ICES advice for 2012

cod-haddock-whiting-plaice-sole
hake-anglerfish-megrim-Nephrops

North Western Waters RAC

5 July 2011 – Dublin

Manuela Azevedo
ACOM Vice-chair
Celtic Sea & West, Southwest Ireland
- Cod (VII-e-k)
- Haddock (VII-b-k)
- Whiting (VII-e-k)
- Anglerfish (II-a, III-a, IV, VI)
- Megrim (IV-a-VI-a; VI-b)
- Saithe (IV, III-a, VI)
- Nephrops (FUs 14-15-19)

West of Scotland & Rockall (VIab)
- Cod (VI-a; VI-b)
- Haddock (VI-a; VI-b)
- Whiting (VI-a; VI-b)
- Anglerfish (II-a, III-a, IV, VI)
- Megrim (IV-a-VI-a; VI-b)
- Saithe (IV, III-a, VI)
- Nephrops (FUs 11-12-13)

Irish Sea (VIIa)
- Cod
- Haddock
- Whiting
- Plaice
- Sole
- Nephrops (FUs 14-15-19)

English Channel
- Cod (IV, VII-d, Skagerrak)
- Plaice (VII-d)
- Plaice (VII-e)
- Sole (VII-d)
- Sole (VII-e)
Advisory Committee (ACOM)
Approve draft advice; consistency assurance
(1 scientist from each of the 20 ICES member countries + chair & 4 vice-chair)

Advisory Drafting Group (ADG)
Draft the advice, based on the peer reviewed assessments
(scientists & reviewers)

Review Group (RG)
Review the work carried out by the EG; quality assurance & peer review
(scientists independent of the EG)

Expert Group (EG)
Assessment of the status of the fish stocks (scientists)

Advice Release
29 June 2011
Management Plan
Consistent PA & recognised as potential basis for advice by interested parties

No

ICES MSY framework
Transition

No

ICES PA framework

All options in Outlook Table for 2012
Same principles, concept & framework:

- Maximize long term average yield
- Safeguard against low SSB
- Stepwise transition to ICES MSY Harvest Control Rule by 2015

ICES MSY framework

Revisited in 2011: http://www.ices.dk/advice/icesadvice.asp
ICES MSY Transition

Moving from Current $F_{2010}$ to $F_{\text{MSY}}$ in 2015 in 5 steps

$F_{\text{MSY-HCR transition 2012}} = \text{"Minimum \{ 0.6 F(2010) + 0.4 F_{\text{MSY-HCR}(2012)}; F_{pa}\""} \}

$F_{\text{MSY-HCR transition 2013}} = \text{"Min\{0.4 F(2010) + 0.6 F_{\text{MSY-HCR}(2013)}; F_{pa}\""} \}

$F_{\text{MSY-HCR transition 2014}} = \text{"Min\{0.2 F(2010) + 0.8 F_{\text{MSY-HCR}(2014)}; F_{pa}\""} \}

$F_{\text{MSY-HCR transition 2015}} = \text{"Min\{0.0 F(2010) + 1.0 F_{\text{MSY-HCR}(2015)}; F_{pa}\""} \}

$F_{\text{MSY-HCR}}$
ICES MSY Transition does not apply when:

1) $F_{2011}$ below $F_{MSY}$ & $SSB_{2012}$ above $MSY B_{trigger}$
   F at $F_{MSY}$

2) $SSB$ is small, further decline predicted (low R)

more rapid transition
or
$F_{MSY-HCR}$ asap
## Stocks without population size estimates

<table>
<thead>
<tr>
<th></th>
<th>No Overfishing</th>
<th>Overfishing or Unknown Exploitation Status</th>
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</thead>
<tbody>
<tr>
<td><strong>Decreasing stock trend</strong></td>
<td>Reduce catch</td>
<td>Reduce catch</td>
</tr>
<tr>
<td><strong>Stable stock trend or No trend information</strong></td>
<td>Do not allow catches to increase</td>
<td>Do not allow catches to increase</td>
</tr>
<tr>
<td><strong>Increasing stock trend</strong></td>
<td>Do not allow catches to increase</td>
<td>Do not allow catches to increase</td>
</tr>
</tbody>
</table>

**Intended to move in the direction of MSY**

- **Catches are already very low:** *No increase in catch until there is evidence that this will be sustainable*
- **New stocks:** *catches should not be allowed to increase*
### Overview by species/stocks

<table>
<thead>
<tr>
<th>Stock</th>
<th>F&lt;sub&gt;MSY&lt;/sub&gt;</th>
<th>MSY B&lt;sub&gt;trigger&lt;/sub&gt;</th>
<th>Catch/Land 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cod West Scotland</td>
<td>0.19</td>
<td>22 000 t</td>
<td>lowest possible</td>
</tr>
<tr>
<td>Cod Rockall</td>
<td>nd</td>
<td>nd</td>
<td>no increase</td>
</tr>
<tr>
<td>Cod Celtic Sea</td>
<td>0.40</td>
<td>8 800</td>
<td>&lt; 10 000 t</td>
</tr>
<tr>
<td>Cod Irish Sea</td>
<td>0.40</td>
<td>10 000</td>
<td>0</td>
</tr>
<tr>
<td>Haddock WScotland</td>
<td>0.30</td>
<td>30 000 t</td>
<td>&lt; 10 200 t</td>
</tr>
<tr>
<td>Haddock Rockall</td>
<td>0.30</td>
<td>9 000</td>
<td>&lt; 3 300</td>
</tr>
<tr>
<td>Haddock VIIb-k</td>
<td>nd</td>
<td>nd</td>
<td>no increase; technical measures</td>
</tr>
<tr>
<td>Haddock Irish Sea</td>
<td>nd</td>
<td>nd</td>
<td>reduce; technical measures</td>
</tr>
</tbody>
</table>
### Overview by species/stocks

<table>
<thead>
<tr>
<th>Stock</th>
<th>$F_{MSY}$</th>
<th>MSY $B_{\text{trigger}}$</th>
<th>Catch/Land 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whiting WScotland</td>
<td>nd</td>
<td>nd</td>
<td>reduce; improve selection pattern in <em>Nephrops</em> fleet</td>
</tr>
<tr>
<td>Whiting Rockall</td>
<td>nd</td>
<td>nd</td>
<td>no increase</td>
</tr>
<tr>
<td>Whiting Celtic Sea</td>
<td>nd</td>
<td>nd</td>
<td>no increase; technical measures to reduce discard rates</td>
</tr>
<tr>
<td>Whiting Irish Sea</td>
<td>nd</td>
<td>nd</td>
<td>Reduce to lowest possible; technical measures to reduce discard rates</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Stock</th>
<th>$F_{MSY}$</th>
<th>$MSY B_{trigger}$</th>
<th>Catch/Land 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plaice SW Ireland</td>
<td>0.24</td>
<td>nd</td>
<td>reduce</td>
</tr>
<tr>
<td>Plaice W Ireland</td>
<td>nd</td>
<td>nd</td>
<td>no increase</td>
</tr>
<tr>
<td>Plaice Celtic Sea</td>
<td>nd</td>
<td>nd</td>
<td>reduce; technical measures</td>
</tr>
<tr>
<td>Plaice Irish Sea</td>
<td>nd</td>
<td>nd</td>
<td>no increase; tech measures</td>
</tr>
<tr>
<td>Plaice W Channel</td>
<td>0.19</td>
<td>2 400 t</td>
<td>&lt; 1 440 t</td>
</tr>
<tr>
<td>Plaice E Channel</td>
<td>nd</td>
<td>nd</td>
<td>no increase</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stock</th>
<th>$F_{MSY}$</th>
<th>$MSY B_{trigger}$</th>
<th>Catch/Land 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sole SW Ireland</td>
<td>0.31</td>
<td>nd</td>
<td>no increase</td>
</tr>
<tr>
<td>Sole W Ireland</td>
<td>nd</td>
<td>nd</td>
<td>no increase</td>
</tr>
<tr>
<td>Sole Celtic Sea</td>
<td>0.31</td>
<td>2 200 t</td>
<td>&lt; 1 060 t</td>
</tr>
<tr>
<td>Sole Irish Sea</td>
<td>0.16</td>
<td>3 100</td>
<td>&lt; 200</td>
</tr>
<tr>
<td>Sole W Channel</td>
<td>0.27</td>
<td>2 800</td>
<td>&lt; 740</td>
</tr>
<tr>
<td>Sole E Channel</td>
<td>0.29</td>
<td>8 800</td>
<td>&lt; 5 600</td>
</tr>
</tbody>
</table>
### Overview by species/stocks

