the number of *P. monodon* captured within foreshore sites was observed during August to October 2000, when smaller individuals occurred within these sites

Small Spatial Scale Patterns in Seasonality

- The timing of the peaks in catch abundance were close within lower estuarine and foreshore habitats of Trinity Bay
- A difference in catch was observed between years, with higher catch rates recorded during 2001
- The timing of catch abundances between estuarine and foreshore habitats is similar to the timing of rainfall and peaks in waterflow

Wake Up:
It's time for questions.

- **Objective 5. Tag-Release-Recapture of *P. monodon* within North Queensland**

Key Results:

Estuarine
- **85 % displayed no movement from site (100 m reach) (17 animals)**
- **Short Time at Liberty average 23 days**
- **Growth average 16 mm total length**

Closure
- **85 % displayed movement north to commercial grounds**
- **Gender – 2 females: 4 males**
- **Time at Liberty - average 74 days**
- **Total Growth averaged 8 mm total length**
- **Movement range 5 to 100 km (False Cape To Bailay Creek)**

Commercial
- **No movement between commercial grounds (ie between QFS CFISH grids – 30 nm sq)**
- **Gender - 75 % male: 25% female**
- **Time at Liberty**
  - **average 33 days**
  - **range 1 to 166 days**
- **Growth (adult)**
  - **average 13.5 mm total length**
  - **range 0 to 110 mm total length**

Homing Behavior
Definition: movement back to capture location, when released in new area
- **Time at Liberty – influences movement recorded**
- **Example One:**
  - **Double Is (back to) Bailay Creek (70 km north)**
- **Example Two:**
  - **Bailay Creek (back to) Yorkeys Knob (80 km south)**

Penaeus Monodon Tag - Release and Recapture Program

By Sarah Kistle

OBJECTIVE 5: Identify Recruitment, Movement and Growth of *Penaeus Monodon*

- **Define:**
  - Recruitment
  - Movement
  - Size

2

OBJECTIVE 5: Identify Recruitment, Movement and Growth of *Penaeus Monodon*

- **Methods:**

  Tag – Release and Recapture Program

Capture Method	*Areas Fished*	*Number Tagged*
Commercial Trawl	Commercial Grounds	1 466
Research Trawl	Cairns Closure	192
Research Cast net	River	357
TOTAL		2 015

3

OBJECTIVE 5: Identify Recruitment, Movement and Growth of *Penaeus Monodon*

- **Results:**
  - Population Structure and Abundance between grounds
  - **Recruitment** - nursery to commercial grounds (post larvae to adult)
  - **Movement** - within nursery grounds
    - within commercial grounds
    - homing pigeon behavoiur
  - Size - total length (juveniles and adults)

4

Results: Recaptures

✓ Total Recapture Rate of 4.3 %

(93 animals from the 2 015 tagged)

Grounds	Number
Commercial	74
Researchers	4
Recreational	15

✓ Recaptured twice = 9

5

Results: Population Structure and Abundance Between Grounds - Gender

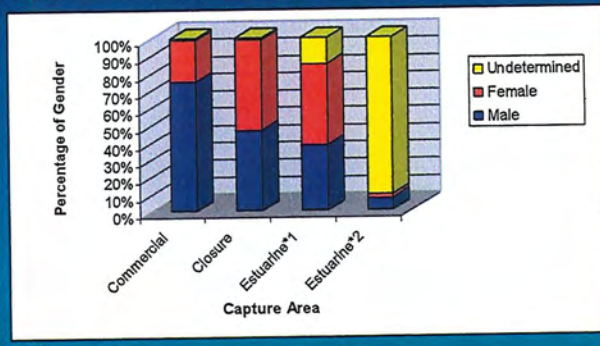


Table 2: Gender of tagged *P. monodon* by Grounds/Capture

6

Results: Population Structure and Abundance Between Grounds - Size

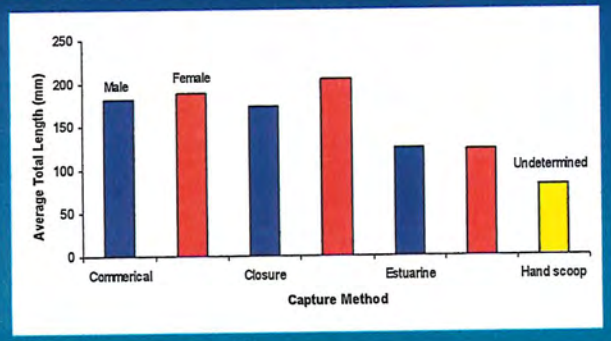


Figure 2: Average Total Length (mm) of tagged *P. monodon* by gender

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Results: Recruitment

➢ Estuary (Adolescent) to Commercial Ground (Adult)

- Three female adolescent animals showing recruitment
  - Barron River (mid tidal) to Taylor Point (14 km approx.)
  - Hills Creek (lower tidal) to Double Island (16 km approx.)
- **Time at Liberty**
  averaged 124 days
- **Growth**
  averaged 76 mm total length

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Penaeus Monodon Tag - Release and Recapture Program

Results: Movement

Estuarine

- 85 % displayed no movement from site (100 m reach)
  (17 animals)
- **Short Time at Liberty**
  average 23 days
- **Growth**
  average 16 mm total length

9

Results: Movement

Closure

- 85 % displayed movement north to commercial grounds

Closure movement.ppt

- **Gender** – 2 females 4 males
- **Time at Liberty**
  average 74 days
- Total Growth
  averaged 8 mm total length
- **Movement**
  range 5 to 100 km (False Cape To Bailay Creek)

10

Results: Movement (growth)

Commercial

- No movement between commercial grounds
  (ie QFS CFISH grids – 30 min)
- Gender
  75 % male: 25% female
- Time at Liberty
  - average 33 days
  - range 1 to 166 days
- Growth (adult)
  - Averaged 13.5 mm total length
  - Range 0 to 110 mm total length

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Results: Movement (homing pigeon behavior)

Homing Behavior

- Definition: movement back to capture location, when released in new area
- Time at Liberty – influences movement recorded
- **Example One:**
  - Double Is (back to) Bailay Creek (70 km north)
- **Example Two:**
  - Bailay Creek (back to) Yorkeys Knob (80 km south)

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OBJECTIVE 5: Identify Recruitment, Movement and Growth of *Penaeus Monodon*

- Summary

✓Recruitment

- nursery to commercial (summer & winter)

✓Movement

- none between commercial grounds
  (QFS CFISH 30 min grids)
- homing behavior displays localized populations

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Questions & Comments

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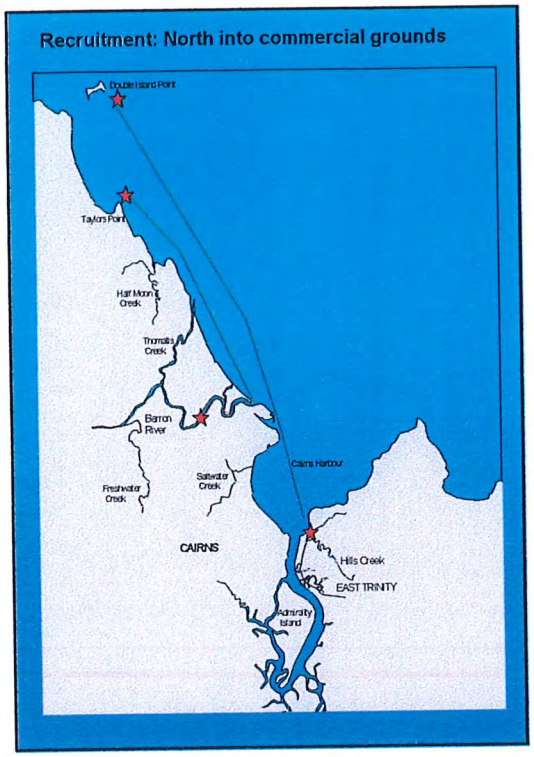
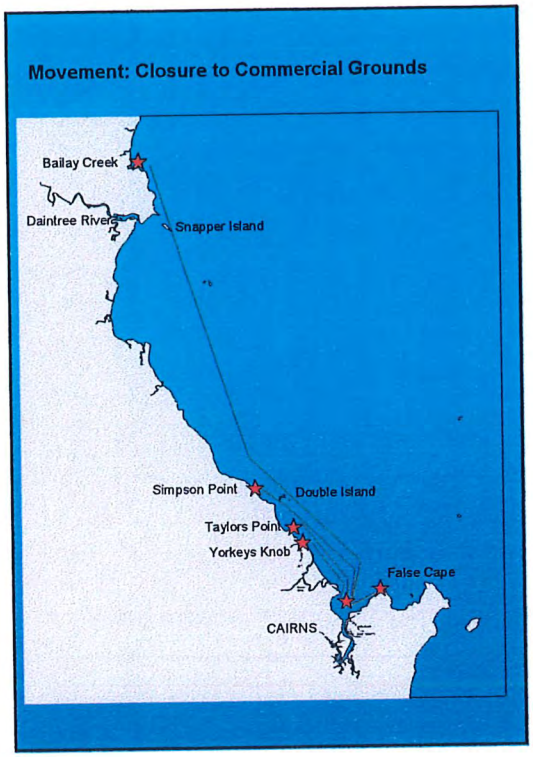
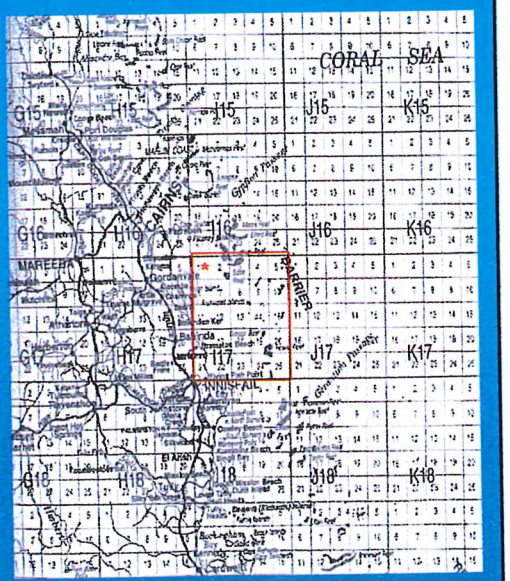
Recruitment: North into commercial grounds



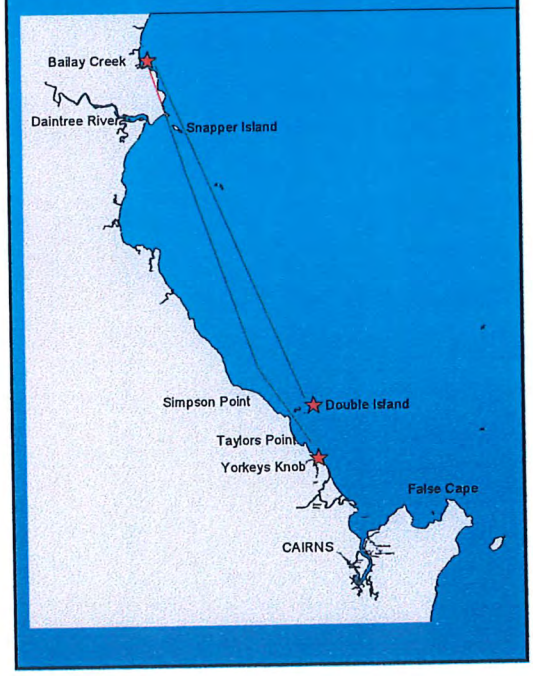
Movement: Closure to Commercial Grounds



No Movements within QFS CFISH GRID (30 min)



Homing Behavior: Localized Populations



- **Objective 6. Alternative Capture Techniques.**

Key Results

- **Catch rates of black tigers in pots, lift nets and trammels is far less than in trawl gear**
- **Economics of using alternative trawl gear in this fishery seem unlikely to be workable**
- **Black tigers are a relatively sparse and uncommon species along Queensland east coast**

Alternative Capture Gear - Black Tiger Prawns

- Matt Campbell
- Mike Dredge
- Neil Gribble
- Sarah Kistle
- Jo Langstreth
- Damian White

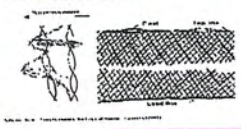
Alternative Capture Gear - Black Tiger Prawns

- Examine alternative capture techniques and the associated stress testing of caught broodstock, in particular for inshore and shallow water habitats which may contain useable quantities of currently unexploited broodstock.

