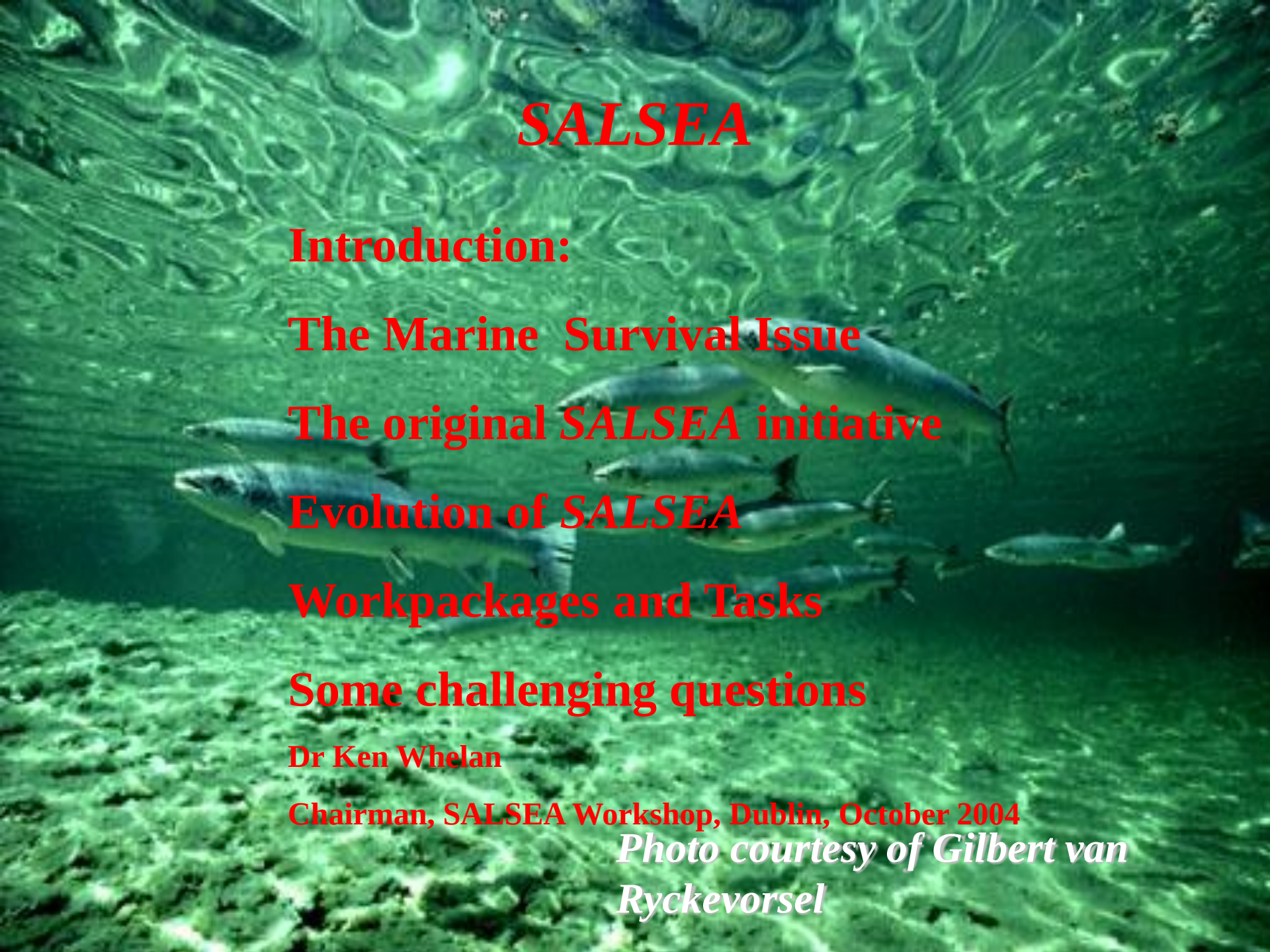


SALSEA

Introduction:

The Marine Survival Issue

The original *SALSEA* initiative

Evolution of *SALSEA*

Workpackages and Tasks

Some challenging questions

Dr Ken Whelan

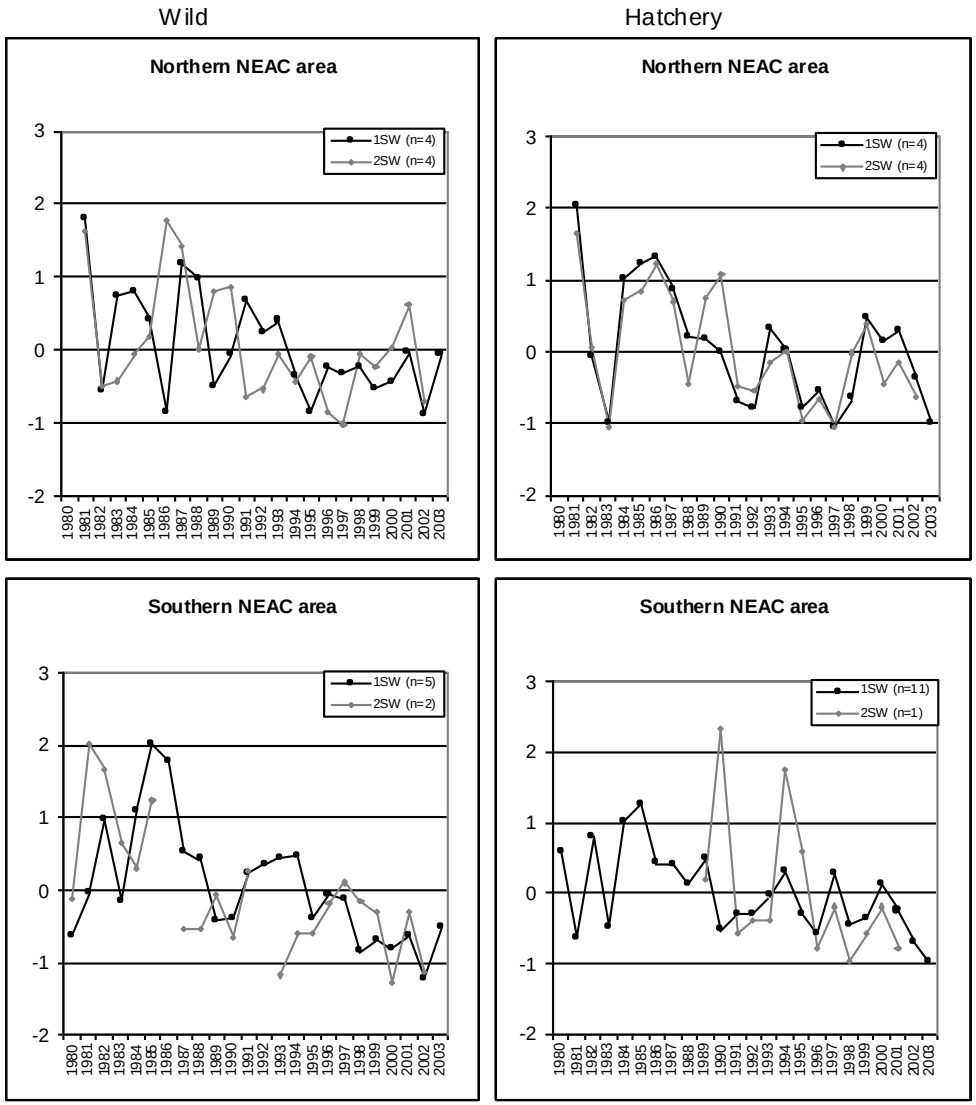
Chairman, SALSEA Workshop, Dublin, October 2004