<table>
<thead>
<tr>
<th>Stock</th>
<th>$F_{\text{MSY}}$</th>
<th>MSY $B_{\text{trigger}}$</th>
<th>Catch/Land 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hake – Northern</td>
<td>0.24</td>
<td>nd</td>
<td>&lt; 51 900 t</td>
</tr>
<tr>
<td>Angler VIIb-k &amp; VIIIabd</td>
<td>nd</td>
<td>nd</td>
<td>reduce</td>
</tr>
<tr>
<td>Angler IIa, IIIa, IV, VI</td>
<td>nd</td>
<td>nd</td>
<td>reduce</td>
</tr>
<tr>
<td>Megrim IVa, Vla</td>
<td>nd</td>
<td>nd</td>
<td>no increase</td>
</tr>
<tr>
<td>Megrim Rockall</td>
<td>nd</td>
<td>nd</td>
<td>no increase</td>
</tr>
<tr>
<td>Megrim VIIb-k &amp; VIIIabd</td>
<td>nd</td>
<td>nd</td>
<td>reduce</td>
</tr>
<tr>
<td>Pollack VI, VII</td>
<td>nd</td>
<td>nd</td>
<td>no increase</td>
</tr>
<tr>
<td>FU</td>
<td>HR ($F_{MSY}$)</td>
<td>MSY B$_{trigger}$</td>
<td>Catch/Land 2012</td>
</tr>
<tr>
<td>-------------</td>
<td>----------------</td>
<td>--------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>VI: 11 North Minch</td>
<td>12.5%</td>
<td>465 million</td>
<td>&lt; 3 200 t</td>
</tr>
<tr>
<td>12 Sout Minch</td>
<td>12.3</td>
<td>1 016</td>
<td>&lt; 5 500</td>
</tr>
<tr>
<td>13 Firth Clyde</td>
<td>16.4</td>
<td>579</td>
<td>&lt; 4 200</td>
</tr>
<tr>
<td>13 Sound of Jura</td>
<td>14.5</td>
<td>nd</td>
<td>&lt; 900</td>
</tr>
<tr>
<td>VII: 14 Irish Sea E</td>
<td>9.8</td>
<td>nd</td>
<td>&lt; 960</td>
</tr>
<tr>
<td>15 Irish Sea W</td>
<td>17.1</td>
<td>3 billion</td>
<td>&lt; 9 800</td>
</tr>
<tr>
<td>16 Porcupine</td>
<td>nd</td>
<td>nd</td>
<td>no increase</td>
</tr>
<tr>
<td>17 Aran Grounds</td>
<td>10.5</td>
<td>nd</td>
<td>&lt; 1 100</td>
</tr>
<tr>
<td>19 Ireland</td>
<td>nd</td>
<td>nd</td>
<td>reduce</td>
</tr>
<tr>
<td>22 Celtic Sea</td>
<td>10.9</td>
<td>nd</td>
<td>&lt; 2 300</td>
</tr>
<tr>
<td>20-21 Celtic Sea</td>
<td>nd</td>
<td>nd</td>
<td>reduce</td>
</tr>
</tbody>
</table>
West of Scotland & Rockall (Vla & Vlb)

- Cod
- Haddock
- Whiting
- Anglerfish
- Megrim
- Saithe
- Pollack
- Nephrops (FUs 11-12-13)
**Advice for 2012:** catches in 2012 should be reduced to the lowest possible

<table>
<thead>
<tr>
<th>F (Fishing Mortality)</th>
<th>2008-2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSY (F_{MSY})</td>
<td>Unknown</td>
</tr>
<tr>
<td>Precautionary approach (F_{PA}, F_{lim})</td>
<td>Unknown</td>
</tr>
<tr>
<td>Qualitative evaluation</td>
<td>Above poss. reference points</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>SSB (Spawning-Stock Biomass)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009 2010 2011</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>MSY (B_{trigger})</td>
</tr>
<tr>
<td>Below trigger</td>
</tr>
<tr>
<td>Precautionary approach (B_{PA}, B_{lim})</td>
</tr>
<tr>
<td>Below B_{lim}</td>
</tr>
</tbody>
</table>

\[ B_{lim} = 14 \quad \text{&} \quad \text{MSY} \quad B_{\text{trigger}} = 22 \text{ th t} \]

\[ F_{MSY} = 0.19 \]
Total mortality is **high**

SSB increased since 2006 (lowest) but remains well **below** $B_{\text{lim}}$

Recruitment **low** for many years
**Haddock in Division VIa (West of Scotland)**

**MSY:** Landings in 2012 no more than 10 200 t. The selection pattern should be improved in the Nephrops (TR2) fleet to reduce discards.

\[
\text{F (Fishing Mortality)}
\begin{array}{c|cc|c}
 \text{2008} & \text{2009} & \text{2010} \\
 \hline
 \text{MSY (F}_{\text{MSY}}) & & \\
 \text{Precautionary} & & \checkmark \\
 \text{approach (F}_{\text{pa},\text{F}}_{\text{lim}}) & & \\
 \hline
 \end{array}
\]

- At target
- Harvested sustainably

\[
\text{SSB (Spawning-Stock Biomass)}
\begin{array}{c|cc|c}
 \text{2009} & \text{2010} & \text{2011} \\
 \hline
 \text{MSY (B}_{\text{trigger}}) & & \\
 \text{Precautionary} & & \checkmark \\
 \text{approach (B}_{\text{pa},\text{B}}_{\text{lim}}) & & \\
 \hline
 \end{array}
\]

- Below trigger
- Reduced reproductive capacity

- MSY \(B_{\text{trigger}} = 30 \text{ t} \)
- \( F_{\text{MSY}} = 0.30 \)

**Landings**

- 2009 YC strong rel terms

**Recruitment (age 1)**

**Fishing Mortality**

- \( F_{\text{pa}} \)
- \( F_{\text{MSY}} \)

**Spawning Stock Biomass**

- \( B_{\text{lim}} \)
- \( B_{\text{pa}} \)
- \( F_{\text{MSY}} \text{trigger} \)

