Presentation of the ICES Workshop on Innovative Fishing Gear (WKING)

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EU-DGMARE Commission request

- *Advice on the **progress that has been made, or impact arising from innovative gears within EU waters.** To assess the benefits for, or negative effects on, marine ecosystems, sensitive habitats and selectivity*

- *The advice should provide information on:*
  - ***what kind of innovative gears** are being used*
  - *their **objective***
  - *their **technical specificities**, and*
  - *the **impact** on both target species, non-target **species** and the **environment** in which they had been deployed*

- **'Innovative gear'** is a little vague
  - *The Commission want ICES to define what 'innovative gear' is.*
  - *They need a **basis to support the legislation** and are expecting ICES to provide boundaries to the concept*
  - *One could argue that **anything that is different in an existing gear** with the objective or reducing impact or being more efficient in catching target species is innovative, but DGMARE have indicated that they do not consider mesh changes or panels as recent innovations*

Scope

Regulation (EU) 2019/1241 of the European Parliament and of the Council of 20 June 2019

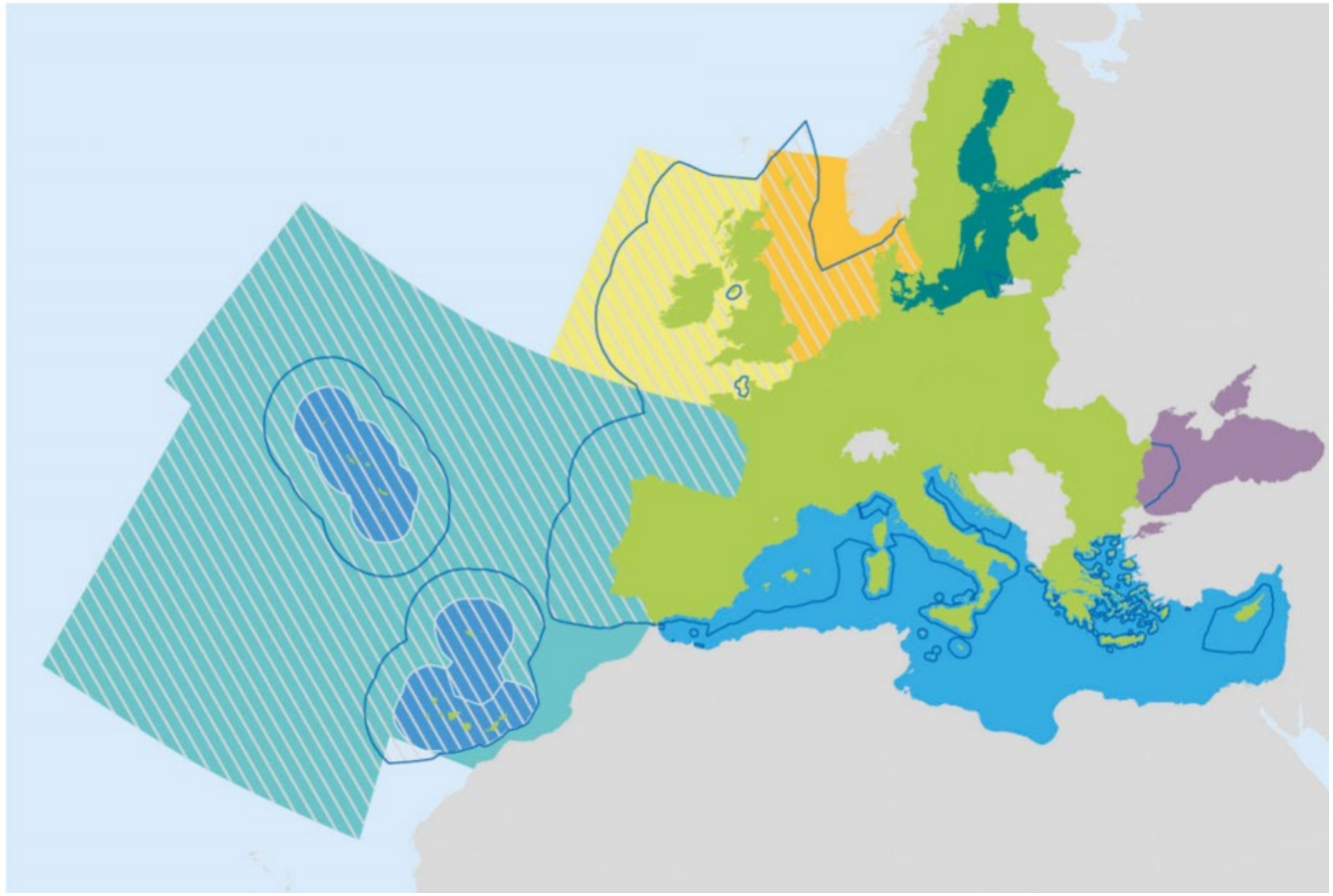
*Member States should have the possibility to develop **joint recommendations** for appropriate **technical measures that differ from baselines***

