

**A study on allergic health problems
in the Australian seafood processing industry**

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Project No. 2003/401

A Study on the Allergic Health Problems in the Australian Seafood Processing Industry

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Published by the Agency for Food and Fibre Sciences (Food Technology), Queensland Department of Primary Industries & Fisheries
19 Hercules St HAMILTON Qld 4007

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OBJECTIVES

1. To determine the various occupational settings in which exposure to seafood allergens occurs and to identify specific work processes associated with high risk exposure.
2. To determine the prevalence of work-related allergic health problems (rhinoconjunctivitis, urticaria/eczema, asthma)
3. To determine the level of occupational health service provision and surveillance of workers in these various workplaces.
4. To characterise the demographic profile of seafood processing workplaces in Australia in the context of the risk from allergen exposure.

NON TECHNICAL SUMMARY

Survey forms sent to over 800 companies in the aquaculture and processing sectors of the Australian seafood industry on the provision of occupational health services and the prevalence of allergic health problems drew 140 responses. The key findings of this survey were:

- About half of the workplaces provided an on-site occupational health service and conducted some form of medical surveillance program.
- There was a positive trend between the size of an operation and provision of an occupational health program.
- Only 9% of workplaces operated an industrial hygiene program.
- The most common form of allergy experienced was urticaria (skin rashes) followed by asthma, rhinitis and rhino conjunctivitis. These results are in agreement with more extensive studies done overseas.
- It is suggested that an awareness program be instituted to alert management and workers to the possibility of allergies, and appropriate avoidance procedures be instituted.

KEYWORDS

Allergens, antibodies, urticaria, rhinitis, rash, conjunctivitis, allergy, immune, survey, occupational, seafood.

ACKNOWLEDGEMENTS

This work was funded under the Seafood Industry Development Fund of Seafood Services Australia. The assistance of Ms Christine Gore of the Agency for Food and Fibre Sciences in coordinating the correspondence is gratefully acknowledged as

well as the analysis of the data by Ms Roslyn Baatjes and Ms Nadia Viljoen of the Occupational and Environmental Health Research Unit, University of Cape Town.

BACKGROUND

Although seafood allergy due to ingestion is commonly observed in clinical practice, the incidence of seafood allergies in general and more specifically in the occupational setting in Australia is largely unknown. There have been no published studies to date. A recent review by Jeebhay *et al.* (2001) outlined the global extent of occupational allergies and asthma among seafood processing workers. A study by Lopata and Potter (2000) assessed the spectrum of suspected allergy due to ingestion of seafood. The five species most commonly reported to cause adverse reactions after ingestion were prawns, lobsters, abalone, black mussels and hake. It is important to note that the occurrence of an allergy may find different symptomatic expression in different individuals. An allergen that may cause skin rashes in one person may cause asthma or gastro-intestinal symptoms in another.

A survey into the South African seafood processing industry (Jeebhay, *et al.*, 2000), which employs approximately 30,000 workers, reported that the most common seafood types processed were finfish (76%) followed by rock lobster (34%) and that the major processing undertaken was cutting and gutting (58%). This current project used the methodology of the South African study as a benchmark to validate the results of this smaller survey.

A public seminar on food allergies convened by the DPI Queensland in Brisbane in November 2002 attracted an audience of 32 participants from very diverse backgrounds. This seminar prompted interest from industry, regulators, medical practitioners, researchers and the public, and was featured on commercial and ABC radio. Two subsequent seminars on food allergies, held in Brisbane for the public and for the food industry, and one held in Sydney attracted audiences of over 200 people, indicating that this is now a major area of public concern.

OBJECTIVES

This project had the following objectives:

1. To determine the various occupational settings in which exposure to seafood allergens occurs and to identify specific work practices associated with high risk exposure.

2. To determine the prevalence of work-related allergic health problems (rhinoconjunctivitis, urticaria/eczema, asthma etc).
3. To determine the level of occupational health service provision and surveillance of workers in these various workplaces.
4. To characterise the demographic profile of seafood processing workplaces in Australia in the context of the risk from allergen exposure.

METHODOLOGY

A cross-sectional employer-based survey design was used to conduct the study in 2003. The target study population included seafood handling and processing workplaces in Australia listed in the most recent version of the database of the Australian Seafood Industry Directory. In an effort to maximise the response rate, each workplace that did not reply or fully complete the survey form was contacted by telephone to confirm the address etc. and seek compliance.

The survey instrument included:

- details of the company and the contact person
- types of seafood processed and the production processes involved
- demographic details of the workforce
- presence and nature of occupational health activities provided
- number of workers with common work-related allergy symptoms associated with seafood processing.

Data entry and analysis was conducted using Epi-Info Stat statistical package (Version 6). Univariate analyses summarized the distribution of each measured variable. The Mantel-Haenszel chi-square test for linear trend was used to explore the relationship between workforce size and the provision of various occupational health activities. The Mantel-Haenszel chi-square test was also used to identify significant differences among workplaces conducting various occupational health activities.