**MP under development**
Haddock in Division VIa (West of Scotland)

Discards 2010 – 51% (catch of 5 830 t)
Splitting discards by fleet shows that *Nephrops* vessels (TR2) are responsible for ~88% of all discards while landing only 21 tonnes, less than 1% of the total landings (2882 tonnes).
**Haddock in Division VIb (Rockall)**

**MSY:** Landings in 2012 should be no more than 3 300 t

<table>
<thead>
<tr>
<th>F (Fishing Mortality)</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSY (F&lt;sub&gt;MSY&lt;/sub&gt;)</td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Precautionary approach (F&lt;sub&gt;pa&lt;/sub&gt;, F&lt;sub&gt;lim&lt;/sub&gt;)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Below target</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harvest sustainably</td>
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<td></td>
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</table>

<table>
<thead>
<tr>
<th>SSB (Spawning-Stock Biomass)</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSY (B&lt;sub&gt;trigger&lt;/sub&gt;)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Precautionary approach (B&lt;sub&gt;pa&lt;/sub&gt;, B&lt;sub&gt;lim&lt;/sub&gt;)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Above trigger</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full reproductive capacity</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Catches**
- Landings
- Discards

**Recruitment (age 1)**

**Fishing Mortality**
- F<sub>pa</sub>
- F<sub>MSY</sub>

**Spawning Stock Biomass**
- B<sub>lim</sub>
- B<sub>pa</sub>
- MSY<sub>trigger</sub>

**MSY**
- B<sub>trigger</sub> = 9 th t
- F<sub>MSY</sub> = 0.30

**MP under development**
- Last years the **discards** are significantly reduced as a result of the small number of young haddock in the population: discard ratio ~ 47% (1991–2009) and 34% in the recent period (1999–2009); in 2010 ~8%
- Estimates of discards in the EU is a main uncertainty in the assessment and forecasts

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>MSY framework</strong></td>
<td>3.3</td>
<td>F_{MSY} (F_{08} *1.2)</td>
<td>0.30</td>
<td>4.0</td>
<td>9.6</td>
<td>-5%</td>
<td>-11%</td>
</tr>
<tr>
<td>Precautionary approach</td>
<td>3.8</td>
<td>B_{ps} (F_{08} *1.44)</td>
<td>0.36</td>
<td>4.6</td>
<td>9.0</td>
<td>-11%</td>
<td>+3%</td>
</tr>
<tr>
<td>Zero catch</td>
<td>0.0</td>
<td>F=0</td>
<td>0.00</td>
<td>0.0</td>
<td>13.7</td>
<td>+35%</td>
<td>-100%</td>
</tr>
<tr>
<td></td>
<td>0.7</td>
<td>F_{ps} *0.2</td>
<td>0.05</td>
<td>0.8</td>
<td>12.9</td>
<td>+27%</td>
<td>-82%</td>
</tr>
<tr>
<td></td>
<td>2.1</td>
<td>F_{0.1} (F_{08} *0.7)</td>
<td>0.18</td>
<td>2.6</td>
<td>11.1</td>
<td>+10%</td>
<td>-43%</td>
</tr>
<tr>
<td></td>
<td>2.4</td>
<td>F_{0.8}</td>
<td>0.20</td>
<td>2.9</td>
<td>10.8</td>
<td>+6%</td>
<td>-36%</td>
</tr>
<tr>
<td></td>
<td>2.7</td>
<td>F_{0.9}</td>
<td>0.23</td>
<td>3.2</td>
<td>10.5</td>
<td>+3%</td>
<td>-29%</td>
</tr>
<tr>
<td><strong>Status quo</strong></td>
<td>2.9</td>
<td>F_{ps}</td>
<td>0.25</td>
<td>3.5</td>
<td>10.2</td>
<td>+0%</td>
<td>-23%</td>
</tr>
<tr>
<td></td>
<td>3.2</td>
<td>-15% TAC (F_{08} *1.12)</td>
<td>0.28</td>
<td>3.8</td>
<td>9.8</td>
<td>-3%</td>
<td>-15%</td>
</tr>
<tr>
<td></td>
<td>3.7</td>
<td>0% TAC (F_{08} *1.4)</td>
<td>0.35</td>
<td>4.5</td>
<td>9.1</td>
<td>-10%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>4.2</td>
<td>F_{ps} (F_{08} *1.6)</td>
<td>0.40</td>
<td>5.1</td>
<td>8.6</td>
<td>-15%</td>
<td>+12%</td>
</tr>
<tr>
<td></td>
<td>4.3</td>
<td>+15% TAC (F_{08} *1.68)</td>
<td>0.42</td>
<td>5.2</td>
<td>8.4</td>
<td>-17%</td>
<td>+15%</td>
</tr>
<tr>
<td></td>
<td>4.9</td>
<td>F_{08} *2.0</td>
<td>0.50</td>
<td>6.0</td>
<td>7.7</td>
<td>-24%</td>
<td>+30%</td>
</tr>
</tbody>
</table>

Weights in '000 tonnes.
**Whiting in Division VIa (West of Scotland)**

**MSY:** Catches in 2012 should be reduced. The selection pattern should be improved in the *Nephrops* (TR2) fleet.
Anglerfish (Lophius piscatorius & L. budegassa) in Divisions IIa and IIIa, and Subareas IV and VI

Advice 2012: Catches should be reduced

Recent dedicated anglerfish surveys (SCO-IV-VI-AMISS-Q2) in Division IVa and Subarea VI indicate a decline in trends of abundance in 2007–2009 and stable biomass in recent years.
Megrim (*Lepidorhombus* spp) in Rockall

**Advice 2012:** No increase in catch

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>F (Fishing Mortality)</strong></td>
<td></td>
</tr>
<tr>
<td>MSY (<em>F</em>&lt;sub&gt;MSY&lt;/sub&gt;)</td>
<td>Unknown</td>
</tr>
<tr>
<td>Precautionary approach (<em>F&lt;sub&gt;pa&lt;/sub&gt;</em>-<em>F&lt;sub&gt;lim&lt;/sub&gt;</em>)</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th></th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SSB (Spawning Stock Biomass)</strong></td>
<td></td>
</tr>
<tr>
<td>MSY (<em>B</em>&lt;sub&gt;trigger&lt;/sub&gt;)</td>
<td>Unknown</td>
</tr>
<tr>
<td>Precautionary approach (<em>B&lt;sub&gt;pa&lt;/sub&gt;</em>-<em>B&lt;sub&gt;lim&lt;/sub&gt;</em>)</td>
<td>Unknown</td>
</tr>
<tr>
<td>Qualitative evaluation</td>
<td>increasing</td>
</tr>
</tbody>
</table>

**Landings**

<table>
<thead>
<tr>
<th>Year</th>
<th>Landings in 1000t</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>0.5</td>
</tr>
<tr>
<td>1995</td>
<td>1.2</td>
</tr>
<tr>
<td>2000</td>
<td>1.5</td>
</tr>
<tr>
<td>2005</td>
<td>0.8</td>
</tr>
<tr>
<td>2010</td>
<td>0.5</td>
</tr>
</tbody>
</table>