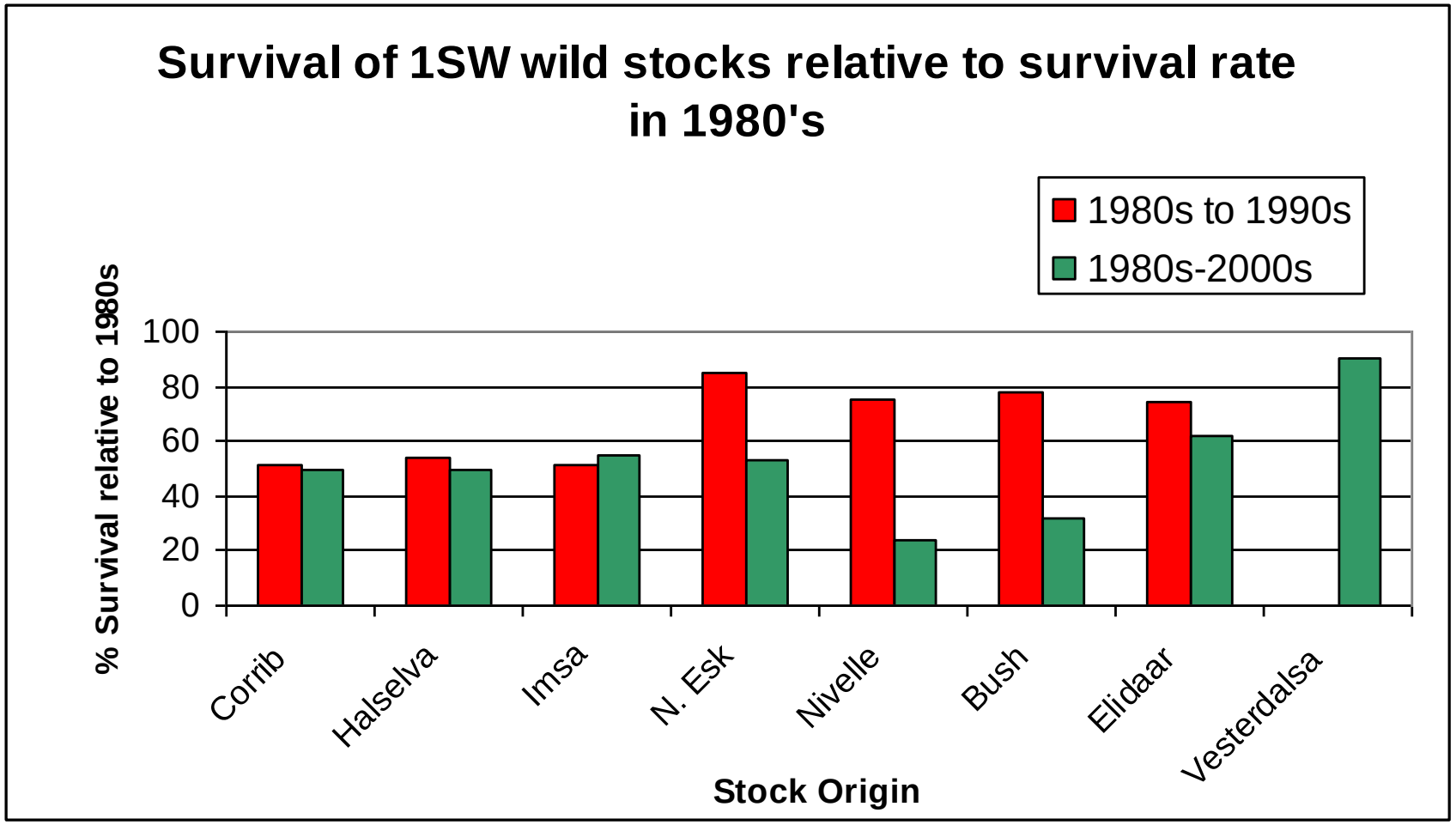
Photo courtesy of Gilbert van Ryckevorsel

