Illegal, Unregulated & Unreported Fishing: Drivers, Consequences for Scientific Advice & Management of Fisheries, & Mitigation

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Unaccounted Fishing Mortality (UFM)–ICES Study Group on UFM

‘Unaccounted Fishing Mortality’ is a significant source of error in Stock Assessments

Two sources of particular concern

- Illegal, unreported and unregulated fishing (IUU)
- Discarding
What is IUU?

- **Complex definition**: FAO / International Plan of Action to Prevent, Deter, and Eliminate Illegal, Unreported and Unregulated Fishing (IPOA-IUU)
- Essentially is ‘Catches taken within an EEZ which are both illegal (contravene rules & regulations) and retained, and which are usually unreported, and all unreported catches taken in high seas waters subject to a Regional Fisheries Management Organization’s (RFMO) jurisdiction’ (MRAG 2008).
- Includes a ‘multitude of sins’.
Where & at what costs?

- A global problem - Occurs in most regions.
- Not only in EEZs of developing world & high-seas areas, but also in EEZs of major developed countries.
- Products from IUU imports into the EU conservatively estimated at EUR 1.1 billion (EC COM/2007/0601).
- European Court of Auditors has criticized fisheries control within EU waters & proposed measures to tackle the problem (ECA 2007).
Drivers of IUU fishing mortality

- Ineffective management (inc. unregulated fisheries).
- Fleet overcapacity & restrictive management measures (e.g. TACs, effort limitation, gear types / configuration).
- Poor enforcement / controls at sea & on land.
- Tax benefits, subsidies & investment incentives from ‘Flag of Convenience’ States.
- Extraordinary economic pressures (e.g. increasing fuel costs).
- De-stigmatized perception of IUU activities by society due to under-estimation of environmental & social impacts.
IUU exacerbates current sustainability problems

- IUU compounds overfishing risk.
  - It adds to ‘decision overfishing’ (i.e. politically agreed regulatory overfishing) when negotiated TACs are set in excess of sustainable levels of exploitation.
  - For example: EU fisheries ministers agreed TACs in 2006 on average 45% higher than the catches recommended by ICES scientific advice. Science-based advice has often formed the basis for ‘talking-up quotas’ (Aps et al. 2007).
  - Then one adds on IUU amounts / percentages which may be substantial....
  - This causes ‘double trouble’.
Problems of IUU

- One doesn’t know how much fish is **extracted** in total (Fishing mortality) relative to Quotas.
- Results in incorrect fish stock assessments: Poor data quality & model outputs.
- Erodes accuracy & credibility of the scientific advisory, management & political decision-making systems. ‘Quotas don’t work’ (Alternative - regulate fishing effort: e.g. days at sea, closed areas).
- Distorts economics, markets, livelihoods, etc. Acts against those who ‘follow the rules’.
- Try to manage a bank account where the ‘balance’ of credit & debit is ‘unknown’, due to not knowing who is removing the ‘debits’ & what ‘interest’ is needed for asset conservation.

**STOCK SIZE**

**FISHING MORTALITY**

**RECRUITMENT**

**NATURAL MORTALITY**
ICES ‘precautionary flag’ reference points

- Fishing mortality (F) is related to **Fishing Effort**. Excessive F reduces the spawning stock (B).
- Conserving a substantial spawning stock biomass (B) is vital for good recruitment. Also a beneficial environment secures recruits.
- Keep below F pa & above B pa! IUU increases risk & uncertainty.