**Survey CPUE VIb**

<table>
<thead>
<tr>
<th>Year</th>
<th>Biomass (tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>500</td>
</tr>
<tr>
<td>2005</td>
<td>600</td>
</tr>
<tr>
<td>2006</td>
<td>800</td>
</tr>
<tr>
<td>2007</td>
<td>1000</td>
</tr>
<tr>
<td>2008</td>
<td>1200</td>
</tr>
<tr>
<td>2009</td>
<td>1400</td>
</tr>
<tr>
<td>2010</td>
<td>1600</td>
</tr>
<tr>
<td>2011</td>
<td>1800</td>
</tr>
</tbody>
</table>
Celtic Sea, West & Southwest Ireland

- Cod (VIIe-k)
- Haddock (VIIb-k)
- Northern hake
- Anglerfish (VIIb-k, VIIIab)
- Megrim (VIIb-k, VIIIabd)
- Plaice (CS; VIIh-k; VIIbc)
- Sole (CS; VIIh-k; VIIbc)
- Whiting (VIIe-k)
- Nephrops FUs 16-17-20-22
**Cod in Divisions VIIe–k (Celtic Sea cod)**

**MSY:** F in 2012 be set at $F_{MSY} = 0.40$, resulting in landings of 10 000 t in 2012.

- **F (Fishing Mortality)**
  - 2008: Above target
  - 2009: Above target
  - 2010: Harvested sustainably

- **SSB (Spawning-Stock Biomass)**
  - 2009: Above trigger
  - 2010: Above trigger
  - 2011: Full reproductive capacity

**MP under development by the NWWRAC**

Discard rates have increased in some fleets in 2010, and this discard information is incomplete in the assessment.
Because of the large 2009 year class is now entering the fishery, which was not anticipated in last year’s advice or TAC, there will be a large inconsistency between the TAC set for 2011 (4023 t) and the predicted landings for that year, assuming the current fishing mortality (10 500 t). Therefore, in the absence of any effort limitation and/or TAC revision, **high discarding will occur**.
Haddock in Divisions VIIb–k

Advice 2012: No increase in catch and technical measures to mitigate the increased discarding of recruiting YC

Discarding is a serious problem! These fish become of marketable size from age 2 onwards: they are likely to be discarded due to a restrictive TAC. Over last 10 years: 70% discarded

![Graphs showing trends in catch, discards, landings, fishing mortality, and spawning stock biomass over years from 1993 to 2009.](image)
**Whiting in Divisions VIIe–k**

**Advice 2012:** No increase in catch and technical measures to reduce discard rates

<table>
<thead>
<tr>
<th></th>
<th>2008 - 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MSY (F_{MSY})</strong></td>
<td>Unknown</td>
</tr>
<tr>
<td><strong>Precautionary approach (F_{pa}, F_{lim})</strong></td>
<td>Unknown</td>
</tr>
<tr>
<td><strong>SSB (Spawning Stock Biomass)</strong></td>
<td>2008 - 2010</td>
</tr>
<tr>
<td><strong>MSY (B_{trigger})</strong></td>
<td>Unknown</td>
</tr>
<tr>
<td><strong>Precautionary approach (B_{pa}, B_{lim})</strong></td>
<td>Unknown</td>
</tr>
<tr>
<td><strong>Qualitative evaluation</strong></td>
<td>Increasing</td>
</tr>
</tbody>
</table>

**Landings**

- **Fishing Mortality** (ages 2-5)
- **Spawning Stock Biomass**
- **Recruitment (age 0)**

---

**Graphs:**
- Landings in 1000 t 1982-2007
- Recruitment in millions 1982-2007
- Fishing Mortality 1982-2007
- Spawning Stock Biomass 1982-2007
Advice 2012: Catches should be reduced. Discards exceed landings and technical measures should be introduced to reduce discard rates.

**Discards** are substantial and have ranged from 30% to 70% in number (mainly below the minimum landing size); In 2011 discards were included in the assessment for the first time, although the time series of discard data available is short.

62% discards in 2010 (700 t)
**Sole in Celtic Sea (VIlf,g)**

**MSY:** Landings in 2012 should be no more than 1060 t

<table>
<thead>
<tr>
<th>F (Fishing Mortality)</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSY (F&lt;sub&gt;MSY&lt;/sub&gt;)</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Precautionary approach (F&lt;sub&gt;Pa&lt;/sub&gt;)</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Harvest sustainably</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SSB (Spawning Stock Biomass)</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSY (B&lt;sub&gt;trigger&lt;/sub&gt;)</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Precautionary approach (B&lt;sub&gt;Pa&lt;/sub&gt;)</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Full reproductive capacity</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

**Landings**

- Landings in 1000 t for each year from 1971 to 2006.

**Recruitment (age 1)**

- Recruitment in millions for each year from 1971 to 2006.

**Fishing Mortality**

- Fishing mortality for ages 4-8 from 1971 to 2006.

**Spawning Stock Biomass**

- Spawning stock biomass in 1000 t for each year from 1971 to 2011.

Above since 2001
### Sole in Celtic Sea (VIIIf,g)

**Basis:** $F(2011) = F_{MSY} = \text{mean}(F2008-2010) = 0.25$; $SSB(2012) = 4100$ t; $R(2011) = GM(1972-2008) = 5025$ (thousands); Landings (2011) = 960 t.

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MSY framework</td>
<td>1060</td>
<td>$F_{MSY} (F_{eq} \times 1.24)$</td>
<td>0.31</td>
<td>3600</td>
<td>-11%</td>
<td>-15%</td>
</tr>
<tr>
<td>Precautionary Approach</td>
<td>1230</td>
<td>$F_{ps} (F_{eq} \times 1.48)$</td>
<td>0.37</td>
<td>3400</td>
<td>-16%</td>
<td>-1%</td>
</tr>
<tr>
<td>Zero catch</td>
<td>0</td>
<td>$F=0$</td>
<td>0.00</td>
<td>4800</td>
<td>+17%</td>
<td>-100%</td>
</tr>
<tr>
<td><strong>Status quo</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>800</td>
<td>$F_{eq} \times 0.9$</td>
<td>0.23</td>
<td>3900</td>
<td>-4%</td>
<td>-35%</td>
</tr>
<tr>
<td></td>
<td>880</td>
<td>$F_{eq}$</td>
<td>0.25</td>
<td>3800</td>
<td>-6%</td>
<td>-29%</td>
</tr>
<tr>
<td></td>
<td>960</td>
<td>$F_{eq} \times 1.1$</td>
<td>0.28</td>
<td>3700</td>
<td>-8%</td>
<td>-23%</td>
</tr>
<tr>
<td></td>
<td>1030</td>
<td>$F_{eq} \times 1.2$</td>
<td>0.30</td>
<td>3600</td>
<td>-10%</td>
<td>-17%</td>
</tr>
<tr>
<td></td>
<td>1060</td>
<td>TAC – 15% ($F_{eq} \times 1.24$)</td>
<td>0.31</td>
<td>3600</td>
<td>-11%</td>
<td>-15%</td>
</tr>
<tr>
<td></td>
<td>1241</td>
<td>TAC$<em>{eq}$ ($F</em>{eq} \times 1.50$)</td>
<td>0.37</td>
<td>3400</td>
<td>-16%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>1430</td>
<td>TAC – 15% ($F_{eq} \times 1.78$)</td>
<td>0.44</td>
<td>3200</td>
<td>-21%</td>
<td>+15%</td>
</tr>
</tbody>
</table>

