ROLE OF ITOPF

Dr. Franck Laruelle, Technical Team Manager

National Oil Spill Conference, Gothenburg, Sweden,
13 November 2019

INTRODUCTION TO ITOPF

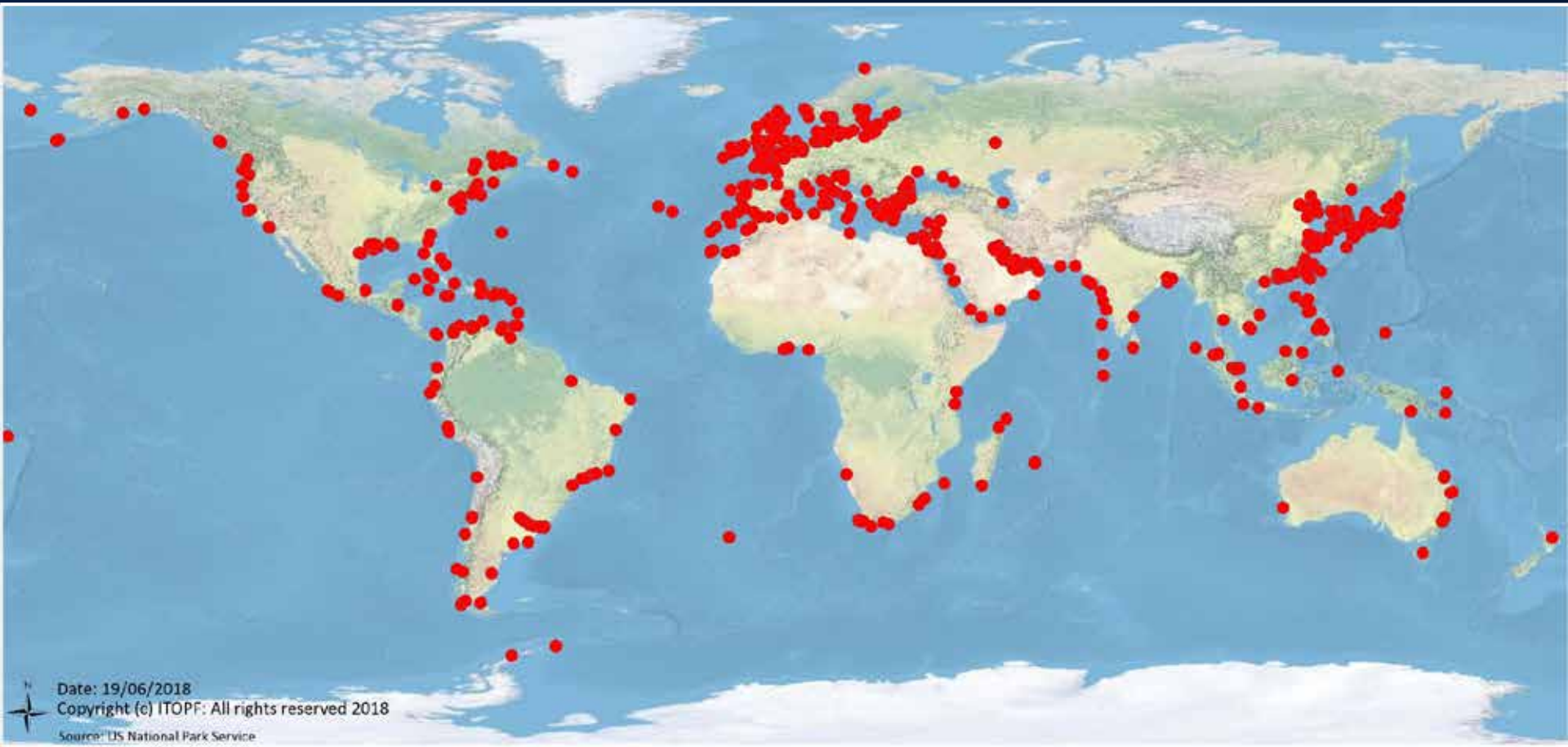
- Not-for-profit organisation established in 1968
- Primarily funded by shipping (via P&I Clubs)
- Main role: advice on marine oil & HNS spills
- Based in London but provides a global service

ITOPF MEMBERS AND ASSOCIATES

- 6,300 tanker owners and bareboat charterers
- 10,900 tankers, barges & OBOs - 340 million GT (>97% world fleet)

- Owners of other types of ship (since 1999)
- 658 million GT of non-tanker shipping (>90% world fleet)

ITOPF RESOURCES

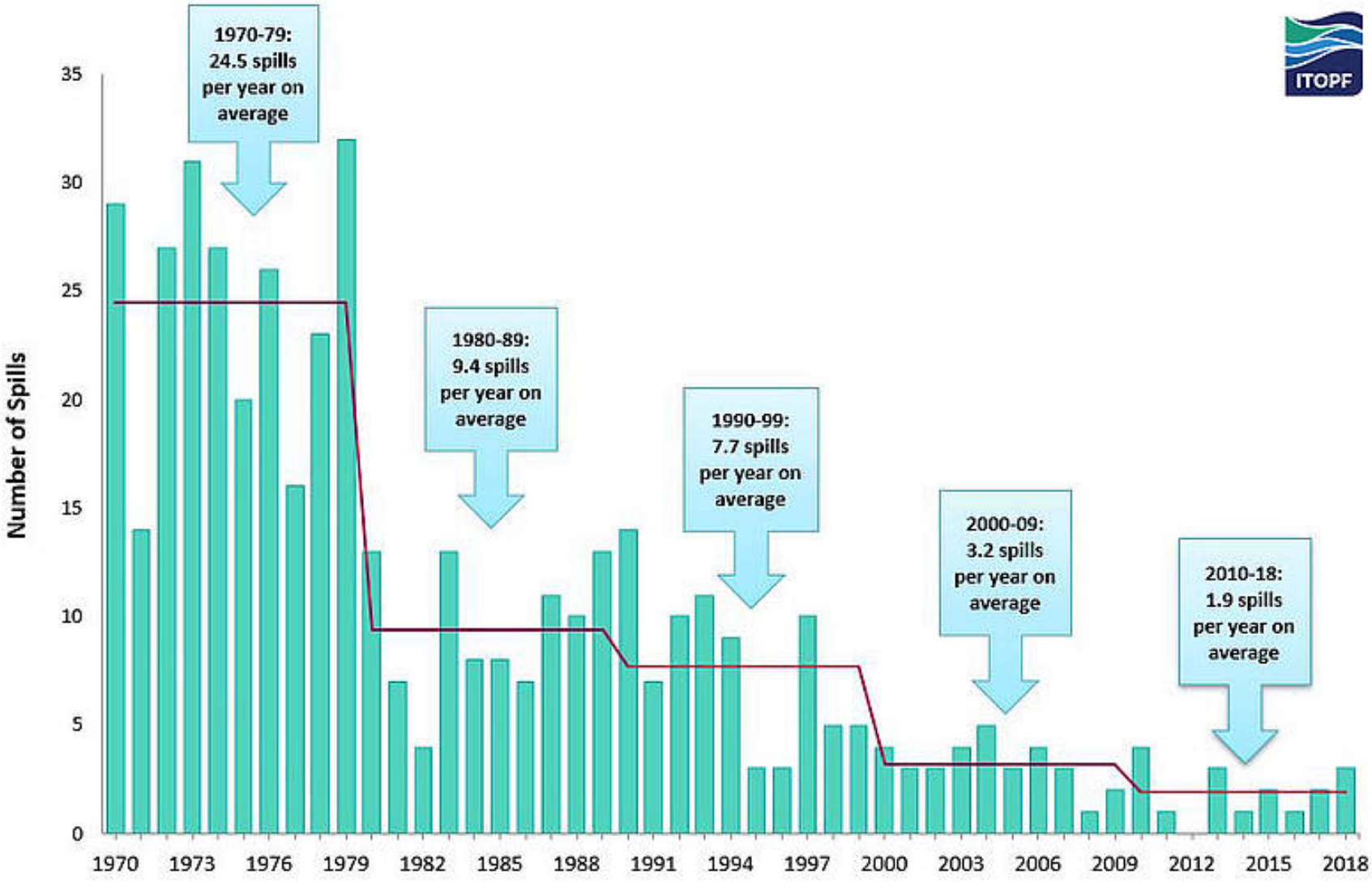


- Single office in London with 34 staff
- Technical team with 14 responders:
  - Ø Scientific background & spill experience
  - Ø On site at >800 spills in 100 countries
- In-house databases and technical library