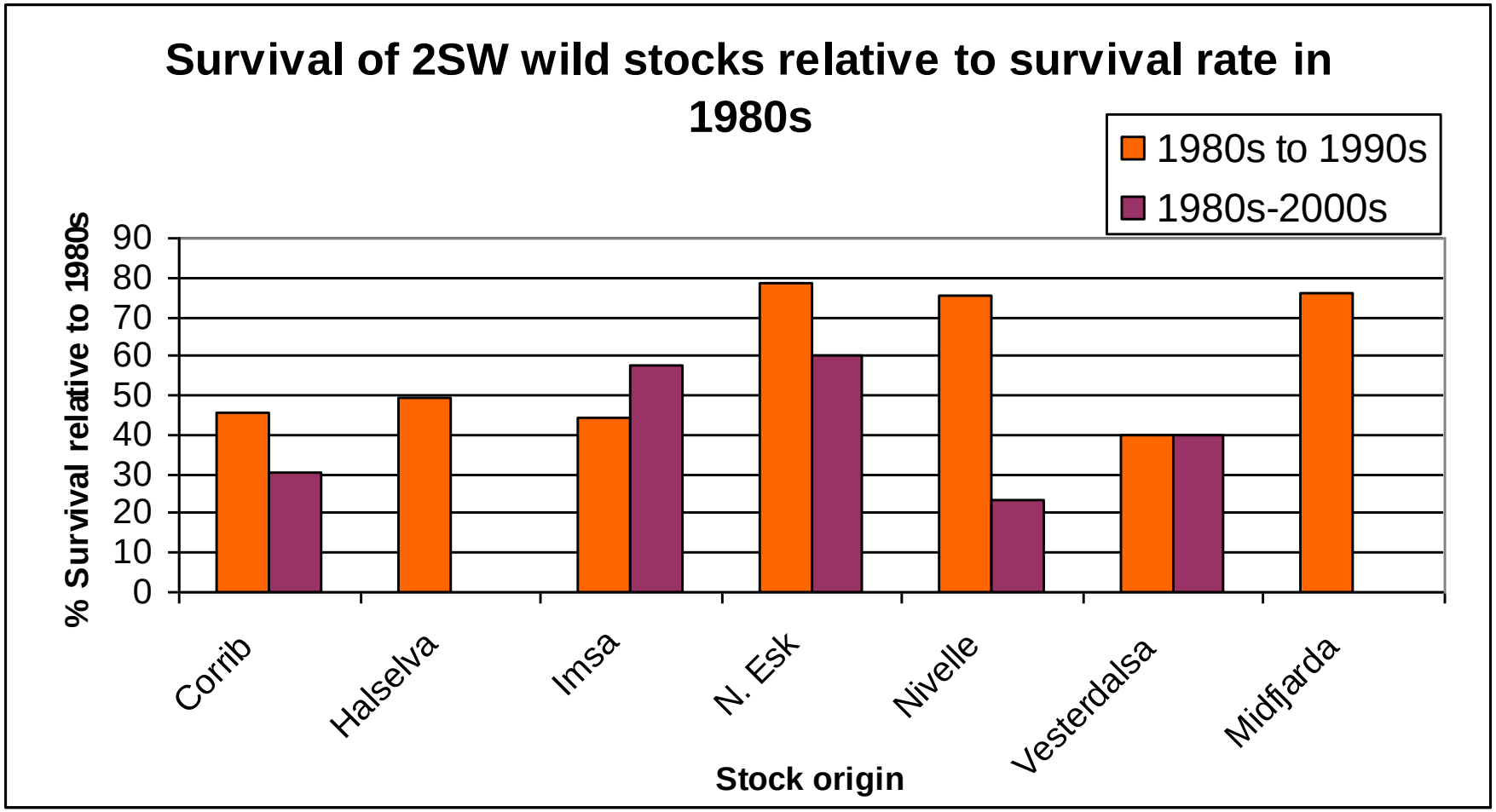
Marine Survival

- Returns are strongly influenced by factors in the marine environment
- Information from index systems indicates that there is a consistent drop in survival from the 1980's to the 1990's to the current decade
- Over the past 15 years we have developed new survey techniques, gained additional knowledge relating to locations, stock composition, timing, migration, feeding habits, growth, distance travelled etc
- Survival of North American stocks to home waters has not increased as expected after closure of the commercial fisheries in 1984 and 1992

Figure 3.9.15.1. An overview of the estimated survival indices of wild and hatchery smolts to adult returns to homewaters (prior to coastal fisheries) in Northern and Southern NEAC area.
Index values represent averages of standardized (Z-score) survival estimates for monitored rivers and experimental facilities, and are relative to the average of the time series (0).
The number of rivers included are indicated in each panel legend.