Alternative Capture Gear - Black Tiger Prawns

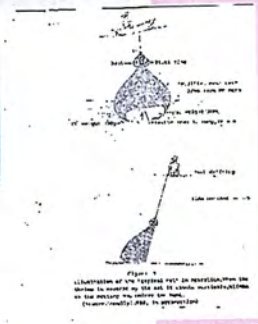
PROCESS

- Literature review
- Preliminary trials-lift nets - Darwin Harbour
- Preliminary trials - traps, trammels, trawl in Moreton Bay
- Field trials - Trinity Inlet - traps, trammels, lift nets, trawl gear



Alternative Capture Gear - Black Tiger Prawns

- Literature review - showed that while >90% of world's prawn catch was taken by trawl, there are numerous alternative gears used in artisinal and recreational fisheries



Alternative Capture Gear - Black Tiger Prawns

- Two main methods for alternative capture gears - passive and active
- Passive gears - fence nets, set /stow nets, traps, trammels etc
- Active - scissor nets, lift nets, cast nets, etc

Alternative Capture Gear - Black Tiger Prawns

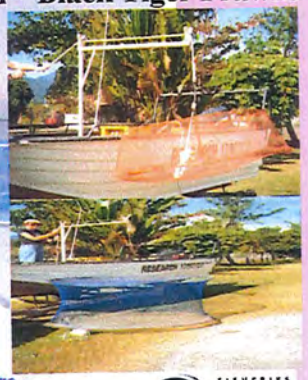
- We selected traps (3 types), lift nets (2 types), trammel nets (3 configurations) for comparison with catch rates, catch composition of trawl gear

Alternative Capture Gear - Black Tiger Prawns

- Preliminary trials - aquaculture ponds
- Three trap types - top opening, opera house and Munyara type
- High catch rates - 630 prawns in 20 lifts/trap type - 90% in Munyarra, 10% in opera house

Alternative Capture Gear - Black Tiger Prawns

- Lift net trials in Darwin Harbour - two net types.
- 48 prawns (4 species) from 27 pot lifts
- >90% from collapsible lift net



Alternative Capture Gear - Black Tiger Prawns

- Prelim trials - Moreton Bay - Traps, trammels, trawl as control
- High levels of prawn abundance (3spp)- ca 250/ 20 minute shot = 1 per 8 square m
- Total catch of 9 prawns from 160 trap lifts (12 hour soak time - 2 trap types, 2 baits

Alternative Capture Gear - Black Tiger Prawns

- Prelim trials - Moreton Bay
- Three types of trammel nets used (Indonesian, three panel mono, 2 panel net
- Small number of prawns from trammel nets (particularly Indonesian style net), but high bycatch levels

Alternative Capture Gear - Black Tiger Prawns

- **Trials in Trinity Inlet**
- **Beam trawl as control**
- **Traps (128 lifts)**
- **Trammels (3 types, 5 sets)**
- **Lift nets (2 types, 65 lifts)**

Alternative Capture Gear - Black Tiger Prawns

- **Summary results**
- Trawl gear - total of 680 prawns taken in 16 *20min shots
- **Metapenaeus spp-50%**
- **Bananas-42%**
- **Black tigers-4.5%**
- **Rainbows-2%**
- **Grooved tigers-1%**

Alternative Capture Gear - Black Tiger Prawns

- **Summary results**
- **Trawl gear - 288 bananas, 27 black tigers - approximate density for all prawns 1/100 sq. m**
- **Approximate density black tigers 1/1000 sq. m**
- **Diverse bycatch - 41 fish species/complexes, 7 crustacean spp, spp complexes**
- **Trawl bycatch ratios quite low prawn to bycatch ratio (number of organisms about 1:2.27**

Alternative Capture Gear - Black Tiger Prawns

- **Summary results**
- Traps- 129 overnight sets - 50 prawns, mostly bananas, <1/lift
- Little bycatch

	Opera house / Pilchard	Opera house / Prawn	Munyara / Pilchard	Munyara / Prawn	Total
Banana	16	3	20	10	49
Black Tiger	0	0	1	0	1
Total	16	3	21	10	50

Alternative Capture Gear - Black Tiger Prawns

- **Summary results**
- Lift nets- 3 bananas fro
  34 lifts of collapsible ne
- None from 31 lifts of rigid lift net

Alternative Capture Gear - Black Tiger Prawns

- **Summary results**
- Trammel nets -15 * 30 minute sets, 3 net types
- Limited catches - 16 prawns (4 black tigers), most in 3 panel mono. Net
- Fair amount of bycatch - ca. 1600 organisms, all small fish, had larger fish been present, they probably would have been taken
- Bycatch ratios from trammels higher than for prawns

Alternative Capture Gear - Black Tiger Prawns

- BOTTOM LINE
- CATCH RATES OF BLACK TIGERS IN POTS, LIFT NETS AND TRAMMELS IS FAR LESS THAN IN TRAWL GEAR
- ECONOMICS OF USING ALTERNATIVE TRAWL GEAR IN THIS FISHERY SEEM UNLIKELY TO BE WORKABLE
- BLACK TIGERS ARE A RELATIVELY SPARSE AND UNCOMMON SPECIES ALONG QUEENSLAND EAST COAST

Queensland Government

FISHERIES RESEARCH & DEVELOPMENT CORPORATION

Alternative Capture Gear - Black Tiger Prawns

Queensland Government

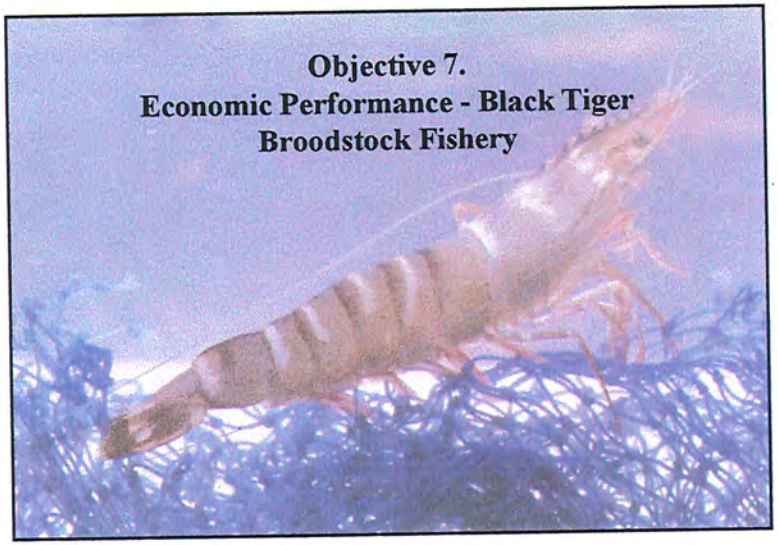
FISHERIES RESEARCH & DEVELOPMENT CORPORATION

Objective 7. Economic overview of the broodstock collection fishery

Key results

- **Detailed economic data (revenue, costs, economic performance indicators) were obtained from a small number of broodstock collectors**
- **Given the very small, and identifiable, sample, it is not appropriate to give details of economic analysis**
- **In general terms, our data suggests that the broodstock collection industry is economically viable**

Objective 7.
Economic Performance - Black Tiger Broodstock Fishery



Economic Performance - Black Tiger Broodstock Fishery

- OBJECTIVE: Conduct economic cost/benefit analyses of various fishing patterns, capture techniques and handling protocols
- Mike Dredge, Bill Johnston, Jo Langstreth

Economic Performance - Black Tiger Broodstock Fishery

- DATA-
- C-Fish data base to give some idea of catch magnitude
- Aquaculture industry survey - to give an idea of the magnitude of the broodstock industry
- Interviews with individual fishers - to get detailed economic performance of the fishery

Economic Performance - Black Tiger Broodstock Fishery

- The Fishery
- C-Fish reports an annual average catch of ca.7-8 tonnes, strong seasonality
- This probably represents a proportion of the trawl catch for human consumption
- Broodstock fishery catch under-represented?
- Aquaculture industry using ca. 5,000 - 10,000 animals / year - ca $0.5-$1.0 wharfside value
- Take of broodstock represents about 10-20% of total reported take from trawl fishery

Economic Performance - Black Tiger Broodstock Fishery

- Black tiger aquaculture industry that hangs off the broodstock industry generates about 60% of Queensland's 2,500 tonne prawn aquaculture production
- Black tiger aquaculture industry generates about $25m - farm gate price.
- Broodstock supply therefore absorbs ca. 2-4% of industry revenue, before hatchery costs are met.

Economic Performance - Black Tiger Broodstock Fishery

- Detailed economic data (revenue, costs, economic performance indicators) were obtained from a small number of broodstock collectors
- Given the very small, and identifiable, sample, it is not appropriate to give details of economic analysis
- In general terms, our data suggests that the broodstock collection industry is economically viable

List of workshop participants

Attendees	Initials	Agency/Vessel
Jo Langstreth	Jo	QDPI
Sarah Kistle	SK	QDPI
Neil Gribble	NG	QDPI
Mike Dredge	MD	QDPI
Ian Smith	IS	QDPI, facilitator
Dorothea Huber	DH	GBRMPA
Martin Russell	MR	GBRMPA
Bev Tyrer	BT	QFS
Martin Breen	MB	APFA
Chris Robertson	CR	QDPI
Andrew Fenton	AF	Seafresh, Yorkey's Knob
Noel Herbst	NH	Gold Coast Aquaculture
Partick Hone	PH	FRDC
Barry Erke	BE	QSIA & EcoFish
Bill Izard	BILL	Cairns Live Prawns
Roger Green	RG	Bellenden Research
Trevor Purkis	TP	Trevanna
Darren Cleland	DC	Ecofish
Alice Eaton	AE	FV. Tub
Byron Moore	BM	FV. Wizard
Sam Coco	AC	

Disscussion

This section is based on the transcript of the open forum discussion held after the presentation of the information on each of the project objectives. All workshop participants were invited to comment, make suggestions on the interpretation, or suggest future work. Although requested to give their names before they made a point (for the transcript) most speakers chose not to, so the editor has had to guess at the speakers' identity from the tape. My apologies for wrongly attributing comments, if this has occurred. Each speaker is identified(?) by his or her initials.

Because there was over 70 pages of raw transcript, editing was required to bring the section down to manageable levels. Some speakers either made their point and kept speaking or wandered off the workshop topics completely. In these cases the editor has tried to maintain the thrust of their comment but has reduced the text considerably.

Similarly, the discussion broke-up into a number of competing private conversations at various times, usually following contentious comments or points raised. No attempt has been made to disentangle conversations not directed through the chair and these episodes have simply been noted.

Because many points of view were expressed, from collectors, hatchery, farms, management and researchers, the editor believes length of the edited version is justified.

NG
Welcome, this afternoon we discuss some of the project results, what we showed you this morning, and more importantly discuss the significance of those results to industry. For the workshop proceedings we're going to record the discussion, get a transcript typed up, edit it so there's no swearing or that sort of thing, then send you each a copy.

First of all, the question posed by the project was: Is the Monodon broodstock population sustainable?

That's what the project was titled. But before you answer that question you must take a good look at the data that we've shown you today. The picture is of highly variable abundance, both in time and in space, but also that Monodon is relatively rare at best. Maybe we should be asking, given these factors, is it possible to realistically assess whether the population is sustainable.

One of the questions I've asked my group was "Given everything that we knew and the sampling that we did in 2000 could we have predicted what happened in 2001?". If you remember, there was that sudden jump in abundance in 2001, particularly in that May period. This was reflected in the juvenile and sub-adult surveys, as well as the research logbooks with the collectors, and in the CFISH commercial trawl logbook data. Was there anything that could have allowed us to predict that? We've had a look at, river flow and rainfall. We looked at past catches. We looked at patterns in catches at various spatial and temporal scales. Could we have predicted that jump in abundance? The answer is NO.