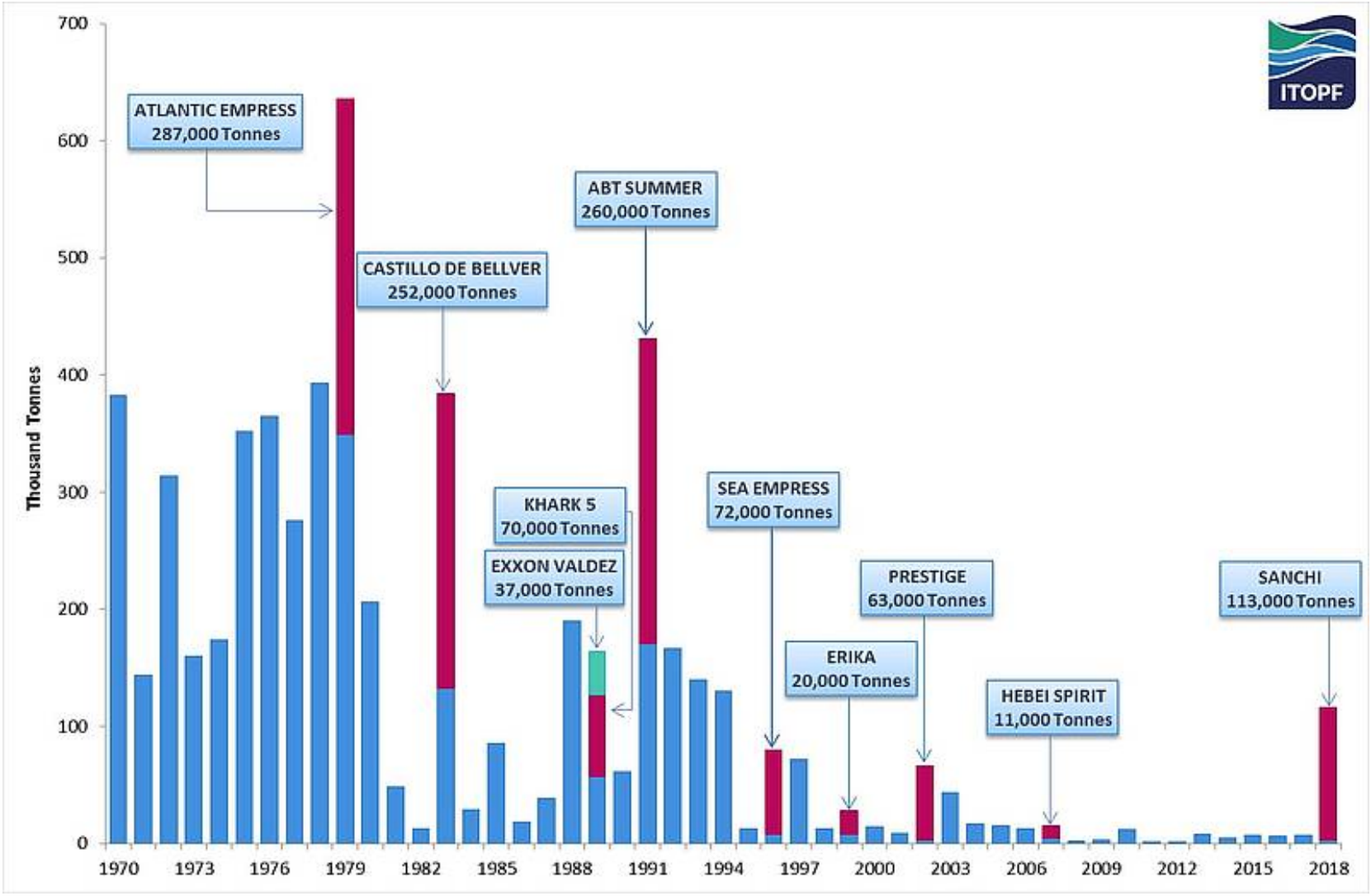
INCIDENTS ATTENDED IN THE LAST 12 MONTHS

- 10 incidents attended in 12 months
- 8 incidents involving Bunker fuel

GLOBAL TRENDS: MAJOR TANKER SPILLS



GLOBAL TRENDS: MAJOR TANKER SPILLS



CORE TECHNICAL SERVICES

1. SPILL RESPONSE (OIL & HNS)
2. DAMAGE ASSESSMENT & CLAIMS ANALYSIS
3. CONTINGENCY PLANNING & ADVISORY
4. TRAINING & EDUCATION
5. INFORMATION

1. SPILL RESPONSE: ROLE ON SITE

- Role varies depending on the requirements and preparedness
- Provide technical advice to government, responders & victims
- Promote effective response, joint assessments & cooperation
- Monitor spill response & investigate damage to sensitive resources
- Arrange for additional expertise & equipment to be brought on site

2. DAMAGE ASSESSMENT & CLAIMS ANALYSIS

- Objective advice on technical merits of claims at request of P&I Club or IOPC Funds
- Providing advice on oil spill compensation is a natural extension of ITOPF's on-site work
- Involves objective analysis of 'reasonableness' of clean-up costs and damage claims
- Utilise information gathered while on-site and 'CLC/FUND principles' for consistency
- ITOPF's advice is often sought on studies to assess damage to fisheries & environment

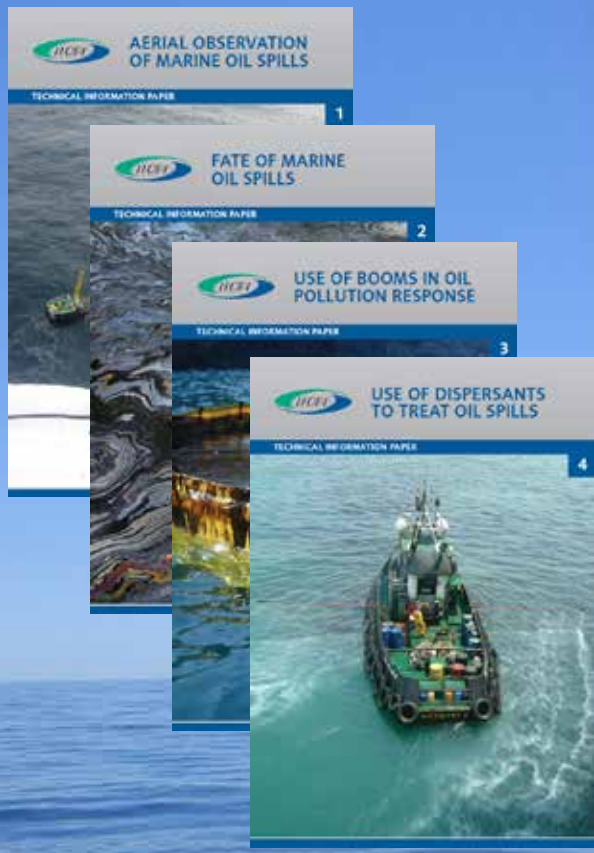
3. CONTINGENCY PLANNING & ADVISORY

- Often requested to advise on contingency plans for government & industry
- ITOPF also helps to test existing plans during oil spill exercises & response drills
- Important lesson: exercises must be realistic & involve actual roles/responsibilities
- Shipowner requirements? … USA, Canada, China, Japan, S. Korea, Chile, Argentina

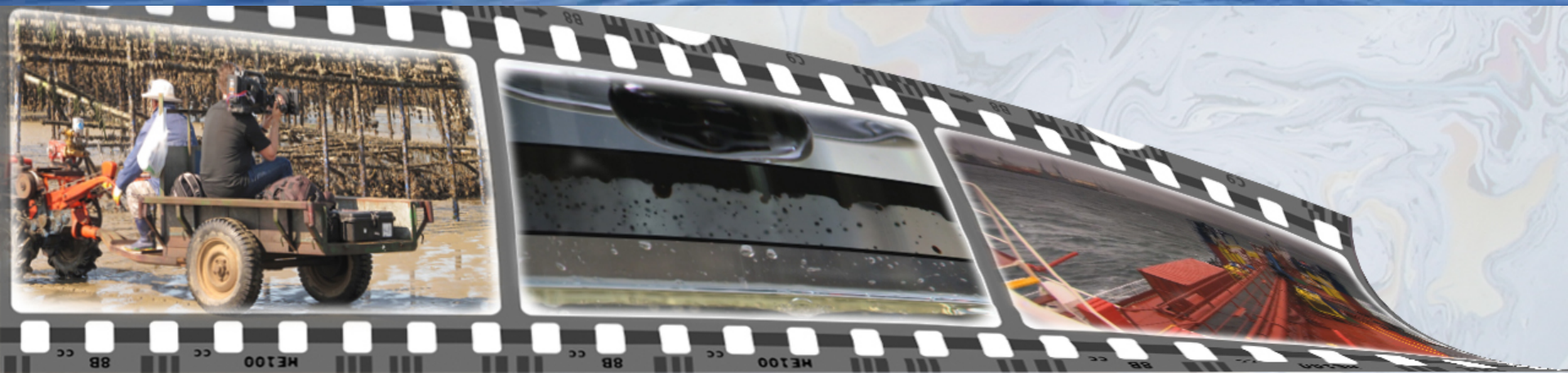
4. TRAINING & EDUCATION

- Main aim of ITOPF: to promote effective response to marine oil & HNS spills
- Organise & participate in training courses, seminars, workshops & conferences
- Key partners include the IMO, the IMO-UNEP Regional Seas Centres & IOPC Funds