Weights in tonnes.
Anglerfish (Lophius piscatorius and L. budegassa) Divisions VIIb–k and VIIIa,b,d

**Lophius piscatorius**

Advice 2012: Catches should be reduced

<table>
<thead>
<tr>
<th>F (Fishing Mortality)</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSY (F_{MSY})</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
<tr>
<td>Precautionary approach (F_{pa},F_{lim})</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SSB (Spawning-Stock Biomass)</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSY (B_{trigger})</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
<tr>
<td>Precautionary approach (B_{pa},B_{lim})</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

Qualitative evaluation: Decreasing

**Lophius budegassa**

<table>
<thead>
<tr>
<th>F (Fishing Mortality)</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSY (F_{MSY})</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
<tr>
<td>Precautionary approach (F_{pa},F_{lim})</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Unknown</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>SSB (Spawning-Stock Biomass)</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSY (B_{trigger})</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
<tr>
<td>Precautionary approach (B_{pa},B_{lim})</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

Qualitative evaluation: Decreasing

Ageing; lack of discard data
Hake – Northern stock

**MSY:** landings in 2012 should be no more than 51,900 t

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>F (Fishing Mortality)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>MSY (F_{MSY})</strong></td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Precautionary approach (F_{Precaution})</td>
<td>?</td>
<td>?</td>
<td>?</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SSB (Spawning Stock Biomass)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>MSY (F_{SSB})</strong></td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Precautionary approach (F_{Precaution})</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Qualitative evaluation</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
</tbody>
</table>

**Basis:**

- Human Consumption landings (2012) = 39.4
- F (2011) = MeanF_{08-10} = 0.42;
- SSB (2012) = 131;
- R (2011) = 281
- Landings (2011) = 77.4;
- Discards (2011) = 1.8

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
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<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>MSY framework</td>
<td>39.4</td>
<td>F_{MSY} (F_{Ext} * 0.57)</td>
<td>0.24</td>
<td>0.20</td>
<td>0.04</td>
<td>1.6</td>
<td>41.0</td>
<td>138</td>
<td>+6%</td>
<td>-28%</td>
</tr>
<tr>
<td>MSY transition</td>
<td>51.9</td>
<td>0.6 * F_{2010} + 0.4 * F_{MSY} (F_{Ext} * 0.78)</td>
<td>0.33</td>
<td>0.28</td>
<td>0.05</td>
<td>2.1</td>
<td>54.0</td>
<td>125</td>
<td>-4%</td>
<td>-6%</td>
</tr>
<tr>
<td>Recovery Plan</td>
<td>46.839</td>
<td>-15% TAC (F_{Ext} * 0.69)</td>
<td>0.29</td>
<td>0.25</td>
<td>0.04</td>
<td>1.9</td>
<td>48.7</td>
<td>131</td>
<td>0%</td>
<td>-15%</td>
</tr>
</tbody>
</table>
English Channel (VIIId & VIIe)

- Cod (IV, VIIId, Skagerrak)
- Plaice (VIIId)
- Plaice (VIIe)
- Sole (VIIId)
- Sole (VIIe)
Cod NS (EU/Norway MP):
Landings in 2012 should be no more than 31800 t
<table>
<thead>
<tr>
<th></th>
<th>Plaice VIIId: no increase</th>
<th>Plaice VIIle: &lt; 1,440 t</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>F (Fishing Mortality)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2008-2010</td>
<td>〇 Unknown</td>
<td>〇 Above target</td>
</tr>
<tr>
<td><strong>MSY (F_{MSY})</strong></td>
<td>? Unknown</td>
<td>? Undefined</td>
</tr>
<tr>
<td><strong>Precautionary approach (F_{depF})</strong></td>
<td>? Unknown</td>
<td>? Undefined</td>
</tr>
<tr>
<td><strong>Qualitative evaluation</strong></td>
<td>〇 Indications of reduction</td>
<td></td>
</tr>
<tr>
<td><strong>SSB (Spawning-Stock Biomass)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2009-2011</td>
<td>〇 Unknown</td>
<td>〇 Above trigger</td>
</tr>
<tr>
<td><strong>MSY (B_{disc})</strong></td>
<td>? Unknown</td>
<td>? Undefined</td>
</tr>
<tr>
<td><strong>Precautionary approach (B_{depB})</strong></td>
<td>? Unknown</td>
<td>? Undefined</td>
</tr>
<tr>
<td><strong>Qualitative evaluation</strong></td>
<td>〇 Slight increase, from lowest level</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Sole VIIId: &lt; 5,600 t</th>
<th>Sole VIIle: &lt; 740 t</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>F (Fishing Mortality)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2008-2009</td>
<td>〇 Above trigger</td>
<td>〇 Appropriate</td>
</tr>
<tr>
<td><strong>MSY (F_{MSY})</strong></td>
<td>〇 Above trigger</td>
<td>〇 Below trigger</td>
</tr>
<tr>
<td><strong>Precautionary approach (F_{depF})</strong></td>
<td>〇 Risk harvested unsustainably</td>
<td>? Undefined</td>
</tr>
<tr>
<td><strong>SSB (Spawning-Stock Biomass)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2009-2010</td>
<td>〇 Above trigger</td>
<td>〇 Appropriate</td>
</tr>
<tr>
<td><strong>MSY (B_{disc})</strong></td>
<td>〇 Above trigger</td>
<td>〇 Appropriate</td>
</tr>
<tr>
<td><strong>Precautionary approach (B_{depB})</strong></td>
<td>〇 Full reproductive capacity</td>
<td>? Undefined</td>
</tr>
<tr>
<td><strong>Qualitative evaluation</strong></td>
<td>〇 Slight increase, from lowest level</td>
<td></td>
</tr>
</tbody>
</table>
Plaice VIIe– Western Channel

**MSY:** landings in 2012 should be no more than 1440 t above avg

Discards are not included in the assessment.
Discard rates of plaice in Division VIIe are much lower compared to other plaice stocks.
Plaice – Western Channel

Basis: \( F(2011) = F_{sa} = \text{mean}(F_{2008-2010}) \) rescaled to \( F_{2010} = 0.45 \); \( SSB(2012) = 3751 \text{ t}; R(2011) = GM(1989-2008) = 5007 \text{ (Thousands)}; \) landings \( (2011) = 1755 \text{ t}. \)