RESULTS/DISCUSSION – ANALYSIS OF RESPONSES

(1) Response rate

The response rate was relatively low (17%) with 140 responses from 806 survey forms sent. Twenty-seven forms were returned unopened as the companies had closed or moved without notifying the compilers of the Directory. Among the responses, there were 85 respondents from the post-harvest processing sector and

55 from aquaculture. Not all respondents addressed all the questions asked, despite telephone follow-up.

The majority of responses to the questionnaire came from managers (74%) and only 4% were from health & safety officers.

(2) Characteristics of responding companies

The Seafood Directory divides companies into a number of categories based around the major activities they perform. The two categories of interest here were 'Post Harvest', which covers processing, packing etc, and 'Aquaculture', which covers seafood farming operations. There is some overlap involved here, as some companies did more than one form of processing and some aquaculture operations also process and pack at the farm. As expected, most of the processing was conducted by the post-harvest group (Table 1 & Figure 1). However, shucking of oysters was mainly conducted by the aquaculture group.

The most common form of processing listed was freezing, followed by gutting, filleting and cooking (Figure 1). Obviously more than one activity can be carried out at a given plant.

Table 1: Distribution of work processes used in the seafood industry. Results are given as percentage of responding workplaces (n=140), stratified by category.

Types of processes	Aquaculture (n=85)	Post-harvest (n=55)	Total (n=140)
Freezing	11 (20%)	44 (52%)	55 (39%)
Degutting	8 (15%)	31 (36%)	39 (28%)
Filleting	5 (9%)	31 (36%)	36 (26%)
Cooking	6 (11%)	27 (32%)	33 (24%)
Aqua-act	12 (22%)	5 (6%)	17 (12%)
Shucking	7 (13%)	8 (9%)	15 (11%)
Canning	3 (5%)	5 (6%)	8 (6%)

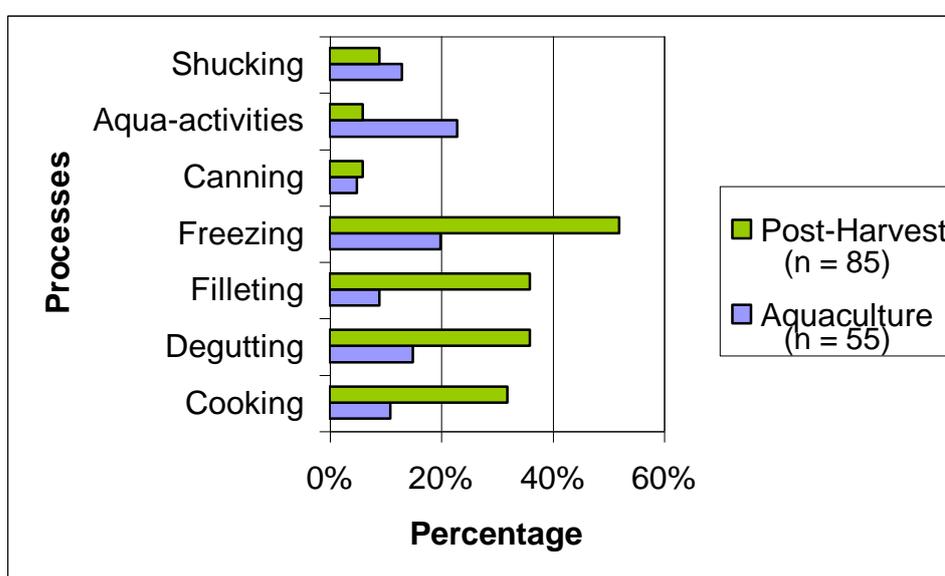


Figure 1: Common work processes used in the seafood industry. Results are given as percentage of responding workplaces (n=140), stratified by type of company.

(3) Species handled

The post-harvest sector did the processing for most species except that most oyster shucking was done by the aquaculture group (44% versus 7%) (Table 2 & Figure 2).

Table 2: Types of seafood processed by the seafood industry. Results are given as percentage of responding workplaces (n=140), stratified by type of industry.

<i>Types of seafood</i>	<i>Aquaculture (n=55)</i>	<i>Post-Harvest (n=85)</i>	<i>Total (n=140)</i>
Finfish	11 (20%)	36 (42%)	47 (34%)
Prawn	6 (11%)	28 (33%)	34 (24%)
Oysters*	24 (44%)	6 (7%)	30 (21%)
Lobster	1 (2%)	24 (28%)	25 (18%)
Squid	3 (5%)	18 (21%)	21 (15%)
Abalone	4 (7%)	15 (18%)	19 (14%)
Mussels*	2 (4%)	6 (7%)	8 (6%)
Crab*	0	7 (8%)	7 (5%)