*The use of innovative gears could be included as **an option** in joint recommendations*

*The joint recommendation shall contain an **assessment of the likely impacts** of using innovative fishing gears on the targeted species and on sensitive species and habitats, within a specific sea basin*

Baseline standards for each sea basin

An innovative gear is a gear or a significant component of the gear **that has not been used commercially or is sufficiently different from the baseline in the current European Regulations**, or in the absence of them, different from the commonly used gear in the specific sea basin (area) in EU waters.



WKING Terms of References

- **Develop a suite of criteria to objectively define an 'Innovative gear'**
  - Performance improvement
  - Technology Readiness Level (TRL)
  - Levels of technological complexity

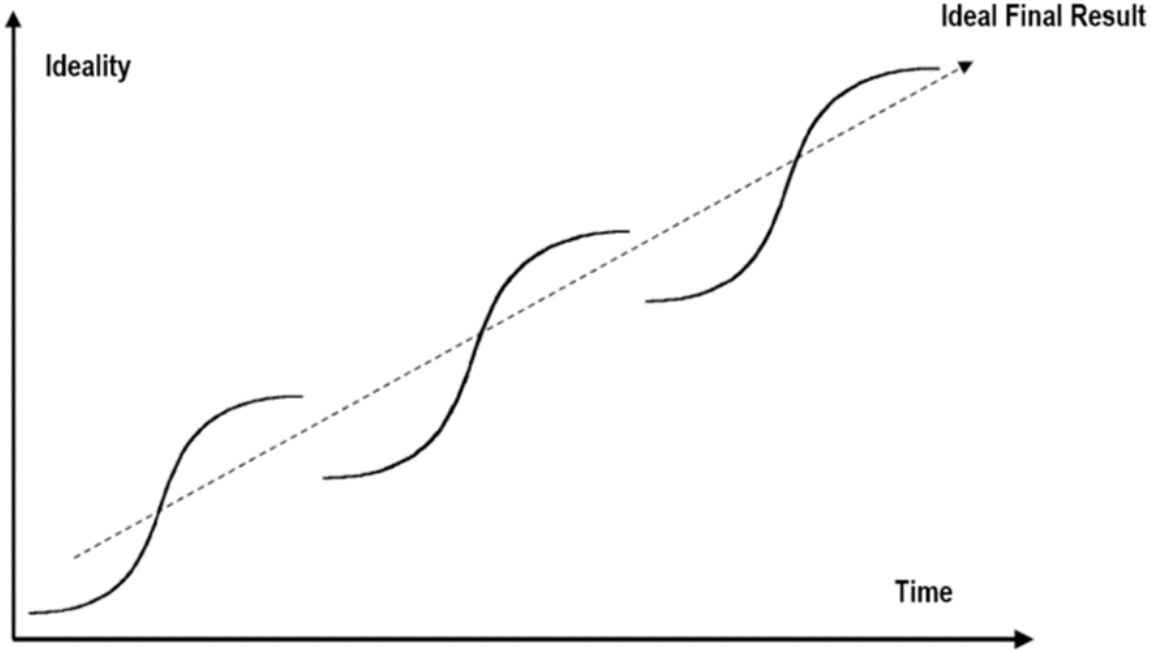
- **Catalogue of gears considered 'innovative'**

General definition of Innovation

An innovation can be considered as ***"any new ideas, creative thoughts, new imaginations in the form of technology or method"***

A successful innovation gives to customers a more **ideal solution** than what had previously been available. 'Ideal' in this sense is defined as the (perceived) benefits that the customer receives divided by the costs and harms that are also present.

$$Ideality = \frac{\sum positive\ effects}{\left(\sum costs\right) + \left(\sum harms\right)}$$