5. INFORMATION



www.itopf.com

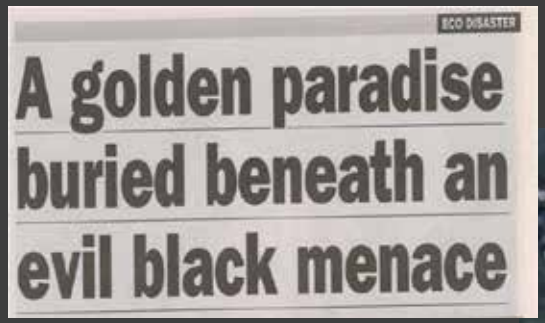


HISTORIC SPILLS AND ENVIRONMENTAL CONSEQUENCES

Dr. Franck Laruelle, Technical Team Manager

National Oil Spill Conference, Gothenburg, Sweden,
13 November 2019

ENVIRONMENTAL IMPACTS: PUBLIC PERCEPTION



Oil spill peril spreads

A crime against humanity

ecosystems in peril

'8-11 tragedy'

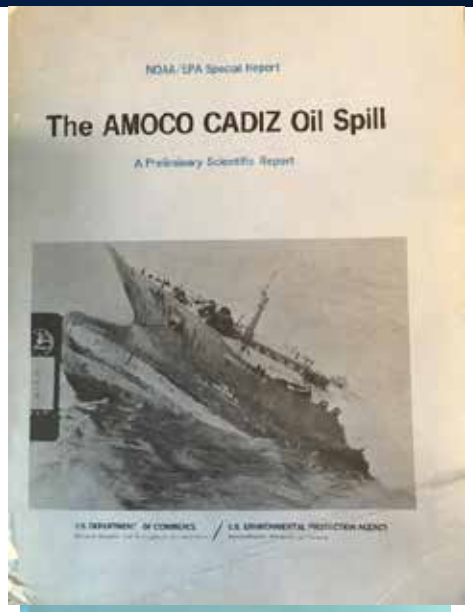
NATIONAL CALAMITY

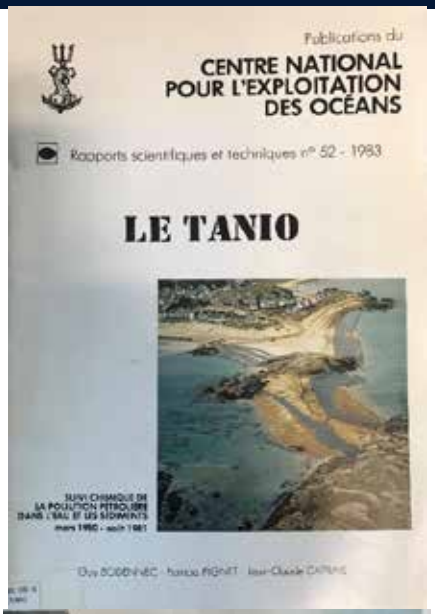
Wrong lessons from Exxon Valdez

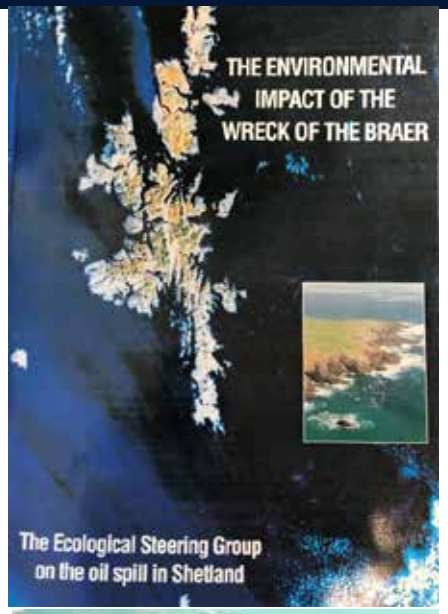
'Oil spill could kill whole Visayan Sea'

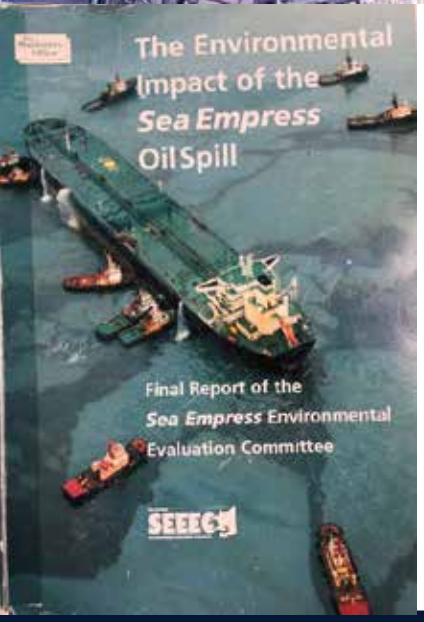
'impending disaster'

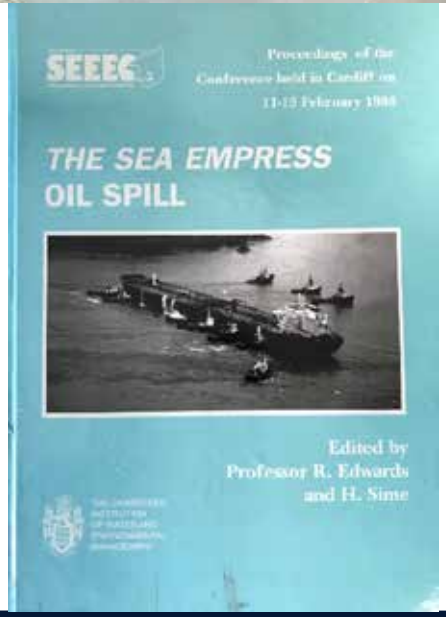
ENVIRONMENTAL IMPACTS: PAST EXPERIENCE

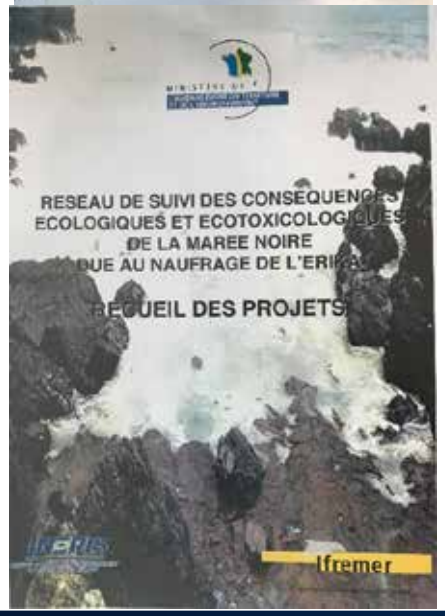


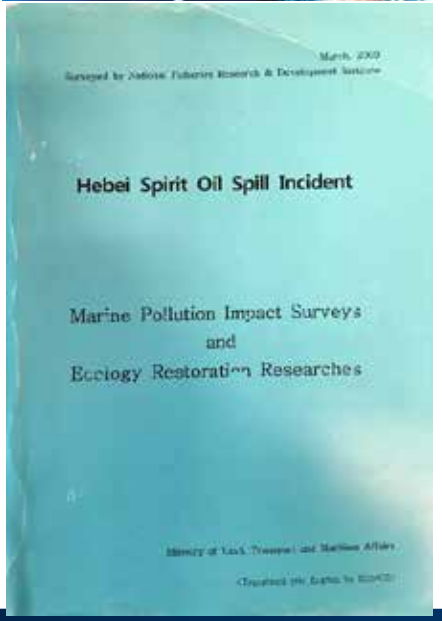










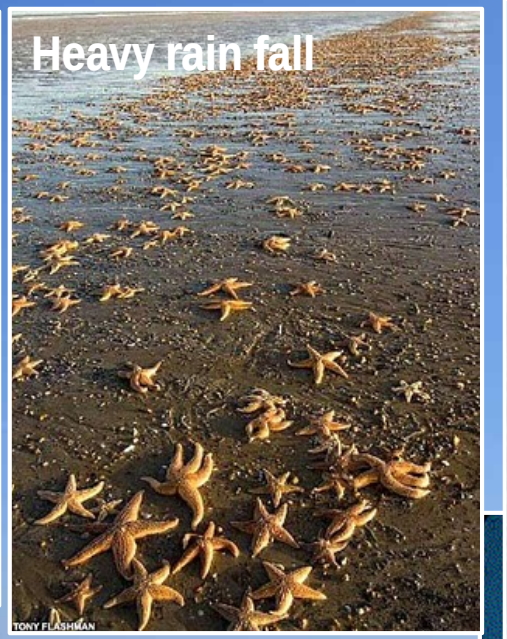


Numerous Environmental Impact Assessments following major oil spills

ENVIRONMENTAL IMPACTS: PAST EXPERIENCE

- Widespread mortalities are typical for large spills
- Populations are naturally resilient to acute impacts
- Natural processes are capable of repairing damage
- Ecosystem structure & function is typically restored

MARINE ECOSYSTEMS: NATURALLY RESILIENT



- Ecosystems able to cope with natural perturbations
- Massive natural mortalities, but ecosystem recovery
- Key adaptations: high fecundity & broadcast spawning

