FISHERIES AND AQUACULTURE SESSION MOM

Meeting Date	08.10.2024	**Time**	14:00-17:30
Meeting Called By	EUSPA	**Location**	Online event
Minutes Taken By	Lowie Vueghs, EY	**Next Meeting Date**	N/A
Speakers	**Manuel Lopez Martinez, EUSPA, Session moderator** **Karel Callewaert, EUSPA, Session moderator** **Regina Kozyra, EY** **User Community Representatives (UCRs)** **Fisheries:** Sven Tahon, EFCA Jorge Romon, ARVI Ismael Alcala, Arxitec Nuno Grosso, NextOcean Aitor Aizpurua, Zunibal Esben Sverdrup, DPPO **Aquaculture:** Alexandra Neyts, EATIP Stefan Mülhbauer, EOMAP Alessandra Bleve, Planetek Ana Borrero, Seaweed Solutions Runi Joensen, Ocean Rainforest Claire Dufau, CLS A complete list of attendees can be found under Annex 1.		
Distribution (in addition to attendees)	UCP Plenary, EUSPA, Public		

AGENDA

Time	Topic	Speaker
14.00-14.05	Welcome, description of the session, and presentation of the speakers of the first roundtable on Fisheries	EUSPA
14.05-14.10	User requirements for Fisheries Control	EFCA
14.10-14.15	New Galileo OSNMA	Arxitec
14.15-14.20	Sustainable fisheries and protection	ARVI
14.20-14.25	Sustainable fisheries and operation optimization using GNSS and Copernicus	DPPO
14.25-14.30	EO services for fisheries	NextOcean
14.30-14.35	Buoys communications and EO for tunamaps	Zunibal
14.35-14.55	Q&A with the panellists	EUSPA (moderator)
14.55-15.15	Consultation of the EO requirements for Catch Optimisation	EY
15.15-15.30	Q&A with the panellists	EUSPA (moderator)
15.30-15.50	Break	
15.50-15.55	Welcome, and description of the session	EUSPA
15.55-16.00	EO for Aquaculture	EATIP
16.00-16.05	EO for Aquaculture	Planetek
16.05-16.10	EO for Sargassum monitoring	CLS
16.10-16.15	Seaweed farming	EOMAP
16.15-16.20	Seaweed farming	Seaweed Solutions
16.20-16.25	Seaweed farming	Ocean Rainforest
16.25-16.40	Questions to the panellists	EUSPA
16.40-17.00	Consultation of EO requirements	EY
17.00-17.20	Questions to the panellists	EUSPA
17.20-17.30	Closing remarks	EUSPA

Summary

The Fisheries and Aquaculture panel of the User Consultation Platform (UCP) 2024 took place on the 8th of October 2024 as an online event. The panel gathered around 90 participants coming from the wider industry as well as from national authorities and European Institutions, covering the whole spectrum of the market segment stakeholders.

The panellists gave presentations of their applications, how they use satellite technologies (EO and GNSS) and what their specific needs and requirements are. This broad coverage generated interest from the participants and helped start good interactions with all the attendees with many questions and comments.

The most commented topics are the following:

