5.5 Jellyfish databases

This "Reporting System" continues to form part of the activities of the International Consortium for Jellyfish Stings (ICJS).

The period covered by jellyfish reports is now September 1989 - March 1996, near the end of summer and the marine `sting season' in tropical Australia. However the Author and his colleague regularly receive reports of stings right to the current day. Because of the inevitable difficulty getting all the information from many sources (see Appendix D) – the report is usually not prepared until June, the end of the summer jellyfish season in Australia.

The information is divided into two parts: -

1. Australia – which forms the major part of the database.

2. the rest of the world – more information is now being gathered from the increase in modern communications (described below).

5.5.1 Methods of collection of information to 30 June 1995

1. Written report forms requested from Medical Officers and Hospital Superintendents in tropical coastal waters in northern Australia.
2. Written and verbal reports (verified) from Australian and world scientists and colleagues (see below)
3. Surf Life Saving records, almost exclusively from Surf Life Saving Clubs in Queensland.
4. Antivenom usage reports, including those forwarded from Commonwealth Serum Laboratories(CSL) till 1993, courtesy Prof Struan Sutherland, MD, DSc.
5. Antivenom usage reports, including those forwarded from Commonwealth Serum Laboratories(CSL), 1993 on, courtesy Dr Julian White.
6. "Personal contact" and media reports – all individually followed up and confirmed as being factual.

Methods of collection of information since 1 July 1995

1-6. As above
7. Reports from Queensland Tropical Ambulance Stations
8. Reports from West Australian Hospitals
9. Reports from State Ambulance Authorities, West Australia and the Northern Territory.
10. Reports from Poisons Information Centres in each State of Australia
11. Reports from members of the Australian College of Tropical Medicine via closed E-mail.
12. Reports from Toxinet via closed E-mail
13. Reports from Healthnet via closed E-mail
14. Reports from `Cnidaria network' via closed E-mail
15. Internet searches

Areas 7-14 above were included at the start of this thesis to widen the database as much as possible. World contributions from members of the International Consortium for Jellyfish Stings to this collection of reports have been sent from Australia, Papua New Guinea, United States, Puerto Rico, Malaysia, Indonesia, South Africa, Thailand, Singapore, Pakistan, India, China, Japan, Portugal, Italy, Yugoslavia, Greece, Russia and Argentina. This is the only currently-known on-going such epidemiological report on this marine subject presently in existence.

This information cannot include every fatality or serious morbidity that has occurred during the period covered. Accurate recording of world marine envenomations resulting in human death or morbidity remains inadequate, despite the initial efforts of Halstead (1988) and Cleland and Southcott (1965), and the current efforts of Associate Professor Bart Currie in Darwin, Australia, Burnett and colleagues in USA, Mingliang in China, Yakovlev and colleagues in Vladivostok, Russia, Alam and colleagues in Pakistan, Mianzan in Argentina, Kokelj in Italy, Gili and Cornelius, among others.

5.5.3 Data collected from Australia

Fatalities documented 1986-1995:

Chironex fleckeri

Four deaths were recorded in this time, all in children. Three were Aboriginal children in the Northern Territory - a 9-year-old male on 1/2/88, a 13-year-old male on 4/4/88 and an 18-month-old boy on Bathurst Island, in the Northern Territory, in February1996. The other was Caucasian - a 5-year-old male who died on 20/1/87

at Gladstone, central Queensland - the most southerly death from a jellyfish sting reported in Queensland, or Australia. Autopsy results exist for all but the latest death.

See Map 1 below:– The Indo-Pacific and Australia showing fatalities and chirodropid distribution

Significant morbidity 1985-1995

Chironex stings

Three victims developed impaired consciousness and one had respiratory distress. Two patients were pregnant at the time of the sting (one 7 months gestation) but neither mothers nor foetus came to permanent harm in either case. One mother developed a delayed allergic skin reaction to the *Chironex* venom 15 days later that settled with steroid creams. *Chironex* antivenom was not given to either of these pregnant victims. One patient was a Down's syndrome and responded well to antivenom administration, and one was a SCUBA diver. One patient developed acute right bundle-branch block on electrocardiography that reverted to sinus rhythm spontaneously after 4 hours. Two patients were intoxicated with alcohol at the time of the sting; one "had no pain" and the other received 3 ampoules intramuscularly of antivenom, but the response is not recorded.