TYPES OF ENVIRONMENTAL IMPACT

PHYSICAL SMOTHERING

- Physiological impairment
- Seabirds & mammals

CHEMICAL TOXICITY

- Cellular damage
- Lethal or sub-lethal

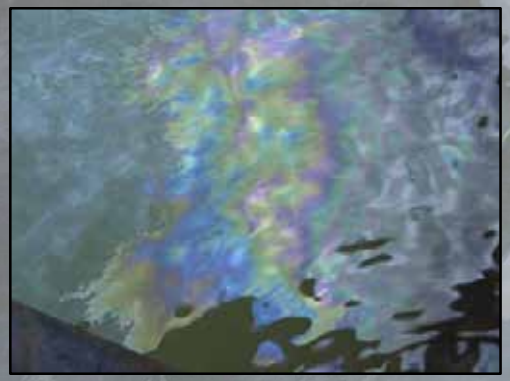
ECOLOGICAL CHANGES

- Loss of ‘keystone species’
- Opportunistic takeover
- Ecological successions

INDIRECT EFFECTS

- Impact on habitat
- Loss of prey species

IMPACT OF OIL



LIGHT OILS — HEAVY OILS

GASOLINE — MARINE DIESEL OILIGHT CRUDE OIL — HEAVY CRUDE OIL — IFO 180 — HFO

TOXIC EFFECTS — SMOTHERING

Oil typical behaviour:

- Float
- Evaporate and disperse
- May sink
- Very limited dissolution

- Type & quantity of oil spilled.
  FATE & BEHAVIOUR
- Characteristics of the area.
  SENSITIVITY AND VULNERABILITY TO POLLUTION
- Time of year
  WEATHER & SEASONALITY
- Type & effectiveness of clean-up
  AGGRESSIVE CLEANING / REMAINING OIL

POTENTIAL IMPACTS OF SHORELINE RESPONSE

- Extraction of sediment / erosion
- Marine communities disruption
- Physical damage
- Dispersants / increase of oil bio-availability

EXTRACTION OF SEDIMENT / EROSION

- Unreasoned used of mechanical equipment
- Generate massive quantities of lightly contaminated waste
- Has a bearing on shore profile as beach material extraction = increasing shore vulnerability to erosion

COAST OIL SPILL SAGA

Stripped by Hamish, our beaches lose more sand

MARINE COMMUNITIES DISRUPTION

- Sediment reworking in lower intertidal zone
- High pressure / hot water washing on highly colonised rocky areas (lichens in splash zone, marine organisms in lower intertidal)
- Can lead to significant mortalities of key community organisms

STRUCTURAL DAMAGE

- Significant reworking in rocky shores unlikely to be re-structured by the sea
- Construction of accesses to get to the shoreline or within the intertidal zone
- Destruction of structuring vegetation (e.g. chopping trees in mangroves)

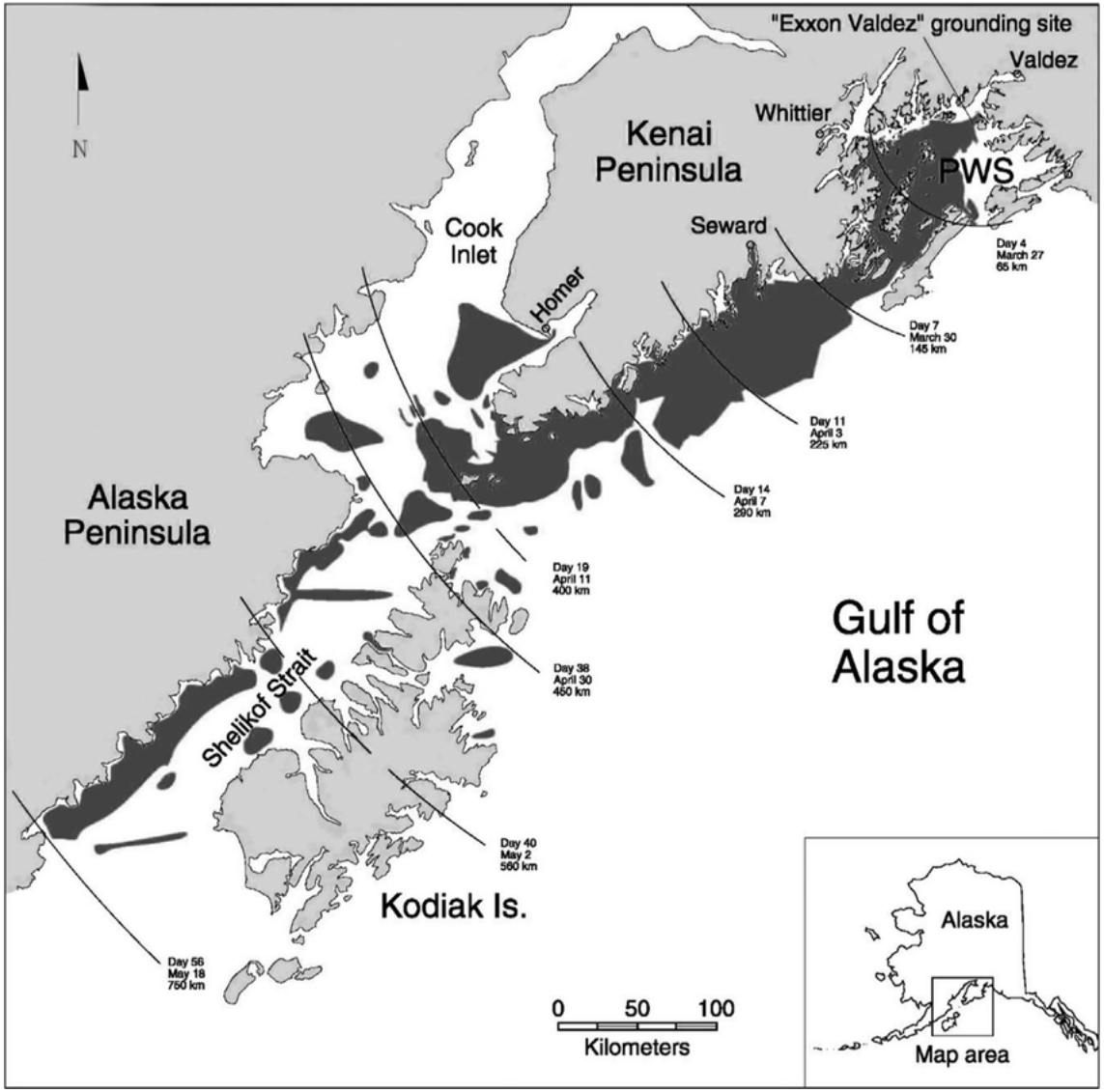
DISPERSANTS – INCREASE OF OIL BIO-AVAILABILITY

- Use of dispersants in sensitive shoreline areas
- Can lead to mortalities from dispersant itself if type 1 (kerosene-based) dispersants
- Depending on the type and quantity of oil being dispersed, can lead to acute toxicity on key marine organisms

EXXON VALDEZ, ALASKA, 1989

- 24 March 1989
- Grounding
- 37,500 tonnes Prudhoe Bay Crude oil spilled

EXXON VALDEZ, ALASKA 1989



- Extent of oiling over 760 km from source (Prince William Sound – PWS)
- 2,100 km of shoreline impacted / 320 km moderately to heavily

EXXON VALDEZ: LINGERING OIL

Lingering oil on Eleanor Island, August 2013. Photo by David Janka, *Auklet* Charter Services.