Performance improvement

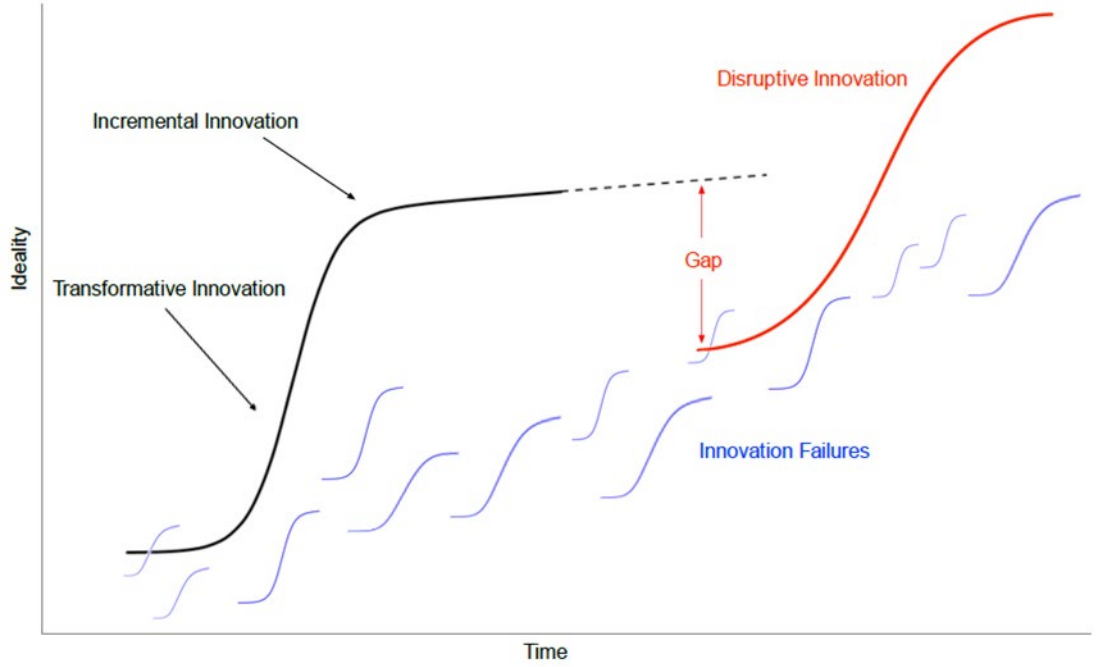
Innovation evolution dynamics. Systems jump from one *S*-curve to another in the direction of Ideal Final Result (IFR) outcomes

The development steps that apply to the core principle / technology of the system can be considered **incremental** innovation.

Technologies that make a significant improvement can be considered **transformative** innovation.

The blue curves are attempts to fulfil the same function, but using an alternative technology or principle. These are often the "**innovation failures**" in a sector.

At some point, a new technology is introduced, this new innovation starts to outperform the incumbent technology and eventually dominates the market – becoming the red curve. These are defined as **disruptive** innovations.



Technology Readiness Level (TRL)

Technology readiness levels (TRLs) are a measure for assessing the maturity of technologies during the acquisition phase of a program

TRLs category *(technical readiness parameter)*	European Union TRLs scale
Low	TRL 1 – Basic principles observed TRL 2 – Technology concept formulated TRL 3 – Experimental proof of concept
Moderate	TRL 4 – Technology validated in lab TRL 5 – Technology validated in relevant environment *(industrially relevant environment in the case of key enabling technologies)* TRL 6 – Technology demonstrated in relevant environment *(industrially relevant environment in the case of key enabling technologies)*
High	TRL 7 – System prototype demonstration in operational environment TRL 8 – System complete and qualified TRL 9 – Actual system proven in operational environment *(competitive manufacturing in the case of key enabling technologies)*

Criteria of Assessment (CA)

To objectively assess the impact of an innovative fishing solution in a fishery includes an estimation of <u>three main criteria</u>

1) **Catch efficiency** (CPUE)
2) **Selective** properties of the gear, and
   - *i. Target species*
   - *ii. Bycatch*
3) **Impact of the gear on the marine ecosystem**
   - *i. Seabed or benthic impact*
   - *ii. Gear loss, ghost fishing and marine plastic pollution*
   - *iii. Impact on endangered, threatened, and protected (ETP) species*

Performance and technical readiness rating guidelines

Innovative gears can be assessed against two main parameters:

- the potential **performance** for each specific targeted Criterion of Assessment (e.g., catch efficiency, selectivity, and impact on marine ecosystems) addressed by the innovation and
- the **technical readiness level**

Performance	Low	Moderate	High
Disruptive	Probably worth considering	Highly promising	Unicorn "no brainer"
Transformative	May be worth considering	Some potential	Very promising
Incremental	Not worth considering	Probably not worth considering	Commercial R&D
Negative	Negative outcomes	Negative outcomes	Negative outcomes
	Technology readiness level		