Australian sting reports

From 1970 to April 1997 - Total stings 1228 stings

This total consisted of: Irukandji stings 455; *Chironex* stings 388; *Physalia utriculus* (Australian "bluebottle") 81, *Tamoya* (Morbakka) 33, as well as “others stings” ranging from jellyfish to hydroids, anemones, and sea snakes, together with venomous fish such as stingrays and stonefish comprising the balance.

Probably included in the above *Chironex* tallies are *Chiropsalmus* (Australia) stings as although they are less venomous, a minor sting is probably indistinguishable. One *Chiropsalmus* sting was positively identified from nematocysts, and produced severe pain, which subsided only to recur some hours later.

Table 6 - *Chironex* stings 1985/97

	Total Number stings	Recorded cases	% of all recorded stings	% of total stings
TOTAL	388	388	100	100
Morning	124	361	34.3	32.0
Afternoon	237		65.6	61.1
Females	131	371	35.3	33.8
Males	240		64.7	61.9
Fine	117	178	65.7	30.2
Cloudy	61		34.3	15.8
Kids <10		108		27.8
females	41		38.0	10.6
males	67		62.0	17.3
NT stings	257	388	66.2	66.2
Qld stings	125		32.2	32.2
WA stings	6		1.5	1.5

This table contains 26 cases from September 1996 to the end of April 1997.

Deductions

* Afternoon stings are again statistically greater than morning stings. However, this may be normal percentages of people that swim in the morning, compared to those who swim in the afternoon. This percentage of stings is much less than that for Irukandji (see Irukandji results below).

* Males are more likely to be stung than females. However, although this is statistically significant, it may simply reflect the usual percentage of males that swim compared to females. The figures are similar to the percentages reported in the Irukandji (Table11).

* A sting is more likely to occur on a fine day. However, the figures are again similar to those of the Irukandji stings, and may just reflect the numbers of fine days compared to cloudy days in the summer season in tropical Australian areas.

* Almost 28% of victims are children less than 10 years old. This is statistically significant compared to the numbers stung by Irukandji. As *Chironex* is a shallow water jellyfish younger children are often stung whilst paddling .

Table 7 - Body areas stung - *Chironex* stings

Stung area	Stung	Percentage (stings known)
Total	602	100
Arms	164	27.2
Trunk	108	17.9
Upper legs	58	9.6
Lower legs	171	28.4
Head and neck	28	4.6
Multiple areas	91	15.1

NOTE: stings covering more than one region are also totalled in the regional area

This table contains 26 cases from September 1996 to the end of April 1997.

Deductions

- Stings are common on the legs – some 38% of the total – as *Chironex* is a shallow-water jellyfish. Most, if not all, people are stung whilst entering the water, before they actually start to swim.
- A high proportion of stings occur on the arms where the victims tends to pull at adherent tentacles, trying to remove them, thus sustaining further stings to the arms
- Stings on the head and neck less common, but occur when the victim dives into the water either directly into the jellyfish, or surfacing under it.

Chironex antivenom use

(Commonwealth Serum Laboratories reports courtesy of Professor Struan Sutherland & Dr Julian White)