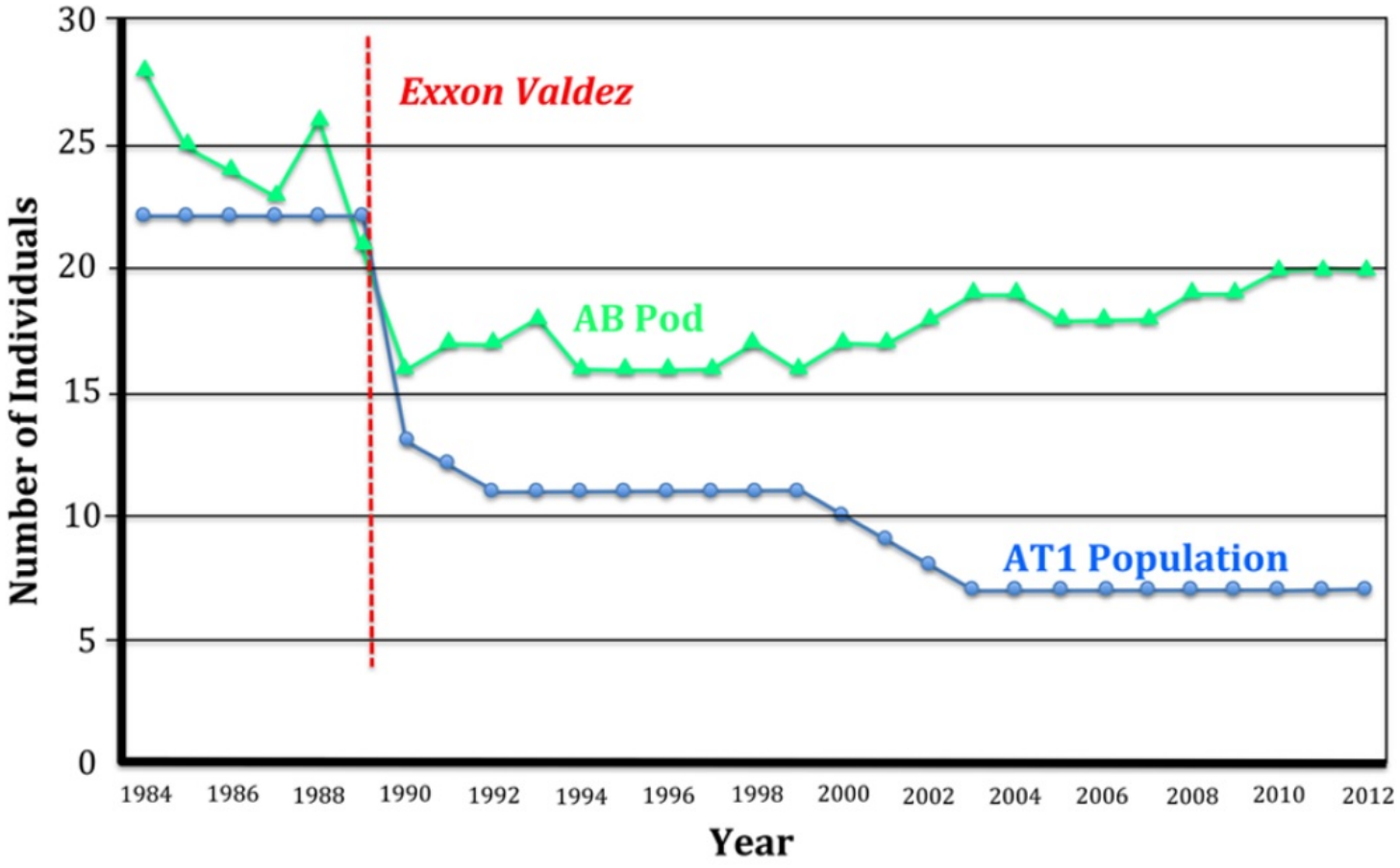
Lingering oil at Herring Bay, Knight Island, February 18, 2014. Photo by David Janka, *Auklet* Charter Services.

- Residual oil still found along the shorelines of PWS
- Not a large volume
- Surprisingly unweathered (percolated/buried oil in highly sheltered environments)

EXXON VALDEZ: WILDLIFE

- 35,000 dead birds collected
- 1,000 sea otters carcasses found
- Estimated toll:
  - 250,000 seabirds
  - 2,800 sea otters
  - 300 harbour seals
  - 250 bald eagles
  - Up to 22 killer whales
- Long lasting impact on sea otters and harlequin duck populations – Recovery in 2013 (NOAA)

EXXON VALDEZ: KILLER WHALES



- 28 years of killer whales monitoring in PWS (pre-spill data since 1984)
- Synchronous decline of two populations coincidental with EXXON VALDEZ spill
- Slow recovery of AB pod
- No recovery in AT1 population (could lead to extinction of this group)

EXXON VALDEZ: PACIFIC HERRING

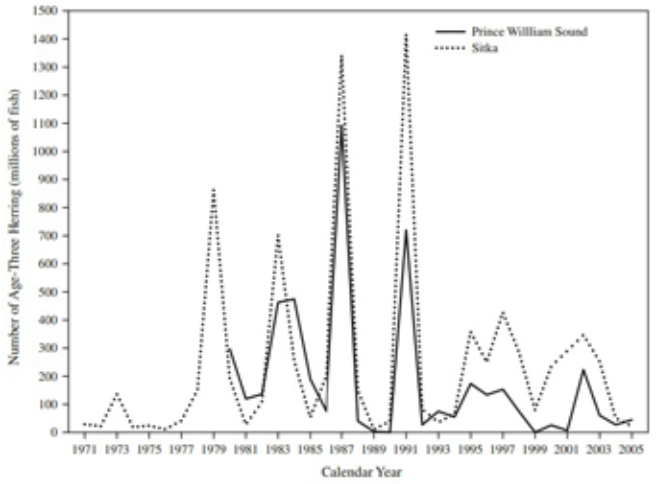
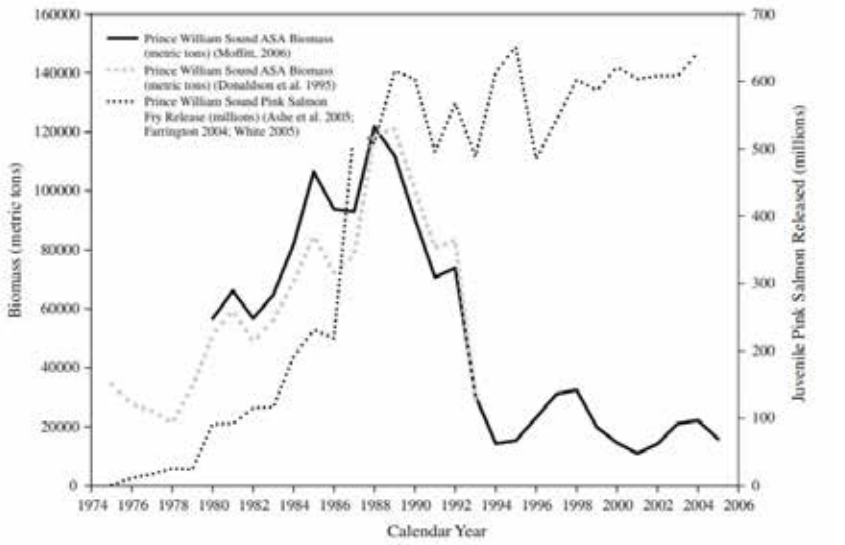


Fig. 2 Number of age-3 herring recruits for Prince William Sound and Sitka, Alaska, estimated by ADFG ASA models by calendar year (Dressel 2006, Moffitt 2006)



- Immediate toxicity effect to herring embryos and larvae
- Initial decline:
  - Poor nutrition as the probable cause of the 1993 decline (Pearson *et al*, 2012). Oil spill added a contributing effect (NOAA, 2014)
  - Disease during the decline secondary effect after a portion of the PWS herring population was stressed by poor nutrition (Pearson *et al*, 2012)
- Poor recovery:
  - Present-day lingering oil residues not believed to have a continuing impact (NOAA, 2014)
  - Predation by an increasing number of overwintering humpback whales (NOAA, Pearson)
  - Interactions with juvenile pink salmon released from PWS hatcheries may be influencing nutrition in juvenile herring and their subsequent growth, survival, and recruitment

EXXON VALDEZ: SHORELINE ECOLOGY PROGRAM

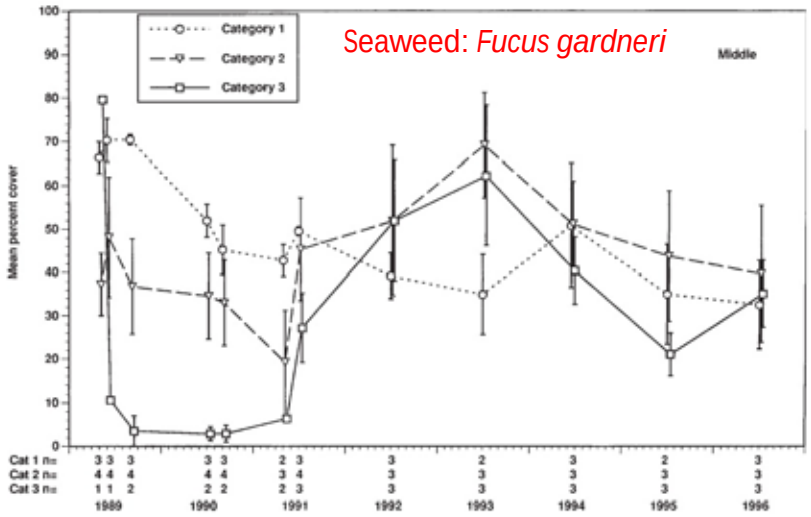


Figure 3. Mean percent cover (±1 SE) of *Fucus gardneri* from middle rocky stations, by category 1989–1996

Category 1: unoiled
Category 2: oiled and low pressure clean-up
Category 3: oiled and HP/HW washed