- Self-reported

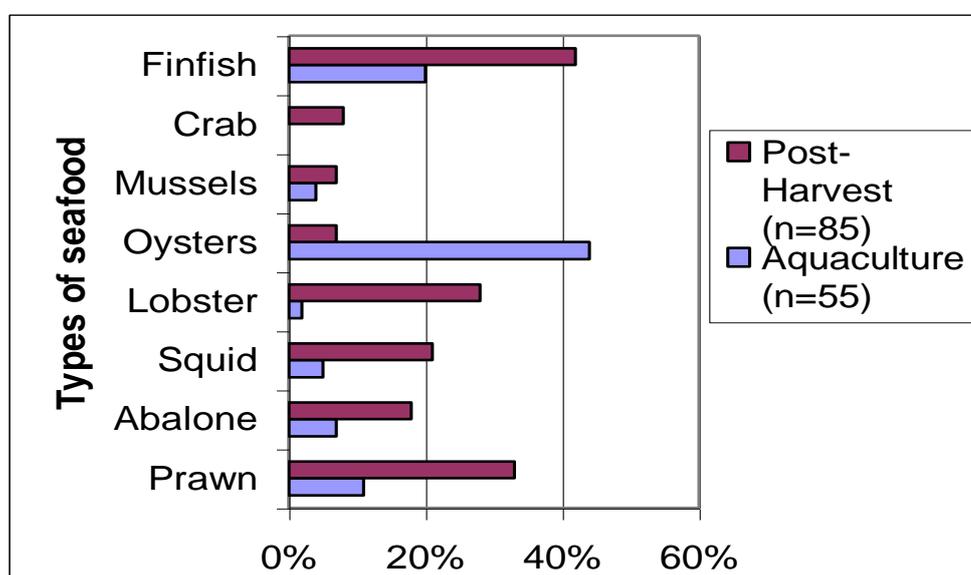


Figure 2: .Distribution of types of seafood handled by the seafood industry. Results are given as percentage of responding workplaces (n=140), stratified by industry category.

The most common type of seafood handled was finfish (34%), followed by prawns (24%), and the least commonly processed seafood type was reported as crab (5%). Dividing the seafood species into the three marine phyla, one observes that finfish is the least processed group (34%), followed by crustaceans (47%) and the most commonly processed group were the molluscs with 56% processed.

(4) Provision of health services

Of the 130 workplaces that responded to all questions regarding occupational health activities, 41 were small (employing 5-49 workers), and 78 were medium size (employing 50-199 workers) and only 11 workplaces employed more than 200 workers (Table 3).

Table 3: Percentage of seafood processing workplaces that conduct occupational health activities according to size of workforce

Occupational health activity	Total no. of Workplaces (n = 130)	Number of workplace by workforce size (%)			p-value*
		Small (%) (n = 41)	Medium (%) (n = 78)	Large (%) (n = 11)	
Occupational health service on-site	67 (52%)	12 (29%)	46 (59%)	9 (82%)	<0.001
Med. surveillance program	65 (50%)	17 (41%)	43 (55%)	5 (45%)	0.337
Industrial hygiene program	11 (9%)	6 (15%)	4 (5%)	1 (9%)	0.192
Work-related symptoms reported in the past year	37 (28%)	8 (20%)	25 (32%)	4 (36%)	0.154
No. of workplaces who indicated that workers left employment due to allergic health problems	9 (7%)	0	6 (8%)	3 (27%)	0.004

Note: small = 0 – 4 workers; medium 5 – 49 workers; large 50 – 200 workers

** Chi-square test for trend*

Just over half of the workplaces (52%) provided an occupational health service on-site and half of the workplaces conducted some form of medical surveillance of their workers. Only 9% had an industrial hygiene program in place. There was a positive trend observed between the size of the workforce and the provision of an occupational health service ($p < 0.001$) and identification of at least one worker per workplace that left employment due to an allergic health problem. Workplaces employing more than 200 workers were more likely to provide an occupational health service on-site and identify a worker who left employment due to allergic health problems

There was a significant association between workplaces with an on-site occupational health service and the existence of a medical surveillance program ($p < 0.001$) (Table 4). However, only a minor statistically significant association was found between workplaces with medical surveillance program and those that had reported work-related symptoms in the past year ($p < 0.05$). The provision of occupational health service was similar between the post-harvest and aquaculture sectors (Table 5).

Table 4: On-site occupational health services provision and reporting of work-related symptoms by presence/absence of medical surveillance program among seafood processing workplaces

Occupational health activity	Medical surveillance program (n = 132)			p-value
	Present	Absent	Total	
Occupational health service present	50 (74%)	18 (26%)	68 (100%)	<0.001
Work-related symptoms reported in the past year	25 (66%)	13 (34%)	38 (100%)	0.042

*Chi-square test

Table 5: On-site occupational health service provision in the aquaculture and post-harvest sector.

Occupational Health Activity	Aquaculture N = 54	Post Harvest N = 79	TOTAL
Occupational health service on-site	27/54 (50%)	42/79 (53%)	69/133 (52%)
Medical surveillance program	27/53 (51%)	41/79 (52%)	68/132 (52%)
Industrial hygiene program	3/51 (6%)	8/75 (11%)	11/126 (9%)
Work-related symptoms/ailments reported in the past year	14/53 (26%)	24/80 (30%)	38/133 (29%)
No. of workplace who indicated that workers left workplace*	2/50 (4%)	7/80 (9%)	9/130 (7%)