Table 8 - *Chironex* antivenom use

Year	Month	Age-sex	Location	Dose (route – no. of amps)	Comments
1989	March	11-m	Mossman, North Qld	IV-1	Great reduction in pain of sting
1990	?	?	North Qld	IM-3	Large sting, few details -Downs syndrome patient
1991	Jan	36-m	Cape York, North Qld	IV-1	Generalised itching for 4 days
		14-f	Cairns, North Qld	IM-3 IV-1	Great reduction in pain of sting
	Feb	26-f	Gt Keppel Is, Central Qld	IM-1	?? jellyfish
	March	4-m	Gove, Nth. Territory	IV-½	Nodal arrhythmia
		9-f	Darwin, NT	IV-1	No details
	April	7-m	Bamaga, Nth Qld.	IV-1	Pre-med used
	May	39-m	Chagos Arch.	IV-1	Dramatic improvement
	Dec	10m	Townsville Nth Qld.	IV-3	Large sting, imp. Conscious
		36-m	Edward Is, Nth Qld.	IV-1	? Irukandji
1992	Jan	27-f	Darwin, NT	IV-2	Good pain relief, reduced inflammatory reaction
	April	6-f	Darwin, NT	IV-1	Sinus arrest on ECG before a/v – given 35mins after sting
		25-m	Darwin, NT	IV-1	Good pain relief
	May	28-f	Darwin, NT	IV-1	Fair pain relief
1993	Jan	10-f	Cooktown, Nth Qld.	IV-1	Fair pain relief
		6-m	Cooktown	IV-1	Fair pain relief
1994					
1995	Dec	10-f	Airlie Beach, Cen Qld	IV-3	Good relief of pain
1996	Feb	3-f	Bathurst Is, NT	IM-3 IV-3	Adrenalin, sodium bicarbonate, atropine, verapamil x 2 IV - died

Total antivenom usage (these reports) January 1989 - October 1996:

Chironex fleckeri CSL antivenom 18 patients

Footnotes to database

- It is clear from the reports that some medical persons still persist with the incorrect belief that vinegar (4-6% acetic acid in water) has an analgesic action. It does not (Hartwick *et al 1980),* as has been repeatedly pointed out since the original 1980 publication (Fenner *et al* 1989; Beadnell *et al* 1992). Its role is simply as a prevention of further envenomation by cubozoan nematocysts.
- The important analgesic role of specific CSL antivenom is once again amply illustrated in chirodropid envenomation.
- Box Jellyfish antivenom is not effective against the venoms of non-chirodropid jellyfish, at present levels of understanding (Fenner *et al* 1986a).

- A detailed and medically informed account of a jellyfish sting in Diego Garcia, in the Indian Ocean confirmed this antivenom was effective against other chirodropids, and even perhaps-other "large carybdeids"? More research is necessary.
- Dosage of antivenom should not be reduced for small patients. The antivenom is to neutralise the venom, not the patient.
- The use of appropriate premedication prior to antivenom should be used when possible, especially in relatively uncontrolled medical circumstances. This is currently advised and supported by existing data (Sutherland 1994).
- The place of compression bandaging in major jellyfish envenomation (Williamson *et al* 1996,p.110) awaits results of controlled tests (see above). It has been used without short or long term harm in 2 of the above cases, and others (Fenner *et al* 1989; Beadnell *et al* 1992).

Chironex antivenom 1985-1996

Antivenom was used on 6 cases: -

- A delayed "reaction" occurred after 8 days in 1 patient; no details are given, but immunological examination of this patient's serum by Professor Burnett's laboratory in Baltimore, USA, showed a specific immunoglobulin (IgE) titre against *Chironex* venom of 1:2850.
- Two days hospitalisation without antivenom occurred with one patient.

Antivenom use

Twenty three patients have received antivenom in the period 1989-1996. In these cases effective pain relief was achieved in 20, including in the Down's syndrome patient. It still remains unclear how this pain relief is achieved, but it occurs too often to be not statistical. Further work is needed to assess this effect.

Significant morbidity documented in all reports

Chironex fleckeri - 97

The Northern Territory had 58 significant stings, Queensland 38, and Western Australia 1. Twenty one of them were children, thirteen requiring hospital

admission, with one fatal sting in the Northern territory, one described as "very severe", and another requiring aero-medical retrieval to Darwin.

Specific Commonwealth Serum Laboratories' Box Jellyfish Antivenom was administered to seven of those victims to date, including the fatal case. No untoward reactions were reported and just one death was reported in this series.

Table 9 - Northern Territory stings 1995-96

Northern Territory stings 1995-96	
Month	**Number of stings**
January	11
February	3
March	9
April	3
May	1
September	2
October	2
November	6
December	3

Table 10 - *Chironex* : first appearances (from north Australia to south)

	1993-94	**1994-95**	**1995-96**
Northern Territory	Aug 1	Sep 10	Sep 19
North Queensland	Nov 13		Nov 19
North Central Queensland	Nov 28	Dec 31	
South Central Queensland	Dec 25	Dec 11	

1996-97 dates not yet available

Deductions

- This table show that the closer to the Equator, the longer the season – ie. the season starts earlier, probably associated with the water temperatures. In the Northern Territory, there have been stings in every month of the year (Currie *et al* 1992).