1. The Fisheries sector is expecting to combine multiple data sources and uptake of new technologies and services, ultimately improving the fishing abilities and operations with integrated sensors to minimise bycatch and allow efficient movement across the sea with a higher level of automation.
2. A growing frequency in security events, jamming, and spoofing are directly impacting the GNSS and Satcom requirements and make that both vessel monitoring and reporting, VMS, and onboard navigational systems must be very robust.
    - New Galileo OSNMA prototype is being tested in enhanced VMS equipment, VMS is compulsory for fishing vessels as it is used to monitor fishing vessel presence and activity. Galileo OSNMA will provide an additional layer of trust to the information provided to the authorities, which uses this information for fisheries monitoring and control. Galileo OSNMA will provide an additional layer of trust to encrypt the SatCom and improve the reliability of the information provided to the authorities and relevant EU bodies.
3. Copernicus together with other EO data can contribute to an enhanced monitoring capacity to ensure sustainable fisheries, to reduce fuel consumption, to estimate the areas where pelagic fish is and will be with high probability, measuring and estimating by correlation different physical and biological parameters.
    - Automated fishing was identified as a forward-looking application with significant potential.
    - Modelling of species other than the current tuna-based operations was identified as a natural follow-on to the existing services.
    - The importance of user-friendliness, compatibility with existing reporting schemes, confidentiality and cost when trying to get the sector stakeholders on board was emphasized.
    - Moreover, a seamless delivery of decision support systems (based on both EO and in-situ data) would also overcome the hurdles of engaging in this complex service.
4. Seaweed farming is growing importance in the need to meet food production and supply needs. Seaweed products are considered an alternative for biomass provision as its inherent properties make it very suitable for sustainable production. The main challenge remains to produce at scale, for which EO can be a significant supporter.
5. Copernicus together with other EO data can contribute to aquaculture seaweed farming. Especially it can contribute to site selection, time to deploy, time to harvest and infrastructure monitoring. EO can enhance decision-making in aquaculture management by offering data on environmental conditions and risks, water quality, algal blooms and farm site characteristics.
6. Users are expecting an integrated service which is easy to use and accessible to non-technical users as many farmers are not aware or do not know how to use the EO services and rely on in site data in majority for now. The Copernicus datasets remain extensive and are not seen as very accessible. An active go to market of Copernicus Services in combination with proven use cases through pilot projects would be able to support user uptake and impact the sector through further optimised operations and monitoring.
7. Further actions in terms of studies, pilot projects and coordination between authorities is expected to benefit the wider sector, and different stakeholder have clearly indicated their interest and willingness to participate.

1 MINUTES OF MEETING

14.00-14.05	Manuel Lopez (EUSPA) opened the session and welcomed all speakers and participants; he set out the objective of collecting user needs and requirements for fisheries and aquaculture. He presented the agenda and invited participants to take part in the roundtables for both segments. He introduced the speakers and introduced the topics of their presentations: • Sven Tahon (EFCA), Specialist officer on surveillance technologies from EFCA, the European Fisheries Control Agency. Topic: User needs from a fisheries control perspective • Ismael Alcala (Arxitec), CTO from ArXiTEC. Topic: Galileo Authentication for VMS • Jorge Romon (ARVI), President of the Spanish technological platform of fisheries and Aquaculture; and Head of R&D department in ARVI, one of the biggest fishing vessel owner associations in Europe. Topic: Needs in terms of secure satellite communications • Esben Sverdrup (DPPO), CEO of the Danish Pelagic Producer Organisation and President of the European Association of Fish Producers Organisations. Topic: Potential in EO, Galileo OSNMA and secure satellite communication for fishing • Dr. Nuno Grosso (NextOcean), EO Apps team coordinator at Deimos Group, representing the consortium NextOcean. Topic: NextOcean - get clear insights into fishing and aquaculture • Aitor Aizpurua (Zunibal), CTO of Zunibal. Topic: Copernicus, added value for Zunibal Solution
14.05-14.10	**User needs from a fisheries control perspective** Sven Tahon (EFCA) presented the user requirements for Fisheries Control and the user needs for control based on Galileo authentication, Copernicus and Communications. He introduced the mandate of the European Fisheries Control Agency (Regulation 2019/473) and their mission to ensure a high, uniform and effective level of control, inspection and compliance with the rules of the common fisheries policy, including its external dimension. He noted that a lot of EFCA's work is not confined to EU waters and that monitoring needs stretch far beyond European waters, and therefore the role of EO is of paramount importance to be able to monitor activities in remote areas. He added that the user needs entail global and balanced coverage of services, which needs to be affordable and allows access to historical GNSS and Copernicus data for legal proceedings. In addition, he called for research into validation & enhanced accuracy of alternative detection technologies, as well as specialized Copernicus services for Fisheries monitoring and control under the coordination of EFCA. .
14.10-14.15	**Galileo Authentication for VMS** Ismael Alcala (Arxitec) shared his experience in VMS. He explained that ArXiTEC offers services in industrialization of custom components. He added that they have performed research on a dual-frequency-receiver for vessel authentication together with ArVi for EUSPA. In addition, he explained the functioning of Galileo OSNMA for VMS enhancement. By focusing on the VMS hardware which stands in relation with communication satellites, and ground stations, Arxitec identified the impact of spoofing, data leakage, tampering of hardware. They identified that through encrypted vessel data, the validation and authenticity can be guaranteed.
14.15-14.20	**Needs in terms of secure satellite communications** Jorge Romon (ARVI) presented his organization as the biggest fishing owners' organization in Europe. He explained the multitude of international associates under Spanish, Portuguese, Irish, French and other flags represented in their organisation. He expanded on the specific needs of ARVI, entailing global coverage requiring reliable satellite coverage. Also, they have experienced VMS signal problems, for which security or defence