Monodon is going to be relatively unpredictable; we know it's going to have sporadic increases and decreases. Now we can tell within general bounds that if you have areas of high tropical rainfall you are likely to find Monodon. We can also say that the peaks in abundance seems to be generally matched with the rainfall and river flow, but we can not really use either rainfall or stream flow in one year to predict whether the prawns are going to be abundance or not. An added difficulty is its relative rarity (low sample sizes) means that it is very difficult to draw conclusions from the information we get.

The bottom line from an industry perspective is; it is a rare animal, sporadic in its occurrence. Sometimes you'll get good catches, sometimes you will not. And in the data we've been able to collect, we cannot really come up with a model that we will be able to forecast that. The best example I have got of this sort of animal is the banana prawns in the Gulf of Carpentaria. After twenty years or so of work, CSIRO still can not come up with a reliable model to predict banana prawn catches, because on the fine scale the animal is pretty close to unpredictable. Given a whole lot of factors, ie rainfall, temperature, availability of food, or all of those combined, and suddenly BOOMPF, they're there. Next year it can appear to be the same set of factors but the timing of the mix is slightly different and the prawns do not "fire".

So that's one of the things we've come to understand, it is going to be very very difficult to assess the sustainability of this particular species. I take Patrick Hone's point that if they are on the edge of their distribution, on the extreme edge of their physiological range, that means that by nature they're going to be highly unpredictable.

The second point I would like to make is and this is one of the things that the industry asked us for specifically. We did NOT find any new unexploited grounds and the reproductive timing of these animal does NOT seem to fit the needs of aquaculture. We didn't find that major second spawning that would allow you to reliably stock ponds over the summer months. We found one major spawning early in the year with a much smaller and erratic pulse later in the year, with a low level of spawning in between. We found a slight hint that there might be two spawnings in some years but not consistently through all years in all areas.

There is whole series of issues that you identified, just a few up here [on the whiteboard; ED]. What I'd like to do now is to get feedback from the group and find out what is your interpretation of the data presented.

I will open it up to the floor.

MB
Can I kick off, Mr Chairman. I think it is really important that this project clearly states up front the limitations of the data set, not just the CFISH data set [Commercial Logbook data. ED] but also the actual fishery independent data set. Because from what I have seen today I do not think we have enough information to be making clear and decisive management decisions. In fact we had Bill's [Izzard] data analysed and there seems to be a lot of overlap. The two sets of findings support each other, which for us a good result, but I still have reservations.

And the issue about timing. I think that is a really important one that needs to be looked at, probably in a separate project. There is a number of ways around it. One of them might be for the aquaculture industry to investigate ways of catching the animals and keeping when they are in large supply. Surely our people have put some brain power into that in the past. Obviously they have decided it can not be done for one reason or another but we need to know more about that. Maybe Noel can comment on that.

SC
Mr Chairman, my name is Sam Cook, an ex-Mourilyan prawn farmer, probably you ask why I am here. I am here because I was invited by some people who wish to invest money in Monodon aquaculture and this workshop is very vital, very important. That's why I came. How reliable is the supply of broodstock and how are we going to get special people from the regional cities of Australia that have the money to invest? So they want information. They trust in me to give them the right information, if I can get some today. In my opinion, we need more research in the area of spawning. A while ago we were looking at closing the breeding cycle in the laboratory, you get 1 out of 50.

I was going to ask you what percentage success you get with the trawler caught animals. I was just trying to compare what spawning success for prawns from different trawlers in the same area and regarding as you said, about where to look for other areas. I believe it is very vital for the industry to look at other areas. Therefore, in conclusion we need more research, more effort to put in to satisfy the need of industry. It's a bit hardline on the environment but I believe, as I understand the Minister, the QLD Government want this industry to kick off. They have not put a white elephant here for nothing [new QDPI Aquaculture Centre in Cairns ED]. They put that here to satisfy the Aquaculture industry together with the seafood industry. So I support that.

MD
Can I just get in another question, it's a hypothetical question. What would happen to the economics of this industry if for whatever reason you could double or triple the supply of brood stock? What would happen to the economics of the current brood stock industry?

IS
We'll just put it up as a question. [on the whiteboard ED] We can have at look later.

PH
I think if we look at original question which is : "Is the stock sustainable?" I think you've got quite a lot of data to start answering questions about sustainability. The other question is; should the stock be allocated to a different user? I think that is a very difficult question and maybe the economic argument is the way you go. But that was not really what this project is about, allocation. I think the project has the opportunity to talk about what are absolute numbers that are caught out there and the sorts of relative numbers between what's been used in aquaculture and what's been used in wild fisheries. Then it is up to someone else to make some decisions on the allocation. I think we do at least have preliminary data on this and I think the question mark is: "are there other issues that could drive the fishery to not being sustainable"? Have you got any comment on that, would that be a fair comment?

NG
My feeling from what I've seen so far. It looks like there has been a reasonable harvest of Monodon through time, which has been sustainable; that is the fishery has not fallen over as yet. I would not like to see the harvest increase however given the variability that appears to be inherent in the stock. I think the way to go is to better utilise the current catch and remember that when I say the stock I'm talking about the whole stock and not just talking about broodstock supply. I am including the harvest of frozen product. It's all Monodon. It's all coming out of the same stock. Rather than try to make artificial compartments of broodstock and frozen product let's make the best use of what is currently harvested and try not to expand the harvest. There are two ways you can do that: (1) work with the trawler fishery and utilise that frozen product, turn that frozen product into broodstock and (2) make sure that in the hatchery you get maximum benefit from every broodstock. The same amount of fishing pressure,

or even less pressure, on the stock and you would be getting better benefit from it in terms of the aquaculture industry.

MD
Can I? Two points. The first is about sustainability. One thing that has not been discussed before in relation to sustainability is the fact that there is an East Coast Trawler Plan and any reduction in species that can be retained or trawlable area is going to cut into the viability of trawlers quite considerably. The new Representative Areas program will also reduce the space available for trawlers. Now if the animal has been sustainable up until now, I can not see any good reason why it should not be in the future given that pressure on the stock does not increase dramatically. The second point is a question I would like to throw in, particularly to Noel. Neil's talked quite a bit about the need to use better those animals that are being caught. Does the aquaculture industry need more brood stock at this point in time?

NH
There are a lot of answers there. The aquaculture industry needs more brood stock? It's a bit like the Gulf. We have our highs and our lows and if you look back in history; fellows have told me sixty years ago that certain places along the East Coast have always been known for big catches of Monodon. Now, it's only natural, it's like the rest of the wild fisheries. One year it is up, and the next year it is down. And on those ups, yeah we have got an abundance of spawners. The problem lies in stock which is caught in the wild is going into frozen product, it is caught in the months of about March when hatcheries and farms are do not require the spawners.

See, this is a problem, because of the winter period we only get one crop, more so in the south, it is a bit warmer in the north. If we shipped you up to New Guinea somewhere, at a warmer temperature we'd be able to do two crops. Which would be far better as far as the aquacultures is concerned, because we would be selling prawns in September, October and November and getting a higher price. But the way it is, we can do about one and a half crops and down in the south (where you've got over two thirds of the state) you can't. We are locked into one crop a year. We've got to get our spawners in the months of August, September, October or else. And it's very very hard some years. Some years, no problem at all – last year we got 250,000 in a few days, that's it. But they're not all like last year.

There's been problems as you know full well. I've had boats up around Cooktown, everywhere, searching for spawners. We've been wanting to go into the Torres Straits and get spawners. I think the closure of some areas and some restrictions is going to help. I honestly believe there is probably enough out there, if there is a few closures. Especially along a few beach areas or something like that, or some restrictions on net sizes and there will definitely be enough. Because I believe there is product already being exported out of the spawners that are being exported from our East Coast waters here.

DH
I just want to make a point here. I do not want to get into the issue of resource allocation but I just want to bring up something that you've both been talking about, Neil and Mike. You talk bout sustainability. I mean, I've not really heard anything this morning that would show that would show that you have actually have the data to do a stock assessment on sustainability. You have some understanding of the movement and that, but you are not really in a position to say, build a model and project the take that could come out of fisheries. So when you talk about sustainability you are really just going on catch/effort trends and they are all over the place. Really what you presented this morning; some good years, some bad years, and so on.

NG
That is valid point and one that I brought up in my introduction. However when assessing sustainability in these cases you can look back at past harvest records and ask "have these been sustainable through time"? Has the catch per unit of fishing remained stable. If the answer is yes, then the harvest has been sustainable at that level BUT you can not go on increasing the effort, you have got to keep the effort controlled.

DH
If I understood you correctly you were talking about that species occurring throughout the Pacific, is that correct? It is the same species?

PH
No, not throughout the Pacific, through Papua New Guinea. It is a straggly population in New Caledonia but the main contribution is in the Indian Ocean, South China Sea.

DH
So in other words if we were to overfish the population of the Queensland East Coast is there a chance that we could get recruitments from elsewhere in the fishery. I mean, has that scenario been considered because often when you are on the fringe you can fish fisheries opportunistically, in particular animals that have a high turnover like prawns do.

PH
Crustaceans (prawns) are almost the most impossible species to crash, because of the short life-cycle, high fecundity.... all those sorts of things. This fishery also has an enormous escapement, because you cannot fish in shallow waters [due to current closures ED] and yet we know it occurs in very shallow waters. Notwithstanding that, it is not possible to do a formal assessment but they are all the sort of things that comes out of the data. Would you be able to get alternative supplies of spawners out of the Indo-Pacific?

MB
While we are on sustainability can I just add another angle to it, there is more to sustainability than just having lots of fish in the sea. There is also social and economic sustainability. And Mike's point earlier about the value of the crop. The harvest of brood stock is a tiny percentage of the harvest but a whopping

value compared to standard frozen product. In this regard I think we all need to commend the work of brood stock collectors, who in recent years they have been putting the animals back into the sea, because that just adds value to the fishery.

BILL
I would like to say that sustainability on my terms is the sustainability of the fishermen. I have been fishing over twenty years and have specialised in collecting brood stock over fifteen years. Basically I probably pioneered it right from the days of George Badao(??) who was the first guy who had a prawn farm and still has a prawn farm. Through the East Coast Management Plan we have lost 40% of the boats in the last twelve months. Now, the situation at Mission Beach – we've lost that fishery – we do no have access. Well, through a proposed permit GBRMPA are looking at giving us access back into that area but only after considerable lobbying.

What has happened over the last few years is because of the difficulty at times on different years. Out of this fifteen years I have also only seen three years that had the ability to service the industry into the later part of the year when the hatcheries are still demanding a product. There is enough product there – the sustainability of the resources – there is not a problem with that. It is getting access to grounds.

One of the big things that seems to have an effect that has really only come into force in the last few years, and is the reason we can not find animals, is the turbidity in the water. When we have these light winds, it drops – the sediment loads drop down and it only takes a matter of days. Last night I brought in over 100 spawners – now it is clear as a bell, highly likely that there will be nothing there today. These are the sorts of things that have the biggest impact. We have no control over it – nor has any sort of management. The problem we have got is the availability to areas that could be still, that might have these animals.

Part of the work that I started to do was a list of projects I put up, this was 1991: "Tagging and biology of monodon" "Environmental indemnification and projection", "Access to fishing grounds", "Stockpiling brood stock locally", "Light transport of sawdust and other stress-reducing handling techniques", "Restocking, hatching eggs and transporting ", "Fishing gear modification and environmentally safer gear". Warren Lee Long, I must thank Warren, because Warren and I put this together quite a number of years ago. I have sent these two pages off, not in order of presence. Objectives, final positive achievements through action, some consequence of no action.

Every single one of these things has happened to us- we have lost fishing grounds, our habitats have changed. These are relevant, and I've gone off and tackled these projects. Now the tag work that I have done over the years, what I was sent out to do and what I was hoping that the stock assessment that DPI were doing would enhance the work that I have done in the past, because I have proved it worked, my recapture rate out of 1400 odd animals is 13-14%, not 4.3%. The fishermen willingly gave supported this tagging? Bear in mind, several years ago, the commercial fishing industry absolutely hated aquaculture.

