THE ADVANCED SCHOOL ON MULTISPECIES MODELLING APPROACHES FOR ECOSYSTEM-BASED MARINE RESOURCE MANAGEMENT IN THE MEDITERRANEAN SEA

Amare-Med 2025 Edition
19 - 23 May
Tunis, Tunisia

CONTENTS

EXECUTIVE SUMMARY

The Advanced school on Multispecies modelling Approaches for ecosystem-based marine REsource management in the MEDiterranean Sea (AMARE-MED) is a series that started in 2017. AMARE-MED takes place each year and moves around the Mediterranean Sea. The concept to develop an annual advanced school that would represent a high level point of reference for PhD students, researchers and policy makers to learn about models and useful approaches for fisheries management in a Mediterranean context dominated by multiple gears and several target species.

The Advanced School Series promotes multispecies modelling solutions given an ever increasing need for holistic and ecosystem-based marine resource management in the Mediterranean and Black Seas.

The School series has been organized in: Capo Granitola 2017 (Italy); Trieste 2018 (Italy); Venice 2019 (Italy); Split 2021 (Croatia); Larnaca 2022 (Greece); Lisboa 2024 (Portugal).

AMARE-MED was promoted by the Dynamics of Ecosystems and Computational Oceanography group at Oceanography Section of OGS. Since 2022, the AMARE-MED series has been co-sponsored by The Laboratory on Quantitative Sustainability (TLQS).

AMARE-MED editions are generally dedicated to 25-30 students selected on the basis of experience, computational ability, subject knowledge and motivation.

Each edition includes the presentation and use (hands-on computer) of two or three different modelling approaches used for scientific analysis, useful for the management of marine renewable resources: MICE, GADGET, RPATH, CMSY, FISHPATH, ECOSPACE, SMART, SDMtmb (and many others). Internationally renowned scientists such as Andre Punt, Valerio Bartolino, Natalie Dowling, Giampaolo Coro, Kim De Mutsert, Natalia Serpetti, Tommaso Russo, Lewis Barnett were speakers in previous editions.

INTRODUCTION

The summer school underscores the importance of capacity building and regional collaboration in the Mediterranean and Black Sea. Through the TLQS programme, a limited number of selected applicants from non-EU Mediterranean and Black Sea countries received support. Additional fellowships were provided by key organising institutions.

The selection of participants is based on expertise, skills, and interest, as demonstrated through the online application process. Participation is free, reflecting the commitment to fostering inclusivity and access to cutting-edge knowledge.

This initiative continues to strengthen scientific dialogue, cooperation, and capacity building across the region, ensuring the effective application of innovative models and approaches for sustainable fisheries management.

GENERAL AIMS OF THE AMARE-MED SERIES

- To provide theory and hand on computer practice for understanding and to facilitate the use of multispecies models for fisheries and socio economic models for fisheries management.
- To cover topics and models that provide scientific practical advice for policy makers and management.
- To provide in-depth understanding and functioning, applicability, capabilities and limitations of models and analytical approaches.

During the various editions of AMARE-MED, different single, multispecies and holistic approaches (e.g., MSVPA, MICE models, size based models, multispecies age-structured assessment model MSASA, Gadget, Atlantis, Osmose, ISISfish, Ecopath with Ecosim, Rpath and many others) are presented, discussed, compared and applied.

AMARE MED

Capo Granitola (Italy)	Trieste (Italy)	Venice (Italy)	Split (Croatia)	Larnaca (Cyprus)	Lisbon (Portugal)	Tunis (Tunisia)
2017	2018	2019	2021	2022	2024	2025
A.Punt	A.Punt	A.Punt N. Dowling	K. DeMutsert A.Punt	A.Punt	A.Punt	A.Punt
V. Bartolino	K.Privitera-Johnson	G. Coro	N. Serpetti S. Libralato	T. Russo	L. Barnett	J. Thorson
MICE GADGET	MSE Rpath	Ceattle FISHPATH CMSY	ECOSPACE Spatial modelling	2D MICE SMART	MICE sdmTMB	SS3 VAST

SPECIFIC AIMS OF AMARE-MED 2025

In the context of advancing sustainable fisheries management and fostering capacity building, AMARE-MED 2025 focuses on cutting-edge methods for analyzing trawl survey data and their application to multispecies models.

AMARE-MED 2025 provided participants with theoretical insights and practical skills, covering essential topics such as:

1. Basic analysis of trawl survey data.
2. Application of joint species distribution models (JSDM), incorporating environmental covariates with data from the Copernicus Marine Service.
3. Predicting species' biomass index under climate change and evaluating species overlap and interactions.
4. Integrating results into Stock Synthesis (SS3) for stock assessment also considering species interactions.
5. The week-long course will blend lectures with hands-on programming, equipping participants with advanced tools and methodologies crucial for fisheries management.

ORGANISATION

The Institut National des Sciences et Technologies de la Mer (INSTM) was the supporting insitute for Amare-Med 2025. INSTM is a Tunisian public research institute administered by the Ministry of Agriculture, Water Resources, and Fisheries. The Institute for Marine Biological Resources and Biotechnology of the National Research Council (IRBIM CNR) provided the case study used in the learning materials. Amare-Med 2025 was held at the El Mouradi Gammarth Hotel in Tunis with full conference facilities.

ORGANISING COMMITTEE
Simone Libralato (OGS, Italy)
Mounir Ghribi (OGS, Italy)
Béchir Béjaoui (INSTM, Tunis)
Olfa Ben Abdallah (INSTM, Tunis)

SCIENTIFIC COMMITTEE
Simone Libralato (OGS, Italy)
Alexandra Silva & Carla Gameiro (IPMA, Portugal)
Enrico Arneri (CNR-IRBIM,Italy)
Angelo Bonanno (CNR-IRMA, Italy)
Roberto Carlucci (CONISMA, Italy)
Piera Carpi (IMR, Norway)
Francesco Colloca (SZN, Italy)
Gianpaolo Coro (CNR-ISTI, Italy)
Fabio Fiorentino (CNR-IRBIM, Italy)
Saša Raicevich (ISPRA, Italy)
Giuseppe Scarcella (CNR-IRBIM, Italy)
Svjetlana Krstulović Šifner (University Split, Croatia)
Cosimo Solidoro (OGS, Italy)
Maria Teresa Spedicato (Coispa, Italy)
Thanasis Tsikliras (AUTh, Greece)
Nedo Vrgoč (IOF, Croatia)

SECRETARIAT
Giulia Casalena (OGS, Italy)
Sophie Burton Pogledic (OGS, Italy)

Left to right: Bechir Bejaoui, Olfa Ben Abdallah, Simone Libralato

INVITED LECTURERS

André Punt

(School of Aquatic and Fishery Sciences, University of Washington – USA)

Stock Synthesis (SS3) for stock assessment with deviation to include climate and predation

James T. Thorson

(Affiliate Professor, University of Washington - USA)

Geostatistical modelling approach VAST applied to single and multispecies trawl survey data and including covariates

AGENDA

Day 0 - May 18th, Sunday (Simone Libralato)
18:30-19:30   Ice break - Brief Introduction to the course, self
                        introductions, software issues

Day 1 - May 19th, Monday (by Andre Punt)
08:00-08:30   Registration and Opening (Simone Libralato)
08:30-09:30   A: Conducting stock assessments, including a welcome to
                        Stock Synthesis.
09:30-10:00   B: Key elements of Stock Synthesis and r4ss for this class
                        (Part I).
10:00-10:30   Coffee break (and check you can use DOS)
10:30-12:00   B: Key elements of Stock Synthesis and r4ss for this class
                        (Part II).
12:30-13:30   Lunch
13:30-14:30   Assignment 1: Applying Stock Synthesis to an example
                        data set.
14:30-15:00   Coffee break
15:00-15:30   Assignment 1: Viewing the solution
15:30-17:30   C: Extending Stock Synthesis to include climate and
                        predation
19:00   Social dinner

Day 2 - May 20th, Tuesday (by Andre Punt, Fabio Falsone, Diego Panzeri, James Thorson)
08:30-10:00   Assignment 2: Adding predation to Stock Synthesis (Andre).
10:00-10.30   Coffee break
11:00-12:00   D: Introduction to the case study (Fabio, Diego)
12:30-13:30   Lunch
13:30-14:30   E:Lecture: Background on generalized graphical mixed
                        models (Jim)
14:30-15:00   Coffee break
15:00-16:00   E:Code tutorial: Introduction to arrow-and-lag syntax
                        using DSEM (Jim)
16:00-17:30   E:Exercise: Simulating abundance-at-age and fitting
                        DSEM (Jim)