	movements could be the source. In addition, spoofing could lead to significant reputational damage when fishing vessels are misled and perform illegal operations, which also can result in fines, and loss of certification.
14.20-14.25	**Potential in EO, Galileo OSNMA and secure satellite communication for fishing** Esben Sverdrup (DPPO) presented the Danish Pelagic Producers Organisation as a frontrunner in technological innovation, sustainability and research. He indicated that their fleet is fully covered with cameras and sensors. He then discussed the potentials of EU Space data, indicating the aim of reducing fuel and saving time, as well as optimising of individual yield of fishing groups, but ensuring sustainability of operations at the same time. He is looking for information of fishing grounds, vessels, and a live database of the politic fleet in the North Atlantic. In parallel, he is looking to optimise fishing vessels as data providers for science and business, given their global coverage and information on biology. They are currently exploring at the potential of automation though GNSS in combination with AI. In relation to fully documented fisheries, they are looking for improved data-streams to authorities.
14.25-14.30	**NextOcean: get clear insights into fishing and aquaculture** Nuno Grosso (NextOcean) introduced the NextOcean project, coordinated by DEIMOS, which is entering its commercial phase. They integrated a set of services into and online store individually or in bundle. In addition, they offer customisation of the current products. He then explained the characterisation of fishing areas developed under the project, which aimed at the identification of areas for potential fish aggregation to increase efficiency of fishing operations, reducing bycatch, and providing reliable indicators for stock assessment and fisheries management (current focus on tuna). He indicated that they have explored the expansion to pelagic fishing. In addition, NextOcean offers a fishing footprint service which monitors location and intensity of fishing activities for sustainable fisheries management and provenance certification. In conclusion, Nuno Grosso presented the fisheries monitoring and surveillance service, which are closely related to VMS. This service uses satellite data and tracking systems to spot illegal activities. It is considered as a cost-effective way to monitor traffic over large maritime areas.
10.30-10.35	**Copernicus, added value for Zunibal Solution** Aitor Aizpurua (Zunibal) presented Zunibal as the company, which launched the first satellite connected to tuna fishing, making them a leader in innovative fishing and better decision making. Their aim is to optimise fishing operations, reduce environmental impact, better assess fishing areas, especially in remote areas. By mapping biomass and collecting data through voice equipment on buoys monitoring voice, maps are integrated and customised to the fishing operations. Oceanographic information is crucial to assess the water column. Resolution, reliability and security are crucial factors. AI is being used for to plot the best road for efficient fishing, analysing species hot points (based on nutrients) daily. Their solutions are aimed at reducing bycatch and fuel consumption. After their monitoring, they are now able to make predictive models for further catch optimisation.
14.35-14.55	Manuel Lopez (EUSPA) then opened a Q&A session and asked Sven about the importance of the quality of GNSS related information. Sven Tahon (EFCA) replied that due to the integration of GNSS in almost all VMS tools, the reliability of trustable base data is crucial. In case of suspicious activities, control means must be sent out by national administrations; meaning that a false alert costs a lot of resources. Manuel Lopez (EUSPA) then asked Ismael about the challenges of GNSS authentication into their products. Ismael Alcala (Arxitec) replied that complexity of the algorithm is not easy to iterate into an application, therefore more microcontrollers and power is needed. Another factor is the total cost, underlying the need to limit the number of data transactions related to economic constraints.