The general public think that the jellyfish swim from the north and spread slowly southward, thus the arrival of the jellyfish is later in the spring / summer season, the further south one

travels. However, just to swim a short distance uses up large amounts of energy, and *Chironex* could not possibly travel that far. The answer probably lies in the fact that the water temperatures warm up slowly as the sun moves closes to the Tropic of Capricorn, where it reaches on mid-summer's day, 22nd December in Australia. It is difficult to predict when the jellyfish will arrive in an area, and even more difficult to predict when they will be gone:-

Arrival and disappearance of *Chironex* in north Queensland

The first *Chironex* sting in the Northern Territory in 1993 was 1 August, in 1994 September 10 and in 1995 it was 19 September . However, Phil Alderslade, a Marine Biologist in Darwin, caught a 14cm specimen (his largest in the NT) on 15 November 1995.

The first *Chironex* caught in Far North Queensland in 1993 at Cairns, was 13 November 1993; in North Queensland at Forrest Beach on 21 November and Townsville on 27 November; North Central Queensland in Mackay on 28 November 1993; South Central Queensland at Yeppoon on 25 December 1993.

Needless to say, the appearance time varies year to year with water temperatures and weather patterns:

First *Chironex* caught in Queensland in 1994 was Port Douglas on 15 November, Cairns (13.5cm specimen - unusually large for that time of the year) on 22 November 1994. Forrest Beach 12 November, Mackay 31 December 1994 and Yeppoon 11 December. The first *Chironex* sting in Queensland was in Cairns (on lifesaver!) on 20 January 1994.

The first *Chironex* caught in Queensland in 1995 were Cairns on 9 November 1995, Townsville on 19 November 1995, Mackay on 6 January 1995 and nil in Yeppoon (South Central Queensland) that year..

Unrelated facts on *Chironex*

- On 24 November 1995 lifeguards in Cairns had caught an 18cm Chironex
- A large, mature specimen was also caught in Port Douglas on 8 July 1996; no others were caught at that time.
- First *Chironex* sting in Queensland was at Cardwell 2 December 1995 on a male aged 27 - not severe.

- A *Chironex* sting occurred in a 1m swell, in the middle of a surf carnival on Mackay Harbour Beach, 13 February 1994 whilst hundreds of people were in the water around - so much for stings `not occurring' in crowded waters (when the jellyfish swim away), or `not occurring' in rough water.
- A surf lifesaver was stung on his legs as they hung off his ski, but in deep water, 100m offshore in a 1m swell.
- A 10cm *Chironex* with 8 tentacles per pedalia was `washed up' on Trinity Beach, Cairns on 15 July 1995 - the water being very calm, and with a sea temperature of just 23.5^{o}c. Barnes (1966) suggested that *Chironex* only appeared when the temperature reached 28degC, and disappeared by 24.5degC.
- A SCUBA diver without a hood was stung upon surfacing.
- In 3 cases the stings occurred inside a stinger enclosure, in two of these cases it is suspected that irresponsible persons placed the animals inside the net.
- In at least 2 patients the application of ice packs eased the sting pain, and was thought to reduce subsequent blistering.
- Impaired consciousness was described in 1 patient and breathlessness in another.

Irukandji (*Carukia barnesi*)

Earliest stings

1993 – 5 September 1993 - Cairns
1994 – 5 November 1994 – Port Douglas
1995 – 8 November 1995 - Cairns
1996 – 4 September 1996 - Townsville

Unlike *Chironex* the database does not show the clear appearance of Irukandji stings starting in the north, and moving southwards.

Unrelated facts

- There were no deaths; hypertension is reported in approximately 70% of cases presenting where data was collected.
- Pulmonary oedema has occurred in about 10 cases, 5 of which are recorded by Carney & Fenner (1997) and were life-threatening.
- Two cases with premature ventricular contractions were documented in the database.
- Almost 60% of these stings occurred inside the stinger enclosures, some of these involving the "Mark 1" enclosures, prior to their redesign using smaller mesh to try to exclude this tiny carybdeid jellyfish; however some did not.
- Divers in open water are at risk of Irukandji envenomation.
- A SCUBA diver was stung on the face in open water.