AGENDA

Day 3 - May 21st, Wednesday (by Jim Thorson)
08:30-10:00 F: Lecture: Background on JSDMs using tinyVAST
10:30-11:00 Coffee break
11:00-12:00 F: Code tutorial: Walk through spatial modelling vignette
12:30-13:30 Lunch
13:30-18:30 Afternoon: social event - excursion to Bizerte Lagoon

Day 4 - May 22nd, Thursday (by Jim Thorson)
08:30-10:00 G: Code tutorial: Walk through "multiple data types" vignette
10:30-11:00 Coffee break
11:00-12:00 G: Group work:Divide into groups and walk through:
●Group 1: Simultaneous autoregressive models' vignette
●Group 2: Condition and density vignette
●Group 3: Spatial factor analysis vignette
●Group 4: Vector autoregressive spatio-temporal models' vignette
12:30-13:30 Lunch
13:30-14:30 Assignment 2, working in groups: Applying tinyVAST to student data sets
14:30-15:00 Coffee break
15:00-16:00 Assignment 2, working in groups: Present back to class
16:30-17:30 Lecture and discussion: Validating structural causal models

Day 5 - May 23rd, Friday (by Andre Punt)
08:30-10:00 Assignment 3: South of Sicily case study
10:00-10:30 Coffee break
10:30-11:00 D: Stock Synthesis and conducting projections
11:00-12:00 Assignment 4: Evaluating multispecies harvest strategies under climate change (part 1)
12:30-13:30 Lunch
13:30-15:00 Assignment 4 continued
15:00-15:30 Coffee break
15:30-17:00 Assignment 4 continued (including presentations)
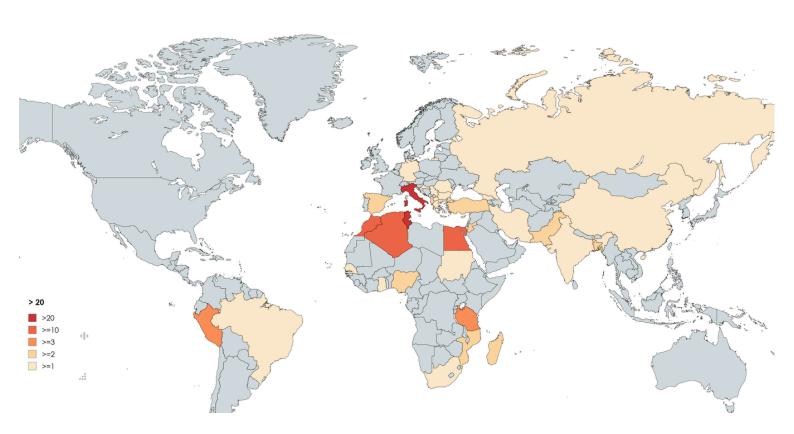17:30-17:30 Close

APPLICATION AND SELECTION PROCESS

The call to apply for Amare-Med 2025 was launched in late February 2025 and closed at 12pm CET on 15 March.
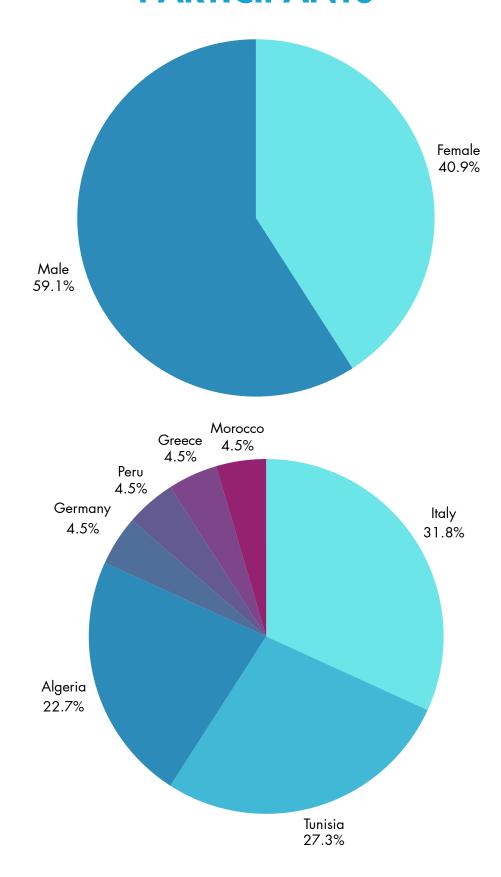
The application form was in a Google Doc format and can be found here.

There were 157 applications from among 39 nationalities (see map below), which were reviewed and selected by the Selection Committee, consisting of Simone Libralato and Igor Celic (OGS, Italy), and Béchir Béjaoui and Olfa Ben Abdallah (INSTM, Tunisia), through a vigorous grading system before the final 30 were selected while a small number was placed on the waiting list. Programming skills, experience in the field, motivation, status as a young career scientist and representativeness of countries and institutions were all factors that were taken into account in the decision-making process.

Unfortunately, last-minute issues related to health, visa permits and family led to the final participation of 22 students.

PARTICIPANTS

Female
40.9%

Male
59.1%

Morocco
4.5%

Greece
4.5%

Peru
4.5%

Germany
4.5%

Italy
31.8%

Algeria
22.7%

Tunisia
27.3%

A GLOBAL
VIEW OF THE MEDITERRANEAN

COURSE MATERIAL

Following an introduction to the key elements of Stock Synthesis, applying it to a data set and including the factors of climate and predation, the summer school incorporated four assignments across the five days, as well as a case study based on the canal of the South of Sicily, which was presented by Diego Panzeri of OGS and Valentina Lauria of CNR IRBIM.

By Day 4 and Day 5, students were already working in small groups before making a final presentation, incorporating all knowledge gained and the application of joint species distribution models.

Materials provided by Andre Punt were made available to participants on a shared Google Drive folder and those provided by Jim Thorson were accessed through github. The content of lectures covered generalised graphical mixed models, background on JSDMs using tinyVAST and validating structural causal models. Code tutorials inlcuded the introduction to arrow-and-lag syntax using DSEM and vignettes on spatial modelling and multiple data types. Group work involved focusing on vignettes covering simultaneous autoregressive models, condition and density, spatial factor analysis, and vector autoregressive spatio-temporal models.

The shared Google Drive was effectively used to share presentations and work done during Amare-Med 2025, as well as useful literature and photos.
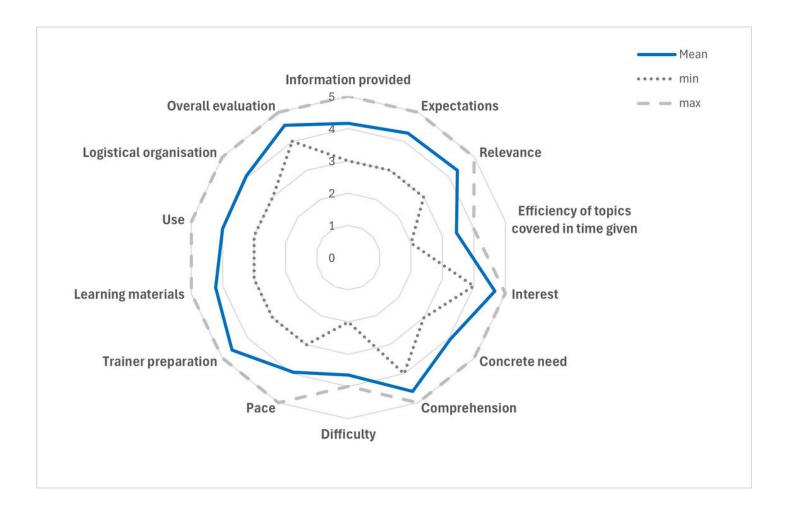
EVALUATION OF COURSE BY PARTICIPANTS

Feedback provided by participants represents an invaluable reference point for improvement and the design of future editions of Amare-Med.
All answers remain anonymous.

Participants were asked 14 questions on: the provided level of information regarding objectives, how far expectations were met, how relevant was the training to their work, the efficiency regarding the number of topics and time allotted, how interesting was the course, how much the course was oriented to concrete needs and problems, the level of comprehension, the level of difficulty, the pace, trainers preparation, the standard of learning materials, the usability and applicability of course content, the logisitical organisation of the course, and finally the overall evaluation.

