Advancing the Aquaculture Agenda
Paris, 15th – 16th April 2010
‘Managing Risk and Uncertainty’
Tom Rutter
Head of Aquaculture
Sunderland Marine Mutual Insurance Ltd

INTRODUCTION
Forget that we are Insurers; we are all Risk Takers

Credentials

- A mutual insurer established 1882
- Specialising in marine and aquaculture
- Insuring aquaculture risks since 1986
- A survey database of 6,000 site specific risk reports, risk scales and beacons.
- Clientele includes the David’s and the goliaths eg Marine Harvest
- Risk Management
Regional Offices - exporting the Company’s philosophy around the world

Senior management within many of these offices originate from, and were trained, in the North East of England.

SMMI insure Marine and Aquaculture risks in 55 countries worldwide

- Marine
- Aquaculture & Marine
Nidderdale - UK

Akua-Dem - Turkey

North Atlantic Sea Farms – Canada East

Grieg Seafoods – Canada West

Cooke Aquaculture - Canada East

Tuna Graso Cartagena - Spain

Ocean Wave Seafoods – Australia

Sea Bait - Northumberland
Species Diversification

Atlantic Salmon  
Halibut  
Barramundi  
Yellow Perch  
Eel  
Blue Fin Tuna  
Yellow Fin Tuna  
Rag Worm  
Flounder  
Rainbow Trout  
Brown Trout  
Lugworm

Abalone  
Haddock  
Cod  
Pearl Oyster  
Bass & Bream  
Tilapia  
Oyster  
Mussels  
Arctic Charr  
Snapper  
Lobsters

Claims View
Aquaculture Division

Provision of Aquaculture Insurance and Risk Management Services

- Insurer: Global
- Capital Insured: $906m
- Sites: 454
- No. of species: 23

Formed in 1986
Coverage – “All Risks” As standard
Unique Risk Management Sector
RISK AND UNCERTAINTY

Geographical Underwriting Methodology

- Risk Identified
- Risk Categorized
- Extreme/Major/Minor

- Portfolio loss data
- Geocoding
- Analyses Modelling Scenarios
- Risk-adequate action
Industry Losses

Aquaculture Claims By Cause as an Accumulated % of the Sum Insured


Total Claims

Disease 0.00% 0.05% 0.10% 0.15% 0.20% 0.25% 0.30% 0.35% 0.40% 0.45%
Algal Bloom 0.00% 0.05% 0.10% 0.15% 0.20% 0.25% 0.30% 0.35% 0.40% 0.45%
Weather 0.00% 0.05% 0.10% 0.15% 0.20% 0.25% 0.30% 0.35% 0.40% 0.45%
Cage Damage 0.00% 0.05% 0.10% 0.15% 0.20% 0.25% 0.30% 0.35% 0.40% 0.45%
Disease 0.00% 0.05% 0.10% 0.15% 0.20% 0.25% 0.30% 0.35% 0.40% 0.45%
Jellyfish 0.00% 0.05% 0.10% 0.15% 0.20% 0.25% 0.30% 0.35% 0.40% 0.45%
Net Failure 0.00% 0.05% 0.10% 0.15% 0.20% 0.25% 0.30% 0.35% 0.40% 0.45%
Physical Damage 0.00% 0.05% 0.10% 0.15% 0.20% 0.25% 0.30% 0.35% 0.40% 0.45%
Predation 0.00% 0.05% 0.10% 0.15% 0.20% 0.25% 0.30% 0.35% 0.40% 0.45%
Water Quality 0.00% 0.05% 0.10% 0.15% 0.20% 0.25% 0.30% 0.35% 0.40% 0.45%

Top 5 Claims by Country (Value)

1997 2002 2007
Ireland  UK  Chile
UK  Canada  Spain
Chile  Norway  UK
Spain  Chile  Norway
Australia Australia Ireland
MANAGING THE UNCERTAINTY

G.I.S. - GEO Coding

Canadian West Aggregation Areas

Value (CAN $)

<table>
<thead>
<tr>
<th>Aggregational Areas</th>
<th>Value (CAN $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ocean Falls</td>
<td>20,000,000</td>
</tr>
<tr>
<td>Esperanza Inlet</td>
<td>30,000,000</td>
</tr>
<tr>
<td>Queen Charlotte Strait</td>
<td>40,000,000</td>
</tr>
<tr>
<td>Bushholz Channel</td>
<td>50,000,000</td>
</tr>
<tr>
<td>Hankin Ridge</td>
<td>60,000,000</td>
</tr>
<tr>
<td>Hardwicke Island</td>
<td>70,000,000</td>
</tr>
<tr>
<td>Quadra Island</td>
<td>80,000,000</td>
</tr>
<tr>
<td>Deer Passage</td>
<td>90,000,000</td>
</tr>
<tr>
<td>Jervis Inlet</td>
<td>100,000,000</td>
</tr>
<tr>
<td>Russel Channel</td>
<td>110,000,000</td>
</tr>
<tr>
<td>Cowichan Bay</td>
<td>120,000,000</td>
</tr>
<tr>
<td>Fidalgo Island</td>
<td>130,000,000</td>
</tr>
<tr>
<td>Port Angeles</td>
<td>140,000,000</td>
</tr>
</tbody>
</table>
Satellite Exposure Mapping