There was a percentage there, these guys just would not, even if they found the animals, they would throw them away. I knew there was an element there, but I just lived with it. But the thing what I was able to prove to some of the people I have worked with, was that by putting these animals back in certain areas we had a high chance of recapturing them. Now, frozen and put in a box these things are worth 70cents - $1 each. At the moment we are getting anywhere around from $70-100 for a spawner. That is a huge increase in value adding.

MD
I'm having difficulty trying to figure out exactly where all this is going.

BILL
Where it is all going is the fact what I wanted – you talk about sustainability – what we are staring down the track at – we have just had the MSC people up from Adelaide to have a look – looking at this inshore fishery, we are looking at changing the apparatus, bringing in a code of conduct and a code of practice, getting this fishery and it is the first, possibly will be the first prawn trawl fishery on this planet to get this type of accreditation. Through that type – through the work that we are going to do in the process, I believe we will wind up with a very very good fishery at the end of the day and it will prove that where the problems lie with this species. And I think this – we do not really have a worry with the sustainability of the brood stock, what we have got is the sustainability of the people that are in it. Because at the moment the industry is not growing. We have got 600 hectares. I hear one farm has been granted permission in the last two years. My problem is orders.

We just do not have enough orders in Australia to entertain the brood stock. We have got one guy here that is really very profitable with it but to bring it – the networking I do with these other boats and the effort and equipment we are using – the money is not there to support the infrastructure that is there, and if this industry does not grow, I can't – I've been exporting these animals overseas being very very successful with – the opportunity is there. Also, the opportunity for the market to take off, and bring more and more effort into it. You have got every live trout facility here, ready to turn the key. There is already a facility – spent $300,000 purely for brood stock to go overseas, and it is all up ready to go.

IS
Could you make your point BILL?

BILL
Well, we are not in danger of the sustainability of brood stock.

NG
The brood stock collectors are in danger because they can not get enough money, and now you are telling me that you are exporting spawners overseas.

BILL
Yeah, but you have got two things Neil. If you do not have some management in there, it will take off like the live trout industry, you will have too many

people doing it, you will not have enough stock come later in the year when the Australian people need it. So, unless we all sort of sit around the table – we are all here to try to make each – we need support from each other and if it is going to work, we all need to not throw rocks at each other, but all work together and understand each others problems.

TP
I would just like to confirm what Bill and Noel said, it all depends on the season. Like last year there was heaps of south easters, the water was dirty, so we just caught a lot of leaders. If you get a year like this where you have got a month of calm weather it is going to become extremely hard to catch them.

PH??
But we have not got the pressure we have been putting on it in previous years and it will not ever be there. We could actually wind up losing – if we have more problems with fish on the beach we could wind up with a scenario like at Mission Beach.

TP
One thing the Trawl Plan has done is remove the pressure from the coast. A lot of the effort has been bought out. I live at Lucinda. There is one boat left at Lucinda out of nine. So it has transferred the effort from the coast. It has transferred the effort from the smaller to the bigger boats that work offshore.

NG
[To the broodstock collectors] The spawners that are important to the aquaculture industry are the ones that are being caught later in the year. One of the main problems is the variability of the secondary peak.

NH
So the secondary peak is the big problem for the industry, because I mean as Bill and everybody knows there are miles of prawns around early in the year and that's when you are not able to sell them. But they are two different prawns, aren't they? Breeding times and everything else? Are they the same prawns that come through from the early peak to the second peak?

IS
They are survivors. So the better the peak at the start is, the more that survive, and the higher the numbers in the second peak

MB
This is a critical issue. If Bill and the collectors start catching them in March and exporting them and other fishers are looking for an opportunity to get $200/head for them and we have a blow out in fishing effort. Not only will we have an issue but we will have a very big problem for prawn aquaculture industry. Because if they are the same animals, basically what we are saying it let's export them instead of keeping them here in Australia. What we need to develop it the technology or some know how to keep those animals in March available later in the year when they are needed

[Background noise, conversations not well picked-up by the recorder ED]

MD
Nobody is suggesting there will be a crash by exporting to these overseas markets. Bill is saying that he is starting sales but whether the wild fishery has the capacity and whether there is any sort of economic justification for the change in the fishing patterns targeting Monodon remains to be seen. That seems to me to be a hell of a lot of assumptions in there.

MB
Sounds like you are applying a precautionary principle to allow it to happen. We need to recognise that there is a huge demand for these stocks overseas and they pay a lot more than Australians do. The economics are for this to become an issue very quickly and government needs to respond in a precautionary manner rather than sit back and watch what happens.

PH
Will catching more prawns in March have any effect on the sustainability – the answer is NO. Will catching prawns in March have any effect on the aquaculture industry the answer is YES. That then becomes a resource allocation question and this project cannot possibly answer that question. From what the data is showing of the highly variable nature of the underlying abundance, we do know that if you take prawns out in March you probably would have almost zero effect on the future. So it is a question of allocation and if someone wants to say that that's one of this projects objectives, I disagree, I don't think it was. It is a very difficult thing to do.
[Background conversation]
The problem then is it is going to come down to, someone has to make a cost benefit of whether you value the Australian industry versus the another county's industry. No one has ever made that decision. We export live marron overseas and someone stabs the marron industry – aquaculture overseas – do we stop it? The answer is no. We have never done it in Australia.

(Unknown speaker 2, probably BILL)
We are very limited. Bear in mind this overseas market is very limited and dependent on the availability of aeroplanes. The space available – at the moment – all we have got is two flights per week. But bear in mind also, after September there are another seven Asian destinations we are going to be opening up that we will have access to. At the moment it has all got to go through Hong Kong down to Brisbane. It is very difficult, it is not that easy.

PH
I think we should get back to Bill's original question, which is: What factors would influence other people who fish in the fishery to catch monodon for brood stock as opposed for monodon for frozen product? What influences their decision making. We heard quotes that if you are catching a lot of banana prawns it is a lot of effort to have to separate Monodon out of the catch. So at what point would it be worth separating out the catch? What would be the critical value of the catch?

TP
By the way, when I'm working up here I do not keep them – I just throw the leaders back – we do not box them. When we are catching bananas we do not have the time, I'm talking south of Townsville.

BILL
I've really drilled these guys about boxing them up – if you do I'm not going to use you. Haven't I Trevor?

TP
I probably released about 300 or more last year.

[Editors Note. This comment shows firstly how relatively rare broodstock are, and secondly the commitment of the fisher as at $100 an animal this represents $30,000 forgone earnings].

IS
Probably 10 tonne of leaders are taken as frozen product, according to the figures that have been given. That is a fairly big resource; that is a lot of prawns that are available for the aquaculture in March.

SC
We have two or three different issues here. I think we have to come up with some sort of formula as to why. We discussed before we are not getting enough monodon. We have to start at the appropriate time when the required industry – that's one. Two – we have got fishermen, they are freezing this product at the time when they are really abundant and that is something which is shortening the industry. Three – we have got prawns being exported. I think the export would probably be a minimal at this stage. I do not know how big it will be. So how do we go about with these three different issues?

NG
Realistically; with another research project. I do not think the current project was designed to address any one of those issues. What we have shown from our research is that at the time of year that you need your spawners, which is the later part of the year, the species is not going to cooperate. The most regular spawning is the first peak, the March peak. So, you are going to have a regular supply from the wild at that time of the year but an irregular supply when you need it. There is going to be good years, there is going to be bad years. But we really find it very difficult to be able to predict it given the inherent variability in the stock.

As for the allocation issue, I'd take Patrick's point, the project was not designed to try and come up with advice on allocation. That is really an industry and a management issue.

PH
Can I make a suggestion.. It would not be impossible for the project to put forward scenarios. You could ask questions like, what would happen if you took

ten times the number of brood stock out in March without changing the catch and you could actually give the answer. You can say: What would happen?

NG
Is this in terms of finances?

PH
No, just straight questions, because then we could just have it written down so you could take 10% more out for brood stock in March, not changing the catch of your total fish – what would happen? And the answer is of course, Nothing. It is still sustainable. So I think you can answer some of those sorts of scenarios.

NG
You can propose a question. Answering them is very different, given the amount variability that you have. Ten percent is probably less than the total amount of variability between years.

PH
Lets say that your catch is 100 units in March and lets say ten of those units goes to aquaculture, you can make it twenty, but you still have 100 units. The question is – is it still sustainable?

NG
Yes

PH
So you can put those sort of questions in as scenarios and explain that it would not have difference between March and April, with what you know about this life cycle?

NG
Yes.

PH
This is not a problem about protecting brood stock but "is the number being caught early in the wild having an effect on future recruitment"?

RG
I think before you can answer the questions, you have to know the problems. Now, the fact that what goes on here, and what we are saying is not quite the same. Each and every May people catch the brood stock or the Monodon prawns by the tons and tons and tons. Within a mile and a half of my river there would be three ton caught by four or five boats in May over three days.

Now, if that was not caught, then there is more than enough in that little bay alone, for the whole of the aquaculture industry. There are many places like that throughout Australia. If you are talking Australia wide, there are miles of them. The problem is that we have to look after this area because this area can produce spawners in such a fashion that it can be delivered to industry. No use

delivering it from somewhere over in Esperance, because it is a little difficult, as you know. So, this is area is convenient and certainly that puts the problem squarely in Bev's court. Because the resources are there, how are you going to manage them? Now it is not one I envy, because the very people who provide broodstock later in the year are the people that caught the three or four ton of these so they can sell them frozen in May.

Now that makes about as much sense as trying to fly to the moon. But that is exactly what goes on. And it goes on every year. So, we have to KNOW the problems before we can address them. There are plenty of those problems. Next problem is boats are getting forced onto the beach [fishing close inshore ED]. We have heard that there is not that much pressure but there is a lot of pressure and one of the main areas would be between Fitzroy Island and Coopers Point. If Cairns goes ahead with its eight fathom limit, which is fine, I do not have a problem with that – it only leaves that area open for boats with more than eight fathoms. The Plan or the unit allocation of the Queensland Management Plan limits people to a certain number of days, therefore, they try to allocate themselves a 24 hour day rather than 12 hours day. So the boats that are working in this area spend half of their day, or sometimes all their day close to the beach, as well as their nights out wide; actually increasing the effort inshore near the beach. But overall this increase in effort is being masked by the reduction of boat numbers. Not on that beach, and the more we leave that particular one un-managed, then the grimmer the future looks for the provision of aquaculture brood stock.

BILL??
The bigger the problem we are going to have is the thing that people perceive that we are, especially on the Marlin coast here, and down at Brampston Beach – the amount of boats that are actually roaring up and down. Roger is 100% correct. Through the Management Plan and allocation of days what you are doing is forcing people to 24 hours. You might find it a little bit hard to believe but we have people here doing sixteen and eighteen and twenty days without turning the motor off, and I am not joking.

MB
Can I ask what the TRAWLMAC or the Qld Fisheries, how they would go about the project?

BT
Trawling for 24 hours?

MB
Yeah, the effect of the new Plan on the inshore fishery and the possibility of if we have a gear restriction here. There is a little gap between the Mission Beach closure and the northern bit. When are we going to extend that? Or get some arrangement for gap.

BT
We could have a look at it. I would like to have someone pose the questions so that we could look at what sort of data we would have to crunch to get a handle on it, I do not fully understand what the issue is.

RG
Application has been made by the local branch, that is the Innisfail branch, of the QCFA [now the QSIA ED]. To have that area restricted gear size the same - and so far that has not as far as I understand it got through TRAWLMAC.

BT
Well it is coming out soon.

BE
No Bev, the one for Cairns is coming out soon, the one down where Roger is talking about is not on the books yet.

RG
Now, the longer that remains open, then the more pressure will go on it. No one wants to deny the fisherman his right to fish, but maybe we would not mind it quite so much if you said, ok, but you have got to change your gear, and that will take away the 24 houring unless of course he's prepared to change his gear.

BT
Well what would you suggest?

RG
I would say follow on with Cairns, straight down on the eight metre net limit down.

BILL
And that in itself is a good management tool, it's a great management tool. Through what we are trying to do with this gear restriction I believe will reduce the actual physical amount of swept area by 80-90% of previous years. That's huge.