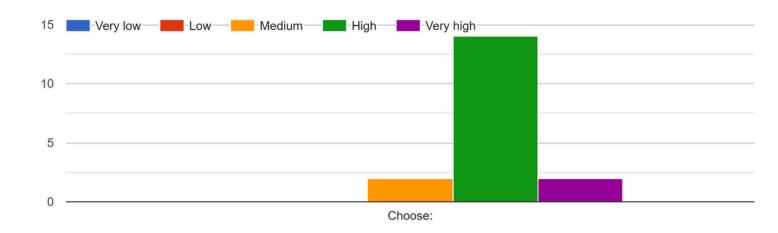Of the 22 participants, 18 responded. The responses are summarised below.

EVALUATION OF COURSE: HIGHLIGHTS

Highlights of the feedback received include:
- Nearly all participants selected high - very high on understanding course objectives and meeting expectations
- The relevance of the material also scored highly, with some commenting: *"In my work I am exploring stock assessment models, and I have not had the opportunity to explore SS3 yet. Therefore, what I have learned opens the door to new direct application tools."*
- Once again, participants rated the orientation to concrete needs and problems very highly: *"I felt the training was focused on practical needs and real problems, especially with its hands-on approach to using new methods for fisheries management in the Mediterranean region. It definitely matched future challenges that I will most likely be facing in my work."*
- There was also extremely high scores given to the teachers and the learning materials: *"They are both brilliant teachers and interesting human beings to interact with. Overall it is very noticeable that Andre has extensive experience as a teacher, but on the other hand, Jim has technological resources with helpful guidelines (e.g., vignettes / github etc) interesting to explore."*
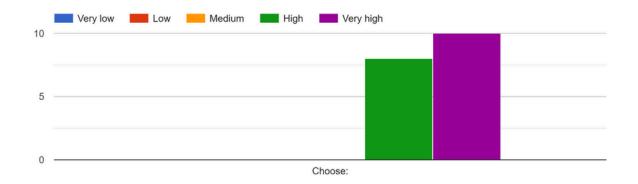
12. Use: To what extent will you be able to use what you have learned on this course?

ROOM FOR IMPROVEMENT?

- Most participants stated the level of difficulty was appropriate, although this question had one of the lowest scores among participants - a result that was not unexpected since at times, some found the new content challenging.
- Alongside the difficulty factor, it was noted that efficiency of topics covered in time given also had a lower score relative to other aspects, which correlates with the challenging level of difficulty some participants encountered, with some desire expressed for more time to be devoted to case studies.

14. Overall evaluation: What is your overall evaluation for this course?

SUPPORT

The Amare-Med Secretariat

SECRETARIAT
Giulia Casalena (OGS, Italy)
Sophie Burton Pogledic (OGS, Italy)

Participants and teachers were provided with support prior to the week of summer school and throughout the week in Tunisia.

BEFORE:
- An info pack was sent before 19 May (Annex 1)
- Full logisitical support was provided with flights via Turismo 85, as well as with visa applications
- A Whatsapp group chat was set up to ensure participants and teachers could remain in contact with one another outside the class

DURING:
- Participants were asked to sign a privacy notice statement at the start of the summer school week (Annex 2)
- During the summer school week, participants were supported with details of social activities after class

AFTER:
- Participants were sent the Amare-Med Evaluation via a Google Doc, which can be found <u>here</u>. Results of the evaluation can be found on Page 14.

CERTIFICATES

Participants were presented with certificates of completion on the last day of the summer school (Annex 3)

FINAL COMMENTS

AMARE-MED 2025 successfully achieved the objectives of improving the capacities of selected students on quantitative approaches to support sustainable fisheries management. In particular, students were exposed to very recent developments on geostatistical approaches (tinyVAST) to analyze ecological data (trawl surveys, oceanographic data, effort, etc.) and to stock assessment modellig (SS3) that embeds oceanographic drivers and species interactions (predation). A combination of theory and practice proved to be key in supporting the transfer of methods. The application of approaches to a specific Mediterranean case study (Strait of Sicily) improved interest and confidence on the application. The development of activities within working groups enabled the proactive application of methods as well as authonomous thinking on the best solution.

ACKNOWLEDGEMENTS

FINANCIAL SUPPORT

ANNEXES

1. Info Pack
2. Privacy notice
3. Certificate
4. Assessment Form Results

INFO PACK

"Advanced school on Multispecies modelling Approaches for ecosystem based marine REsource management in the MEDiterranean Sea"

Summer School 2025
19–23 May in Tunis, Tunisia

OGS

AMARE MED

TLQS — The Laboratory on Quantitative Sustainability

📍 **Tunis, Tunisia**

📝 19 – 23 May 2025

Background

The 2025 Programme:
AMARE-MED will provide participants with theoretical insights and practical skills, covering essential topics such as:

1. Basic analysis of trawl survey data.
2. Application of joint species distribution models (JSDM), incorporating environmental covariates with data from the Copernicus Marine Service.
3. Predicting species' biomass index under climate change and evaluating species overlap and interactions.
4. Integrating results into Stock Synthesis (SS3) for stock assessment, taking into consideration species interactions.

The week-long course will blend lectures with hands-on programming, equipping participants with advanced tools and methodologies crucial for fisheries management.

Each edition includes the presentation and use (hands-on computer) of two or three different modelling approaches used for scientific analysis, useful for the management of marine renewable resources: MICE, GADGET, RPATH, CMSY, FISHPATH, ECOSPACE, SMART, SDMtmb (and many others). Internationally renowned researchers such as Andre Punt, Valerio Bartolino, Natalie Dowling, Giampaolo Coro, Kim De Mutsert, Natalia Serpetti, Tommaso Russo, Lewis Barnett were speakers in previous editions. Since 2017, the OGS modelling group has been the promoter and main organiser of AMARE-MED, in collaboration with other Italian and foreign research institutes, which have also hosted some editions (2017 CapoGranitola-Italy; 2018 Trieste-Italy; 2020 Venice-Italy; 2022 Split-Croatia; 2023 Larnaka-Cyprus; 2024 Lisbon-Portugal).

- This year, AMARE-MED 2025 will be held in Tunisia from 19 - 23 May, organized by OGS and INSTM, focusing on the Joint Species Distribution Model (tinyVAST) and stock assessment model application considering multispecies interactions (SS3).

What is and what is not included in the support for your travel and accommodation?

Included:

- Meals (only lunches in the hotel) and social dinner for the the 19th of May.
- Welcome activities and coffee breaks
- Field trip as study visit

Not included:

- Local Travel expenses (country of origin)
- Insurance
- Cost of visa
- Dinners
- Any other cost not mentioned in the "included" list

Do I need insurance?

Yes, it is important to have sufficient insurance when participating in the Summer School.
Check for the appropriate insurance required with the Visa Office before you proceed with the payment.

People requiring accommodation

Accommodation is available for participants who require lodging. If you need a room, please send a private email to ELMOURADI GAMMARTH, BP 597, LA MARSA 2070, TUNIS, TUNISIA, and kindly copy gcasalena@ogs.it in your message. You may mention that you are attending the AMARE-MED Summer School as a selected candidate. We will provide you with the relevant contact references.

People with accomodation covered

For participants whose accommodation expenses are covered, rooms will be shared with another participant of the same gender (mixed-gender rooms will not be arranged). The accommodation includes breakfast.

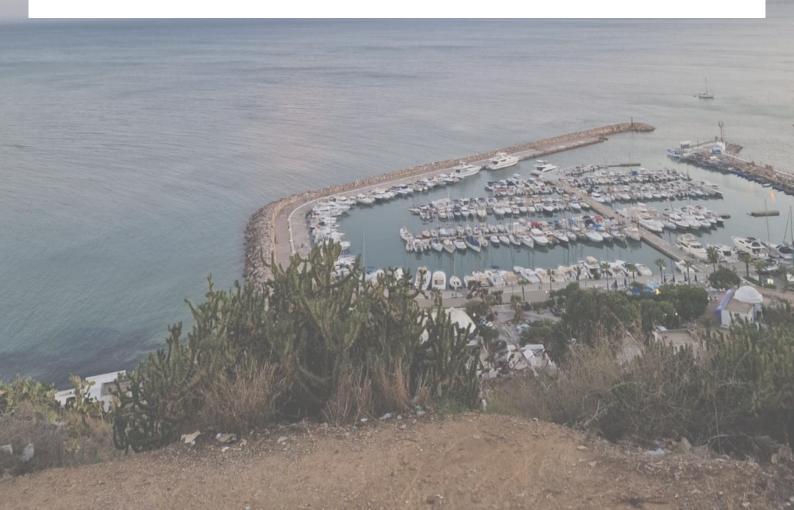**If you have any food allergies or dietary restrictions, we kindly ask that you inform us in advance so appropriate arrangements can be made.**

Type C   Type E

What is the voltage in Tunis?