Survival of 1SW wild stocks relative to survival rate in 1980's
1980s to 1990s
1980s-2000s
% Survival relative to 1980s
100
80
60
40
20
0
Corrib
Halselva
Imsa
N. Esk
Nivelle
Bush
Elidaar
Vesterdalsa
Stock Origin


Survival of 2SW wild stocks relative to survival rate in 1980s
1980s to 1990s
1980s-2000s
% Survival relative to 1980s
90
80
70
60
50
40
30
20
10
0
Corrib
Halselva
Imsa
N. Esk
Nivelle
Vesterdalsa
Midfjarda
Stock origin

Progress to date

- IASRB established 2002
- European scientists initiative 2003
- NASCO meeting in Dublin October 2004
- Chairs:Ted Potter, Marianne Holm, Philip McGinnity and Chris Poupard

Objectives:

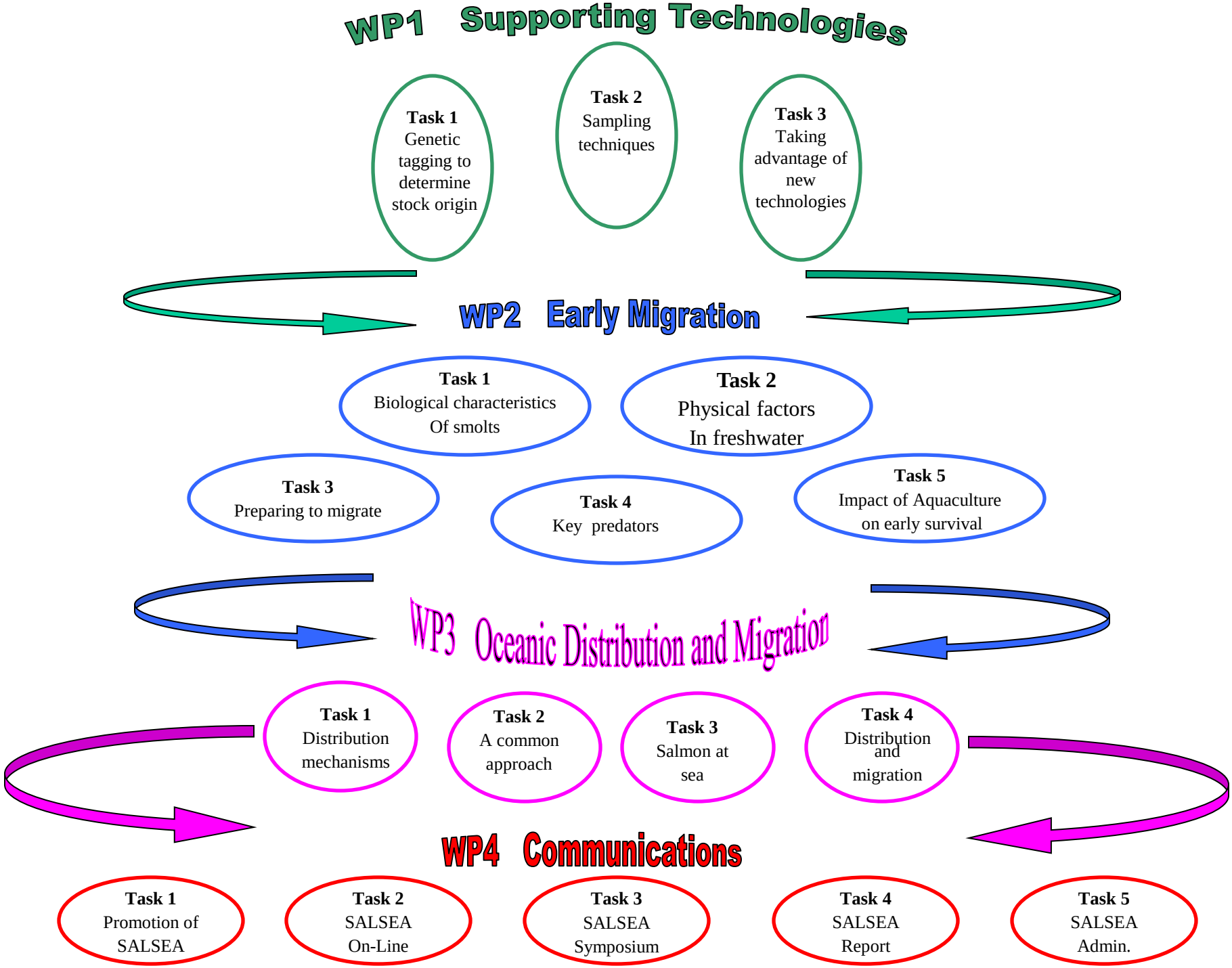
- To develop a major proposal for research on marine mortality of salmon, drawing on the ***SALSEA*** concept, examine and where possible refine hypothesis