Levels of technological complexity

"The degree to which an innovation is perceived as relatively difficult to understand and use" (Rogers and Shoemaker, 1971)

Technological complexity indicates the needed technological level for the design and manufacture of an industrial product, considering its characteristics and performances

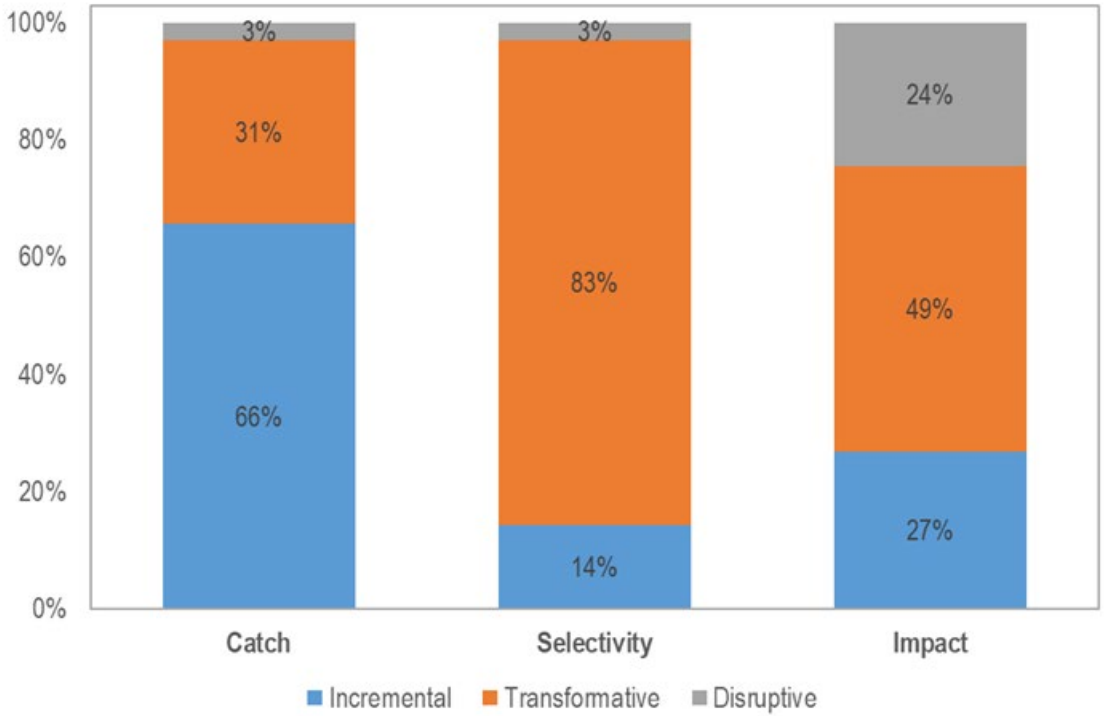
A universal model to measure technological complexity is still missing, because the variety, the dynamism and the uncertainty on the causes of such complexity and on their relationships make it difficult to establish a unique definition and measurement method.

Complexity measurement method based on three empirical classification levels:

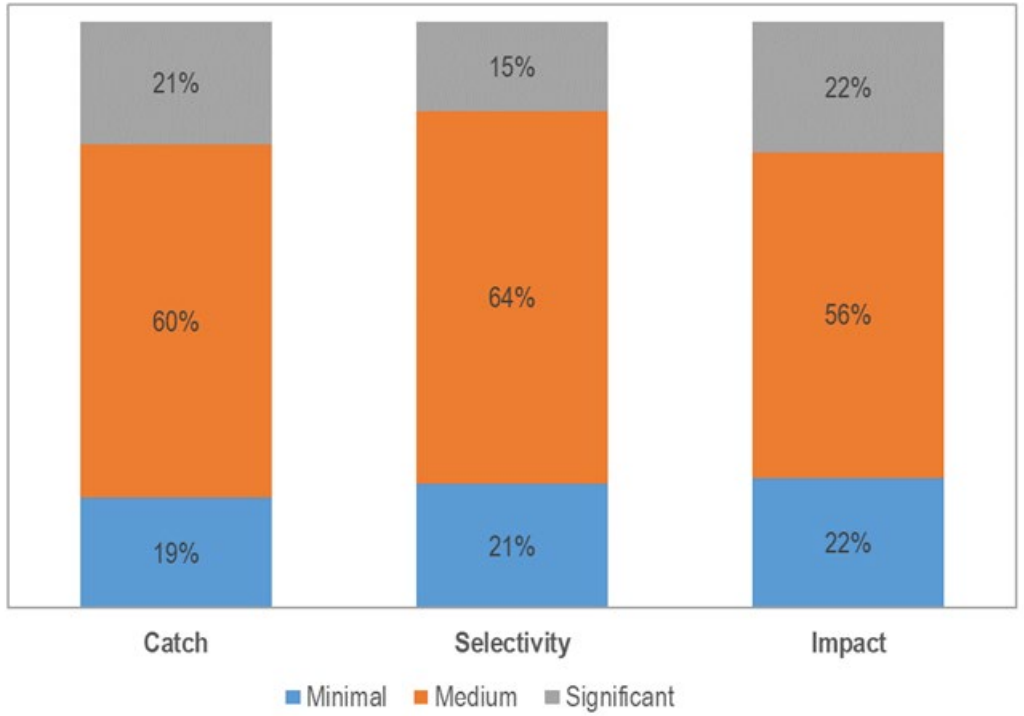
- **Minimal complexity**. Known technologies are being further developed with a minimal difference compared to the already used fishing gear or technologies (baselines);
- **Medium complexity**. The innovations are predominantly based on the R&D activities;
- **Significant complexity**. Considerable changes in the conventional models. They have a very high degree of innovation's complexity, which requires a sharp break with traditional routines and delivered knowledge.

Catalogue of Innovative gears

Performance level



Technical complexity



Information collection of the innovative gears: ***42 factsheets***

Innovation matrix by Criteria of Assessment

Catch efficiency

Performance	Low	Moderate	High
Disruptive	-	Flying drone	-
Transformative	-	Species separation, Controllable door, Echo-sensor detector, Magnetic deterrent	FlexSelect, Netgrid, SepNet, Flemish panel, Nemos+Roofless, Dual codend, Semi-pelagic doors
Incremental	Batwing doors	Electro-razor, Crustacean BRDs, ADD	Brown shrimp sorting grid, Combination grid, Grid and double codend, Shrimp pulse, Floating sweeps, Scaring ropes, Kon's covered fisheye, Soft brush groundgear, Hokpod, Mini Danish seine, Pontoon trap, Pearl-nets, Alternative pots, Boat seine, High-strength materials, Flex-TED, Guardian-nets, JTED, Surf-BRD panel
Negative	-	-	-
	Technological readiness level		

Innovation matrix by Criteria of Assessment

Selectivity

Performance	Low	Moderate	High
Disruptive	-	Flying drone	-
Transformative	-	Species separation, Electro-razor, Controllable door, Echo-sensor detector, Magnetic deterrent, Crustacean BRDs,	FlexSelect, Brown shrimp sorting grid, Combination grid, Grid and double codend, Netgrid, Shrimp pulse, Four-panel grid, Scaring ropes, Kon's covered fisheye, Alternative pots, High-strength materials, SepNet, Flemish panel, Floating sweeps, Nemos+Roofless, Dual codend, Hokpod, Flex-TED, Seabirds mitigation device, Guardian-nets, JTED, Surf-BRD panel
Incremental	Batwing doors	-	Soft brush groundgear, Pontoon trap, Semi-pelagic doors, Lionfish trap
Negative	-	-	-
	Technological readiness level		

Innovation matrix by Criteria of Assessment

Impact on marine ecosystems

Performance	Low	Moderate	High
Disruptive	Batwing doors, Recycled plastic doors	PingMe, Controllable door, Electro-razor	Shrimp pulse, Biodegradable twines, Pearl-nets, Semi-pelagic doors, Flex-TED
Transformative	-	Flying drone Echo-sensor detector, Magnetic deterrent, ADD	Grid and double codend, Boat seine, Scaring ropes, Lionfish trap, JTED, Alternative pots, Floating sweeps, Hokpod, High-strength materials, Nemos+Roofless, Dual codend, Seabirds mitigation device, Guardian-nets, Pontoon trap, Soft brush groundgear, Mini Danish seine
Incremental	-	Species separation, Crustacean BRDs	FlexSelect, Brown shrimp sorting grid, Netgrid, Combination grid, Four-panel grid, SepNet, Flemish panel, Kon's covered fisheye, Surf-BRD panel
Negative	-	-	-
	Technological readiness level		

1. Joint recommendations for appropriate technical measures that differ from baselines: support Members States and EU-DGMARE

2. Rigorous analysis to assess innovations using the *IDEF0* method