The voltage in Tunis is 230 V and plug type C&E.
Check whether you need a world adapter for your local plugs.

Will I have Internet connection?

During all activities and lessons between the 19th and the 23rd of May you will be provided with an Internet connection. The Hotel's own Wi-Fi network will also be made available to you during your stay. You will have a temporary account to access Wi-Fi at the venue in which activities are organised.

What living expenses can I expect during my stay in Tunis?

Lunch will be provided by the organisation only during working days (19-23 May), while dinners are not included (except for the AMARE-MED social dinner). Therefore, we recommend to bring the necessary amount of money for the following activities:

- Dinners and any other extra meals
- Public transport: depending on your interests (taxis are not expensive, but **only accept CASH**)
- Other expenses (e.g. if you visit museums and undertake more social activities)

What is the common form of payment in Tunisia? Should I bring Tunisian Dinar?

The Dinar is the currency in Tunisia. You could consider bringing some cash with you for the first day or so, but overall there are plenty of ATMs available, and VISA and Mastercard credit and debit cards are accepted in most shops and restaurants. Our suggestion is to **change some money at the airport**.

What is the weather like on the Tunisian coast in May?

May in Tunisia can be described as quite warm – hot. Usually the average temperature will be around 26 degrees Celsius during the day and around 17 degrees Celsius at night. Make sure you bring a light summer jacket that you can wear during the evenings. We suggest you bring sun protection (sun cream, sunglasses, hats, …).
Bring an umbrella in case it rains!

Live communication: join the Whatsapp group!

For urgent issues and live communications, please join the Whatsapp group:
https://chat.whatsapp.com/Iza77mAvOs38xUC7FHEYQJ

Participants list

Surname	Name	Gender	Nationality
Abdallah	Khadidja Wissal	Female	Algeria
Agrebi	Siwar	Female	Tunisia
Barbato	Matteo	Male	Italy
Belaabed	Mohamed	Male	Morocco
Ben Hadj Hamida	Nader	Male	Tunisia
Benziane	Meryem	Female	Morocco
Cali	Federico	Male	Italy
Cecapolli	Enrico	Male	Italy
Di Bona	Gabriele	Male	Italy
Fezzani	Samia	Female	Tunisia
Filali	Tahar	Male	Algeria
Gharsalli	Manel	Female	Tunisia
Guechaoui	Merzouq	Male	Algeria
Hadj Taieb	Aymen	Male	Tunisia
Ingrosso	Maurizio	Male	Italy
Kacimi	Adel	Male	Algeria
khemiri	sana	Female	Tunisia
Kroebel	Sina	Female	Germany
Panzeri	Diego	Male	Italy
Sacanha	Bitonia Jose	Female	Mozambico
Sahbani	Sabrine	Female	Tunisia
Scanu	Martina	Female	Italy
Stefani	Matteo	Male	Italy
Stergiou	Konstantina	Female	Greece
Zarrad	Rafik	Male	Tunisia
Zerarguia	Islem	Male	Algeria

Getting here

How to reach the hotel from the airport

🚕 **Option 1: Taxi (fastest & convenient)**
- Duration: Approximately 20–25 minutes
- Cost: Around 27 TND (approximately €5–8)
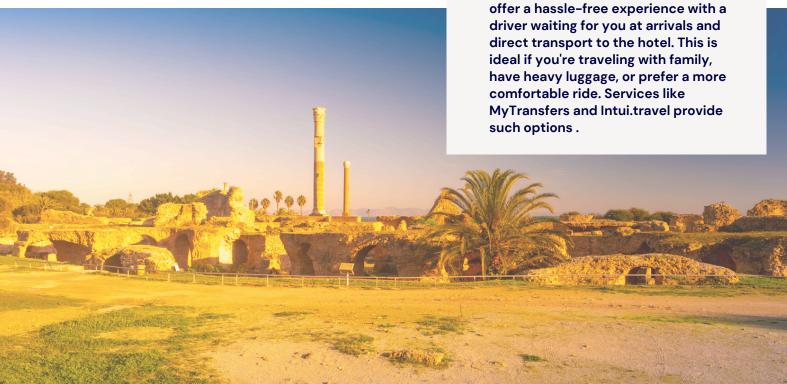- Details: Taxis are readily available outside the arrivals terminal.

For a more predictable fare, consider using ride-hailing apps like Bolt or OTO (similar to Uber Black), which offer fixed pricing and are commonly used in Tunisia.

🚌 **Option 2: Public Bus (Budget–Friendly)**
- Duration: Approximately 45–50 minutes
- Cost: Less than 2 TND (around €0.60)
- Route:
  a. Take bus line 635 from the airport to Charguia1.
  b. Transfer to bus 20B towards E.P Gammarth.
- Note: Buses operate every 20 minutes. However, they can be crowded and less reliable, especially if you're carrying luggage or arriving late in the day.

🚗 **Option 3: Private Transfer (Comfortable & Door-to-Door)**
- Duration: Approximately 25–30 minutes
- Cost: Around 119 TND (35€)
- Details: Pre-booked private transfers offer a hassle-free experience with a driver waiting for you at arrivals and direct transport to the hotel. This is ideal if you're traveling with family, have heavy luggage, or prefer a more comfortable ride. Services like MyTransfers and Intui.travel provide such options .
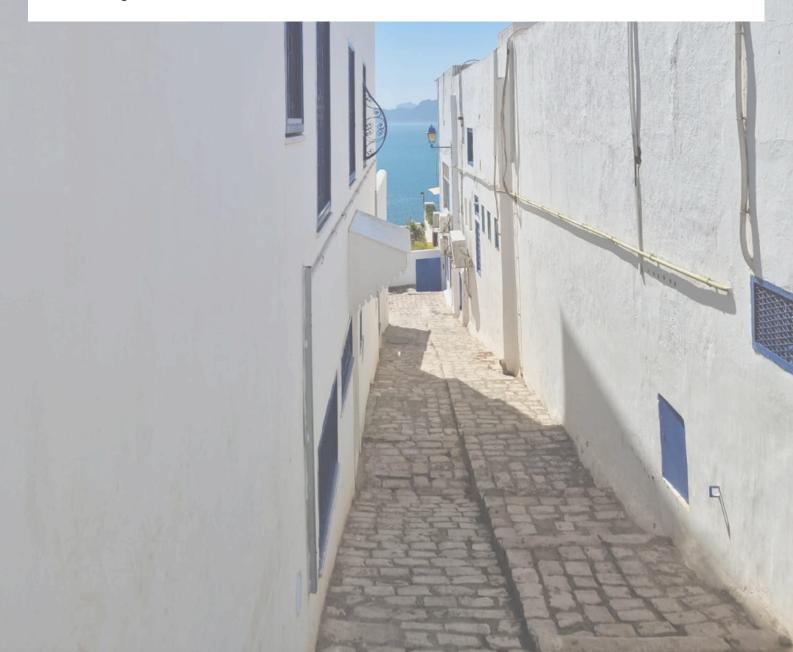
Venue

The venue of our Summer School for the week is <u>ELMOURADI GAMMARTH</u> BP 597 LA MARSA 2070 TUNIS, TUNISIA.

The field trip will take place on the afternoon of **21st of May.** The group will travel together to **Bizerte Lagoon.**
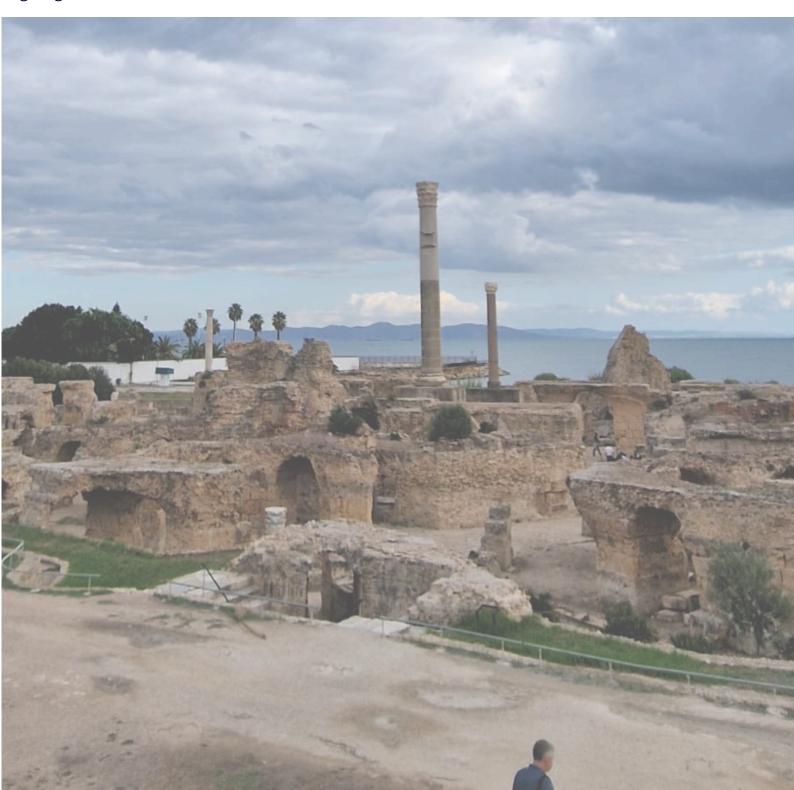
Meeting point

The group will move together to participate in all the activities. On the first day (18th May) we will have an Ice break and the day after we will meet at 8.15 AM in the hall.