Tasks

- Formulate a series of work packages to examine the agreed key hypothesis:
- provide a detailed series of tasks under each,
- support each task with indicative timelines and costs,
- differentiate between tasks which may be achieved through co-operation or co-ordination or national funding,
- those requiring additional external resources

Current state of knowledge

- Increased marine mortality accounts for a significant proportion of decline in the abundance of salmon stocks.
- Factors in fresh water such as water temperature, pesticides, endocrine issues etc. may reduce salmon survival at sea.
- Smolts and post-smolts move quickly to the ocean.
- Mortality of salmon in the sea is high during the first few months after the smolts leave fresh water.
- Analysis of scale growth patterns suggest that at least some of the mortality at sea is related to change in the rate of the salmon's growth.
- There is a wide variety of food items available in the ocean and it is suggest that the abundance of larger salmon is unlikely to be sensitive to changes in the availability of any specific food item.
- Predation of smolts and post-smolts may be most severe in estuaries and fjords Concerns have been raised regarding the capture of post smolts in commercial fisheries for fish such as mackerel
- Parasites and diseases may also affect post smolt survival.


WP1 Supporting Technologies
Task 1 Genetic tagging to determine stock origin
Task 2 Sampling techniques
Task 3 Taking advantage of new technologies
WP2 Early Migration
Task 1 Biological characteristics Of smolts
Task 2 Physical factors In freshwater
Task 3 Preparing to migrate
Task 4 Key predators
Task 5 Impact of Aquaculture on early survival
WP3 Oceanic Distribution and Migration
Task 1 Distribution mechanisms
Task 2 A common approach
Task 3 Salmon at sea
Task 4 Distribution and migration
WP4 Communications
Task 1 Promotion of SALSEA
Task 2 SALSEA On-Line
Task 3 SALSEA Symposium
Task 4 SALSEA Report
Task 5 SALSEA Admin.

Work Package 1 – Task 1

Genetic tagging to determine stock origin – map the regional genetic structure for Atlantic salmon and establish a standardised genetic baseline database for regional or river-specific populations

Objectives:

- Review existing knowledge of genetic structure
- Compile an inventory of available samples, both recent and historic
- Establish a cooperative programme between the principal genetic laboratories
- Select an experimental set of populations
- Determine whether sufficient precision is achieved for the purposes outlined in the core SALSEA tasks
- Establish a standardised database
- Carry out comparative studies using conventional tags
- Establish a “Biobank” of samples

Work Package 1 – Task 2

Refine sampling equipment design, to increase the sampling efficiency for salmon at sea

Objective

Initiate research efforts to develop smolt trawl design to minimise size selection.

Work Package 1 – Task 3

Signals from scales – establish standardised scale analysis techniques

Objectives

- Ensure that results from scale analysis in Europe and North America is comparable
- Carry out scale analysis training for all laboratories where this is required
- Introduce standardised scale examination procedures and techniques
- Carry out scale analysis on selected scale sets and co-ordinate the examination of scale material for several research agencies to identify spatial and temporal anomalies in the time series of scale growth during the marine phase.

Work Package 2 – Early Migration through the Inshore Zone: freshwater, estuaries and coastal waters

Work Package 2 – Task 1

Investigate the influence of biological characteristics of Atlantic salmon smolts on their marine mortality

Objectives

- Identify the key biological variables among smolts that may affect marine survival.
- Determine the impact of smolt characteristics on migratory behaviour.
- Determine the impact of smolt characteristics on marine survival and return of adults.
- Model the impact of smolt characteristics.
- Determine management options.