![Diagram showing fishing mortality (F) and spawning stock biomass (B)]
Quality of stock assessments

- Depend on
  - Model (Natural Mortality, Abundance indices)
  - **Data** (Landings, logbooks, fisheries sampling, Vessel Monitoring Systems, abundance indices)

- Catch data are problematic for many fish stocks (unreported landings, unaccounted removals)

- [Changes in natural mortality and distribution]

- [Recruitment difficult to estimate]
IUU Incidence ICES Area (SGUFM 2005)
All stocks ca. 150 stocks. Critical stocks in ecosystem ca. 37 stocks
Mis- or non-reported Landings

- **When recognized**
  - Landings are corrected or ignored in assessment
  - Unbiased advice and prognoses
  - Assessment and prognoses uncertain
  - Advice and prognoses include non-reporting (exception North East Atlantic mackerel)

- **When not recognized**
  - Biased advice and prognosis
  - Misleading information and advice
  - Assessment often internally inconsistent
  - Over/underestimation - unpredictable
  - Investigate on a case-by-case basis
Possible Effects of unrecognized non-reported Catches

- Recruitment and SSB most often underestimated
  - Method dependent
  - Misreporting may add fish to a stock
  - Status quo prognosis: below the actual catches

- Stock status may be assessed wrongly - Depending on type of mis- or non- reporting
  - Which Period
  - Which fleets
  - Which size classes
  - Which areas (misreporting)
  - Overall exploitation pressure
  - Quality of abundance indices (commercial and research vessel Catch Per Unit Effort)
Possible effects of unrecognized non-reported catches

- **Equally spread over fleets**
  - F is correct
  - Underestimation of stock (Recruitment and SSB)

- **Unequally spread over fleets**
  - F incorrect
  - Recruitment and SSB can be either over- or underestimated - mostly underestimated
ICES policy for Stock Assessment

Where IUU is indicated decide between

1. Ignore data influenced by IUU fishing (e.g. North Sea demersal fish)
2. Correct for IUU fishing and incorporate in Stock assessment (e.g. Eastern Baltic Cod)

- Base decision on investigation of how sensitive the stock assessment is to reasonable estimates of IUU fishing

IUU estimates

- Available in the Assessment and Advisory Report
- In the Stock database available from the ICES website
Examples of Illegal, Unreported & Unregulated Fishing (IUU) – ICES Estimates

**Eastern Baltic Cod**
True catch 35-45% greater than reported

**NE Arctic Cod**
Since 2002: 90 – 115 Kt of catch per annum transhipped to Russia (~20% total catch)

**Irish Sea Cod**
2005: Catch ~25% over quota.

**Redfish**
True catch underestimated by 25%

**Northeast Atlantic Mackerel**
2003 Scottish fleet: 60% over quota
1998-2002 Irish fleet: 70% over quota

**North Sea Demersal stocks**
“IUU – seriously compromising Stock Assessments”
“But no reliable estimates”

**Deep water fisheries**
“IUU – seriously compromising Stock Assessments”
“But no reliable estimates”
Status example: Eastern Baltic Cod

- **Spawning Stock Biomass**: well below $B_{\text{lim}}$ (160,000 t)
- **Fishing mortality**: high (~1) and clearly above $F_{\text{pa}}$ (0.6)
- **Recent recruitment**: low and relatively constant
- **Stock status**: Large changes unlikely in the short-term
- **Recovery above $B_{\text{pa}}$ (240,000 t)**
  - Significant reduction in fishing mortality (to about 1/3 of present)
  - Substantial reduction of landings in the short term relative to recent level
  - Recovery cannot be achieved by a TAC in the absence of effective enforcement and control
- **Recovery to stock levels observed in the 1970s and 1980s**
  - Increased productivity dependent on environmental conditions
IUU – Estimation techniques

Estimate & Include in Assessments
When Catch Effort Data thought to be biased

Various estimation techniques available

Statistical Accounting
- Compare Trade Estimates & Reported Catch
- Estimate catch from Discard observer data
- Raise R/V abundance estimates to catch
- Comparing catch rates between countries
- Comparing Landed Catch Per Unit Effort (LCPUE) of fishing between inspected and non-inspected landings
- Estimate IUU Effort (e.g. from Satellite imagery – VDS)

Unaccounted Industry/Authority estimates

Model Based Estimates
IUU Behaviour & Surveillance Encounter Probability
# Estimating Techniques