This is a picture of the room we will use to have lessons.

It is kindly recommended to **arrive on time**, as arriving late is disrespectful to the professors who are giving the lecture

WEEKLY AGENDA

Day 0 - Sunday, 18th May
Simone Libralato

18:30-19:30   Ice break – Brief Introduction to the course, self introductions, software issues

Day 1 – Monday, 19th May
Andre Punt

08:00-08:30: Registration and Opening (*Simone Libralato*)
08:30-09:30 A: Conducting stock assessments, including a welcome to Stock Synthesis.
09:30-10:00 B: Key elements of Stock Synthesis and r4ss for this class (Part I).
10:00-10:30 *Coffee break* (*and check you can use DOS*)
10:30-12:00 B: Key elements of Stock Synthesis and r4ss for this class (Part II).
12:00-13:00 *Lunch*
13:00-14:30 Assignment 1: Applying Stock Synthesis to an example data set.
14:30-15:00 *Coffee break*
15:00-15:30 Assignment 1: Viewing the solution
15:30-17:30 C: Extending Stock Synthesis to include climate and predation

19:30 Social Dinner

Day 2 – Tuesday, 20th May
Andre Punt, Fabio Falsone, Diego Panzeri & James Thorson

08:30-10:00 Assignment 2: Adding predation to Stock Synthesis (*Andre*).
10:00-11:00 *Coffee break*
11:00-12:00 D: Introduction to the case study (*Fabio, Diego*)
12:00-13:00 *Lunch*
13:00-14:30 E: Lecture: Background on generalized graphical mixed models (*Jim*)
14:30-15:00 *Coffee break*
15:00-16:00 E: Code tutorial: Introduction to arrow-and-lag syntax using DSEM (*Jim*)
16:00-17:30 E: Exercise: Simulating abundance-at-age and fitting DSEM (*Jim*)

Day 3 – Wednesday, 21st May
Jim Thorson

08:30–10:00 F: Lecture: Background on JSDMs using tinyVAST
10:00–11:00 Coffee break
11:00–12:00 F: Code tutorial: Walk through spatial modelling vignette
12:00–13:00 Lunch
13:00–17:30 *Afternoon: social event – excursion to Bizerte Lagoon*

Day 4 – Thursday, 22nd May
Jim Thorson

08:30–10:00 G: Code tutorial: Walk through "multiple data types" vignette
10:00–11:00 Coffee break
11:00–12:00 G: Group work: Divide into groups and walk through:
  • Group 1: Simultaneous autoregressive models vignette
  • Group 2: Condition and density vignette
  • Group 3: Spatial factor analysis vignette
  • Group 4: Vector autoregressive spatio-temporal models vignette
12:00–13:00 Lunch
13:00–14:30 Assignment 2, working in groups: Applying tinyVAST to student data sets
14:30–15:00 Coffee break
15:00–16:00 Assignment 2, working in groups: Present back to class
16:30–17:30 Lecture and discussion: Validating structural causal models

Day 5 – Friday, 23rd May
Andre Punt

08:30–10:00 Assignment 3: South of Sicily case study
10:00–10:30 Coffee break
10:30–11:00 D: Stock Synthesis and conducting projections
11:00–12:00 Assignment 4: Evaluating multispecies harvest strategies under climate change (part 1)
12:00–13:00 Lunch
13:00–15:00 Assignment 4 continued
15:00–15:30 Coffee break
15:30–17:00 Assignment 4 continued (including presentations)
17:30–17:30 Close

All material is available at:
  • **Andre's materials on google drive** here
  • **Jim's materials on github** here

What to do in Tunisia?

You will have some free time to visit the city and surrounding area.

Places of interest are:

Medina of Tunis

Moschea al–Zaytuna

Bardo Museum

Carthage

Sidi Bou Said

**Cities and Culture
Tunis:**

- Medina of Tunis (UNESCO World Heritage): a maze of souks, mosques, and historic buildings.

- Bardo Museum: one of the most important museums in North Africa, known for its incredible Roman mosaics.

- Carthage: ancient Punic and Roman ruins located near Tunis.

- Sidi Bou Said: a charming hilltop village with white houses and blue doors—perfect for photos and sunsets.

The Venue for social dinner

On the 19th of May at 19.30h OGS is organising a social dinner for all participants.
No specific dress code is required.

The event will be held at Le Grand Bleu, Tunis.
The address is: Le Grand Bleu, 2070 Av. Taieb Mhiri, Marsa, Tunisia

You will receive more information about the dinner in a separate email.

Google Maps

Enjoy your experience in Carthage

About OGS-Blue Skills

The Italian National Institute of Oceanography and Applied Geophysics – OGS proposes a multidisciplinary training offer on sustainable blue economy to suit the long-term education and short-term upskilling experience, circular mobility and knowledge transfer. Specifically, the Blue Skills initiative promotes opportunities for marine and maritime careers through capacity building, skills development, knowledge exchange, and talent circulation across the Mediterranean. The activities include: an Advanced Master, a Summer School, opportunities for research mobility and a traineeship programme.

About INSTM

The Salammbô Oceanographic Station 'S.O.S' was created by beylical decree in 1924, according to the standard model of the time, with laboratories for research, a museum for the public, a library for documentation and a reference collection of different marine species.
This station was the first and largest institution of its kind in Africa and the Arab world. Thanks to the dynamism of H. Heldt, the Station's first Director, research underwent a major boom.

The National Institute of Marine Sciences and Technologies INSTM is now a Public Research Establishment under the supervision of the Ministry of Agriculture.

Privacy Notice

DATA CONTROLLER

The Data Controller is the National Institute of Oceanography and Applied Geophysics - OGS (hereinafter also "OGS" or "Data Controller"), located in Borgo Grotta Gigante 42/c - 34010 Sgonico (TS).

In order to exercise the rights recognized by the REGULATION (EU) 2016/679 (hereinafter "GDPR" or "Regulation") or to ask for any clarification regarding the processing of personal data, the Data Controller can be contacted at the following address: privacy@inogs.it.

The Data Controller has appointed a Data Protection Officer, who can be reached at the following address: dpo@inogs.it.

PURPOSES OF THE PROCESSING

The Data Controller will process the personal data, given by the data subject on a voluntary basis, for a number of purposes:

1. Allow participation in the training course, including all related or instrumental activities, functionally linked to the operations of the Data Controller or to the protection of its rights. We consider connected and instrumental to such activities, for example: the selection of participants; the organization and delivery of activities, also using e-learning platforms; the management of logistical aspects (travel arrangements, including the procedure for applying for a visa; food and accommodation; etc.); the recording of courses and other activities (also for later viewing); the activity of reporting; the elaboration of statistics or other analysis; the sharing of contents with possible partners of the project;
2. Fulfil tax and accounting obligations;
3. Send information and promotional communications on services or initiatives of OGS and/or its partners by means of:
- traditional methods of contact, such as paper mail and telephone calls;
- automated methods of contact: e-mail, SMS (Short Message Service), instant messaging systems.

LEGAL BASIS FOR THE PROCESSING

1. Performance of a contract and/or implementation of pre-contractual measures: purpose No 1;
2. Performance of a task carried out in the public interest for which the Data Controller is responsible: purpose No.1;
3. Performance of a legal obligation to which the Controller is subject: purpose No.2;
4. The consent of the data subject: purposes No 3 and No 4.

PROVISION OF DATA AND CONSEQUENCES IN CASE OF REFUSAL TO PROVIDE DATA

Failure to provide data or consent will make it impossible to participate in the training course, attend the lessons that are recorded, receive information on promotional and institutional events of OGS (purpose No 3).