* Average of 2 ± 1 workers left per workplace

(5) Incidence* of work related allergies

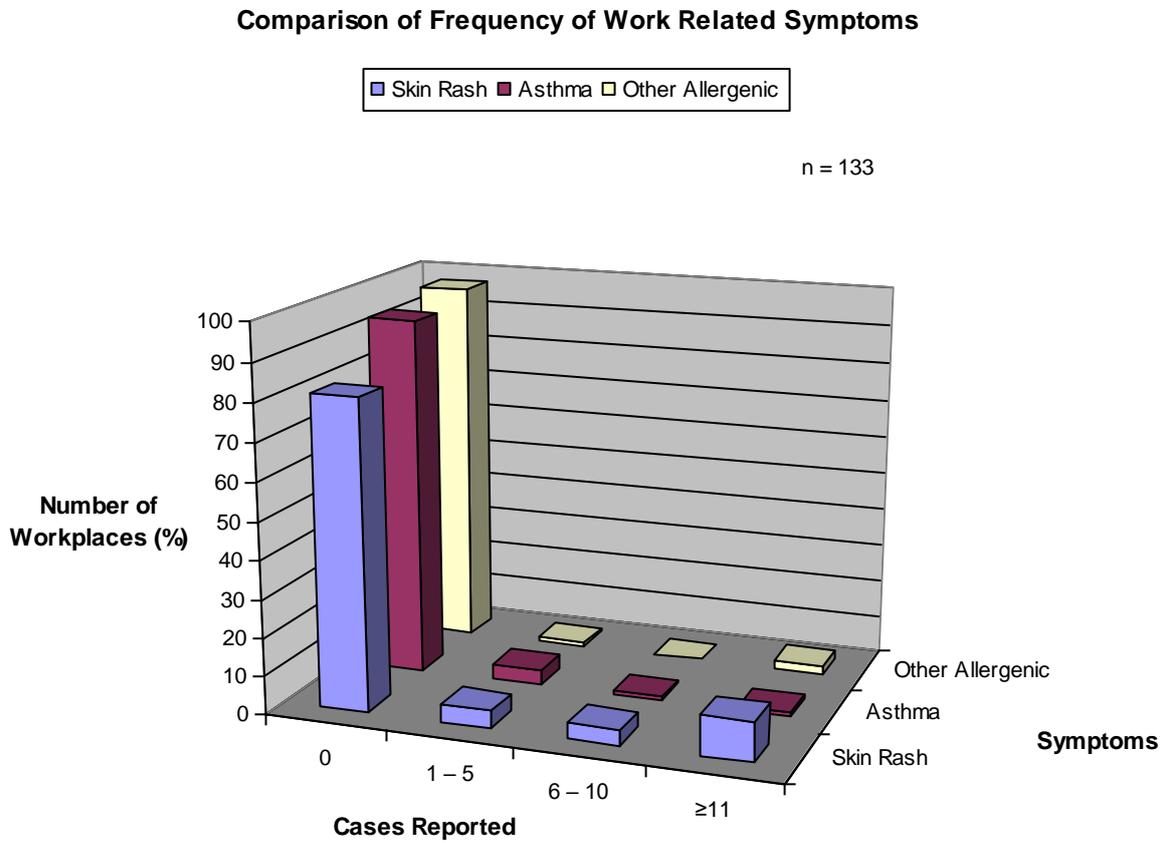
The proportions of work-related symptoms reported are presented in Table 6 and Figure 3. Skin rash accounted for 80.5% of all reported health problems, asthmatic symptoms for 10.3%, and other non-specific allergic symptoms (e.g. rhinitis and rhinoconjunctivitis) a further 9.3%.

Table 6: Proportion of work-related symptoms (n = 87)

	Proportion (%)
Skin	70/87 (80.5%)
Asthma	9/87 (10.3%)
Other (eg. rhinitis, conjunctivitis)	8/87 (9.2%)

Most workplaces reported the annual prevalence of work-related allergic symptoms to be less than 5%. However, the annual prevalence of work-related symptoms reported per workplace was substantially higher for skin than for asthmatic symptoms. Skin symptoms of more than 5% were reported by 14.5% as compared to asthma (2%) and other symptoms (2%). Workers had left due to work-related allergic problems in 9 (7%) of the 133 reporting workplaces.

Figure 3 : Annual Frequency of common work-related symptoms reported by seafood processing workers.



CONCLUSIONS

1. Despite the poor response rate to this survey, it is evident that there is a significant incidence of work related allergies in the seafood industry.
2. The trends mirror those observed in more extensive surveys done overseas such as in South Africa.
3. The most common type of seafood type handled were molluscs, mainly oysters (56%), crustaceans, mainly prawns (47%) and finfish (34%).
4. The size of the workforce was related to the provision of occupational health services, the larger workforces having a higher provision than smaller ones. Approximately 50% of workplaces in both aquaculture and post harvest sectors reported programs for on site occupational health services and medical surveillance, whilst only about 10% had an industrial hygiene program in place.
5. The number of workplaces reporting work-related allergic health problems in the past year was fairly uniform at about 30% in both sectors. Not surprisingly the incidence of reported work-related symptoms mirrored the provision of on site occupational health services.
6. The main form of allergy reported was urticaria (skin rashes). This is not surprising, as the skin is in contact with the product in a wet environment very frequently during handling and processing. Many seafood species have rough skin, spines etc. that can cause abrasions and sometimes pierce the skin of the workers. This exposes the immune system to a wide variety of foreign proteins.
7. Work-related asthma also figures in the list of allergies. There are numerous references to the presence of airborne seafood allergens in the literature from such sources as cutting with a band saw, blowing out the gut cavity with compressed air and cooking, and this exposes the respiratory pathways to the allergens causing asthma, rhinitis etc.