BE
The closure that they are talking about out is in front of Cairns, and was asked for by industry, and it was all of industry in Queensland that supported it. Now the one that you are sitting here talking about is from Fitzroy Island south. This has not been to industry and industry has not even been asked to support it. The Innisfail branch has agreed to it but the rest of Queensland has not. That is where it would have to go to for starters

As for the Trawl Plan and people now trawling 24 hours per day. Billy is saying some of them haven't turned their motor off in twenty days, in actual fact, that would be around about forty days. Because you either start at midnight and go to midnight or start at midday and go to midday so if you've been working all night and then you work all day, that is two, not one days. So, if they are not turning it off in twenty days, they have actually worked forty

days. According to the plan that is how the "nights" allocation is calculated. Those forty days would come out of a boats "night" allocation.

So – I have a bit of trouble believing that people are working out there all night and then coming in on the beach and working all day.

BILL
Well, my evidence suggests it is exactly right.

[General background discussion within group.....ED]

BT
I would like to see if there is any foundation in comments like that. If someone could give us an example of what your observation has been, we will go and have a look at the data and tell you whether it is fact or not. Because it is quite concerning. I do not think it is possible and I think that is what Barry is saying but if you have examples of where it is we will go and have a look at the data.

IS
We might draw the line under the Trawl Management Plan and start talking about Monodon.

PH
I think one of the things we can do is outline possible actions. There is probably non-project activity but maybe one action would be for someone to put down on paper and write to Bev the issue of displaced effort from changes to the management/allocation around the Cairns region.

IS
The other four points that are up there on the board in black are the ones that were raised during the course of the discussion this morning and were cut off, so if anyone wants to make any comments. The second one I think has been dealt with, the accuracy of the sea fish database. Bill had some suggestions about proposals for validation of the data. Neil certainly looked at that in various ways.

BILL
The actual true amount of boxes coming into the fishery – the log book stuff – I find it really hard to believe the tonnage that was put down as Monodon catches. Where it came from in different grids was very inaccurate. I tried to explain how easy it would be to go to the variety of different freezer facilities – there is the manifest, the amount of boxes of Monodon that are unloaded on a pallet, would give you a very accurate idea of how physically. I mean Roger said to me the other year when we were talking about it, that he had spoken to the Innisfail fish depot down there and it would be very easy to see. You do not want to know where it was caught or who caught it, but the actually the amount of product that was actually brought in – not hypothetical [ie, based on logbook information ED], but truly unloaded off the boats.

PH
This is a slightly different question to what you were proposing which was spatial data and I think I agree. I think the same thing came into Mike Dredge's sub-project which is, that we do need the range of the bottom and the top of what the TOTAL catch is, not where it came from.

BILL
That is accurately how many Monodon are caught, how big is the fishery? And the other thing is, also the data that I collected and the amount of returns. My returns were 14%. Now, there was also a percentage there, the guys did not bring them in for a variety of reasons that were really caught. Mine is a rough estimate but I believe that there is little predation [?natural mortality ED] in nature. The size of the animal and the fact I caught them over an eight month

MD
The 10 ton frozen product [from the logbook data ED], which is probably worth to the fishermen about $100,000. If we stop them from going into boxes and then be able to harvest them in the latter part of the year? What percentage would the survival of those prawns boost the second spawning peak?

Give me ¼ hour on the computer and I'll do a quick "back of the envelope" calculation on the computer.

(Unknown speaker ? NH)
Just to complicate things Mike, don't forget about the banana prawn catch.

MD
Yeah, well that is a major issue. Noel's given me a hypothetical and it's a perfectly fair question, but I think I can come up with a quick answer. One of the problems that we have with all of this type of process is that the allocation mechanism that increases the supply of brood stock in Spring may involve allocating that against the existing fishery. In other words, it maybe that to make another 10,000 brood stock available we need to wipe out the existing banana prawn fishery between Innisfail and Cairns. This scenario creates certain social problems, and it doesn't make a managers job easy. If you could come up with a better, a win-win solution that doesn't involve taking away from the existing industry to give to the aquaculture industry it's obviously a much better solution.

I'd like to ask the fishermen, do you think its possible that a smaller area would protect those black tigers?

(unknown speaker)
What do you mean a smaller area?

MD
You know, areas set aside with different net sizes, something like that. Is there a solution to this? Other people can still catch their bananas on the majority of the coast but Monodon areas have separate restrictions?

BILL
Yeah, well that's what we're trying to do, [in the Cairns area ED]. The smaller boats are fine with it, but the bigger boats like Trevor and Sam are going down to half the gear they normally spread. That is a huge imposition on them to be able to still work that fishery, so unless they can value-add it? But we do not know that, we are only assuming that because there will be less effort on the fishery, less boats and there should be more stock around.

PH
We know what the density of the animals are, we can make a subcheck that there's say, 1 per 500 square metres or 1 per 1000 which is what you had, and we can say, if you want 5,000 then you need to protect, have roughly this much area and then you can add in an extra factor to say, protective and native areas, and if you needed ten times that much, how much would you need. They can do that sort of analysis for you, if that's the sort of question your asking. If you needed to put something aside for brood stock protection, they could do that scenario test.

[Background discussion, indecipherable ED].

BILL
Last year, probably in the last five years, about half of my income when I'm collecting brood stock, comes from bannanas. Like half is brood stock and the other half bananas. So that's just to complicate things a bit more.

IS
You would be at the more extreme end of the Monodon industry, there would be a hell of a lot more people who make no money at all out of Monodon.

BILL:
I make, yeah I make money out of trawling yeah.

BT
So restricting the gear size, increasing the restricted down the coast would hit you really hard?

BILL
Not happy about it. It just means that instead of doing two days to catch the order, you've gotta do four. You could say there would be more prawns around, but if the water clears up, they're still gonna be hard to catch.

BILL
See that's the biggest problem for the Australian hatcheries is - Nature, when these northerlies kick in and the whole biomass actually changes. No amount of management is going to fix that - that's Nature, but its understanding what actually happens. Now the other thing I'd like to ask, considering all the research work that was done in closed areas, how many public complaints did you receive over the timeframe of boats, of you guys working?

IS:
That is irrelevant because before we go into an area it is widely publicised. It's advertised in the paper, and the boats are clearly marked "Research". From personal experience, because I was driving the boat on a lot of occasions, large numbers of recreational fishermen came across close enough to see that "Research" written on the side of the boat and then kept on going. So there's no comparison between what happens between our operation and a commercial boat operating inside a closed area.

BILL
Maybe, we might have to disguise the boats. Hasn't Roger got "Research" written over the side of his boat?

[Laughter.]

RG
Mr Chairman, thank you very much for having me, and ladies and gentlemen, I have to go thank you very much.

[Roger is thanked and departs.]

NH
Neil, you mentioned earlier about making better use of our brood stock. I agree with this, but on a lot of occasions they do not come up to the scratch of previous years. You know you can't get them to spawn correctly, there are a lot that are not fertile, things like that are a problem. More than likely it's a seasonal thing, fits in with the highs and lows that we're having, because when we're having highs we have good stock. But when there are low numbers of wild broodstock our egg numbers are down, our maturity is down, everything's down. The stock we produce is nowhere near the quality of a year when wild broodstock are abundant. When we look at that Bill, as I said earlier, about 12, 13 or 15 years ago, we used to get a few spawners off you, and we'd get 800 to a million eggs and a 90% hatch rate, that sort of thing. Those things are gone, we haven't seen that for years.

BILL
Noel, these things are still there. That time was in April, May or even June, July all those years ago - Bob's done a couple of runs earlier in the year and he's had phenomenal hatch rates and survival with his eggs out of the animals. But as for the quality of that animal, through Ecofish we put a project up, not just monodon but all the species, to bring in stage 5's [females ready to spawn ED], and spawn them in a controlled environment and just do an egg and fertilisation counts. That way you get a picture, and you'd be able to demonstrate to the commercial and the aquaculture industry, of the best time to collect these animals in their natural habitat when they're most productive.

SC
But what you are you going do, if you can't sell them?

BILL
OK, what Noel is saying is that you're buying a lot of duds late in the year, well stay away from that time.

NH
But I can't "stay away" in the South. I'm talking about when we've got a stock the ponds in the South, and you know that we're locked into a timeframe down there of a couple of months. And its been the way ever since I started buying it, but we were able to secure good quality spawners in the early days but we can't secure them now, its as simple as that. As far as we can we actually spawn every spawner, individually at our hatchery. So we do have head counts of every spawner that comes out. We have head counts, the whole lot, and we have it all computerised. That'll give you a lot of information there Bill.

SC
I agree with you that best quality is between March and April. The only way I can see we can overcome the problem is if those PLs, whatever you call them – if you put them in a nursery and then later on you restock the pond. But is it economical.

NH
But getting back, I hadn't finished, just one second. About more work on the spawners, yes I think there needs to be some more work, looking more closely at the quality, and why we're not getting the egg counts that we should be getting and that sort of thing.

NG:
I think in bad years you may be pushing it up hill, because the spawners are going to be in poor quality due to the same conditions that cause the low abundance in the first place.

NH
Hatchery techniques have improved. Over the last 2-3 years it has improved considerably. Up to that time we were still flying in the dark a fair bit, and there are still some things that we are flying in the dark. I mean yes, it happens in our hatchery, it happens in all hatcheries. All of a sudden you've lost the lot. Anybody who says they haven't is telling lies.

PH
Lets get that on the record. What you're saying that is in the past, when you used to get them in the August, September, October period the number of eggs, the fecundity and the fertilisation rate was higher than on average of what you are achieving now?

NH
Yes

PH
I think you should note that somewhere, that is important.

BILL
Excuse me. Maybe they should do some water qualities along the coast.

BILL(?)
Yep, one of our biggest things is loss of habitat and change of habitat. For the last two years the amount of brood stock that I've caught or used for the hatcheries that were caught between Yorkeys and Double Island wouldn't even be 0.5%. Now I'm having to travel a lot further away. I'm using totally new different grounds that I used to use two or three years ago. It is only through the likes of Trevor and Stan that I've got the ability to be able to move and get these animals back over longer distances. What we've got left now is a brick wall, what we've got to work with, this is it. There's no more new bonanzas out there, we're not going to find any more new grounds, and basically we're locked in to try and manage and put up with what we've got to work with.

These grounds are quire sustainable. We don't know what's happened in the Cairns area, we don't know why is that stock has been depleted, why the bananas have been depleted? Its probably Nature itself but one of the biggest problems I believe is the change of habitat. Whether its been a human problem.

(unknown speaker interrupts)
Could be that its been the driest bloody year on record too.

NH
We've lost half the mangroves and all the drains in Cairns. We've got a problem with the East Trinity with acid sulphate soils. How many thousands litres/day get leached into the Cairns inlet? This doesn't help marine life – eg acid sulphate soil.

SK
Although that's shown to have dropped since the bunded walls have been opened and the drains cleared. I had a really good look at pH in the Hills Creek site and there was no acid sulphate - they were all reasonable pH's.

NH
Sarah, have they had any fish kills out of that?

SK
No we haven't and the abundance and diversity of fish with inside Hills Creek bunded wall is better than outside.

NH
Earlier, you said that ph - you didn't gauge ph because you didn't think it had an effect on it [Monodon distribution ED].

SK
Just that the variability wasn't large enough to show any patterns.

NH
It's one of the things on the farm that's there's probably not enough emphasis on, is the pH. On growing prawns we've found out this is a very important factor. Farmers have tended to overlook the pH side of water quality but pH has got to be kept very very stable and you'll find out you'll produce a lot more. In my opinion the pH in some of these streams does create a stress on wild Monodon and any stress on these we know what the problem is.

PH
One of the bits of data that seems to be coming out at the moment. The Australian wild catch is something like 220,000 tons. They are now estimating that between ¼ and ½ of the commercial wild catch is lost to environmental factors every year. Things like acid sulphate soil, habitat, mangrove loss, seagrass loss, sandfly communities, pollution, sewage outpour, you name it. So its one of the things that you've actually got in common with all the other groups like recreational fishermen, and it's one you've got to keep arguing.