CATEGORIES OF RECIPIENTS OF THE PERSONAL DATA

As far as the OGS is concerned, only persons who have been authorized to process personal data and persons who, processing data on behalf of the Data Controller, have been identified as Data Processors may access personal data. These subjects are bound to secrecy and confidentiality also on the basis of specific internal rules. The data may be communicated:

a) to other public or private entities, in the cases provided for by law and regulations;
b) hotels and other accommodation facilities, for the management of the stay;
c) agencies, tour operators, etc., for the management of the trip and travel;

d) other public or private entities for the organization of field trips;
e) any Partners involved in the organization of the Summer School.

This is without prejudice, in any case, to the communication or dissemination of data required, in accordance with the law, by the Public Safety Authority, the Judicial Authority or other public entities for purposes of defence, state security and crime detection, as well as the communication to the Judicial Authority in compliance with legal obligations, in the event of a crime.

TRANSFER OF PERSONAL DATA TO THIRD COUNTRIES
Finally, the personal data of the interested parties may be transferred to third countries with the publication of the event recordings on the communication channels of the Data Controller, on the basis of the provisions of Article 49(1)(d) of the GDPR.

DATA STORAGE CRITERIA
Personal data are processed for the period of time that is necessary to achieve the purposes for which they were collected or for any other legitimate related purposes. Therefore, if personal data are processed for different purposes, they will be kept until the purpose with the longest retention period has expired; however, data collected for purposes for which the retention period has expired will no longer be processed.

In particular, personal data will be kept for a period identified according to criteria of strict necessity in view of the different aims pursued and, in any case, in compliance with the current legislation on the protection of personal data and following the rationale to protect the rights of the Data Controller.

In particular, the images and audio-video recordings of the event/initiative may be kept for the purpose of archiving and documenting the activities carried out by the Data Controller.

In the event that any information is the subject of a dispute and/or is necessary for the exercise of legal claims, it may be kept even beyond the above limits.

RIGHTS OF THE DATA SUBJECT
The Data Controller informs you that the Data Subject has the right to request:
- access to personal data and information (Art. 15 of the GDPR);
- rectification or erasure of the same (Articles 16 and 17 of the GDPR);
- restriction of the processing of personal data (art. 18 of the GDPR).

Finally, the Data Subject has the right to:
- object to the processing of personal data under the conditions and within the limits set out in Article 21 of the GDPR;
- exercise the right to data portability (Art. 20 GDPR).

With regard to processing operations based on consent (within the meaning of Articles 6(1)(a) and 9(2)(a) of the GDPR), we inform you that the Data Subject has the right to withdraw such consent at any time (without undermining the lawfulness of the processing based on the consent given before the withdrawal).

Finally, please note that if the Data Subject considers that the processing of his or her data is in breach of the Regulation, he or she has the right to lodge a complaint with a supervisory authority (Data Protection Authority or any other competent authority) pursuant to Article 77 et seq. of the GDPR.

Name:

Signature:

Date:

AMARE MED

CERTIFICATE OF ATTENDANCE

This certificate is awarded to   for attending Amare-Med 2025, held in Tunisia from 19 - 23 May 2025.

Lectures were provided:

☐   Prof. Andre Punt

☐   Prof. James Thorson

Sincerely,

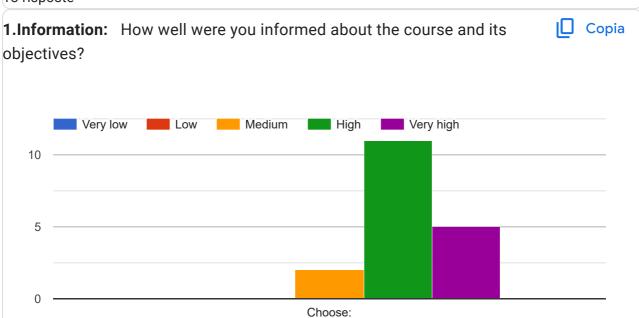Amare-Med Scientific Committee

Simone Libralato (OGS)

OGS National Institute of Oceanography and Applied Geophysics

TLQS

INSTM Institut National Des Sciences Et Technologies De La Mer

AMARE-MED 2025 Assessment Form

18 risposte

1.Information: How well were you informed about the course and its objectives?

Legend: Very low (blue), Low (red), Medium (orange), High (green), Very high (purple). Choose:

Please comment to explain the score above on objectives

7 risposte

The info pack was well prepared and the secretariat was always available to answer questions.

Interesting course brings new perspectives for the management of fisheries resources

This is the first time I've heard of Amaremed

Since the annoncement of the course util the end, we were well informed from the organizers, differente documents, GitHub, google drive and the professors.

Everything was very clear, before my arrival in Tunis

The objectives were clearly explained during the publicity of the course.

I felt well informed about the course and its objectives. The OGS website provided comprehensive details, and the agenda was very helpful in knowing what to expect.

2. Expectations: To what extent did this training course meet your expectations?

Legend: ■ Very low ■ Low ■ Medium ■ High ■ Very high

Choose:

Please comment to explain the score above on **expectations**

8 risposte

It was a very intense session that introduced me to several concepts in mathematical modeling, which could be beneficial to me in my future work.

Overall, the summer school was well organized and the topics treated have been clear and well-explained.

Very important training and the courses offered are very interesting, especially in my field, the training met my expectations to gain new skills to use in my research.

The course met my expectations perfectly in the sense that it allowed us to use advanced tools and methodologies essential for fisheries managements
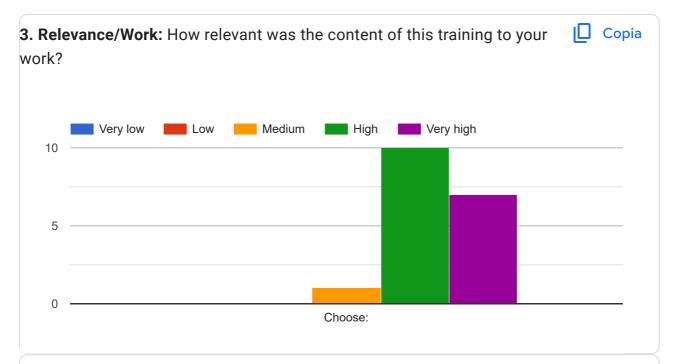
I'm working in stock assessemnt and the SS3 model is so used

Not only were my expectations met, but they were exceeded

During the course the mentioned objectives were covered, perhaps it would have been important to review the training material some time in advance.

The course definitely met my expectations, not only because of the growing relevance of multispecies modelling in achieving a more holistic approach, but also for the opportunity it provided to network and combine learning with enjoyment.

3. Relevance/Work: How relevant was the content of this training to your work?

Legend: Very low | Low | Medium | High | Very high

Please comment to explain the score above on *relevance*

7 risposte

The concepts explained will be useful in my future work on species distribution modeling.

Thorson's work is not related to my field of research, but I still found it interesting.

The training enabled me to gain new skills to use in my research and to complete my thesis.

As I work on ecobiology, dynamics, and stock assessment of marine organisms, so this training is perfectly suited to my needs.

I'll applied the new knoledge in the stock assement of large pelagic using SS3 with environmental covariables.

In my work I am exploring stock assessment models, and I have not had the opportunity to explore SS3 yet. Therefore, what I have learned opens the door to new direct application tools.

As someone working in fisheries science and aiming to advance in this field, I found the course valuable for learning new skills that I can potentially apply in my current role at some point.

4. Efficiency: How would you rate the relationship between the number of topics taught in the course and the time allotted for each topic?

Legend: Very poor (blue), Low (red), Medium (orange), Good (green), Very good (purple)

Choose:

Please comment on the score above on **efficiency**

9 risposte

On that note, the course was very busy, covering many concepts at once. I would have liked to focus on a single concept and explore it in detail.

I felt that Thorson's lessons could have needed more time to be clearer.

The composition of the course is rich with important and new information for me, but the time is short to understand all the new models.

I would have liked more time to do more applications on our data.

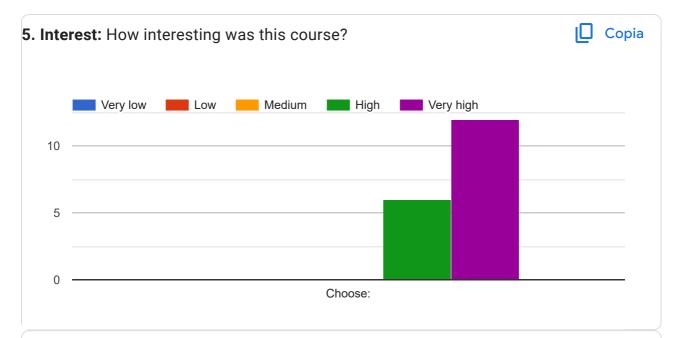I would say very good, if there were more time to discuss all the topics Jim brought up

I think both topics were too broad to be covered in a single week. I think there was too short to explore tinyVAST.