RECOMMENDATIONS

Employers have a duty of care to protect the health and safety of their employees. In the case of allergies, the best form of protection is avoidance of contact with the allergen. Several steps could be taken to achieve this.

- Education of management and workers to enable them to recognise an allergic response. This might be done with fact sheets and/or posters.
- Instituting industrial hygiene and medical surveillance programs (focussing on skin and lungs) through the provision of occupational health services especially in small and medium sized enterprises in the post harvest sectors of the industry.
- Instigation of surveillance and reporting systems to identify when a problem is occurring, focussing especially on the oyster and mussel processing plants that appear to form a large proportion of activities.
- Introducing workplace controls such as the provision of local exhaust extraction systems and protective clothing where this is practical.
- Moving workers with early allergic symptoms to areas of low/no exposure to prevent them from developing further complications.

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APPENDIX 1 - DEFINITIONS

Occupational health services – services provided by the employer of a workplace aimed at protecting and promoting workers' safety, health and well-being and improving working conditions and the working environment. The International Labour Organisation defines *occupational health services* as "services entrusted with essentially preventive functions and responsible for advising the employer, the workers and their representatives in the undertaking, on the requirements for establishing and maintaining a safe and healthy working environment which will facilitate optimal physical and mental health in relation to work the adaptation of work to the capabilities of workers in the light of their state of physical and mental health"

Industrial hygiene program – program responsible for the identification, evaluation and control of workplace hazards eg. dust, noise, chemicals, bioaerosols (e.g. allergens) in the workplace environment that may pose a risk to workers' health.

Industrial hygiene is the science of protecting the health of employees through control of exposures in the work environment. In other words, it is primarily concerned with the prevention and control of occupational health hazards that arise during work.

Medical surveillance – medical surveillance is the process of evaluating the health of workers as it relates to their potential occupational exposures to hazardous agents (e.g. allergens) and the presence of an occupational disease (e.g. occupational allergies such as occupational asthma, urticaria, rhino-conjunctivitis). It is also used to assess the adequacy of protective measures as well as the overall health of workers through regular medical examinations.

Aqua-activities – based on the affirmative responses received to the question relating to types of production processes employed by both aquaculture and post-harvest workplaces, the following activities were grouped together due to the small number of responses: growing, hatchery, harvesting and farming.

APPENDIX 2 - SURVEY

Questionnaire for the study of seafood allergies in the Australian Seafood Industry- 2003

Study No.

Name of Company: _____

Contact Person: _____

Position: Occupational health officer
 Health and safety/risk control officer
 Human Resources Department
 Manager
 Other (specify _____)

Address: _____

Telephone: (____) _____ Fax: (____) _____

E-Mail: _____

1. Please indicate types of seafood/s processed (more than one if necessary):

Prawn/Shrimp Lobster
Abalone Finfish (indicate type)

Squid/Octopus Other (specify)

2. Please indicate the types of production process/s involved:

Cooking/boiling Filleting Canning
Gutting Freezing/Thawing Drying/Smoking
Other (specify)

3. Please indicate number of employees:

Permanent _____ Seasonal _____

Male

Female

Total

4. Do you have an occupational health and safety officer at your workplace?
Yes
No

5. Is there an occupational health and safety programme in place to monitor the health of your employees?
Yes
No

6. Has an employee/s ever complained of work-related allergy type symptoms?
e.g. asthma/breathing difficulties/skin rash/other allergy
Yes
No

7. If yes, please indicate in the box the number of workers in the past 12 month
Asthma Skin Other allergy

8. Has an employee/s ever left the company due to asthma/skin rash/other allergy?
If yes please indicate in the box the number of workers (in the past 5 years).

9. Is there an industrial health and safety programme that evaluates exposure to seafood allergies?
Yes
No

THANK YOU! (Please note all individual information will be treated as confidential)

APPENDIX 3

Draft manuscript of a paper for submission to *Seafood Australia*

Occupationally Related Allergies in the Seafood Industry

S. J. Thrower, A.L. Lopata and M. F. Jeebhay

Abstract

Survey forms sent nationally to over 800 companies listed in the “post-harvest” and “aquaculture” sectors of the database of the Australian Seafood Industry Directory on the provision of occupational health services and the prevalence of allergic health problems drew 140 responses. The key findings of this survey were:

- About half of the workplaces provided an on-site occupational health service and conducted some form of medical surveillance program.
- There was a positive trend between the size of an operation and provision of an occupational health program.
- Only 9% of workplaces operated an industrial hygiene program.
- The most common form of allergy experienced was urticaria (skin rashes) followed by asthma, rhinitis and rhino conjunctivitis. These results are in agreement with more extensive studies done overseas.
- It is suggested that an awareness program be instituted to alert management and workers to the possibility of allergies, and appropriate avoidance procedures be instituted.