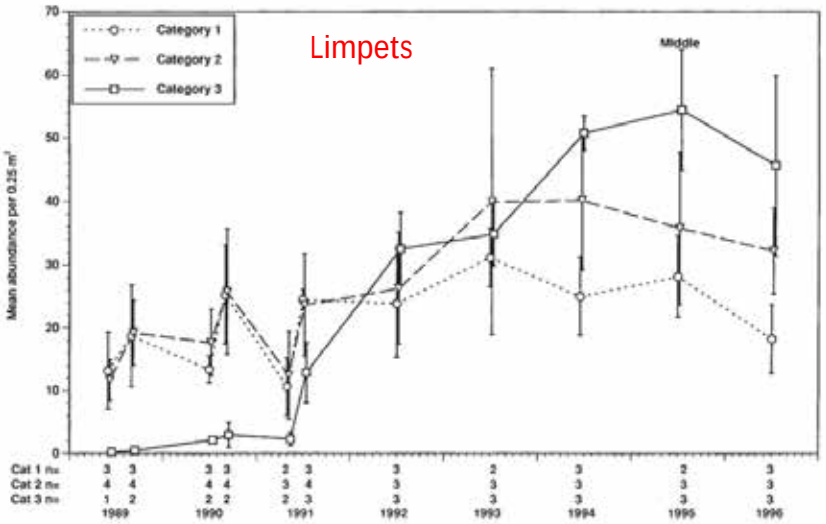


Figure 6. Mean abundance (±1 SE) of limpets (Lottiidae) from middle rocky stations, by category 1989–1996

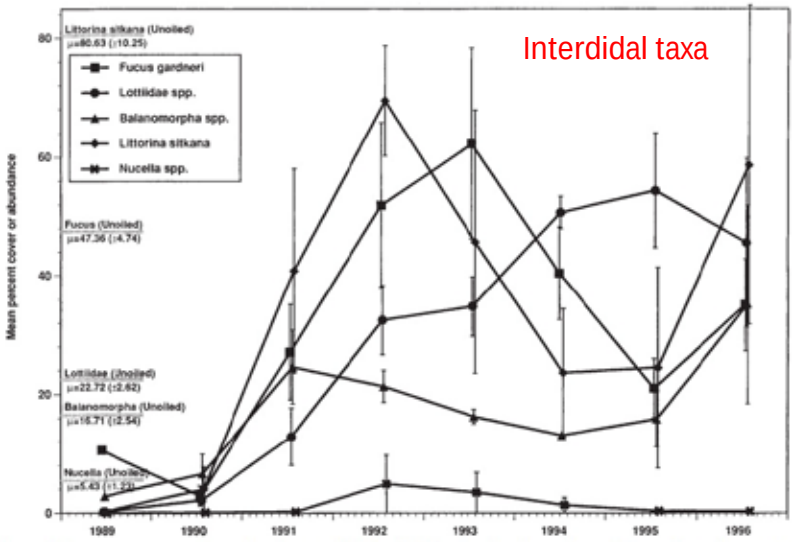


Figure 7. Mean percent cover and mean abundance (±1 SE) of selected taxa from the oiled and treated (category 3) middle rocky stations, 1989–1996

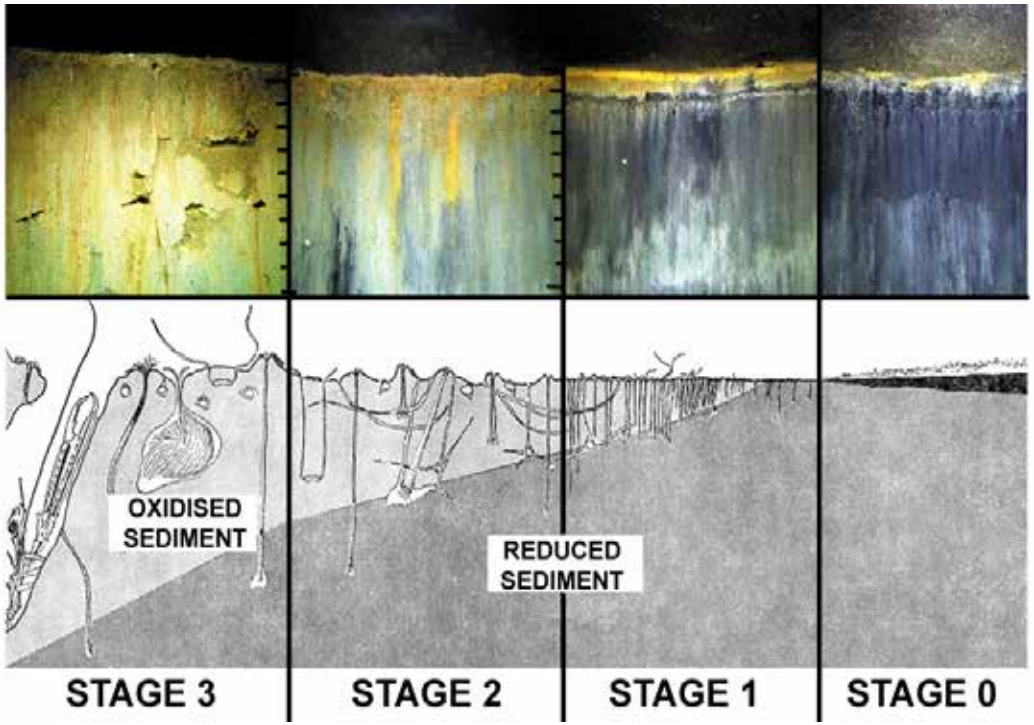
- The shoreline of PWS had largely recovered from the effects of the spill by the summer of 1990, 15 to 18 months after the spill (Gilfillan *et al*, 1995)

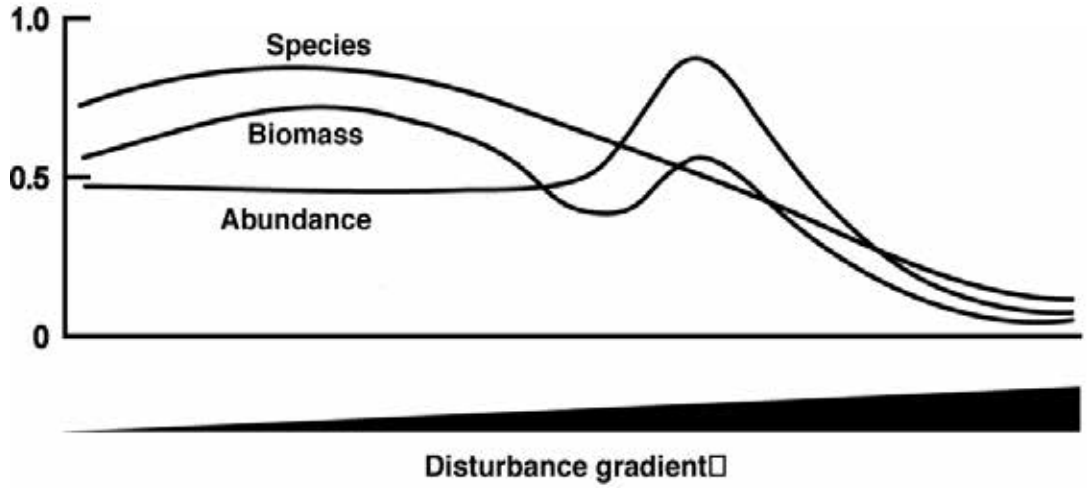
AMOCO CADIZ, BRITTANY, 1978

- 16 March 1978
- Grounding
- 227,000 tonnes Arabian light Crude oil and HFO bunker fuel spilled