	Manuel Lopez (EUSPA) asked Jorge Romon (ARVI) about the perception of fishing companies on VMS, to which he replied that the perception has improved over time but experienced a difficult beginning. He added that today, VMS is seen as a security system allowing a legal warranty of fishing in the proper area and time. The device is especially important in conflictive international waters, where an additional layer of security proves useful. Manuel Lopez (EUSPA) then asked Esben Sverdrup (DPPO) about how he sees the development of fishing technologies in the next 10 years. He replied that he expects the combination of multiple data sources and uptake of new technologies, and that technological development is extremely quick currently. The expectation is improved fishing abilities and operations with integrated sensors, which should minimize bycatch and allow efficient movement across the sea with a higher level of automation. Manuel Lopez (EUSPA) then asked a question to Aitor Aizpurua (Zunibal) on the integration of AI and Copernicus; to which Aitor replied that the development started from curiosity and the innovative background, in combination with the willingness to develop a tool to provide a daily guidance for best fishing stocks according to the user needs. The combination with big data technology allowed for the further development of the tool for understanding ocean conditions.
14:55-15:15	Regina Kozyra (EY) presented the collected requirements for EO in catch optimisation. She defined catch optimisation as the identification of potential fish aggregations based on water quality (chlorophyll concentration levels, turbidity and sediment) and oceanographic data (current, depth, light penetration, nutrients, nitrates, phosphorus, salinity). EO has the aim to reduce fishing search time, fuel consumption, bycatch, ultimately enhancing the efficiency and sustainability of fishing operations. In addition, she expended on the need for multiple reliable data sources to understand both oceanographic conditions and species behaviour. A Slido query was launched with a question to understand the key enablers for the uptake of EO data in catch optimisation application. The results showed that technical performance is the key factor to the uptake of EO data and services in catch optimisation. Accuracy of data (13 votes), availability of data, easy data access and processing (8 votes) and frequency and latency of data (6 votes) were indicated as the most important aspects for this application. Other relevant answers covered the aspects of availability of proven use cases with cost-benefit, easy integration of different data types and low price of the services. Regina Kozyra (EY) then presented the preliminary requirements for catch optimisation for EO data; after which she launched a query on the requirements. The results showed that there are diverse needs, ranging from 1km grids for empowering SSF use cases, 5-10km to monitor the sites rather than finishing stocks and going to the area of the whole of the North Sea. In addition, majority of users indicated that it is necessary to get daily updates about fish stock localisation (9 out of 12 responses). The consultation aimed also at validating the spatial resolution of EO data requirement of 10m but did not provide a decisive decision point, having contradictive feedback provided (6 confirmations, 6 negative replies). Aitor Aizpurua (Zunibal) added that improved resolution is always welcome, but 10m is sufficient considering the bandwidth and total scale, and real-time serving of maps. Lastly, Regina Kozyra (EY) launched a query on the main challenges related to the uptake of EO for catch optimisation, to which the following issues were raised: • More than half of responders indicated organisational aspects, with procedures or skills not adapted to the use EO data and services (7 out of 13 votes); • Technical performance – availability of data, easy data access and processing (31%); • Economic challenges – lack of proven use cases with good cost-benefit ratio (31%).
15.15-15.30	Manuel Lopez (EUSPA) then reopened the Q&A. Hispasat asked a question to Esben Sverdrup (DPPO), about the automatic fishing operations including autonomous drones mentioned on one slide. Are these drones depending on a mother/fisher vessel? What distance do they usually operate from the control centre and what communications requirements they present? Esben Sverdrup (DPPO) replied that drones were