I think some topics need a week!

need more time

I think all the topics received a fair share of time, however, when it came to tinyVAST, I felt there could have been more emphasis on practical work.

5. Interest: How interesting was this course?

Very low ■ Low ■ Medium ■ High ■ Very high

Choose:

Please comment on the score above on ***interest***

6 risposte

-

The course covers the topic of my thesis project.

This course is very interesting to stock assessment and fisheries management

It was great to learn how others outside of the Mediterranean work on stocks and MultiSpecies Models

I was so excited above two topics. On one side having little more experience in SS, was more easy to catch the lectures and assigments. But on the other side being new in state space models and tools like tinyVAST was so excited too.

I found the course highly interesting, especially because it introduced me to new concepts like incorporating species interactions in modelling, which was a first for me.

6. Concrete Need: To what extent did you consider the training was oriented to concrete needs and problems?

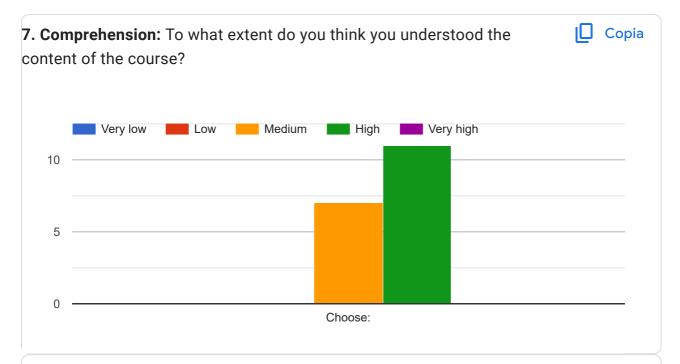*Please comment on the score above on **concrete need***

5 risposte

The exercises were oriented to real-life scenarios that one can encounter in everyday research.

Nowadays, the effects of climate change and species interaction and distribution is fundamental for fisheries management

Learning new tools such as SS3, with wide potential use in broad context is very relevant. On the other hand, causal models and tools like dsem or tinyVAST are still a bit abstract given my background. However, knowing of their existence and with good documentation provided is of great help to find a potential future application.

Yes, but no time to apply a real case study!

I felt the training was focused on practical needs and real problems, especially with its hands-on approach to using new methods for fisheries management in the Mediterranean region. It definitely matched future challenges that I will most likely be facing in my work.

7. Comprehension: To what extent do you think you understood the content of the course?

Legend: Very low | Low | Medium | High | Very high

Choose:

Please comment on the score above on **comprehension**

6 risposte

The pace was fast, but I felt like I understood most of the topics.

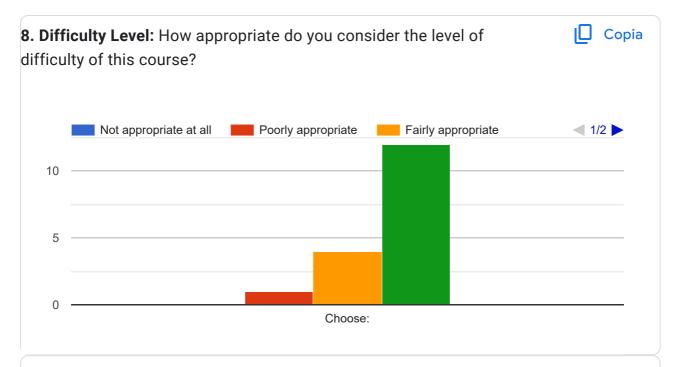It is difficult to learn new information in a short time.

I consider that I have understood the course well

I would say around 80-90% of Andre's lectures and 20% of Jim's. But, I put high because if I give myself time to read more about all the things that were discussed, I will finally have more understanding

I consider that the training course is only an introduction to the topics, it is up to each person to go deeper into the subject.

I found Andres' section easy to follow, even though I had limited background knowledge of SS3. I appreciated how he started with some theory and then shifted to practical, hands-on work, which helped reinforce the concepts. In contrast, I found Jim's part more challenging to grasp, as it was quite theoretical. At times, this made it a bit difficult to stay engaged.

8. Difficulty Level: How appropriate do you consider the level of difficulty of this course?

■ Not appropriate at all   ■ Poorly appropriate   ■ Fairly appropriate   ◀ 1/2 ▶

Choose:

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*Please comment on the score above on **difficulty level***

6 risposte

Sometimes I felt like i lacked some preliminar knowledge to better understand the topics.
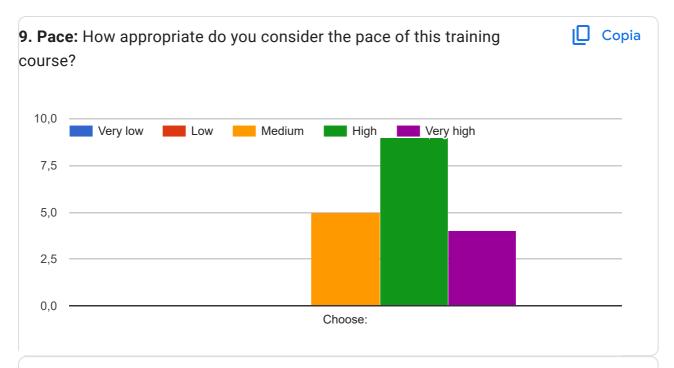
I consider that the level of difficulty of this course is relatively high

It was fairly appropriate as all of the participants were from different levels

Having a general experience of the subject matter, I consider that the level of difficulty was adequate.

In my opinion, a short questionnaire (or test) before the application could help the student and the teacher to understand what (and how) to implement in the course

As mentioned earlier, I found Andres' part easier to understand, and I felt the level of difficulty was just right. Jim's section, on the other hand, was a bit too challenging, especially for someone like me without a strong background in maths.

9. Pace: How appropriate do you consider the pace of this training course?

Bar chart legend: ■ Very low ■ Low ■ Medium ■ High ■ Very high

Y-axis: 10,0 / 7,5 / 5,0 / 2,5 / 0,0

Choose:

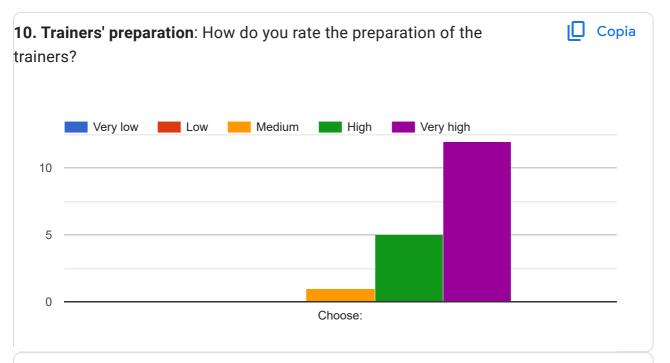*Please comment on the score above on* **pace**

5 risposte

As I said above, sometimes it was hard to follow the lessons, especially Thorson's.

I consider that thepace of this course is relatively high

We could have some more days I think and slow down with the pace. Maybe 2-3 more days?

rather fast

Overall, I found the pace appropriate, especially as someone still new to the topic. That said, there were moments where it could have moved a bit faster, such as when troubleshooting folder setup issues for SS3, which might have been prevented with some prior preparation. Conversely, at times it felt a bit too fast, particularly during Jim's walkthrough of the theoretical slides.
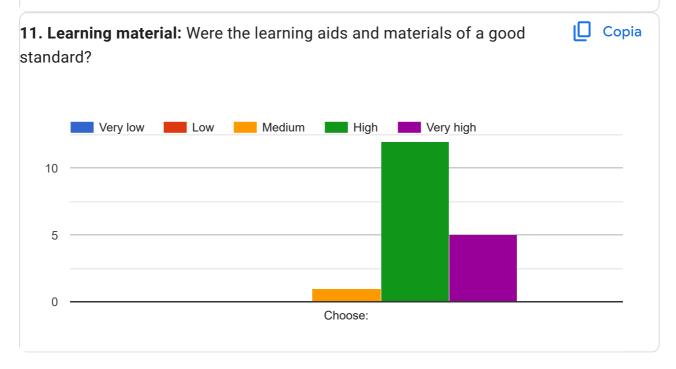
10. Trainers' preparation: How do you rate the preparation of the trainers?