Work Package 2 – Task 2

The impacts of physical factors in freshwater on the marine mortality of salmon

Objectives

- Determine the impact of physical variables at the time of smolt emigration and smolt survival
- Determine the impact of key physical variables, such as temperature, flow etc. on run timing
- Determine the impact of physical variables on behaviour of smolts
- Determine the impacts of coastal transition waters on survival
- Model the impact of freshwater physical variables on Atlantic Salmon
- Determine management options for mitigating impacts

Work package 2 – Task 3

Preparing to migrate – investigate the influence of freshwater contaminants on the marine survival of Atlantic salmon

Objectives

- Identify freshwater contaminants that are common throughout the geographic range of Atlantic salmon
- Determine the effect of environmental levels of the target contaminants on parr / smolt transformation
- Determine the impact of the target contaminants on run-timing of wild smolts and migratory behaviour
- Determine the impact of target contaminants on marine survival
- Model the impact of freshwater contaminants at the population level
- Provide management options for resolving impacts identified in these studies

Work Package 2 – Task 4

The part played by key predators

Objectives

- Determine the proportion of out-going smolts and returning adults that are removed by predation
- Compare current patterns and intensities of predation with the situation prior to the salmon decline
- Identify the predators involved

Work Package 2 – Task 5

The impacts of aquaculture on mortality of salmon

Objectives

- To summarise available knowledge on the interactions between aquaculture and wild salmon stocks
- Identify gaps in current understanding of interactions
- Review progress in managing interactions of aquaculture
- Make recommendations for additional measures, including cooperative ventures between various stakeholders, to ensure that aquaculture practices are sustainable and consistent with Precautionary Approach

Work Package 3 – Investigating the Distribution and Migration of Salmon at Sea

Work Package 3 – Task 1

Distribution and migration mechanisms – Develop theoretical migration models from existing studies

Objectives

- Assemble all available scientific data, both near and off shore on smolt distribution, migration, growth and feeding at sea
- Review current investigations using oceanographic data so as to refine/develop predictive tools.
- Test the hypothesis that distribution and stock composition are stable over time.
- Review the existing information on differences in the behaviour and survival of hatchery and reared salmon at sea.

Work Package 3 – Task 2

A common approach – Refine the plans for a large-scale marine survey programme and standardization of trawl survey techniques between the participating partners

Objectives

- To develop Standard Operating Procedures and plan the large-scale marine survey programme

Work Package 3 – Task 3

Salmon at sea – Carry out a comprehensive marine survey to collect samples and information required to compare migration patterns, distribution and factors affecting survival of reared and wild salmon post-smolts at sea

Objectives

- Determine the ocean migration patterns of salmon from fresh water to home water
- Provide adequate samples to describe the major migration routes
- Identify regional stocks
- Collect information on a variety of physical barometers such temperature, salinity, current speed etc.
- Collect information on predators at sea
- Determine the distribution of salmon in relation to:
  - Sea temperature and currents
  - Presence of prey
  - Presence of predators
  - Presence competitors
  - Ocean up-welling and productivity
- Collect and analyse oceanic data compared to the relative abundance of salmon captured in targeted trawl surveys

Work Package 3 – Task 4

Distribution and migration – analyse and collate data from the marine surveys, report on the distribution of salmon at sea, report on the biological and physical oceanographic factors which influence migration and distribution of Atlantic salmon and report on natural and man-made mortality factors which may significantly affect survival of salmon

Objectives

- Genetic assessment of stock composition
- Man-made effects
- Predators
- Productivity
- Food availability
- Growth effects
- Water temperature
- Competition
- Combined synergistic effects

Work Package 4 – Communications

Work Package 4 – Task 1

Promoting SALSEA to potential fundraisers

Work Package 4 – Task 2

SALSEA on-line – Development of a SALSEA website

Work Package 4 – Task 3

SALSEA Symposium

Work Package 4 – Task 4

Generation of the SALSEA Programme Report + scientific papers

Work Package 4 – Task 5

Administration support for SALSEA