Seafood is a risky business

Employers owe a duty of care to protect the health and safety of their employees in the workplace. Working with seafood can be a risky business, especially for those in the catching sector. Activities such as abalone diving and trawling in comparatively small boats can expose fishers to immediate physical danger, and systems of licensing with the associated training etc. have developed to reduce the risks. Similar precautions are taken ashore, such as teaching people to operate machinery, lift boxes correctly etc. to minimise the risks of accidents.

A less recognised hazard in the seafood industry is the development of allergies from exposure to seafood, yet this should be included in workplace health and safety (OHS) assessments. There is a dearth of published information on the prevalence of occupationally related allergies in the Australian seafood industry. This paper reports on a survey supported by Seafood Services Australia Ltd and DPI Queensland into occupationally related allergies and the provision of (OHS) measures to avoid them. The survey was patterned on a much larger study done in South Africa, which allowed us to use the established methodology and facilitated a comparison of results.

Before proceeding to the results of the survey, it is useful to describe the mechanisms involved in the allergic response and the paths of exposure to allergens in the occupational setting.

What is an allergy?

An allergy is a malfunction in the defensive reaction of the body's immune system to exposure to foreign agents, usually proteins, referred to as antigens or allergens. When allergens enter the body, they trigger mechanisms that seek to isolate and destroy these “invaders”. Often this is done in a quiet, controlled way and we are hardly aware of the battle that is going on inside us. Sometimes however, if the

individual has been sensitised by earlier contact with the allergen, the battle can be more vigorous, employing strong chemical agents that can cause acute discomfort, and triggering severe physiological reactions that can even result in death.

There are a number of different lines of defence in the immune system. B cells, which originate in the bone marrow, are involved in allergies. On contacting an invading allergen, B Cells react by turning themselves into microscopic factories manufacturing millions of proteins called antibodies. These are “Y” shaped molecules with a site on the tip of each arm of the Y (the *epitope*) being customised to bind to a site on the allergen.

The antibody involved in development of allergies is called immunoglobulin type E or IgE. Its original role was to defend against parasites such as flukes and ringworms. The stem of the Y becomes embedded in the outer membrane of specialised cells called Mast cells, which guard the points of entry to the body, namely the gut, the nose and the bronchi.

Each Mast cell is densely packed with granules containing at least 10 lethal chemicals (mediators) designed to attack the allergens and mobilise physiological responses intended to destroy and expel them. The Mast cell behaves like a naval mine with its surface covered with protruding IgE molecules. An allergen binding to two adjacent IgE epitopes on a Mast cell triggers the cell to rupture, releasing the granules with their chemicals to attack the allergen.

Some of the physiological responses elicited by mediators include dilation and increased porosity of blood vessels leading to inflammation and swelling in the affected tissue, and contraction of the smooth muscles of the autonomic system in an effort to “flush out” the allergens.

An allergic reaction occurs when a benign allergen, usually a protein, mistakenly triggers the immune response. In the initial contact, there may be a mild reaction due to degranulation of some Mast cells, but the system is now sensitised. Subsequent exposure to the allergen, may result in a massive, uncontrolled immune response, releasing large amounts of mediators etc. that can produce reactions throughout the body. This can result in symptoms varying from minor skin irritation such as rashes and hives to a violent, life threatening systemic reaction called anaphylactic shock.

What are the agents that cause occupational seafood allergies?

Although this survey did not attempt to identify the allergenic agents associated with allergies, the nature of some of the material that causes allergies in seafood workers has been identified in the literature (Jeebhay *et al.*, 2001). High molecular weight proteins cause almost all seafood allergies. These enter the body in a number of forms.

Aerosols

Analysis of the particulate matter in aerosols created during crustacean processing found fragments of exoskeleton, muscle protein, internal organs, and background material including salt crystals, cellulose, synthetic fibres, silicates and pigment constituents. These particles were irregularly shaped and 30% were in the respirable range (< 5 microns).

Processing techniques that generate dry aerosols such as cracking crab shells, bagging fish meal and blowing carcasses of finfish clean with compressed air,

generate more aerosol particulates than wet processes that use high pressure water for washing, cleaning etc.

Fish juice

Analysis of fish juice associated with skin rashes found biogenic amines, digestive enzymes and high molecular weight proteins (possibly denatured). Allergenicity is exacerbated by deterioration after death, storage of fish on ice for several days resulted in increase in high molecular weight allergens.

Parasites

As noted above, defence against parasites is a major function of IgE. Marine parasites such as *Anisakis simplex* and other pathogenic organisms will naturally provoke an immune response that may lead to an allergic reaction in some individuals (Purello-D'Ambrosio *et al.*, 2000).

What are the most common routes of exposure to occupational allergies?

In general, most food related allergies are caused by ingestion of the allergen. In an occupational context however, there are three paths of exposure to allergens, inhalation, injection and dermal contact (Table 1).

Inhalation occurs when the allergen is breathed in as an aerosol, exposing the respiratory pathways and lungs. Seafood production is a “wet” occupation, and a number of handling and processing operations can cause aerosol formation. When allergenic material has been inhaled, it can contact Mast cells in the mouth, nose, bronchi and lungs, triggering an immune response.

Injection of an allergen can occur when the skin is punctured. Many sea creatures have hard, sharp spines, which protect them from predators. These can easily puncture an unprotected hand, opening a pathway into the bloodstream that can then carry the allergen around the body triggering immune responses.