## Supply Balance

\[
\text{Landings} = \text{Export} - \text{Import} + \text{Local Consumption}
\]

### Provides
- Landing estimates by Country
- Indicates that IUU fishing overall is significant
- Indicates country specific problem

### Problems
- Trade Statistics are in product units, e.g. fillets
- “Local Consumption” is estimated from the same relation at a time with no IUU fishing

Overall, the estimate is lower than provided by ICES
Estimating Techniques
Raise Research Vessel abundance estimates to catch

Procedure

- Total mortality from comparing abundance indices for the same year-class in two consecutive years
- Subtracting an amount of mortality to account for mortality causes other than fishing
- Converting abundance indices to absolute abundance based on years without IUU fishing
- Mean weight per age group in the catches
- Estimate total landing for the entire stock

Problems

- Total mortality estimated imprecisely
- Mortality other than fishing not known precisely
- Data extrapolated from years without IUU fishing
  - Conversion factor from abundance index to population
  - Mean weight per age group in the catches

- Eastern Baltic Cod: Estimate suggest IUU amount may as much as reported landings
Estimating Techniques
Estimate catch from discard observer data

Landing = catch rate (observer sampling) * Total effort

Catch rate: Observer programmes. Effort: Satellite, logbooks, etc.

- Problems
  - Observer sampling is directed at estimating discards — not representative for IUU fishing
  - Vessels with observers show different fishing strategy compared to those without observers

- Results not available
Estimating Techniques
Correct catch from Inspection data

Landing = Landing (reported) * Catch rate (inspected landings)/ Catch rate (non-inspected landings)

**Problem**
- Inspections directed at "problem areas" may not be a random sample of the fisheries
- Effort on a "per trip" basis
- Confounded by
  - Inspection efficiency
  - National policies

Mainly useful for identifying whether IUU fishing occurs

**Provides**
- Landing estimates by Country
- Indicates that IUU fishing overall is significant
- Indicates country specific problem

Overall, the estimate is lower than provided by ICES
Eastern Baltic Cod
Officially reported & estimate of non-reported landings (t) 1993-2005
Eastern Baltic Cod
Comparing SSB estimate with and without correction for non-reporting
1990-2004
Example Baltic Cod

Summary

- Strong Indications of IUU fishing
- Estimates vary depending on:
  - Trade statistics
  - Abundance surveys
  - Inspection sampling
  - Unaccounted industry estimates
- ICES provides for Eastern Baltic Cod an overall estimate of about 15,000 tonnes p.a. or more in recent years of landings not reported
What must be done to tackle IUU

- There are few technical impediments to obtaining the necessary data.

- Policy, legal and institutional arrangements, particularly at the international level, need to be more firmly established & actively implemented, in particular flag State duties & responsibilities.

- Implement at national level the duties & responsibilities in the FAO Code of Conduct on Responsible Fisheries, UN Fish Stocks Agreement & FAO Compliance Agreement, EU instruments, etc.
Specific actions to tackle IUU

- Adoption of mandatory systems for Port State control & trans-shipment inspections, set-up common databases in countries in Regional Fisheries Management Organizations (RFMOs).
- Improved control of vessel licensing /permits & control at sea for compliance. Inspection for under-sized fish, by-catch /discards, fishing gears, catch on-deck & in holds, vessel tracking devices (VMS, VDS), catch log-book, etc.
- Better control at landings for compliance. Landings declaration/sales note.
- Traceability of fish standards: harvested from a legitimate source /manner, through ‘chain of custody’ to consumer.
- Open, objective & verifiable certification schemes rewarding fishers & fisheries with good standards.
- Include fisher & environmental organizations with market-representatives in strategies for tackling IUU.
- Extended international cooperation between national authorities (e.g. tax, customs, police & prosecutors). Link these closely with scientists & managers. Task Force?
Thank you for your attention!