- All stings required some medical consultation
- One victim was wearing a stinger suit in the surf, two clothed others were pulling nets into a boat, and one of the 3 pearl divers stung was fully clothed, illustrating the ability of Irukandji to sting significantly via the smallest exposed skin area.
- At least 6 victims were retrieved to hospital via helicopter.
- 3 victims (all foreign tourists) suffered multiple stings when jumping off a tourist boat off Hamilton Island in January 1994: all three suffered varied reactions to the stings; 1 (male) was mildly hypertensive; 1 female developed severe hypertension, heart failure and needed intermittent positive pressure ventilation (IPPV); 1 female became hypotensive, suffered acute renal failure, then as the blood pressure returned to normal, developed heart failure needing IPPV. Investigations on all 3 by echocardiography showed a dilated, inefficient heart causing pulmonary oedema (Carney & Fenner 1997)(case history outlined above).

Table 11 - Irukandji stings 1985/97

	Total Number stings	**Recorded cases**	**% of all stings with this information**	**% of total stings**
TOTAL	455	452	100	100
Morning	74	399	18.5	16.3
Afternoon	325		81.5	71.4
Females	179	435	41.2	39.3
Males	256		58.8	56.3
Fine	76	103	73.8	16.7
Cloudy	27		26.2	5.9
Kids <10	63	63		13.8
females	33		52.4	7.3
males	30		47.6	6.6
NT stings	41	452	9.1	9.0
Qld stings	377		83.4	82.9
WA stings	34		7.5	7.5

This table contains 53 cases from September 1996 to the end of April 1997.

Deductions

- Afternoon stings are statistically greater than morning stings. This may be due to more people swimming in the afternoon than swim in the morning. However,

comparing these percentages to those of *Chironex* below, they are possibly more significant.

- Males are more likely to be stung than females. However, more males swim than females.
- A sting is more likely to occur on a fine day. However, most summer days in tropical Australia have been fine in the past 10 years, despite it being in the official `wet season'. Due to the influences of `El Nino', the meteorological effects in the Pacific Ocean, the east coast of Australia has been experiencing drought conditions.
- Approximately 13% of children less than 10 years old are victims. This is statistically significant compared to the numbers stung by *Chironex*, which are double. This is because the Irukandji is a deep-water jellyfish and most people are stung whilst swimming. Less children swim than wade. *Chironex* is a shallow water jellyfish and many people, including children, may be stung whilst in just a few inches of water.

Table 12 - Body area stung - Irukandji stings

Stung area	Stung	Percentage (stings known)
Total	510	100
Arms	121	23.7
Trunk	98	19.2
Upper legs	36	7.1
Lower legs	116	22.7
Head and neck	6	1.2
Multiple areas	80	15.7

NOTE: multiple area stings are also totalled in the regional stung area

This table contains 53 cases from September 1996 to the end of April 1997.

Deductions

- Stings are common on the legs – some 38% of the total – similar to *Chironex* although it is regarded as a deep water jellyfish. Probably many of these victims are stung whilst entering the water, before they actually start to swim. These figures much lower than those previously suggested by Barnes (Kinsey 1988) who felt that the majority of stings occurred on the upper torso.
- Almost 47% of stings occur on the arms and trunk whilst victims are swimming – again, contrary to those suggested by Barnes.
- Stings on the head and neck are rarer than *Chironex*. These all occurred in divers, usually whilst surfacing

- Multiple stings are unusually common. As Irukandji are so small, multiple stings must be from multiple animals as they have little tentacle material. This is unlike *Chironex* stings where one animal may cause a sting to multiple areas because of the large tentacular material present.