Dermal contact can trigger an allergy without actually piercing the skin of the operator. The skin of some fish is quite rough and may abrade the skin, which can set up a reaction that results in a rash developing.

Often symptoms will appear near the points of entry of the allergen, but this is not always the case, as some symptoms can be the result of a more generalised systemic reaction. Dermatological symptoms such as hives and rashes can be caused not only by skin contact with fish juice, but also by inhalation of allergenic aerosols, whilst asthma can be caused by a number of pathways of exposure. This can often make the identification of the source of the allergy and measures to eliminate it difficult.

Table 1 Occupational exposure to seafood allergens.

Category	Technique	Form of exposure
Crustaceans	Cooking	Inhalation of aerosols & particles
Prawns	Cracking	Injection from spiking
Lobsters	Blowing	Dermal contact

Crabs
Fresh Water Crays

Scrubbing
Grinding
Cleaning
Grading

Molluscs

Oysters
Abalone
Cephalopods
Mussels & clams

Washing
Shucking
Cutting

Inhalation of aerosols
Dermal contact

Finfish

Many species

Heading & gutting
Skinning
Cooking
Milling & bagging
Mincing
Washing

Inhalation of aerosols
Dermal contact
Injection by spikes

Results of the Australian survey

The survey was designed to estimate not only the incidence of allergies, but also the measures in place to protect the workers' health and well being. It examined such factors as:

- The types of species handled
- The size of the operation.
- The appointment of a designated OHS officer.
- A medical surveillance system to track the health of workers.
- The frequency of reports of allergies amongst the workers.
- The type of symptoms reported.
- Any workers who had left their jobs due to allergies.

Survey forms were sent to all the companies listed in database of the Australian Seafood Industry Directory under the classifications "Post Harvest" and "Aquaculture". This meant that over 800 companies were sent the forms. Follow up phone calls were made to those who did not reply to maximise the response. In all there were 140 responses, 85 from the post harvest sector, and 55 from the aquaculture sector. Unfortunately, not all respondents answered all questions

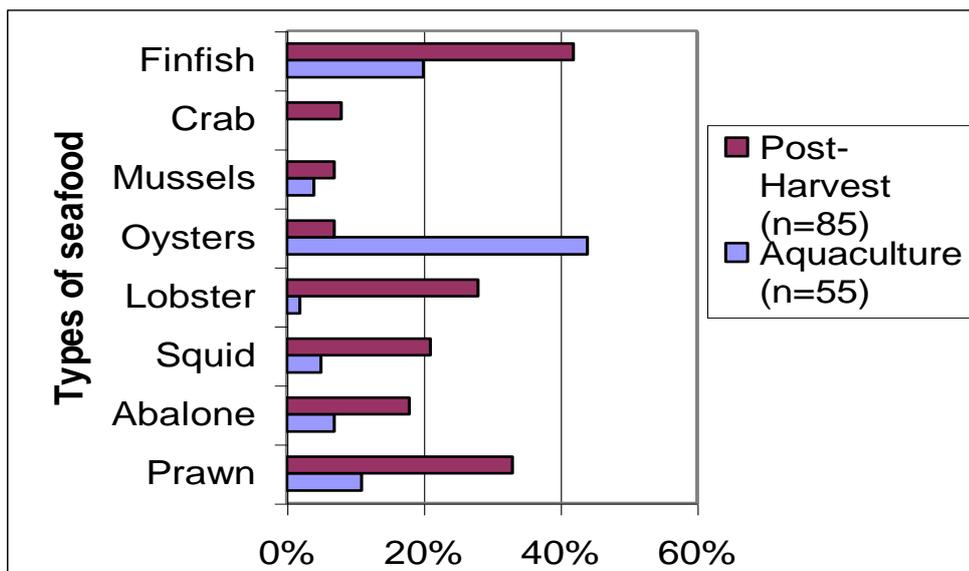
Despite the low response rate, there was sufficient data to show trends that could be compared to those found in larger surveys overseas, and confirm that the pattern in Australia is similar.

Species handled

Most species are processed by the "post-harvest" sector except for oysters, which were reported to be mainly processed in the aquaculture group (Figure 1). The most common type of seafood handled was finfish (34%), followed by prawns (24%), and the least commonly processed seafood type was reported as crab (5%). Dividing the seafood species into the three marine phyla, one observes that finfish is the least

processed group (34%), followed by crustaceans (47%) and the most commonly processed group were the molluscs with 56% processed.

Figure 1: .Distribution of types of seafood handled by the seafood industry. Results are given as percentage of responding workplaces (n=140), stratified by industry category.



Provision of Health Services

Responses to the questions on provision of health services were received from 130 companies. These are summarised in Table 2. There was a clear trend that the larger companies were more responsive to the need for workplace health and safety. This was reflected in the higher reporting of work related illness. A comparison between the post harvest and the aquaculture sectors showed that the level of awareness of both sectors was similar (Table 3).