	considered as one of the possibilities but are currently not being used in the fleets, even if they are looking towards the potential opportunity of covering a larger area around the vessels. CLS asked a question for Ismael Alcala: Are the OSNMA GNSS receivers already available on the market with a compact design for integration into small automatic VMS terminals? Ismael Alcala (ArXiTEC) replied that there are no commercially available receivers with authentication. Chipset manufacturers are planning to deliver firmware later. Prototypes are being tested and more information is available upon contacting. Manuel Lopez (EUSPA) asked Sven Tahon whether Copernicus services are also used for fisheries control and his views on potential enhancements. Sven Tahon (EFCA) clarified that they are part of the restricted Copernicus Maritime Surveillance service, for which they coordinate the uptake for fisheries control authorities. In this they ordered 1300 satellite images on the high seas. They correlate detected targets on an image with other available tools. The main challenges remain in the accuracy and availability, specifically on the high seas. Manuel Lopez (EUSPA) then asked Nuno Grosso (NextOcean) about the co-designing with users and the target group. Nuno Grosso (NextOcean) replied that different users were used at different stages, a mature offering was validated and further developed in coordination with a defined group of users. After the identification of target market, they worked with fishing companies, aquaculture companies and service providers which have the capacity to integrate the technology into their current operations. They went into the level of insurance certification and conservation and want to better understand assurers and diverse needs of other fishing actors. In addition, public and international entities and policy organisations are motivated to shift from a yield based informed systems to more predictive systems. Information systems are to be seen as a complement to current knowledge. An additional question for Aitor Aizpurua from Zunibal was asked in the chat, about the scalability of oceanography for different types of fisheries. Aitor Aizpurua (Zunibal) answered that fishing companies are looking to become more efficient and sustainable. They believe that the tuna model can be modified for a diverse set of species and tailored to the specific needs of fishing companies and definition of the fishing operations. Through clustering needs and partnering with fishermen, automation and service delivery can be foreseen. CLS asked a question to Sven Tahon: With the new fisheries control regulation, more vessels including those below 12 meters in length will be monitored, using VMS and ERS. Will EFCA oversee the control? Sven Tahon (EFCA) replied that there is a new control regulation considering two reporting obligations to carry VMS for vessels >12m and to carry AIS when vessels are >15m. He added that at the end of the day, it will be the responsibility of the national authorities to monitor and control their fleet.
15.30-15.50	Break
15.50-15.55	Manuel Lopez (EUSPA) reopened the session after the break and welcomed the presenters and participants to the aquaculture session, including presenting the topics covered. • Alexandra Neyts: Senior advisor from EATiP, the European Aquaculture Technology and Innovation Platform. Topic: user requirements for planning and operation. • Alessandra Bleve: Business Development specialist at Planetek Italia. Topic: Rheticus Marine Platform for fisheries and aquaculture. • Dr. Claire Dufau: Head of solutions and innovation in the environmental monitoring services unit, in CLS. Topic: Sargassum macro-algae monitoring. • Stefan Muhlbauer: Senior Project Manager at EOMAP. Topic: Copernicus and other EO data to support seaweed farming • Dr. Ana Borrero: Hatchery Manager in Seaweed Solutions. Topic: user requirements for the use of EO data in seaweed farming. • Runi Joensen: CTO at Ocean Rainforest. Topic: Resilient, Regenerative & Scalable

	Seaweed Cultivation.
15.55-16.00	**Research and innovation requirements for Aquaculture** Alexandra Neyts (EATIP) presented the background of EATIP as a multi-stakeholder, membership-based platform, supporting technology and innovation to consolidate the role of aquaculture in society, improve the link with the consumer and develop a sustainable industry. She emphasized current trends such as the impacts of climate change, increasing input costs, coexistence with other marine activities and a diminishing social license to operate. She summarised the main potential user needs for Earth Observation data in the planning, such as location of MPAs, environmental parameters, risk assessments for investors and social-economic considerations. In the operational phase, she stressed on the need for environmental monitoring (of biochemistry, physics, waves), as well as the understanding of treatments, escapees, biosecurity, investigation of accidents, and ultimate effects on ecosystems in interaction with climate change. She concluded that EO data and services potentially can be valuable for informed decision making, provided they are user-friendly, compatible with prevailing systems and in line with existing regulatory requirements.
16.00-16.05	**Rheticus Marine for Fisheries and Aquaculture** Alessandra Bleve (Planetek) presented Planetek and their exploration of satellite technology to be considered as a benefit company. She then explained how their Rheticus Marine Service provides monitoring and optimization of aquaculture processes, monitoring of environmental parameters in shrimp ponds, and the prediction of algal blooms to protect the ecosystem / ensure the use of sustainable use of marine resources. She also presented the optimal site selection project called 'Worldfish - Aquadmc', which supports new aquaculture facilities in Kenya and Bangladesh. Through these projects, Planetek provides EO-learning and capacity building beyond their core service provision.
16.05-16.10	**Sargassum macro-algae monitoring solution - SAMTOOL** Claire Dufau (CLS) presented CLS and their activities around environmental monitoring & climate, sustainable fisheries, energies and infrastructure, maritime safety and mobility. She expanded on their 'SAMTOOL', focused on macro-algae monitoring, which has been monitoring the ocean surface of the tropical Atlantic Ocean since 2018. Through up to eight VHR sensors cover the whole Caribbean area. They can provide 5-day drift forecasts built on Copernicus Services alone. Their web platform provides users with built-in assessments of the current situation and an early warning system.
16.10-16.15	**Satellite solutions for Seaweed Farming** Stefan Mühlbauer (EOMAP) presented EOMAP, as an organisation focusing on satellite-derived water quality, bathymetry (in shallow waters), aquatic habitat mapping, digital elevation models, and web application/IT development. He explained that in seaweed farming, the water quality parameters are central in the farming operations as no external fertilizers can be added. EOMAP has developed a tool to monitor the surrounding of the farms through different datasets (in situ, Copernicus, commercial). They enable statistical comparisons and spatial-temporal analysis through online dashboards and offer a solution which is suitable for seaweed farming.
16.15-16.20	**EO for Seaweed farming** Ana Borrero (Seaweed Solutions) presented Seaweed Solutions as the first company in Europe active in seaweed farming, today providing seedlings/seeds of *Sacharina latissima* and *Alaria esculenta* and B2B organic certified seaweed. Their central needs for EO in seaweed farming are tools and measurements that allow enhanced decision-making. They identify Copernicus Marine Services as a possibility, though they make a critical note that the services are not yet widely known amongst other aquaculture farmers. She indicated their need for a platform / program to transform the data and merge it with different types of data. Their more specific user requirements are high