<table>
<thead>
<tr>
<th>Rationale</th>
<th>Landings (2012)</th>
<th>Basis</th>
<th>( F ) (2012)</th>
<th>( SSB ) (2013)</th>
<th>%SSB change$^1$</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSY framework</td>
<td>840</td>
<td>( F_{\text{MSY}}(F_{sa} * 0.42) )</td>
<td>0.19</td>
<td>4620</td>
<td>+23%</td>
</tr>
<tr>
<td>MSY transition</td>
<td>1440</td>
<td>( 0.6<em>F_{2010} + 0.4</em>F_{\text{MSY}} = F_{sa} * 0.78 )</td>
<td>0.35</td>
<td>4030</td>
<td>+7%</td>
</tr>
<tr>
<td>Zero catch</td>
<td>0</td>
<td>( F=0 )</td>
<td>0</td>
<td>5430</td>
<td>+45%</td>
</tr>
<tr>
<td>Status quo</td>
<td></td>
<td>( F_{sa} * 0.5_{sa} )</td>
<td>0.23</td>
<td>4480</td>
<td>+19%</td>
</tr>
<tr>
<td></td>
<td>1150</td>
<td>( F_{sa} * 0.6 )</td>
<td>0.27</td>
<td>4310</td>
<td>+15%</td>
</tr>
<tr>
<td></td>
<td>1320</td>
<td>( F_{sa} * 0.7 )</td>
<td>0.32</td>
<td>4150</td>
<td>+11%</td>
</tr>
<tr>
<td></td>
<td>1480</td>
<td>( F_{sa} * 0.8 )</td>
<td>0.36</td>
<td>4000</td>
<td>+7%</td>
</tr>
<tr>
<td></td>
<td>1630</td>
<td>( F_{sa} * 0.9 )</td>
<td>0.41</td>
<td>3850</td>
<td>+3%</td>
</tr>
<tr>
<td></td>
<td>1770</td>
<td>( F_{sa} * 1.0 )</td>
<td>0.45</td>
<td>3710</td>
<td>-1%</td>
</tr>
<tr>
<td></td>
<td>1910</td>
<td>( F_{sa} * 1.1 )</td>
<td>0.50</td>
<td>3580</td>
<td>-5%</td>
</tr>
</tbody>
</table>

Weights in tonnes.
**Sole VIIId – Eastern Channel**

**MSY:** landings in 2012 should be no more than 5600 t

- **Landings:**
  - Bar chart showing landings from 1982 to 2007.

- **Recruitment (age 1):**

- **Fishing Mortality:**
  - Line graph showing fishing mortality from 1982 to 2007.

- **Spawning Stock Biomass:**
  - Line graph showing spawning stock biomass from 1982 to 2007.
### Sole – Eastern Channel

**Basis:** $F(2011) = TAC\ constraint = 0.36$; $R(2011) = GM(1982–2007) = 23\ 500$; $Landings(2011) = 4852$; $SSB(2012) = 15\ 000$.

<table>
<thead>
<tr>
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<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MSY framework</td>
<td>4300</td>
<td>$F_{MSY}$</td>
<td>0.29</td>
<td>15 000</td>
<td>0%</td>
<td>-11%</td>
</tr>
<tr>
<td>MSY transition</td>
<td>5600</td>
<td>$(F(2010)\times 0.6)+(F_{MSY} \times 0.4)$</td>
<td>0.39</td>
<td>13 600</td>
<td>-9%</td>
<td>+15%</td>
</tr>
<tr>
<td>Precautionary</td>
<td>5700</td>
<td>$F_{pa}$</td>
<td>0.40</td>
<td>13 600</td>
<td>-9%</td>
<td>+17%</td>
</tr>
<tr>
<td>approach</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Zero catch</td>
<td>0</td>
<td>$F=0$</td>
<td>0</td>
<td>19 700</td>
<td>+31%</td>
<td>-100%</td>
</tr>
<tr>
<td>Status quo</td>
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<td>$F_{pa} \times 0.6$</td>
<td>0.27</td>
<td>15 300</td>
<td>+2%</td>
<td>-17%</td>
</tr>
<tr>
<td></td>
<td>4100</td>
<td>$F_{pa} \times 0.62\times (TAC -15%)$</td>
<td>0.28</td>
<td>15 200</td>
<td>+1%</td>
<td>-15%</td>
</tr>
<tr>
<td></td>
<td>4600</td>
<td>$F_{pa} \times 0.7$</td>
<td>0.31</td>
<td>14 700</td>
<td>-2%</td>
<td>-5%</td>
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<tr>
<td></td>
<td>5100</td>
<td>$F_{pa} \times 0.8$</td>
<td>0.36</td>
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<td>-6%</td>
<td>+6%</td>
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<tr>
<td></td>
<td>5600</td>
<td>$F_{pa} \times 0.89\times (TAC +15%)$</td>
<td>0.39</td>
<td>13 600</td>
<td>-9%</td>
<td>+15%</td>
</tr>
<tr>
<td></td>
<td>6200</td>
<td>$F_{pa}$</td>
<td>0.44</td>
<td>13 000</td>
<td>-13%</td>
<td>+27%</td>
</tr>
</tbody>
</table>

Weights in tonnes.
Irish Sea (VIIa)

- Cod
- Haddock
- Whiting
- Plaice
- Sole
- Nephrops
**Cod in Division VIIa (Irish Sea)**

**MSY: Zero catch in 2012**

- **F (Fishing Mortality)**
  - 2008: ✗
  - 2009: ✗
  - 2010: ✗
  - **Above target**
  - **Harvested unsustainably**

- **SSB (Spawning-Stock Biomass)**
  - 2009: ✗
  - 2010: ✗
  - **Below trigger**
  - **Reduce reproductive capacity**

F in recent years is uncertain (due to unaccounted mortality) but total mortality remains very high;
Haddock in Division VIIa (Irish Sea)

**F (Fishing Mortality)**

<table>
<thead>
<tr>
<th></th>
<th>2008 -2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSY ($F_{MSY}$)</td>
<td>?</td>
</tr>
<tr>
<td>Precautionary approach ($F_{prelim}$)</td>
<td>?</td>
</tr>
</tbody>
</table>

**SSB (Spawning-Stock Biomass)**

<table>
<thead>
<tr>
<th></th>
<th>2009 - 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSY ($B_{MSY}$)</td>
<td>?</td>
</tr>
<tr>
<td>Precautionary approach ($B_{prelim}$)</td>
<td>?</td>
</tr>
</tbody>
</table>

**Qualitative evaluation**

- Below poss. reference points
### F (Fishing Mortality)

<table>
<thead>
<tr>
<th></th>
<th>2008 - 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MSY (F_{MSY})</strong></td>
<td>?</td>
</tr>
<tr>
<td>Precautionary</td>
<td>?</td>
</tr>
<tr>
<td>approach (F_{pa},F_{lim})</td>
<td>Unknown</td>
</tr>
<tr>
<td>Qualitative evaluation</td>
<td>Unknown</td>
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<tr>
<td></td>
<td>Above poss. reference points</td>
</tr>
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</table>

### SSB (Spawning Stock Biomass)

<table>
<thead>
<tr>
<th></th>
<th>2009 - 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MSY (B_{trigger})</strong></td>
<td>?</td>
</tr>
<tr>
<td>Precautionary</td>
<td>?</td>
</tr>
<tr>
<td>approach (B_{pa},B_{lim})</td>
<td>Unknown</td>
</tr>
<tr>
<td>Qualitative evaluation</td>
<td>Unknown</td>
</tr>
<tr>
<td></td>
<td>Below poss. reference points</td>
</tr>
</tbody>
</table>

### Landings
- **Year class**
- **Landings ('000t)**

### Recruitment
- **Year class**
- **Recruitment**

### Total Mortality Z (1-3)
- **Year class**
- **Total Mortality Z (1-3)**

### SSB
- **Year**
- **SSB**
**Irish Sea**

**Haddock**: reduce; tech measures

<table>
<thead>
<tr>
<th>F (Fishing Mortality)</th>
<th>2008-2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSY (F_MSY)</td>
<td>?</td>
</tr>
<tr>
<td>Precautionary approach (F_\text{F Fisheries})</td>
<td>?</td>
</tr>
<tr>
<td>Qualitative evaluation</td>
<td>✔ Below poss. reference points</td>
</tr>
</tbody>
</table>