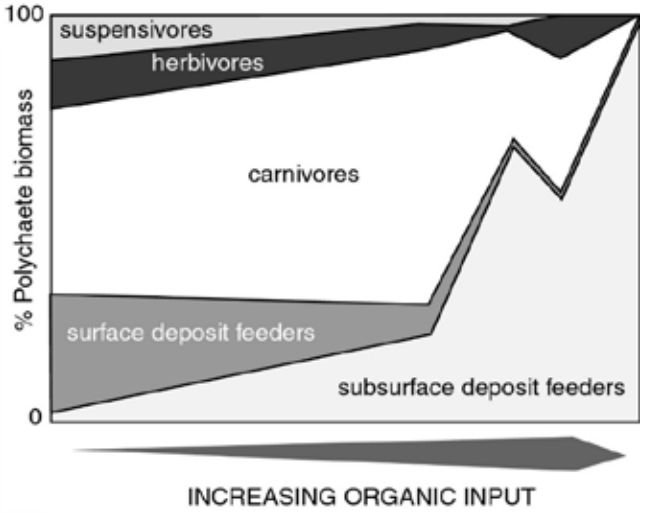
AMOCO CADIZ: MASSIVE INITIAL INVERTEBRATE MORTALITIES

SHORE SEDIMENT COMMUNITIES : ORGANIC MATTER ENRICHMENT



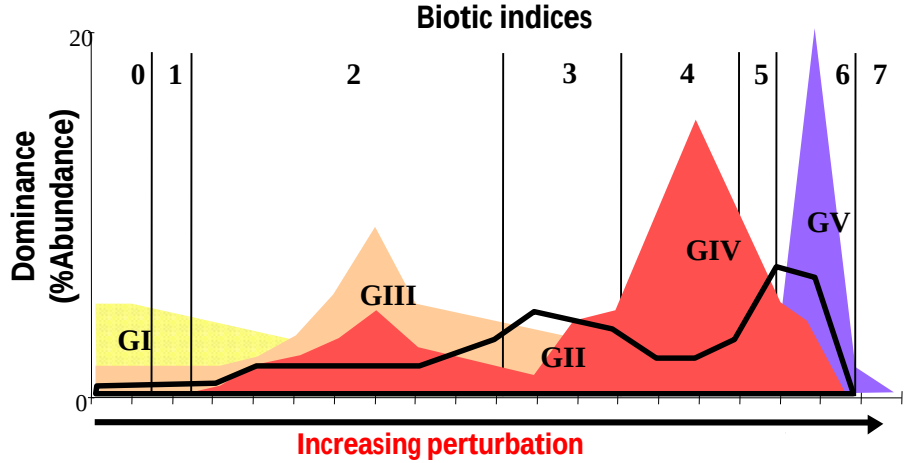


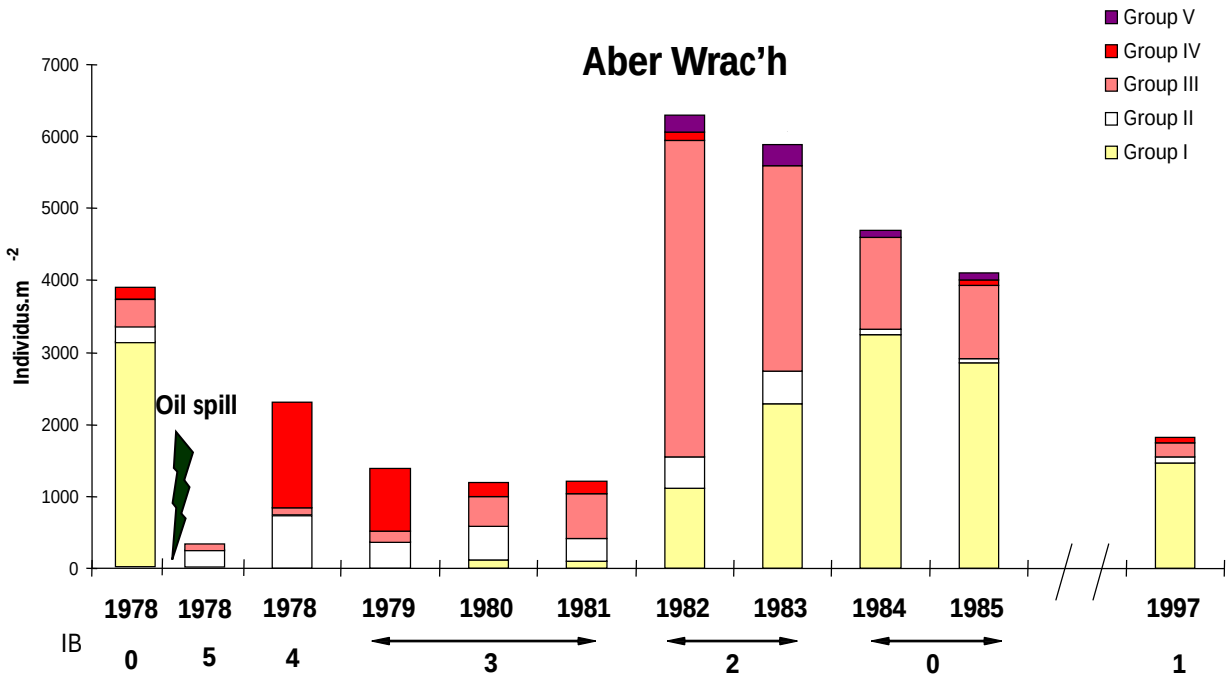
After Pearson & Rosenberg (1978)



After Weston D.P, 1990

AMOCO CADIZ: ECOLOGICAL SUCCESSIONS



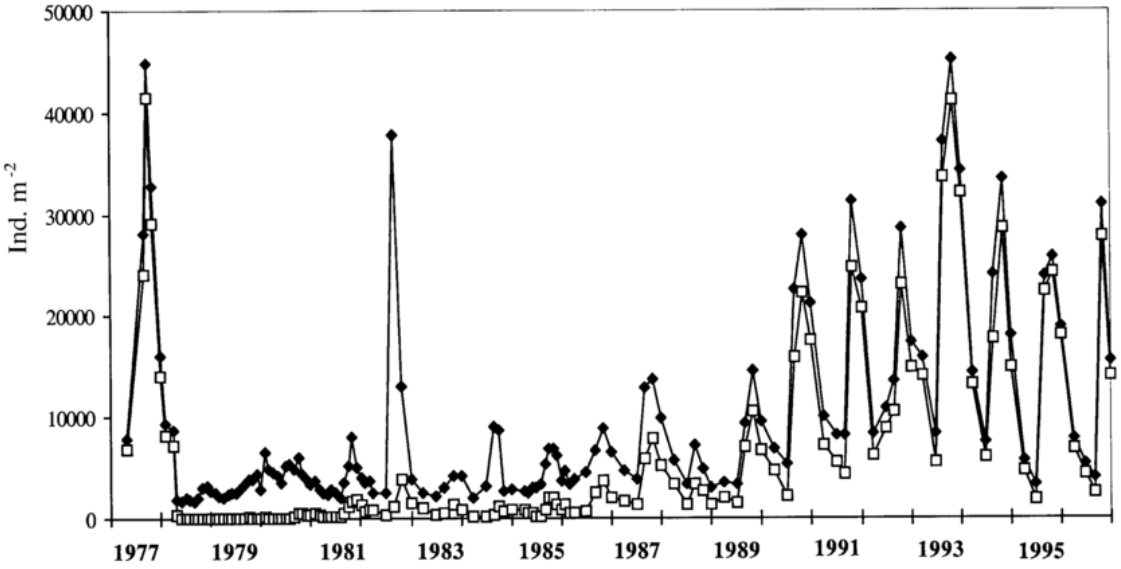


Group V — First-order opportunistic species
Group IV — Second-order opportunistic species
Group III — Species indifferent to enrichment
Group II — Species tolerant to excess organic matter enrichment
Group I — Sensitive species

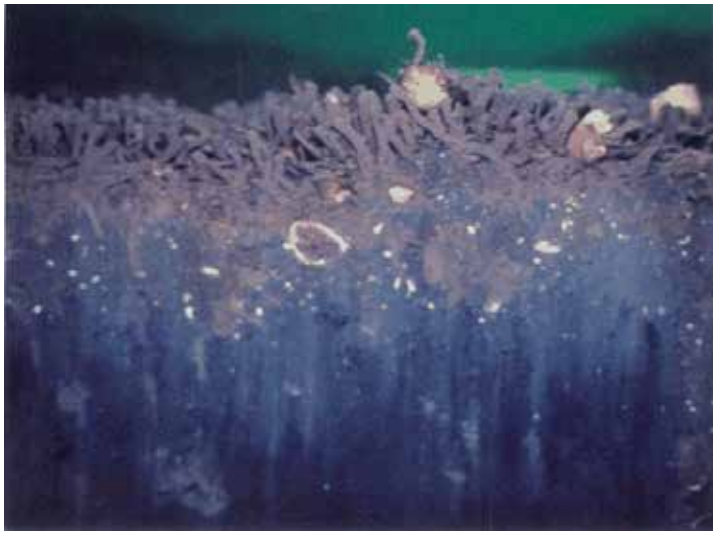
Pluriannual winter fluctuations of ecological group abundance after AMOCO CADIZ spill (shoreline fine sand)

Ecological successions recorded in intertidal and subtidal soft sediments 3 to 5 years recovery)

AMOCO CADIZ: LONG-TERM RECOVERY OF AMPHIPODS



Annual changes (1977–1996) in (¨) total number of individuals of all species and (ÿ) abundance of *Ampelisca* populations



- Subtidal tube-forming amphipods creating habitat for other species
- Very high densities (10,000 to 40,000 per m^2)
- High initial mortalities resulted in loss of physical habitat structure
- > decade long recovery

AMOCO CADIZ: SALT MARSH

- Ile Grande: affected by roughly 10,000 MT of crude oil
- Clean-up involved scraping of heavily oiled soft sediment and vegetation in salt marshes resulting in a change in the tidal zonation
- Significant modification of the physical structure of the marsh