Table 2. Provision of occupational health services by size of workplace

OHS Activity size	Number and percentage of workplaces by size		
	Small	Medium	Large
Workplace size distribution			
Total	n=41	n=78	n=11
n=130			
OHS service on site (52%)	12 (29%)	46 (59%)	9 (82%)
	67		

Medical Surveillance (50%)	17 (41%)	43 (55%)	5 (45%)	65
Industrial Hygiene (9%)	6 (15%)	4(5%)	1 (9%)	11
Work related symptoms In past year (28%)	8 (20%)	25 (32%)	4 (36%)	37
Workers quit due To illness (7%)	0	6 (8%)	3 (27%)	9

Note: small = 0-4 workers, medium 5-49 workers, large = 50-200 workers

Table 3 On-site occupational health service provision in the aquaculture and post-harvest sectors.

OHS ACTIVITY	Aquaculture N= 54	Post harvest N = 79	Total N = 133
Occupational health service on-site	27/54 (50%)	42/79 (53%)	69/133 (52%)
Medical surveillance programme	27/53 (51%)	41/79 (52%)	68/132 (52%)
Industrial hygiene programme	3/51 (6%)	8/75 (11%)	11/126 (9%)
Work-related symptoms/ailments reported in the past year	14/53 (26%)	24/80 (30%)	38/133 (29%)
No. of workplace indicated that workers left workplace*	2/50 (4%)	7/80 (9%)	9/130 (7%)

*Average of 2 ± 1 workers left per workplace

Type of allergies

The allergy symptoms reported in the survey summarised in Table 4 show that most allergies are skin related. This suggests that many of these are caused by dermal contact, although the expression of symptoms does not always reflect the route of exposure. The propensity to allergy can be a very individual reaction. Some people are known to be atopic, that is they have an underlying predisposition to allergy that is manifest in different ways, for example ingestion of an antigen may result in a skin rash in one person and an asthma attack in another.

Table 4 Proportion of work-related allergic symptoms (n = 87)

	Proportion (%)
Skin	70/87 (80.5%)
Asthma	9/87 (10.3%)
Other (eg. rhinitis, conjunctivitis)	8/87 (9.2%)

The prevalence of occupationally related asthma (10.3%) is in the range reported in the literature (2%-36%, average 10%). One study related the allergy to infestation with the parasite *Anisakis simplex* (Purello-D'Ambrosio *et al.*, 2000)

Literature reports of skin allergies from seafood distinguish between irritation caused by contact with fish juice, meat, skin etc. and IgE related protein contact dermatitis and urticaria, which is more chronic and results from sensitisation from repeated exposure. Skin integrity and an atopic predisposition are important factors in these latter conditions.

Recommendations for preventing allergies

Employers have a duty of care to protect the health and safety of their employees. In the case of allergies, the best form of protection is avoidance of contact with the antigen. Several steps could be taken to achieve this.

- Education of management and workers to enable them to recognise an allergic response. This might be done with fact sheets and/or posters.
- Points in the production process where exposure to allergens may occur should be identified in the HACCP plans and monitored.
- Instituting industrial hygiene and medical surveillance programs (focussing on skin and lungs) through the provision of occupational health services, especially in small and medium sized enterprises in the post harvest sectors of the industry.
- Instigation of surveillance and reporting systems to identify when a problem is occurring.
- Introducing workplace controls such as the provision of local exhaust extraction systems and protective clothing where this is practical.
- Moving workers with early allergic symptoms to areas of low/no exposure to prevent them from developing further complications.

Definitions

Occupational health services – services provided by the employer of a workplace aimed at protecting and promoting workers' safety, health and well-being and improving working conditions and the working environment.

The International Labour Organisation defines '*occupational health services*' as services entrusted with essentially preventive functions and responsible for advising the employer, the workers and their representatives in the undertaking, on the requirements for establishing and maintaining a safe and healthy working environment which will facilitate optimal physical and mental health in relation to work the adaptation of work to the capabilities of workers in the light of their state of physical and mental health"

Industrial hygiene program – program responsible for the identification, evaluation and control of workplace hazards eg. dust, noise, chemicals, bioaerosols (e.g. allergens) in the workplace environment that may pose a risk to workers' health.

Industrial hygiene is the science of protecting the health of employees through control of exposures in the work environment. In other words, it is primarily concerned with the prevention and control of occupational health hazards that arise during work.

Medical surveillance – medical surveillance is the process of evaluating the health of workers as it relates to their potential occupational exposures to hazardous agents (e.g. allergens) and the presence of an occupational disease (e.g. occupational allergies such occupational asthma, urticaria, rhino-conjunctivitis). It is also used to

assess the adequacy of protective measures as well as the overall health of workers through regular medical examinations.

Aqua-activities – based on the affirmative responses received to the question relating to types of production processes employed by both aquaculture and post-harvest workplaces, the following activities were grouped together due to the small number of responses: growing, hatchery, harvesting and farming.

***Rhinitis* - Allergens (eg pollen) trigger mast cells in the nose and eyes to produce mediators that inflame membranes resulting in red itchy eyes and/or runny nose. Can also affect ears – itchy or “glue” ear (blocked Eustacean tubes). Can also be triggered by some foods eg yeast.**

Urticaria - Mast cells in the lower layers of the skin degranulate, releasing mediators that cause the tiny capillaries to become leaky. This allows serum to seep into the skin, producing swellings and itchiness (hives and nettle-rash).

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