	resolution, accurate models, integrated models with in-situ data, predictions of seawater temperature and blooms, and integrations with other aquaculture activities.
16.20-16.25	**Resilient, generative & Scalable Seaweed cultivation** Runi Joensen (Ocean Rainforest) presented the operations of Ocean Rainforest as an intermediate seaweed product providers, providing B2B products and research projects. Ocean Rainforest identifies a growing need in food production and see a viable alternative in biomass provision through seaweed. They stress that the inherent properties of seaweed production make it very suitable for sustainable production. At the same time, they stress the need for scaling to result in a viable business case. EO could provide potential benefits for their operational use case, and they believe that through multi-use modelling they would be able to optimize their output and farming operations, leading to the scaling effects they are aiming for.
16.25-16.40	Manuel Lopez (EUSPA) opened the Q&A session. Manuel Lopez (EUSPA) asked Alexandra Neyts (EATIP) about the importance of combining satellite with in-situ data. Alexsandra Neyts (EATIP) replied that the sector is increasingly dependent upon high-quality data to document its impact and support sustainability. Important drivers are increased monitoring and professionalisation of aquaculture farms and service providers, the growing relevance of the Copernicus portfolio, stricter regulations greater sensibility in society. She stressed that farms in more homogeneous, exposed sites beyond shallow waters probably make a better case for the use of satellite data, further leveraging the role of Copernicus. Manuel Lopez (EUSPA) asked Ana Borrero (Seaweed Solutions) on what her motivation was to start using the satellite data and when she started using it in her work. She replied that her background in oceanography motivated to look for ways to use satellite data to understand the environment of their farms to monitor/maximize production combining with in situ data. She looked for manner of improving the database for decision making. She indicated that many farmers are not aware of this service and/or do not know how to use it/extract the data, which constitutes a market barrier. She added that the Copernicus dataset is extensive but not very accessible for non-trained users. Manuel Lopez (EUSPA) asked Runi Joensen (Ocean Rainforest) about offshore operations and the role of EO, to which he replied that he foresees offshore operations as a gamechanger. He explained that for the monitoring of their infrastructure, for verification of the positioning of lines, the measurement of the increasing of biomass throughout the season; EO is seen as a scaling solution for production. In addition, he further defined high resolution with a low frequency as a user requirement. Manuel Lopez (EUSPA) asked Claire Dufau (CLS) about sargassum monitoring and the algae collection, to which she clarified that there are growing needs for collecting of sargassum, and at the same time the reduction of the quantity of sargassum in specific areas for health and navigational reasons. She added that CLS are developing a solution to leverage this double need. Manuel Lopez (EUSPA) asked about the impact on the preservation of farming activities, to which she added that EO could be used as an early warning system, under the condition that a reaction mechanism at the farm level should be developed separate from the EO services. Manuel Lopez (EUSPA) then asked how aquaculture could benefit from EO, to which Stefan Mühlbauer (EOMAP) answered that EO can provide a couple of parameters related to water quality and water depth, providing information about the habitat. He added that seaweed farms are completely dependent on their environment, and therefore information and strategic planning are crucial in operations. He expanded on the different use cases for EO: • Identification for suitable farm locations for farms that wish to expand their operations and are looking for new locations, in this application, the service must include the mapping of adequate nitrate levels, chlorophyll, sea surface temperature, salinity, and