BILL
That's what I was saying before, we should keep a track on water quality. I'm sure a lot of people have...

SARAH:
Most of the juveniles we found throughout Queensland were inhabiting highly degraded habitat. Particularly, the post larvae and the smaller juveniles. If you go further upstream there is a lot more habitat pressure from land use. Freshwater eco-systems are probably the most threatened, one of the rarest habitats along the river, and therefore all post larvae are in extremely degraded habitat.

PH:
It's an important factor because you're talking about resource allocation. If you've got 100 units of anything and 50% has been taken by the non-consumptive component of which one can quote pollution, then that's growing at such a rate, then your consumptive component has to go down and that's the whole issue of sustainability. So at the moment probably the driving factor out here for a lot of you prawn fisheries is that you may be sustainable now, but the long term factor is, is your environment sustainable? Then you've got other things like having a Monodon population at the extreme of its habitat.

(Unknown speeaker)
Bear in mind we don't have anywhere near the pressures of SE Asia where you've got populations of many many millions of people in a small confined area where - right through SE Asia that's happened and here we are with only 100,000 people.

PH
The thing is you've got a natural affinity of what GBRMPA, QFS, all the other groups are trying to achieve which is sustainability of populations in a bigger resource allocation picture. Can I just make another point, there was a question made about aquaculture and someone said you couldn't answer because of

policy. I will put on record though for aquaculture a lot of us have 100% confidence that the industry is just at the tail of what it's going to develop to. We really do believe it's going to be a significantly bigger industry and that will depend obviously on the technologies it users to make sure it is sustainable. There are new technologies about farm design and use of effluent management systems. We are looking at systems now that might even not have disposable into the marine environment.

There is a whole range of things that are coming on board and we believe that you've just seen the tail end of that. That's why projects like this are very interesting to us because investors are saying to us they want to invest in aquaculture and this is a critical factor. And people like Noel are telling us we cannot produce enough PLs for the industry. This is important.

NG
PL's have been going down through time. This is a worry too as its not only the numbers but it is also the quality of brood stock that you get, for whatever reasons. Now I do not know if you can - that's not part of this project. We have to take a look at factors effecting the viability of broodstock.

MB
Mike, Stress testing was meant to be a part of the project?

MD
Yes.

NG: (too far away from mike - difficult to hear)
It was. That was stress due to capture method and we did that. You saw how few we caught out of various different methods but we used the industry standard method of assessing stress that is part of the capture cycle.

MB
I think what we need to do in terms of looking at quality and quantity of PLs and things like that. We need to look at the whole chain of production and I think so far FRDC has worked on some hatchery protocols, Patrick is that right?

PATRICK
Yes.

(Unkown speaker):
That's the sort of thing we'd like to pursue at some stage.

NG:
That is for another project, please; we're getting pretty tired.

(Unknown speaker):
Which comes down to the point, for Noel to be sustainable what we want him to do is to have the minimal number of spawners for the maximum gain. So, if we do know those issues, that would be useful.

BILL:
Between the deeper water spawners and the shallower water spawners, as far as size, things like that, you know, the amount of production you're getting out of them. Has any been work been done on that.

NH
Bill, we've working on mainly shallow water stuff. Because this shallow water stuff seems to be getting smaller and smaller, right.

BILL
Noel, you're 100% right there. Now, the stuff overseas that they're pulling out, they're pulling it out of over 200 feet of water. Now, we don't have it, but we do also have animals out in areas of tiger fisheries where you've got 15-25metres of water. Certain times of the year that the bigger boats catch anywhere from 10-30 Monodon a night, sometimes. It would be very interesting to look at how good are those spawners, because they're all big and they're nearly always roed up. Later on in the year when they're hard to get, they've got them offshore. I've seen the stuff over in Thailand and the deep-water female is definitely a much bigger robust prawn.

I was in a hatchery in southern Thailand just recently and this hatchery is producing a staggering amount but they're averaging 850,000.

NG
That's egg per animal?

BILL
Per animal.

(Unknown speaker to NH)
You said you got some out of the Gulf.

NH
We haven't had anything out of that yet. We're still feeding and looking after them.

NG:
By the way, just in terms of Monodon distribution. If you noticed on the rainfall map Jo presented, the high rainfall was in Cairns/Innisfail region but also on the Gulf coast, up at the top end.

BILL:
Did you have a look? [in Weipa ED] In this project, some of the work was done in the Northern Territory, wasn't it?

NG:
Yes it was.

BILL:
And what did you find out, compared to the East Coast?

NG:
It's still in the development stage, they are still negotiating with NORMAC because the northern trawl fishery is Commonwealth not state run. They have to get over that particular set of hurdles first.

BILL:
I thought they actually went out and caught some.

NG:
Yes, that is in the final report.

IS
Mike has finished some calculations on the question raised before, so we might have a look at that and then break.

BILL
Yeah, a couple of things first. I must thank Bev and Martin. I had a meeting in Brisbane a couple of weeks ago and it was the first time I felt comfortable with the fact that I got my point across and it was a very constructive meeting. The problem we're staring at with a lot of us collectors, is we do not have enough nights, we're going to run out of nights to service the industry. The other thing is these closed areas. Is there a way or a mechanism or any thought on the fact that should have access to these closed areas that are still turbid. The turbidity is something, that I believe effects these animals.

MD
That's something to raise at other meetings, certainly not in this forum.

NG:
On turbidity by the way, we found that even if it's clear, you get a localised areas of turbid water, so you're looking at a micro habitat effect. You can still find your prawns. That's where you throw your cast net.

BILL
We need a big dredge.

SARAH:
You guys actually told us that, localised turbidity, we learnt that from being on the collectors boats.

MD
Before I start. A couple of questions. We've talked about a project with and we've addressed a number of objectives. I just wonder if we get out of here, whether people want to go back to those objectives. Now, you can infer certain conclusions out of those objectives, you know the sort of thing that we're talking about. For example with the alternate gear the conclusion that I've drawn from work that is that using alternative capture gear for a commercial Monodon fishery just is not going to be viable. If anyone wants to challenge

that this is a pretty good time to do it. Some of the economic conclusions that I drew also are challengeable and if people have any challenges again this is a good time to do that. So after break can we re-visit those objectives and see if people are comfortable with them.

(unknown speaker)
Could I suggest to save some time on that economic one, I just ask that you send me a draft copy of the report, and I'll go through it and write some comments on it and send it back.

MD
There are twenty other people in this room and I value their opinions.

MD
What I did was set up a scenario where I recruited some hypothetical prawns, about 100,00 of them on 1st January. I ran them through until the beginning of March and then either didn't have a fishery at all or had a 3 month fishery at varying levels of intensity.

The bottom line was that if you ran them through and had a moderately intense fishery, that is the mortality rate at about the same level as natural mortality, for three months of the year and then switch the fishery off. Without any fishery at all, you had about 17,000 survivors from that 100,00 original population. If you had a moderately intense fishery for three months of the year, which is I think what we're looking at out here, wind up with a bit more than half that number, in other words about 9,000 animals. If you have a really intensive fishery in which you heavily pound the prawns at about a fishing mortality rate double that of natural mortality rate, you go down to about 5,000 animals.

So effectively, by not exploiting Monodon for that three month fishery you would basically double the number that are available. Approximately double the prawns for that Spring generation. What the hell that means in terms of recruitment I don't know. This is really quick and nasty biology because. So please if think about this, bear in mind those two serious qualifiers– guessing fishing mortality rates and natural mortality rates, but also we just don't understand the availability of that Spring time spawners. Whether they're inshore, whether they're in deeper water, nobody knows. So bear in mind even though you increase survival it may not increase availability to a brood stock fishery.

SC
A bit more work to be done in that area?.

NH
I think what you can say is that the prawns taken in May will effect the catch at the latter times of year and that that fishing explains 90% or 80% of lack of catch, so if you know you don't freeze the catch you can explain some Variation in your data.

NG:
Getting data necessary will take a lot of money and a big project because it's such a variable catch, trying to get a handle on that variability and then get some decent estimates. Also realise, not catching the prawns early in the year involves a certain amount of foregone income, foregone value. You have allowed a large proportion of those animals that would have been caught to die in order to increase the value ones that you are going to catch later in the year. A lot of money would be invested in those extra prawns to make up the money that you lost because you allowed the others to die.

SK
In regards to what Noel's being saying, the quality of the prawn in that later batch would be better?

BILL
And don't forget the loss of banana prawns.

[BREAK for coffee].

IS
What Mike raised before smoko, we should go through the objectives one at a time, starting from objective 2, the information search and review was the first one. The second objective was defining the adult stocks and habitats of monodon. Is there any points that need to be raised?

PH
What was the last one?

IS
That was defining the adult stocks and habitats. The first talk that Jo gave this morning, the sampling process. The next one was dividing the juvenile stocks and habitats of monodon. Sarah's talk about the upstream and the cast netting program. The seasonal patterns in monodon population dynamics and that has been discussed again here this afternoon.

[Bit of discussion on which was objective 2].

PH
The first question, I would like to have a look at some more information on why that diurnal data didn't show up any differences in catch rates. That doesn't follow what normally seems to be the application of prawn fisheries and there was a hell of a high variability in that from the period 0300 to 0500 hours catch so I'd just like to make sure of that piece of data.

NG
Just in answer to that; Banana prawn do not show that pattern either and Monodon are caught in association with Bananas so that doesn't worry me too much.

PH
You did have a significant difference in your variance. I think you just can't explain that away with your assumption of normality.

The other one was when you talked about spatial/temporal variation. One of the things I still didn't get a feel for, was the actual female component of the catch. This fits in with one of the other questions about reproduction, and Noel asked you before, what is happening with this females, do they spawn the whole year. Did you collect any of that sort of data about their capacity to spawn, does that vary? Bill had the question, he said that they were serial spawners the whole year round.

BILL
They have the ability to continually spawn, when the temperatures is right, but what I found over a 3 month period was no growth because of the temperature. When it went under 24 degrees there was no stage 5's and then when they came out of that, the quality of the spawners and the eggs were poor – there were a lot of duds. Noel might back up that. Which means the animals is not moulting, its not being fertilised by the male so even though it looks fantastic, the sperm's not there. One of the things overseas that I've learnt is to be able to have some idea that the spermatophores in the female. They paid a guy to go and select the animals off the boats, and they're the ones who are allowed to take or discard. But they obviously pay a lot more money if they're going to allow someone to select them. Some of the stuff I've learnt overseas is the way of detecting the presence of spermatophores.

IS
Right. The juvenile stocks. Objective 3.

NH?
The only thing about that is during the course of the reporting process if you could perhaps clearly pinpoint whereabouts of juveniles. I'm sure that will be in the report but if you could highlight it.

SK
Absolutely. There was way too short a time to present anything like that today.

IS
There is a lot more obviously in the final report.

Unknown speaker)
Just wondering if you had an idea of what percentage was taken in cast nets, by amateurs?

SARAH
By recreational fishers?

(same speaker)
By recreational fishers.

NG
What an interesting statement. That recreational fishermen take prawns.

[Laughter.]

IS
Well especially seeing as the Barron River is a very strong commercial/recreational fishery for bait prawns.

(same speaker)
Is that beam trawls?

IS
No. Cast netting. There's a few fishermen there, about 4 or 5 fishermen who work there consistently taking prawns for bait.

SK
Absolutely.

(same speaker)
Professionally?

IS
Professionally yes. So the information from them is probably where you'd get your percentage.

(same speaker)
Is that legal?

IS
Apparently.

BT
The Rfish program might give you some information as well. I don't now whether it would get down to Monodon. But you could make some assumptions I would assume.

SK
We didn't really have the time or the resources. Obviously recreational fishing surveys in themselves are a separate project..

We did boat to boat conversations and informal surveys whenever we were out there to see what type of catches people were getting in what areas, in what numbers. There was a time, I think it was in 2000 where we couldn't get out due to floods but recreational fishers were getting out along the esplanade and we used some of that catch data to suggest seasonal abundance.

