Diving into Science: Highlights from EUBS 2025 on Scuba and Freediving

Breakthroughs in Freediving and Scuba Safety Unveiled at EUBS 2025 in Helsinki.

The **European Underwater and Baromedical Society (EUBS)** Annual Meeting 2025 in Helsinki brought together leading experts in diving and hyperbaric medicine. Among the many presentations, the sessions dedicated to scuba diving and freediving stood out for their cutting-edge research and practical implications for diver safety and performance.



Freediving: From Physiology to Safer Practices

Freediving was a strong focus this year, with two dedicated scientific sessions and a keynote by **Prof. Peter Lindholm (UC San Diego / Karolinska Institute)**, who highlighted advances in understanding pulmonary barotrauma, nitrogen kinetics, and blackout mechanisms in breath-hold diving.

Key Studies in Freediving

- **Apnea Testing for Risk Prediction**
  Prof. **Erika Schagatay (Sweden)** presented work on whether static apnea ramp tests could predict desaturation during dynamic freediving. Results suggest that laboratory-based tests may provide a safe screening tool for freedivers at risk of severe hypoxia.
- **Heart Rate Variability as a Marker**
  Thomas Lundmark (Sweden) investigated HRV as an indicator of stress and recovery in repeated freedives, pointing toward its potential use in training and recovery monitoring.
- **Blackout Case Study**
  Eric Mulder (Sweden) presented a striking case describing heart rate and oxygen saturation patterns during a real freediving blackout, offering valuable insights into warning signs and recovery.
- **Self-Tests for Beginners**
  Prof. **Erika Schagatay's group** also developed a simple home apnea test to help beginners estimate safe dive durations. The test successfully predicted sustainable serial dive times at about one-third of the static apnea duration.
- **The 1:2 Pacing Strategy**
  Frank Pernett presented controlled trials validating the widely used 1:2 rule (twice the

recovery time compared to dive duration). Results confirmed that it generally stabilizes oxygen dynamics, though about 26% of participants failed to fully recover oxygen levels — highlighting the need for personalized recovery protocols.

- **Monitoring Platforms**
  Michael Binder (Austria) introduced a real-time logging and monitoring platform for freedivers, enabling better data collection for both training and safety.



Scuba Diving: Decompression, Physiology, and Risk Factors

Scuba-focused research also revealed important findings for both recreational and technical divers.

Bubbles and Decompression

- **Big Data on Decompression Sickness**
  Jean-Pierre Imbert (France) analysed 765 commercial diving DCS cases using cluster analysis to identify distinct bubble scenarios, improving our understanding of decompression risk profiles.
- **Nitrogen Kinetics and Variability**
  Oscar Plogmark (Sweden) presented research on whole-body inert gas uptake and washout during submersion, showing significant within-diver variability even under identical dive conditions — challenging assumptions of current decompression models.

Health and Diving

- **Dyslipidemia and Endothelial Function**
  Dr. Münire Kübra Özgök Kangal (Turkey) presented a study on divers with dyslipidemia, showing that a single dive induced measurable endothelial dysfunction in all participants.

- **CCR and Cold Water Diving**
  In his keynote, **Prof. Neal Pollock (Canada)** discussed the physiological challenges of rebreather diving in cold water, underlining the combined risks of thermal stress, hypoxia, and hypercapnia. Supporting talks by **S. Sokolowski (Finland)** highlighted cardiac changes and lung effects during CCR expeditions, while **Sousa Telles (Portugal)** explored the debated role of cold-water–induced ear canal exostosis (benign bone growth).
- **Hypercapnia Awareness**
  Xavier Vrijdag (New Zealand) presented a controlled trial showing that hypercapnia training did not significantly improve divers' ability to detect elevated CO_2 during simulated dives — highlighting the persistent dangers of rebreather diving and the limitations of awareness training alone.



Why It Matters

The EUBS 2025 findings reinforce how **individual variability, health status, and environmental factors** critically influence diving safety. Freediving research is moving toward **personalised protocols and monitoring tools**, while scuba studies are reshaping our understanding of **decompression models, gas exchange, and cardiovascular impacts**.

As diving technology advances and more people push their limits, these scientific insights will be crucial in **reducing risks and improving performance** — whether holding a single breath at depth or managing complex decompression profiles with rebreathers.

Learn more about upcoming research and events at **EUBS** and explore diver safety resources at **DAN Europe**.

Meet the Presenters

Peter Lindholm
Erika Schagatay
Frank Pernett
Eric Mulder
Michael Binder
Jean-Pierre Imbert
Oscar Plogmark
Münire Kübra Özgök Kangal
Neal W. Pollock
S. Sokolowski
Sousa Telles
Xavier Vrijdag

About the author

Graduated in Economics and Business Administration (B.Ec, MBA), Laura Marroni combines a strong managerial background with a lifelong passion for diving. A technical and cave diver, she is Executive Vice President & CEO of DAN Europe, where she oversees the organization’s core mission activities: scientific research, education, emergency assistance, and worldwide medical support.