	bathymetric data, ocean currents, winds and waves. • Upwelling zones (nutrient rich zones which occur seasonally related to oceanographic conditions) which offer optimal aquaculture farming zones. • Supporting ongoing operations by monitoring optimal conditions for the growth of the species and estimate production volumes and optimal harvesting time. In summary, he sees EO as a surveillance system, and as a tool to streamline operations and enhance efficiency and strategic planning. He added that for all use cases, the wide spatial-temporal coverage of EO enables coverage of the entire globe and tap into existing data archives. Manuel Lopez (EUSPA) then asked Alessandra Bleve (Planetek) how the Rheticus Marine platform estimates the growth of shellfish and optimization of aquaculture, to which she replied that it provides in the sense that it gives a clear and comprehensive overview of shellfish growth and potential risks, through which key environmental parameters are combined to predict long term trends.
16.40-17.00	Regina Kozyra (EY) introduced the preliminary needs and requirements for aquaculture operations optimisation. She referred to aquaculture operations optimisation as the process of improving the efficiency, productivity and short and long-term sustainability of aquaculture systems. She then launched a Slido query to identify the main aspects in the uptake for EO data and services for aquaculture operations optimisation, to which stakeholders indicated that the issue of integration with different data types (57%), availability of data, easy data access and processing (50%) and existence of proven use cases with a good cost-benefit ratio (43%) are the most important. In addition, stakeholders mentioned that the mainstreaming of the use of EO, using for certification and integration in reporting requirements, as well as technical performance of spatial resolution also play a role in the uptake. Regina Kozyra (EY) then presented the preliminary EO requirements for aquaculture operations optimisation, to which most stakeholders indicated that their area of interest is <1km2 and that a daily update information is needed for meaningful support to their operations. In conclusion, a Slido query was launched about the main challenges related to the uptake of EO for aquaculture operations, resulting in the availability of data, difficult access and processing (69%), data coverage e.g. in High Latitudes (46%) and the affordable availability of data and services (38%) indicated as the primary issues. In addition, respondents added that better data integration with in-situ data, proven use cases, better spatial resolution in coastal areas and access to hyperspectral data, have an important role to play in the uptake of EO.
17.00-17.20	Manuel Lopez (EUSPA) reopened the Roundtable Q&A. Hispasat asked a question: Are there particular requirements identified regarding SATCOM for seaweed and aquaculture industries when not within terrestrial / cellular network coverage? • Ana Borrero (Seaweed solutions) replied that current operations are still centred in coastal areas which limit the use of this service due to the lack of resolution/data (Norwegian coast case), Runi Joensen confirmed that their operations are also close to the shore. • Stefan Mühlbauer (EOMAP) referred to agriculture and GNSS-enabled machinery. He added that the same systems would not be necessary for aquaculture monitoring, as all the data can be obtained beforehand. • Alexandra Neyts (EATIP) added that most exposed sites can be monitored and remotely operated, depending on available communication systems and how far out the