NG
We do not need to get ANOTHER objective, we've already got seven.in the project and that is quite enough. There was a very nice project on the bait fishery in Queensland, one up in the north, one in the south, and I'll try to get a hold of whatever information was collected as part of that report. That's as far as I think we can go.

(same speaker)
All right.

IS
The next objective is seasonal patterns in monodon. The population dynamics and that related rainfall and river flow rates.

PH
I don't know whether we touched on that one but looking at the type of areas that they live in the adult stage and why they live in those areas.

SK
..... habitat.

MB
Where do they live and why do they live there? I know you've looked at that with the juveniles, but not the adults. These guys are trawling, they know where to catch them and why are they in those areas and if they are associated with bananas or not, have to look at why.

JO
We actually collected sediment samples to compare with catch rates. We caught the highest catch rates within very shallow water right on the edge of the seagrass beds. However, we only captured 17 individuals from about 12 trawls and we would not be able to sadistically identify any sediment preference, even if they demonstrated a strong preference.

MB
But you're looking at that in a closed area, what about the actual areas that they're fishing?

JO
No, we used other data [not fishery independent research sampling ED] to describe the distribution and abundance of the prawns outside of this region.

TP
I've noticed over the years that you catch a lot of leader prawns where there are decomposing mangrove leaves and timber. Drop offs where the mangrove leaves sit along the bank. I don't know if its whether because of the colour, camouflage, or maybe they eat it..

MR
Is that the same area as the bananas?

TP
Yes and no. Sometimes the bananas are with them, sometimes there are more leaders than bananas.

(Unknown speaker)
Yeah, but there are certain areas where they live?

MB
We've talked about this Spring time peak in the spawner numbers. Have you ever observed that in your fishing operations.

TP
Are you talking September?

BILL
Around the top of the moon's when they moult. And usually a week or so after that you could wind up with 80% of the spawners you've got all roed up. I came in with over 100 last night, none roed up. There was a handful at stage 2 or 3 but nothing was developed up and yet 2 weeks ago, there again 40% f them were roed up. So there's a pattern there, those animals, after they've moulted, after the full moon, they've been inseminated the actually develop up and spawn naturally. Now these are the ones I believe the hatchery should be targeting, through natural spawning, not induced spawning. And the quality of the eggs that they could be working with could be very high because they're not an induced spawner. One of the places in Innisfail are actually looking at sending norps, which is the first stage of the prawn after it divides, you've got about 50 hours to transport them.

TP
Excuse Bill, maybe we should be keeping a record of when we catch them, and the water temperature and the water depth as to what how many eggs Noel gets out of his spawners.

NH
One of the big problems I think Bill is that over the years buying stage 5 is that we got to a stage where we were getting nothing out of them. Too much stress somewhere, either before we got them or during holding – too much stress. No. 5's I don't even buy them anymore, simple as that. In the early days, yes. Because you went out, dropped your net there, you bought it in on a surfboard, straight up to the airport and it arrived down to us. This is where the problem lies, we're not getting these spawners quick enough.

IS
We can discuss this afterwards, we sort of missed the point of that question.

MD
We've talked about a small number of spawners being available in Spring to supply the summer generation and I'm just interested to know if you've observed those in the wild and if so where.

MR
What did you want to know?

IS
Whether you see those small numbers of adults that have survived over winter, when you see them in the fishery in Spring. Do you see them, are they closer to the shore? Or is it one of those things that you just don't see them, but they must there somewhere.

MR
It all depends. If you get wind and dirty water, it makes a lot easier to catch them than if the water is clear.

BILL
And its knowing where to work. One of the big things we found last year. Trevor goes mackerel fishing, and we'd search for a couple of days sometimes and the amount of times Stan was about to give it away, and the prawns have been in the fish light, and he's worked out the pattern where they are.

MR
Its extremely hard to explain. Because last year we found a patch of fish with a few bananas in it, we had 2 leaders the first shot, then it got dark, we had 10 and next thing you've got 60 or 70 by midnight and then they're gone by midnight. So they were hanging under the fish.

TP
You were saying about those early spawners, about Aug or something like that. There is something there with water temperature or something like that. Because sometimes we can get these spawners in August and they're no good to us at all. You get them two weeks later and they can be entirely different.

BILL
That's what I was saying about if they haven't moulted, the sperm's not there and they're not fertilised and the eggs are going to be duds, because they wont be fertilised.

TP or BILL
Something we should look at is the males. More emphasise should be done on males.

SC
A point about the gentleman made this morning. I said we used to get 800,000 larvae per spawner. Are we going to do any further research or we have to put a proposition for research, or what's it about. I took your point, very good point to economise, we don't want to waste. I reckon we should enforce the point. Is there going to be any further research? Where can we get the best performance? And that will solve the whole problem with the number of spawners.

NG
During the later part of the year, when the hatcheries need them, there's not going to many of them around at that time. That's the nature of the animal. That's how it breeds, that's its cycle. So the ones that you have got, the few that you will be able to catch and use, make absolutely certain that you get the best value out of them. Hopefully they don't go as frozen product. At that time of the year particularly you'll be looking to make sure that the majority of those caught go to the aquaculture industry and the hatchery technology is such that you make the most out of every one.

Don't think that you're going to get that many more out of your fishery. Try to make the best out of it, make it as efficient as you can. As to research, that will be up to the industry to lobby for continuing such projects.

SC
Yes, contribute. I believe it is very vital. If we can economise as you said, there would be a lot more work to be done in that area. And at the same time, we look for other areas.

NH
Sam, unfortunately there are no other areas, we've got to look after what we've got here.

NG:
I agree with that. You can go have in the Torres Straits, or Weipa, in the Gulf of Carpentaria, or Northern Territory but then you've got problems with translocation of genetic stocks and translocation of potential diseases. Problems like that which would have to be worked out by members of the industry and it would require a certain amount of research.

MB
As far as interstate, we are working with DPI's policy people on translocation protocols particularly in relation to Northern Territory and Western Australia. It's been a long hard slog but we are slowly making progress.

NH
Lets try to protect the stock that we have and improve the amount of stock that we can get out of the stuff that we have. I'm trying to knock Bill with his export trade, but at the same time as we're short of them, they're short of the there, that's why they can offer a lot more money. And that's why you're going to have more problems with people exporting.

IS
We might move along to the next objective which is the tag release recapture and the small number and variation that was raised. Any further comments about the tag release and the results of the recapture?

MB
We've got that report done by Darryl McPhee which we asked Darryl to look at Bills data and give us a preliminary assessment. We asked him to tell us if this

data is good enough to do a proper scientific study on. I think it's a really good report- well worth having a look at. I don't know if its relative to your project but you might want to at least look at it.

NG
If you could please send me a copy.

MB
I can do that if Bill's happy.

BILL
Yeah, the fact I've got 190 odd returns and the returns I got were also re-released, there's a fair percentage that were able to be put back into the system. There was a variety of a number of boats, about 18 or 20 boats return the tags. I had a good camaraderie, the guys whenever they would pick them up were very interested to see where they come from. Stan for example is out there working at the moment – doing this work ourselves. So the information is not lost we still – I'm saying – I'm continuing – I just tagged a bunch again the other day and released them. It is very cost effective, we still want to keep learning it and I am continuing to do it. I know we're not here to talk about that but!

NG
Bill if you are tagging then you may be able to have a look at what influence a particular estuary has and where the juvenile animals go as adults. You've really got to start tagging a few juvenile or sub-adults to get that sort of information. We already know that the adults stay pretty stationary. It is the other part to the story that we really need – how important is a particularly estuary to your stock? And which estuaries do we protect? The only way you can do that, is to take a look at the slightly smaller ones than you normally tag, and see where they move. If you can tag a lot in a particular estuary and you find none of them on the grounds – it tells you that estuary may have lot of juveniles but it really is not making a contribution to your stock. But it is the slightly smaller animals, the juveniles and sub adults that are important in the bigger picture. If you can figure a way of getting that up and running - university students – a perfect way to do it!

Interrupted by PH:
That is the Holy Grail. We have just about not achieved that with anything. We have done things like biochemistry, laser information (? ED). We just did a big project with WA looking at a thing called oxygen ratios in the exoskeleton of crustaceans – that did not work. Trying to attribute contribution from a particular region to a fishery is very difficult.

BILL
But the results that we have achieved through the tagging ourselves, have been probably a lot higher than most research projects that have been done and we did it ourselves.

PH
You're talking about the larvae modelling, you probably have better chance doing it theoretically. More based on some sort of back of the envelope hydro-dynamic model where larvae advection times are modelled and those sorts of things, rather than trying to actually do any sort of tagging to answer that question.

IS
We might put a line under that, we are going back over ground that we have covered. The next one is the alternative capture techniques and I think that Mike Dredge can answer questions on that one.

MD
(Muffled) The inference I drew out of that work was that it doesn't look particularly hopeful.

PH
On that beam trawl, did you try jets, sand jets?

MD
No, but we have before on other projects. It is a great technique if you've got a lot of time.

PH
It works well in 1 or 2 metres – it gets a lot of prawns.

NG
We used it on the tops of reefs for juvenile red spot kings. Essentially, you have a pump on board the boat and pump water to jets on the footropes. The jets blast the buried prawns up and into the following net. We did not try that level of sophistication in the current project. We were looking for environmentaly friendly methods, potentially for use in closed areas.

PH:
Yeah, we've got that gear type, we used it just recently in Shark Bay, WA. The main problem is its depth limitation. It is one of those exponential things, as you want to pump enough water under pressure every metre is like an exponential cost. So if you could keep it to sort of that two metre you'd be alright but getting it down any deeper would be difficult.
IS
The next and the last…

BT (BEV TYER) interrupts
I'm just about to go. I would just like to congratulate you on the day. It has been extremely informative and well presented. Well done and presented. And we will do whatever we can to try and address the issues. It is not going to be easy, I think we all know that. TRAWLMAC will be reconvening its technical working group over the next couple of weeks so we should have the opportunity to look at the issues in a little bit more detail. We have undertaken to have Bill attend the meetings where we discuss broodstock as well as Martin, so there will

be ample opportunity for people to take part in the discussions. Again I congratulate you on your results. Thanks for the day.

[Bev departs]

IS
Thanks Bev. Any more comments on the alternative capture techniques?

(unknown speaker)
What type of bait did you use in the traps?

MD - very feint
In Moreton Bay, worms and pilchards. Worms because they are part of the natural diet of most prawns, pilchard because everything eats them. In Carns, prawns and pilchards.

[Someone asks if there is a difference].

SARAH
Yes, pilchards are a little bit better.

MD
What do the prawn farmers think of that?

NH
We are using worms, and we are using squid and mussel.

BILL
Do you think Noel, they have any type of an attracter that flows off these – the bait I bought back from Canada had an oily sort of substance in it that obviously created some sort of an attracter that these animals wanted to get at it. And that was the whole thing with any sort of trapping device and why that pheromone thing....

PH
If you look at baits, you can break them up to oils, carbohydrates and proteins. It is the protein that is usually the attractant and the it's the free amino acids in the protein which are the mobile. They are probably the most attractive to fish/prawns. In manufactured baits these free amino acids leak out very quickly that's why you usually try things like pilchard or organic mixtures which has actually got a thick skin – these baits actually last longer. That's why it has always been difficult to convince rock lobster fishermen to use a manufactured bait. So usually animals are not that interested in the oil component – that's the thing we see and we observe - but what their drives the animal is protein signals.

NH
The oilier pilchards turns the water off too quickly in aquaculture and if you watch the prawns they love their squid and that sort of thing. You know, we cut up a large amount of squid. They like a change of diet, just don't keep feeding them squid, I mean we're feeding them a commercial/manufactured Japonicus

diet as well. So every now and again we give them a little bit of pellets. You must keep changing.

If the prawns are good, healthy and the conditions are good in your water column and everything else they will just be sitting there waiting and they will just come in grab them. Big pieces of squid and all.

SK
I have to agree with you. When sampling we tried just that little bit of baiting/burly casting, there wasn't any research involved. But it indicates what you were saying about they'll just go for anything. Whenever we saw a recreational crab pot, we just decided to do a cast even though the habitat was not looking like Monodon habitat. Usually we did find something. We even tried throwing bits of crab bait out while we were crab potting on another project and it actually attracted our monodon in and we were able to capture them and that was just like rotten bait, etc.