Table 13 - *Tamoya* stings 1985-1997

	Total Number Stings	Recorded cases	% of all stings with this information	% of <u>total</u> stings
TOTAL	33	33	100	100
Morning	6	28	21.4	18.2
Afternoon	22		78.6	66.7
Females	9	31	29.0	27.3
Males	22		70.1	66.7
Fine	14	16	87.5	48.5
Cloudy	2		12.5	6.1
Kids <10 **females** **males**	 2 1	3	 66.6 33.4	9.1 6.1 3.0
NT stings	15	33	45.4	45.4
Qld stings	19		57.6	57.6
WA stings	0		0	0

This table contains 2 cases from September 1996 to the end of April 1997 (including one from Sydney, NSW)

1990 – 0 stings
1991 – 15 sting
1992 – 4 stings
1993 – 13 stings
1996 - 2 stings

Deductions

- The numbers of stings are too small to be significant, but the percentages quoted, despite such small numbers, are very similar to those of the Irukandji. These jellyfish are very similar in a number of ways except for size. In the experience of the author, distinguishing small *Tamoya* from Irukandji is difficult, and only possible by an expert.

Morbakka" - *Tamoya*

Large carybdeid stings 33

This large, open water Carybdeid is well named as "fire jelly". The sting is always intensely painful as indicated in all fifty-six reports.

Other facts

- A more generalised "back pain/chest tightness", or 1 "Irukandji-like" pattern is described in ten of the reports, with vomiting in one.
- A number of stings were reported from Darwin – probably the “Darwin carybdeid” which is a probable new species under current taxonomic scrutiny (Rifkin, in Williamson *et al* 1996, p.245).
- Specimens were caught in the Pioneer River, Mackay on 9 May 1994, 10 October 1994 and Trinity Beach, Cairns on 29 July 1995

Physalia physalis ("Pacific man-o'-war")

Again, many stings are reported, but probably only a minority of those actually occurring. This database is probably an indefinite representation of the morbidity caused by those stings. See Surf Life Saving reports of jellyfish numbers and stings below.

Other stings- 10

This small group included a possible hydroid sting, a *Cyanea* sting producing severe muscle cramps after 24 hours, and other unidentified fish including blow-fish, jellyfish stings including all the common Australian species (*Physalia, Cyanea, Catostylus*) and 1 hydroid sting.

Lobonema smithii sting - 1

This less familiar jellyfish was identified as the "probable cause" of a sting by Phil Alderslade of the Northern Territory Museum (P Cornelius, 1994, personal communication). Photographs of the fresh sting were taken.

Surf Life Saving Australia Records

Australian Marine Stings (all kinds) documented as receiving treatment on Australian surfing beaches during the 1990/1991-summer season:
(records from the 1990/1991 Annual Report, Surf Life Saving Australia SLSA)

Queensland	10,054
New South Wales	6,998
West Australia	1,030
South Australia	85
Victoria	61
Tasmania	23
Northern Territory	7
TOTAL	18,258

In 1993/4 season some 24,294 stings were recorded Australia wide - 17029 from NSW, 6386 Queensland, 590 South Australia, 215 Western Australia, 43 Victoria, 21 Northern Territory and 10 in Tasmania.

Unfortunately sting statistics have not been kept in other years until the 1996-97 season. These figures are not yet available.

Footnotes

- the majority of the Queensland stings were *Physalia utriculus* ("Bluebottle") on the Queensland Gold Coast and Sunshine Coast beaches;
- similarly, the Australian species of *Physalia* accounted for many of the stings from all other States;
- *Carybdea rastoni* (the "Jimble") almost certainly contributed to the West Australian and South Australian tallies shown here.

Table 14 - Queensland yearly report summaries

Jellyfish Stings	87/88	88/89	89/90	90/91	91/92	92/93	93/94	94/95	95/96
Stings	1960	1271	1579	1176	1224	539	2027	3468	1260
Physalia Sightings	20000	9000	5000	6200	13857	17770	21745	12748	11433
Stings	192	15	20	198	69	31	296	64	23
Cyanea Sightings	1500	204	1400	9200	2084	1	8023	96	899
Stings	114	37	9	271	236	5	67	238	146
Catostylus Sightings	200	364	825	4100	4626	26	14742	2971	6889
Stings	5	1	3	3	4	0	20	2	2
Chironex Sightings	331	126	220	274	159	64	368	138	92
Stings	2	4	0	0	104	1	8	13	1
'Irukandji' Netting	0	38	14	1	0	0	1	0	0