Legend: Very low · Low · Medium · High · Very high

Please comment on the score above on **trainer preparation**

3 risposte

The trainers were top-class instructors, nothing to say about it.

I consider that the trainer preparation is very good

They are both brilliant teachers and interesting human beings to interact with. Overall it is very noticeable that Andre has extensive experience as a teacher, but on the other hand, Jim has technological resources with helpful guidelines (e.g., vignettes / github etc) interesting to explore.

11. Learning material: Were the learning aids and materials of a good standard?

Legend: Very low · Low · Medium · High · Very high

Please comment on the score above on *learning material*
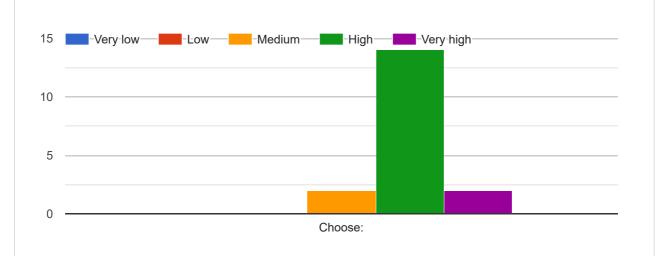
3 risposte

Yes, it is very good quality.

They were good but sometimes confusing, especially Punt's material.

Yes, the learning aids and materials are of a good standard

12. Use: To what extent will you be able to use what you have learned on this course?

Please comment on the score above on *use*

5 risposte

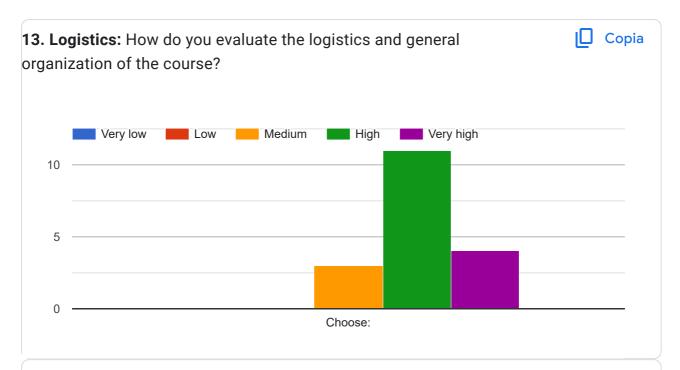In mathematical modelling, especially SDM modelling and ecological niche modelling

I will surely need what I learned during Punt's lessons, and maybe Thorson's research will be of some assistance for collaborations with others.

I have begun to apply the course knowledge to my data.

In the short to medium term I will try to use SS3 in the assessment of jack mackerel in the South Pacific ocean. Currently the model we are using does not allow us to include the effect of the environment. En el largo plazo leere mucho mas sobre dsem y tinyVAST para explorar sus potenciales aplicaciones.

Especially SS3 is very relevant in my field, and it was a good exercise to see what goes into it and how to extend it by including multispecies modelling.

13. Logistics: How do you evaluate the logistics and general organization of the course?

Please comment on the score above on **logistics**

7 risposte

Logistics is lacking somewhat in terms of transportation.

The hotel was too far from interest points, considering that taxis are not refundable without receipt. The room were old and not so clean, but comfortable. The food was surprisingly good. The worst aspect was the poor wi-fi connection, which sometimes slowed down the lessons.

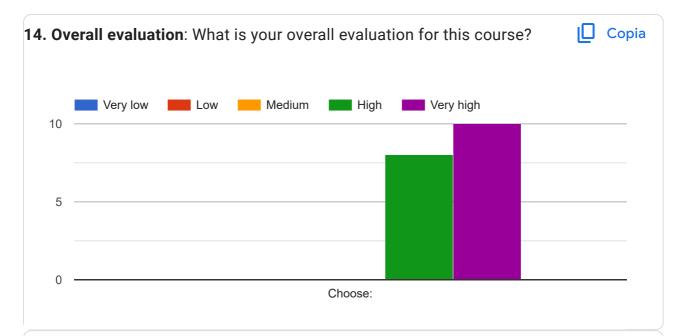very organized and well-prepared training

the logistics and general organization of the course are good

Bellissima!

Great job for the organizers being in another country and dealing with everything. Thank you!

Overall, the course was very well organised, and I can't really highlight any complaints. The OGS team was very helpful in answering questions beforehand and also during the course. While the field trip had some room for improvement, it also definitely added character to the experience, so I still enjoyed it very much.

14. Overall evaluation: What is your overall evaluation for this course?

Legend: Very low, Low, Medium, High, Very high

Choose:

Please comment on the score above on **overall evaluation**

4 risposte

The course was really fruitful, both for knowing new people in my same field of research and for learning useful tools.

very interesting training, interactive course, rich in information, perfect organization

I consider this course very beneficial for me

Overall, I had a great time in Tunisia and I not only deepened my knowledge of multispecies modelling in R but also had a truly memorable time and gained new friendships on top. I'm incredibly grateful to have had the opportunity to take part and would highly recommend this course to others to apply next year.

Suggestion 1: Do you think it is better to have one single method or more methods in one course?

15 risposte

it's better to have one method and focus on it in details

more mthods are good as long as they share some parts

Maybe a single but better explained method could be a good idea

Adopt a single method so that participants can understand well.

Not more than two methods

two methods are good

One sigle method

It depends of the aims of the course, it is always a trade-off between the time spent in hands-on activities and theoretical explanation of the concepts. I think that the formula 2 topics/methods is a good trade-off, giving the possibility to have a wider coverage of topics.

I would prefer one single method

I think more methods are fine. But maybe more days?

I think it depends on the method being explored. However, students only truly learn the technique when they are working autonomously and out of their own interest. Therefore, being able to explore different methods provides students with more resources and tools.

only one!

2 is perfect

I think I would prefer focusing on just one method and gaining a more in-depth understanding of it.

Focusing in one method could improve the pace and the learning curve of the students

Suggestion 2: What would you change? What would you keep?

14 risposte

I will leave out the generalities about mathematical models and focus solely on the Tiny-Vast vignette in more detail.

Keep the combo Jim Thorson + Andre Punt

I would make sure that the location can be more satisfying for both lessons and free time activities.

For change: Providing housing for all participants.
Keep all the rest (organisation, quality of the course and the trainers,...)

I would keep the core of the course as it is

A bit of theory with more application to real data

Nothing, I think it is a good format and organization for a one-week summer school.

I would prefer to understand the script before running it, or build it together.

I don't think I would change a lot except from the place. I would to have 2 or 3 more days for the lectures but I don't know how it would be financially easy to be done.

I would keep the idea of having Andre as a teacher for the various editions of the course. It's great to have him as a teacher at least for a week :) each year. I would expand the publicity of the course, and maybe announce its execution a bit more in advance.

A school on stock assessment and a school on SDM

frist lesson brief intro on fundamentals

For this year's AMARE-MED edition, I would have preferred more emphasis on SS3 and less on tinyVAST, perhaps just an introductory practical session to demonstrate how it works. That said, I may be a bit biased, as I found that part more difficult to understand.

I would keep the mix between theoretical background and direct application with case studies

Suggestion 3: Suggested approaches to be explored next time?

9 risposte

Modeling species distribution with a focus on non-native/invasive species

I would like a focus on the use of environmental variables on multispecies stock assessment.

models address both the impact of climate change and its effects on CPUE and fish size

More details and exploration of the SS3 and tinyvast models

The use of Copernicus Marine Data

methodological comparison of different models/packages applied on the same datasets and interpretation of model outputs.

Osmose :)

biogeochemistry

Fourth Corner and RQL Analysis

Amare-Med 2026: Please suggest a location and a marine institute you feel could provide support (logistical and financial) for the next edition

6 risposte

CIHEAM-Bari, CIHEAM-Montpellier, e-COST Program, University of Pavia

Livorno, OGS

For the Location: Mahdia City Tunisia

Enssmal, Algeria

I will have to come back with this!

ogs@panarea; cnr@venice

Comments: Please add any other comments you would like to make

5 risposte

Thanks to all OGS staff for giving us another great AMARE-MED school!

Thank you for the outstanding opportunity

Thank you very much for everything!
It was a great experience!

Thank you for supporting the development of young scientists coming from developing countries!

I suggest to resume the approaches explored during the course with a final guideline scheme at the end of the course to let the students to grasp better the pros and cons, the main objectives and data requirements of the learnt methods

Google Moduli