MD
That was the other point I was going to raise. Maybe it needs to be considered as well, not only the attractant such as the bait in the traps, but also to retain them in those traps. They'd have to feel happy being in there and whether it's a habitat choice as well.

They certainly would have a predator evasion response. That is in calm days, when the water is calm and clear then they'll bury in the sediment but if it is turbulent and rough then they will be out and about feeding. They use the turbidity as a cover from predators.

PH
I think the bait thing is a diversion – we're discussing whether we think traps can work effectively. Mike has quite clearly shown that based on their densities on the bottom, even if you were to put bait on the bottom, as the best attractant, if there is only one every 1,000 sq metres. You are going to collect five within half an hour. You have to walk a long way to get a really good holding bait, which is also bit of attractant bait. I see it as being a very difficult thing to do unless there is a period when they aggregate for spawning or some other activity. I haven't heard any reports of such behaviour today.

BILL
I have actually put cages out and tried to stockpile the animals at Double Island. I've done it down the wharf here, I have made cages, I've dropped them on the bottom and – the prawn basically – I've lifted them every day, I've lifted them for two weeks, ten days, a week, four or five days. I did it for a number of months thinking it might a way of hanging on to these things, having to keep recapturing them. But because the animal needs to bury and it can't bury because it is in a cage and it is also the fact that you are ringing a dinner bell for every other thing, I actually had to make the things out of wire. With crabs, cod, we've lost the traps altogether, trawled them up three miles away. So, it really is not an option to try and – I have put animals in a trap and stuck them out there and they just – poor things get bugged out – they look a shocker. It's

like putting someone in a straight jacket and sticking them in a chair with a light on them for fifteen hours.

[Background discussion]

IS
Any more questions about the alternative captures?

TP
Just one thing Mike, I would have possibly used black net instead of blue. I think leader prawns possibly like, maybe like a dark – like you were saying you catch them in the shadows. Maybe they like the dark situation.

MD
All this work was done at night.

BILL??
They do like darker situations but also the type/colour of bins that we used on the boats.

TP
I have experimented with different colour shadecloth.

BILL/TP
And we found the colouration, Trevor was the one that picked up on that. It greatly alleviated the stress

And I could show you in five minutes how important the colouration of the environment that animal is in, how much it can settle it down and if it really – I mean it is absolutely astounding to see an animal change within a couple of minutes.

TP
Don't tell them all our secrets Bill.

SK
Actually we did a bit with that Bill when we had a lot problems in our tanks, just by putting half a cover on and some habitat that I use with my juvenile fish and yeah, within a couple of minutes they were back to normal colouration.

BILL
Yeah. And that could have a huge effect when you are looking at the spawning ability of the animal later on – there's all the techniques that we have sort of developed to handle these things better.

HP
Correct handling of the spawners I think is a crucial point and there should be more effort put into it. How long you can hold them.

BILL
A thing that Leigh sent me over was – just using a cloth glove in handling the animals. – I do not touch them with my bare hands anymore. The animal just doesn't flick around anything like it will in picking it up in your bare hands. It's the temperature – the different temperature in your hand compared to a glove. Now these are little things that you do, that help the situation.

IS
These comments actually are probably moving into the next one – the economic overview and how to value add, which is the last objective. The economic overview of the brood stock collection.

Given the constraints that were on the information as explained by Mike, so we don't identify individuals – any other comments?

NH or BILL
I just combine catching banana prawns with collecting brood stock. When you are looking for leader prawns, you find banana prawns, when you're looking for banana prawns you find broodstock. Having the ability, with Trevor's past history, without a doubt he is one of the best fishermen on the coast and utilising that sort of experience and being able to network the boats, really has opened my ability to supply. If you have got more product to work with you're not constrained – you know you've got an order for twenty prawns and you've got eighteen, you can send eighteen. But if you have got forty prawns...

TP
The idea is to catch as many as you can as quick as you can when you get the orders. I think Noel would agree with that. Catch them as quick as you can – get them off the boat.

BILL
In comparison to two years ago with the help of the boys I over-supplied every order I had last year. I threw back four times what we sold and I never missed – the only reason I didn't get the whole order out on the day was the availability of the flight. I mean, what I did worked really really well, and very efficient. So we solved a lot of the problems.

IS
Any further points?

NH
Just wont get over those highs and lows of different years – it is a natural thing – it happens in the fishery all the time. You fishermen, as fishermen you accept it. I mean you mentioned earlier today that it's the same in the Gulf and everywhere else, and this will continue to go on. I think we've got to make the best of what we've got and try and handle it the best possible way.

MD
Those figures that I used? Are the estimated brood stock numbers of 10,000 animals right? Does that sound reasonable to you?

NH
Could be more than that.

[discussion broke down to private conversations]

NG
Well, that's where the information on spawners used by the Aquaculture industry comes from. DPI. Ross works for DPI but he works closely with the APFA, particularly with the hatchery side of things.

MB
As Mike said before, that data that is gathered in Ross's reports from an annual survey for farms and hatcheries and they have to fill it out. Now we know that there is not entirely accurate reporting, to what extent I don't know. The issue with the numbers is an issue we have grappled with as well. We have used every number from 3,000 which was in an old report to 5,000 and now Noel is saying he thinks 10,000 is quite possible, so it is very hard to get a handle on.

TP
I mean, as brood stock collectors, you must have some idea on the total..

BILL
I do. I know every prawn I've sent. I've got every prawn detailed of what I've sent.

TP
If the collectors want to be honest, we should have a very true picture of that.

MD
But the same thing applies. I mean we are talking about the CFISH database and the problems with the accuracy. We are also talking about the prawn farmers and the hatcheries giving incorrect information for various reasons. There is no reason to think that the collectors would give any different. Their information would not necessarily be any more accurate. I mean, you take your information from where you can best get it and you have to rely on the information that you are given.

MB
What do you think Bill? The collectors are taking 5-10,000 spawners. Noel reckons that's a reasonable figure.

BILL
I was sort of kicking figures around of 7-8,000. Because I know myself, and it was just an easy equation- like I do a spreadsheet each month – what hatchery. The total – so I can number them, sort of doing a spreadsheet. And you just work it out off whether it was an average of $80/prawn, whether it was 3 to 1 on the ratio of sex males to females. Some hatcheries never buy a male. Most of the Asian, like Fortune Enterprises – they never buy a male – never. We the

Australian buyers, always buy one male for two or three females. So it is a really easy equation. Roughly, I mean I could sit down and – I've got every prawn I've ever sent out. I haven't got the ones I've returned back in because we just put them back or either tag them. I'm quite open of what I send out – I don't know about the other boys but I am.

IS
5-10,000 from the all three sectors?

NH
I think you'd be up round there. Probably overall Ian, with about – anywhere from 8-10, 0000 as an upper figure.

BILL
I honestly think there would have to be, yeah.

IS
We have got other points. No? Alright, I might put it to the presenters if there is further points that they would like to raise.

PH
I would just like to point out that the steering committee will be responsible for reviewing the draft final report. And we will also probably get parts of it independently reviewed.

SC
This is not a question, it is a comment. I congratulate you for the workshop you have put together, highly commended. I believe it has been enjoyable and I believe it should beneficial for the industry, for the department. Thank you for putting up with me.

Also Bill [Bill Izzard ED] has done a lot of work, and I believe it should be recognised, it should be supported from the industry, from every section of the association. I believe it is very valuable to the industry and working together with your department I think is very valuable. So, thank you so much.

BE
The top two up points on the board there – the catch data for monodon in log books and accuracy of CFISH data – I thought there would have been a recommendation come out of this workshop that there is a column put in east coast log books for future recording of the catches of Monodon prawns.

IS
The accuracy of the CFISH data has been brought up.

BE
But I thought it would have been reinforced again and even asked for again while you had Bev here today.

SK
We'll write that in the proceedings then.

IS
It certainly will come out as a result...

NG
A request to management that a new logbook category for Monodon be created, particularly in the new ECCERS log book where it is electronic and can be changed very quickly

DC
That's what I thought it was – that was one of the main things that came out of all the discussions today is how good is the data – the log book data and everything else. It has sort of been shipped around, so I just thought I'd go back to it and bring it up again to try and try and get it reinforced.

IS
I would like to thank you all for coming. In response to Sam's comments about Bill – certainly Bill is first on the list to be invited to these meetings for his contribution. We certainly recognise what he has done and we are getting figure from that setup for the researchers to look at. But I would really like to thank you for your attention. Thanks for coming today.

* * THE END * * *

Summary.

A number of issues were highlighted during the discussion and I have listed some of the main ones, but this is by no means an exhaustive listing. A wide range of issues was covered with opinions aired on a variety of topics, some relevant to this study and some more relevant to the state of the industry in general.

One issue that became apparent to the researchers was the unrealistic expectations of the project by broodstock collectors, the aquaculture industry, and management. The original proposal had seven diverse objectives, which in reality required seven sub-projects to successfully complete. However the workshop suggested a further series of "objectives", ranging from estimating the recreational catch of *P. monodon,* and determining the viability of broodstock from various sources (Trawlers), to scenario modelling harvest of *P.monodon* at various times of the year to estimate the potential impact of an export trade in broodstock on the Australian industry. These topics were well outside the original objectives of the study and will require further research projects to address them.

Taking the main points made during the course of the discussion:

- **The major issue for the *P.monodon* hatchery/farm sector was still the reliable supply of good quality spawners in the later part of the year.** After the presentation of our results they have come to an acceptance that there is no new "unexploited" grounds on the East Coast, although they are still looking at supplying from Weipa, NT or PNG. They also understood that the major peak in abundance occurred over the March-May period with only a small irregular peak later in the year, when they need their broodstock.

- **Accuracy of the CFISH data for *P.Monodon*.** It was reinforced by a number of participants that the workshop should make a request to management that a new logbook category for Black Tiger (*P.monodon*) be created, particularly in the new ECCERS log book where it is electronic and can be changed very quickly.

- **Accuracy of reported number of spawners supplied to hatcheries**. This was a matter of debate with a consensus achieved on 5-10,000 animals annually. More accurate estimates are required.

- **Spawner quality and PL viability** at different times of year and from different sources (Trawler/collectors) was raised by a number of participants.

- **The effects of exporting broodstock overseas** on the local industry was a concern from some sectors.

- **The effect of harvesting Black Tigers (*P.monodon*) as frozen product by the East Coast trawl fleet.** This is most prevalent during banana prawn trawling during the March-May spawning peak.

- **Optimising exploitation of the existing harvest of *P.monodon*** (without increasing the pressure on the stock). The concept was to turn a greater proportion of the current catch of frozen product into live broodstock available to the hatcheries. This caused considerable debate and was generally accepted as a positive initiative, but without resolution as to appropriate methods.

- **Allocation issues,** these were linked to concern about loss of potential aquaculture spawners to frozen product and export overseas (see above). It was pointed out that there would be a loss of income to the banana prawn fishery, in particular (from any area closures), and that Australia did not have a good history of protecting local aquaculture by banning export of broodstock

- **Habitat degradation and loss.** Two elements were discussed as concerns; the loss of potential inshore trawl areas to Marine Park or Fish Habitat closures; and the loss of recruits to the population due to the general habitat degradation (land use, pollution, and loss of riparian habitats). The latter was seen as a major concern by some sections.

- **Sustainability of broodstock populations.** This was the thread that ran throughout the discussion. The group accepted that *P.monodon* was relatively rare (compared to any other commercially exploited prawn), and that its abundance was highly variable in space and time. No one had an adequate explanation for why 2001 was such a "good year" for spawners compared to the previous 10 years. It was accepted by most of the group that the availability of wild-caught spawners was unpredictable and that there would be "good years and bad years". No participant claimed the population was unsustainable.

  Patrick Hone (FRDC) made two points which registered with all participants: (1) As *P.monodon* is on the edge of its distribution then high variability would be normal and to be expected; (2) it is extremely difficult to "crash" a crustacean population through overfishing.

After the workshop officially closed, participants used the occasion to carry on informal discussions and "industry meetings".