**Whiting**: reduce; tech measures

<table>
<thead>
<tr>
<th>F (Fishing Mortality)</th>
<th>2008-2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSY (F_MSY)</td>
<td>?</td>
</tr>
<tr>
<td>Precautionary approach (F_\text{F Fisheries})</td>
<td>?</td>
</tr>
<tr>
<td>Qualitative evaluation</td>
<td>✗ Above poss. reference points</td>
</tr>
</tbody>
</table>

**Plaice**: no increase; tech measures

<table>
<thead>
<tr>
<th>F (Fishing Mortality)</th>
<th>2008-2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSY (B_\text{MSY})</td>
<td>?</td>
</tr>
<tr>
<td>Precautionary approach (B_\text{F Fisheries})</td>
<td>?</td>
</tr>
<tr>
<td>Qualitative evaluation</td>
<td>✔ Above poss. reference points</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SSB (Spawning Stock Biomass)</th>
<th>2009-2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSY (B_MSY)</td>
<td>?</td>
</tr>
<tr>
<td>Precautionary approach (B_\text{F Fisheries})</td>
<td>?</td>
</tr>
<tr>
<td>Qualitative evaluation</td>
<td>✗ Below poss. reference points</td>
</tr>
</tbody>
</table>
Haddock: reduce; tech measures

Discarding is a serious problem for this stock. The discard rates for all fleets in 2010 were 92-100% for one-year-olds; 22–96% for two-year-olds and 3–68% for three-year-olds by number.

Measures:
In order to minimise discards, a square mesh panel of at least 120 mm should be introduced for all fleets or selectivity devices that achieve equivalent or better improvements.

Whiting: reduce; tech measures

Measures:
- spatial and temporal changes in fishing practices;
- technical measures such as increased codend mesh size, square mesh panels, separator trawls, and increased top sheet mesh in towed gears.
Sole in Division VIIa (Irish Sea)

**MSY:** Landings should be no more than 200 t

<table>
<thead>
<tr>
<th>F (Fishing Mortality)</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSY (F_{MSY})</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Precautionary approach (F_{pap}F_{lim})</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td></td>
<td>Above target</td>
<td>Harvested sustainably</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SSB (Spawning Stock Biomass)</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSY (B_{trigger})</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Precautionary approach (B_{pap}B_{lim})</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td></td>
<td>Below trigger</td>
<td>Reduced reproductive capacity</td>
<td></td>
</tr>
</tbody>
</table>

**Landings**

<table>
<thead>
<tr>
<th>Landings in 1000 t</th>
<th>0</th>
<th>0.5</th>
<th>1</th>
<th>1.5</th>
<th>2</th>
<th>2.5</th>
<th>3</th>
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</thead>
<tbody>
<tr>
<td>1970</td>
<td></td>
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<tr>
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</table>

**Recruitment (age 2)**

<table>
<thead>
<tr>
<th>Recruitment in millions</th>
<th>0</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
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<tr>
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<tr>
<td>2010</td>
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</table>

**Fishing Mortality**

<table>
<thead>
<tr>
<th>Fishing Mortality (ages 4-7)</th>
<th>0.0</th>
<th>0.2</th>
<th>0.4</th>
<th>0.6</th>
<th>0.8</th>
</tr>
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<tbody>
<tr>
<td>1970</td>
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<td>1975</td>
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<td>1980</td>
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<td>2010</td>
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</table>

**Spawning Stock Biomass**

<table>
<thead>
<tr>
<th>Spawning Stock Biomass in 1000 t</th>
<th>0</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
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<tr>
<td>1975</td>
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<td>2005</td>
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<td>2010</td>
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</tr>
</tbody>
</table>
### Sole in Division VIIa (Irish Sea)

**Basis:** \( F(2011) = F_{sq} = \text{mean}(F_{2008-2010}) = 0.31; \) \( R(2011) = \text{RCT3} = 1680 \text{ thousands}; \) \( R(2012) = \text{GM 2001-2009} = 2520 \text{ thousands}; \) \( \text{Landings}(2011) = 320 \text{ t}; \) \( \text{SSB}(2012) = 1280 \text{ t}. \)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MSY framework</td>
<td>80</td>
<td>( F_{HCR-MSY} = \frac{F_{MSY} \times \text{SSB}(2012)}{B_{	ext{MSY}}}. )</td>
<td>0.07</td>
<td>1520</td>
<td>+23%</td>
<td>-80%</td>
</tr>
<tr>
<td><strong>MSY transition</strong></td>
<td><strong>200</strong></td>
<td>0.6<em>F(2010) + 0.4</em>F_{HCR-MSY}</td>
<td>0.19</td>
<td>1390</td>
<td>+14%</td>
<td>-49%</td>
</tr>
<tr>
<td>Zero catch</td>
<td>0</td>
<td>F=0</td>
<td>0.0</td>
<td>1600</td>
<td>+30%</td>
<td>-100%</td>
</tr>
<tr>
<td><strong>Status quo</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>220</td>
<td>( F_{sq} \times 0.7 )</td>
<td>0.21</td>
<td>1370</td>
<td>+12%</td>
<td>-43%</td>
</tr>
<tr>
<td></td>
<td>170</td>
<td>( F_{MSY}(F_{sq} \times 0.52) )</td>
<td>0.16</td>
<td>1420</td>
<td>+16%</td>
<td>-56%</td>
</tr>
<tr>
<td></td>
<td>280</td>
<td>( F_{sq} \times 0.9 )</td>
<td>0.27</td>
<td>1310</td>
<td>+7%</td>
<td>-29%</td>
</tr>
<tr>
<td></td>
<td>300</td>
<td>( F_{sq}(F_{sq} \times 0.98) )</td>
<td>0.3</td>
<td>1290</td>
<td>+5%</td>
<td>-23%</td>
</tr>
<tr>
<td></td>
<td>300</td>
<td>( F_{sq} \times 0.9 )</td>
<td>0.31</td>
<td>1290</td>
<td>+5%</td>
<td>-22%</td>
</tr>
<tr>
<td></td>
<td>330</td>
<td>TAC - 15% (( F_{sq} \times 1.1 ))</td>
<td>0.34</td>
<td>1260</td>
<td>+3%</td>
<td>-15%</td>
</tr>
<tr>
<td></td>
<td>390</td>
<td>TAC (( F_{sq} \times 1.34 ))</td>
<td>0.41</td>
<td>1200</td>
<td>-2%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>450</td>
<td>TAC + 15% (( F_{sq} \times 1.59 ))</td>
<td>0.49</td>
<td>1140</td>
<td>-7%</td>
<td>+15%</td>
</tr>
</tbody>
</table>

Weights in tonnes.
Sole in Division VIIa (Irish Sea)

<table>
<thead>
<tr>
<th>Year</th>
<th>F (Fishing Mortality)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>+</td>
</tr>
<tr>
<td>2009</td>
<td>X</td>
</tr>
<tr>
<td>2010</td>
<td>X</td>
</tr>
</tbody>
</table>

- **MSY (F_{MSY})**
  - 2008: Above target
  - 2009: Above target
  - 2010: Above target