	installation is. A question was asked in the chat: What is the potential to use EO data to support Carbon credits and biodiversity credits for aquaculture industry? How could this drive more investment into the industry • Alexandra Neyts (EATIP) replied that this is increasingly important and that documenting the carbon footprint may give aquaculture a competitive edge. • Alessandre Bleve (Planetek) and Stefan Mühlbauer added that they have not yet discovered the potential. • Ana Borrero (Seaweed solutions) expanded that even for the scientific community is difficult to calculate exact numbers due to the complexity of the carbon cycle and the factors involved. Although it has been big improvements, more research is still needed. However, . She added that EO data could potentially help to evaluate the local mitigation of ocean acidification in seaweed farms comparing sites with no farming activity. It has been already proven that seaweed farming help to reduce local ocean acidification. However, lack of high-resolution data in a very close areas and precise models are still needed to start using it as a tool. . Manuel Lopez (EUSPA) then asked Alessandra Neyts (EATIP) on how to include SMEs and smaller companies more in the process of driving user needs? To which she replied that the capacity and competences are indeed not yet available, and therefore collaboration with authorities, research organisations and service providers is key to bring ready-to use products to the market. Manuel Lopez (EUSPA) asked Alessandra Bleve (Planetek) how service providers can support users in gaining essential skills. To which she referred to +7000 users using Planetek platform and following courses on interpreting satellite data and key environmental parameters. In the case of aquaculture, users can learn how to monitor water quality, monitor algal blooms, assess coastal ecosystems. These skills allow them to enhance the productivity and sustainability of their operations. Manuel Lopez (EUSPA) asked Stefan Mühlbauer (EOMAP) about the integration of different data sources and the adequacy of Copernicus. Stefan Muhlbauer expanded that there are two options, one coming from Copernicus free and open data and services (which they use for water quality parameters and depth, with 10m and 300m spatial resolution). Depending on the use cases this can cover the demand. The services are very useful for large scale analysis, or the analysis of phenomena such as upwelling. Data from clients themselves is needed to further optimise observations and collect more diverse type of data. Emodnet provides 100m bathymetric data for aquaculture in Europe but is only available for limited time-ranges and applications. Additional commercial data can be used for further refinement when users need more accuracy and temporal resolution. Manuel Lopez (EUSPA) asked Runi Joensen (Ocean Rainforest) and Ana Borrero (Seaweed Solutions) for additional applications which could benefit from EO. Runi replied that the composition of biomass and monitoring of different stimuli could be partially supported by EO. Hyperspectral imaging might allow further understanding and monitoring. An anonymous question in chat was asked: What is the potential of hyperspectral data for farms production forecast or monitoring? Another participant replied that they use hyper-spectral and other high resolution data sources for post disaster rapid needs assessment of fisheries and aquaculture, but it's an expensive process. However, these events are becoming more and more significant in the EU as the temperature increases. Ana Borrero (Seaweed Solutions) expanded that EO could further support assessment of the deployment time, site selection, maximising production and optimising harvesting time, in combination with predicting biofouling timing. An anonymous question in chat: Often, high nitrate areas tend to be in marine traffic zones. Can satellite reporting help with optimising location with this in mind?

	Stefan Mühlbauer (EOMAP) replied that Copernicus Services provide a derived product with a limited resolution from 1-2km. This resolution is expected to be insufficient for most ports. Runi Joensen (Ocean Rainforest) added that finfish farmers produce large numbers of nitrate in localized areas. Stefan Mühlbauer (EOMAP) added that proxies as chlorophyll could be used at more precise resolution. He expanded that CMS services have limited accuracy and coverage in the coastal areas because of the floor reflectance in the data. Alexandra Neyts (EATIP) expressed that the future is a seamless integration of the satellite and in situ data in an easy-to-use platform. Ana Borrero (Seaweed Solutions) agreed that the combination of multiple sources is indeed the way to go. She added that more development on nitrate sensors is needed (cost efficient). For the marine environment expensive and few options are available due to the difficulty behind. The only manner of doing in a “cheap” way is analysis the water samples She also agreed with Stefan that the models for nutrients are not precise enough, although useful for a general assessment.
17.20-17.30	Manuel Lopez (EUSPA) thanked all the panellists, speakers and participants and concluded that: In Fisheries: • Galileo OSNMA is being implemented in enhanced VMS equipment, , VMS is compulsory for fishing vessels as it is used to monitor fishing vessel presence and activity. Galileo OSNMA will provide an additional layer of trust to the information provided to the authorities, which can use this information for fisheries control. • Copernicus together with other EO data can contribute to an enhanced monitoring capacity to ensure sustainable fisheries, to reduce fuel consumption, to estimate the areas where pelagic fish is and will be with high probability, measuring and estimating by correlation different physical and biological parameters. In Aquaculture: • Copernicus together with other EO data can contribute to aquaculture seaweed farming. Especially it can contribute to site selection, time to deploy, time to harvest and infrastructure monitoring. A demonstrator is under development including the user requirements for these operations, measuring and estimating by correlation different physical and biological parameters. He invited the participants to provide additional feedback in the online survey and announced the publication of the user and requirements report 2024 and a separate report in 2025, as well as the CASSINI Challenges, activities, hackathon and mentoring.

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