ERIKA, BRITTANY, 1999

- 12 December 1999
- Sinking
- 19,000 tonnes Heavy Fuel Oil

ERIKA, BRITTANY, 1999

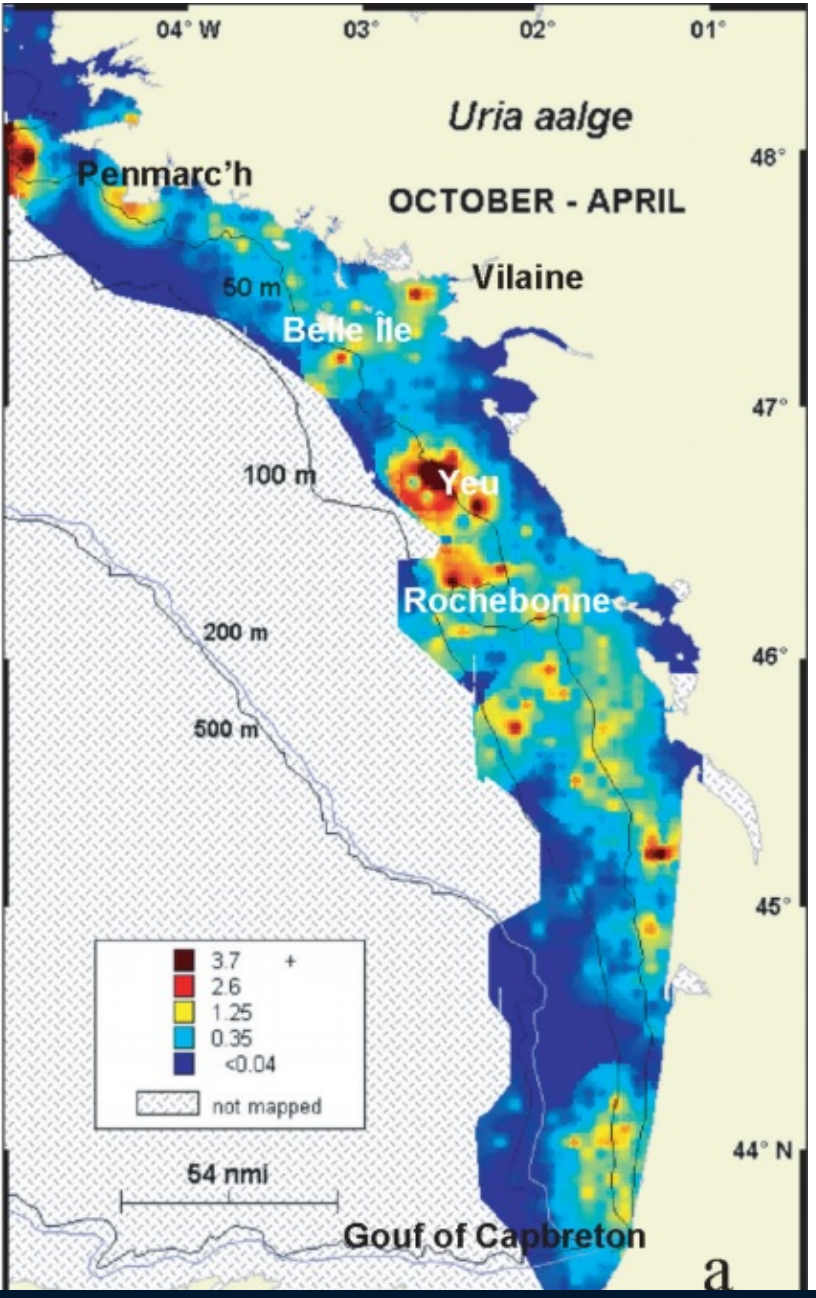
SHORELINE OILING: LOIRE-ATLANTIQUE

Le Pouliguen

Le Pouliguen

Batz-sur-Mer

Batz-sur-Mer



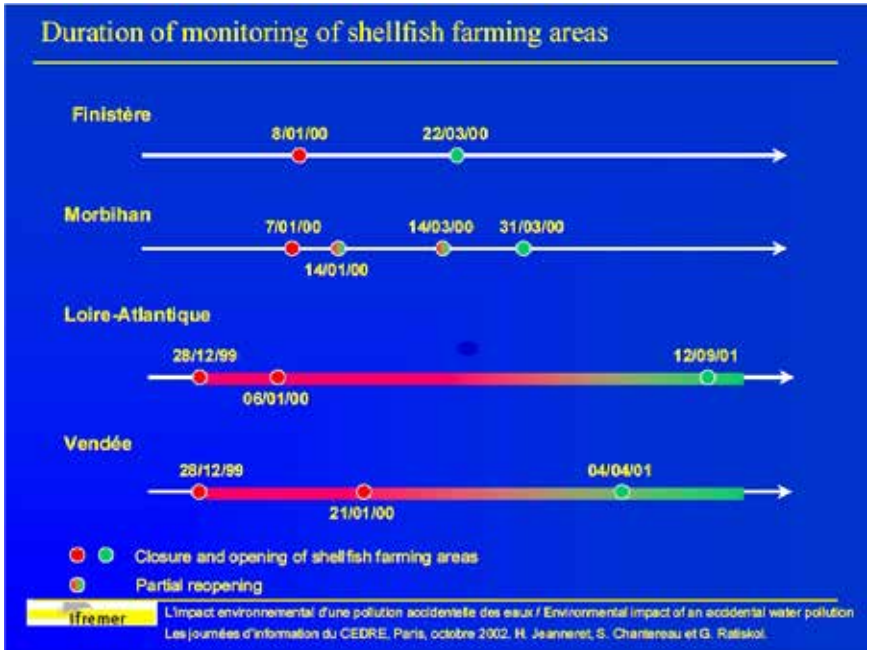
Oil drift coincidence with overwintering areas of large groups of guillemots

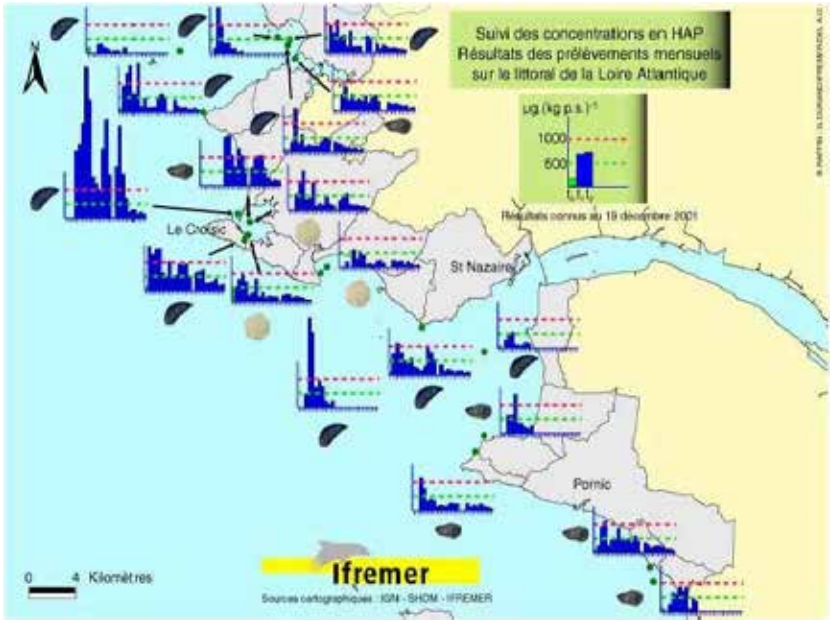
WILDLIFE: HIGHEST SEABIRD TOLL RECORDED FOLLOWING AN OIL SPILL

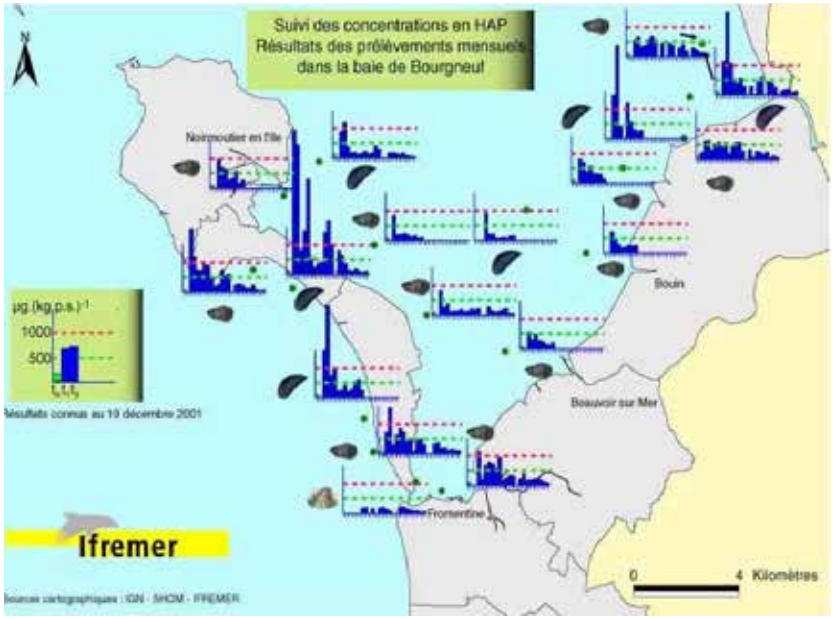
- 74,226 birds collected (underestimated as many sent to waste storage in skips)
- 32,193 alive / 2,874 released
- Estimation: 110,000 to 150,000 mortality
- Auks: 86.9% incl. 79% Guillemot

SEAFOOD SAFETY

- Large scale monitoring of seafood contamination (aquaculture and wild stock)
- Farming and selling restrictions according to results
- PAHs content (French guidelines, now superseded by EU guidelines)
- Temporary restrictions up to 21 months







SUMMARY

- Effects of spilled oil depends heavily on its composition & characteristics
- Weathering processes can increase or decrease bio-availability of oil
- Marine life can recover remarkably through natural processes
- Socio-economic effects of oil spills can be severe in the short to medium-term
- Effective clean-up response operations can mitigate damage
- Marine environment subjected to high natural variability (in space and time)
- Long-term effects often difficult to distinguish from other natural or anthropic factors (chronic pollution, global warming, overfishing, predator/prey population dynamics)