- **Precautionary approach (F_{pa}, F_{lim})**
  - 2008: Harvested sustainably
  - 2009: Harvested sustainably
  - 2010: Harvested sustainably

<table>
<thead>
<tr>
<th>Year</th>
<th>SSB (Spawning Stock Biomass)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>X</td>
</tr>
<tr>
<td>2010</td>
<td>X</td>
</tr>
</tbody>
</table>

- **MSY (B_{trigger})**
  - 2009: Below trigger
  - 2010: Below trigger
  - 2011: Below trigger

- **Precautionary approach (B_{pa}, B_{lim})**
  - 2009: Reduced reproductive capacity
  - 2010: Reduced reproductive capacity
  - 2011: Reduced reproductive capacity

**Landings in 1000 t**

- 1970: 0.0
- 1975: 0.0
- 1980: 0.0
- 1985: 0.0
- 1990: 0.0
- 1995: 0.0
- 2000: 0.0
- 2005: 0.0
- 2010: 0.0

**Recruitment (age 2)**

- 1970: 0.0
- 1975: 0.0
- 1980: 0.0
- 1985: 0.0
- 1990: 0.0
- 1995: 0.0
- 2000: 0.0
- 2005: 0.0
- 2010: 0.0

**Fishing Mortality**

- 1970: 0.0
- 1975: 0.0
- 1980: 0.0
- 1985: 0.0
- 1990: 0.0
- 1995: 0.0
- 2000: 0.0
- 2005: 0.0
- 2010: 0.0

**Spawning Stock Biomass**

- 1970: 0.0
- 1975: 0.0
- 1980: 0.0
- 1985: 0.0
- 1990: 0.0
- 1995: 0.0
- 2000: 0.0
- 2005: 0.0
- 2010: 0.0
and the *Nephrops* ...
FU 11 – North Minch
FU 12 – South Minch
FU 13 – Firth of Clyde & Sound of Jura
### FU 11 – North Minch  2012: < 3 200 t

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### FU 13 – Firth of Clyde  2012: < 4 200 t

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### FU 13 – Sound of Jura  2012: < 900 t

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**Nephrops in North Minch (FU 11)**

### F (Fishing Mortality)

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- Below target
- Not defined

### SSB (Spawning-Stock Biomass)

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- Above trigger
- Not defined
Nephrops in South Minch (FU 12)

**F (Fishing Mortality)**

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**SSB (Spawning-Stock Biomass)**

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**FU 12 : International Landings**

**FU 12 : TV abundance**

**FU 12 : Harvest rate**
Nephrops in the Firth of Clyde + Sound of Jura (FU 13)
Nephrops in the Firth of Clyde + Sound of Jura (FU 13)

FU 13 - Sound of Jura: International Landings

FU 13 - Sound of Jura: TV abundance

FU 13 - Sound of Jura: Harvest rate
FU 14 – Irish Sea East
FU 15 – Irish Sea West
FU 16 – Porcupine Bank (VIIbcjk)
FU 17 – Aran Grounds (VIIb)
FU 19 – Ireland SW and SE
FU 20-22 – Celtic Sea (VIIgh)
### FU 14 – Irish Sea East

**2012:** < 960 t

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<th>MSY (B&lt;sub&gt;MSY&lt;/sub&gt;)</th>
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### FU 15 – Irish Sea West

**2012:** < 9800 t

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### FU 16 – Porcupine Bank

**2012:** no increase

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### FU 17 – Aran Grounds

**2012:** < 1100 t

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<th>MSY (B&lt;sub&gt;MSY&lt;/sub&gt;)</th>
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**FU 19 – Ireland SW and SE**

2012: reduce

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**FU 20-21 – Celtic Sea**

2012: reduce

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**FU 22 – Celtic Sea**

2012: < 2 300 t

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# Nephrops in Irish Sea East (FU14)

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## SSB (Spawning Stock Biomass)

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### Landings - International

![Graph showing landings over time](image1.png)

### Abundance FU 14

![Graph showing abundance over time](image2.png)

### Harvest Rate FU 14

![Graph showing harvest rate over time](image3.png)
Nephrops in Irish Sea West (FU 15)

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FU 15 : International Landings

FU 15 : TV abundance

FU 15 : Harvest rate
Nephrops in Irish Sea West (FU 15)
**Nephrops on Porcupine Bank (FU 16)**

- **Effort**
  - France (’000 hrs trawling)
  - Rep. of Ireland (’000 hrs trawling)
  - Spain (effort index) (*)

- **% Males in the Landings**
  - Male Numbers
  - Male Weights
  - Survey Male

The diagrams show the changes in effort and percentage of males in the landings over time. The effort index indicates the trend in trawling activity, while the percentage of males in the landings shows fluctuations that could be linked to changes in fish population or fishing practices.
### Nephrops on Porcupine Bank (FU 16)

#### F (Fishing Mortality)

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#### SSB (Spawning Stock Biomass)

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<td>Increasing, from critically low abundance</td>
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![Graph showing exploitation proxy](image-url)
Nephrops on Porcupine Bank (FU 16)
### Nephrops on Porcupine Bank (FU 16)

#### Males

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<td>2005</td>
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#### Females

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<td>2005</td>
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<tr>
<td>2010</td>
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#### Spain, Ireland, France, Porcupine Survey

#### Recruit Proxy <32mm

- % >=50mm
- Recruit Proxy <32mm
**Nephrops on Aran Grounds (FU 17)**

### F (Fishing Mortality)

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<td>Precautionary approach</td>
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</table>

### SSB (Spawning Stock Biomass)

<table>
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<tr>
<th>Year</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
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<tbody>
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<td>Status</td>
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<tr>
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</table>

### FU 17: International Landings

- **FU 17: TV abundance**
- **FU 17: Harvest rate**

### FU 17: International Landings

- **FU 17: Harvest rate**

### FU 17: TV abundance

- **FU 17: Harvest rate**

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**Note:** The tables and graphs provide a summary of the fishing mortality (F) and spawning stock biomass (SSB) for the period 2008 to 2010. The status of MSY and precautionary approach are indicated with symbols and text. The international landings data show a trend over the years, with the harvest rate percentage indicated separately.
**Nephrops** off the south-eastern and south-western coasts of Ireland (FU 19)

<table>
<thead>
<tr>
<th>F (Fishing Mortality)</th>
<th>2008-2010</th>
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</thead>
<tbody>
<tr>
<td>MSY (F&lt;sub&gt;MSY&lt;/sub&gt;)</td>
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</tr>
<tr>
<td>Precautionary approach (F&lt;sub&gt;pa&lt;/sub&gt;,F&lt;sub&gt;lim&lt;/sub&gt;)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>SSB (Spawning Stock Biomass)</th>
<th>2008-2010</th>
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<tbody>
<tr>
<td>MSY (B&lt;sub&gt;trigger&lt;/sub&gt;)</td>
<td>Unknown</td>
</tr>
<tr>
<td>Precautionary approach (B&lt;sub&gt;pa&lt;/sub&gt;,B&lt;sub&gt;lim&lt;/sub&gt;)</td>
<td>Unknown</td>
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</table>

Qualitative evaluation: Stable
Nephrops off the south-eastern and south-western coasts of Ireland (FU 19)
Nephrops in the Celtic Sea (FU 20–22)
Nephrops in the Celtic Sea (FU 20–22)
Thank you for your attention!
Comments and questions?