Oceanview

3-D image of Grand Manan Island
Principles of GIS - Thematic Layer Model

Themes & Scales

Exposure data

Tornado

Lightning

Hailstorm

Flood

P.M.L. Scenario Analysis

Storm extreme
Modelling winter storms in Norway - Storm scenario of 1992

As if - Scenario Storm ’92
Losses:
- 540 Mio. NOK
- 70 Mio. EUR
- 40 Mio. GBP

Price Graphs

Fresh Atlantic salmon cross-section

Price (EUR/kg) vs. Week (1-52)

Legend:
- 2000
- 2001
- 2002
- 2003
- 2004
- 2005
- 2006
- 2007
Spanish Farmed Tuna

PML Analysis

- Algorithm determines the event location to produce the largest loss
- Systematically places the event in a large number of locations relative to each site & computes event loss
- 15 largest losses presented considering the specified min. event separation
Aerial and satellite imagery

Socioeconomic data

Hazard data

Insurance data (liabilities distribution)

GIS technology

Geocoding-tools (e.g. GPS)

Claims and event information

Improved risk transparency

<table>
<thead>
<tr>
<th>Post code</th>
<th>Number of risks</th>
<th>Sum Insured (EUR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>300</td>
<td>43,012,000</td>
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<tr>
<td>11</td>
<td>250</td>
<td>63,109,000</td>
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<tr>
<td>12</td>
<td>300</td>
<td>67,312,000</td>
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<tr>
<td>13</td>
<td>300</td>
<td>72,412,000</td>
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<tr>
<td>14</td>
<td>250</td>
<td>77,512,000</td>
</tr>
<tr>
<td>15</td>
<td>250</td>
<td>82,612,000</td>
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Fishfarm Information System (FIS)
A chronic minor problem could aggregate to a major problem i.e. frequency and severity.
For nearly 24 years our dedicated team of Underwriters, Marine Biologists and Aquaculture Specialists have worked together to provide Insurance and integrated Risk Management to the worldwide Aquaculture Industry.
<table>
<thead>
<tr>
<th>Year</th>
<th>Company</th>
<th>Sum Insured</th>
<th>Gross Loss</th>
<th>Ratio</th>
<th>Saving</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>Company X</td>
<td>$30.3m</td>
<td>$268,793</td>
<td>0.89%</td>
<td>$1,173,817</td>
</tr>
<tr>
<td></td>
<td>Company X</td>
<td>$104.8m</td>
<td>$2,106,537</td>
<td>2.01%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Company X Risk Managed</td>
<td>$104.8m</td>
<td>$932,720</td>
<td>0.89%</td>
<td>$1,173,817</td>
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<tr>
<td>2004</td>
<td>Company X</td>
<td>$30.8m</td>
<td>$110,591</td>
<td>0.36%</td>
<td>$3,656,412</td>
</tr>
<tr>
<td></td>
<td>Company X</td>
<td>$104.3m</td>
<td>$4,031,892</td>
<td>3.87%</td>
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<tr>
<td></td>
<td>Company X Risk Managed</td>
<td>$104.3m</td>
<td>$375,480</td>
<td>0.36%</td>
<td>$3,656,412</td>
</tr>
<tr>
<td>2005</td>
<td>Company X</td>
<td>$28.6m</td>
<td>$504,600</td>
<td>1.76%</td>
<td>$3,374,048</td>
</tr>
<tr>
<td></td>
<td>Company X</td>
<td>$106.5m</td>
<td>$5,248,448</td>
<td>4.93%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Company X Risk Managed</td>
<td>$106.5m</td>
<td>$1,874,400</td>
<td>1.76%</td>
<td>$3,374,048</td>
</tr>
</tbody>
</table>
Proactive Schemes

• Natural blooms of algae and jellyfish is a global problem leading to mortality of stocks by toxic insult, depleted oxygen levels or jellyfish stings

• SMMI & ARM Ltd fund and are actively involved with a pilot project on the West Coast of Scotland to monitor algae levels in the sea

• Liaison is maintained with aquaculture companies, government agencies and other stakeholders such as Scottish Office, SAMS, CAIA, FAO

• The buoy collects real-time data validated by additional monitoring from fish farm staff to assist in the prediction of harmful bloom situations

Algal Bloom/DO Mitigation
Severe Category 5 Cyclone Vance batters Western Australia

The eye of severe TC Rosita over the coast 40 km south of Broome
TC Ingrid – 25th July 2004

[Image of a beach scene with ships docked and a clear blue sky]

TC Ingrid – 25 July 2004

[Image of a sandy beach with a wooden cross and debris]

Sunderland Marine
Mutual Insurance Company Limited
Lessons Learned

- Importance of infrastructure both physical and procedural
- Importance of capital providers and access to finance
- Data collection and collation (including industry wide losses)
- Long term and global experience
- Be fearful when people are greedy and be greedy when people are fearful
- Take full advantage of insurance and risk management experience. Important, (always expensive) lessons have been learned on risk minimisation and loss avoidance
- “Best Practice” should not remain theoretical but must be put in to practice indeed become embedded in the companies psyche.
- Biosecurity is essential
- Discriminate between high and low risk operations
  - Identify, quantify, evaluate and action
  - Focus limited resources on what is important
  - Disease, Bloom and Equipment Best Practice

Future Challenges

- Short memories - succession planning
- Low stress regime
- Sea Lice
- PD – until recently
- State sponsored/subsidised
- Licensing of treatments – too slow?
- Bio-security and Area Management Schemes
- Low stress regimes compete with commercial considerations
- Risk knowledge empowers management but are the means available, desirable or affordable?
- The industry’s challenge is to continually earn the support it deserves.