Matteo Santon

BSc MSc PhD

ORCID ID: 0000-0002-9397-4052 Date of birth: 20th February 1990 Nationality: Italian
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Education

01/11/2015 – 21/02/2019 **PhD | Marine Visual Ecology | score: 0.8 (summa cum laude)**
University of Tübingen, Tübingen (Germany)
Advisors: Prof. Dr Nico K. Michiels (Uni Tübingen), Dr Martin J. How (Uni Bristol)
Title: "Visual detection of a cryptic predator by its prey fish"

Research: Behavioural and theoretical investigation of a new form of active sensing in the context of prey predator interaction in marine fish
Grant writing: Light redirection by small fish enhances detection of their cryptic predators

01/10/2012 – 01/12/2014 **Master of Science | Marine Evolutionary Biology | score: 110 cum laude**
University of Padova, Chioggia (Italy)
Advisors: Prof. Maria B. Rasotto, Dr Lisa Locatello
Title: "Mate preference in the marbled goby, *Pomatoschistus marmoratus*"

Research: Female preference and mate choice benefits in a small marine sand goby

01/09/2009 – 21/09/2012 **Bachelor of Science | Evolutionary Biology**
University of Padova, Padova (Italy)

Current position

01/03/2019 – now **Postdoc | Marine Visual Ecology**
University of Tübingen, Tübingen (Germany)
Mentor: Prof. Dr Nico K. Michiels

Research: Prey-predator visual interactions in cryptic marine fish
Grant writing: Luring prey: the role of polymorphic lures in frogfish

Previous position

01/02 – 01/08/2015 **Research assistant | Sexual selection in fish**
Research station 'Umberto d'Ancona' – University of Padova, Chioggia (Italy)
Advisors: Prof. Dr Carlotta Mazzoldi, Prof. Maria B. Rasotto

Research: Sexual selection in a small marine sand goby of the Venetian Lagoon

Strengths

- Design and setup of lab and field experiments
- Intensive field work with SCUBA
- Advanced statistical modelling (frequentist, Bayesian) with R, R-STAN, R-INLA
- Visual modelling with R ("pavo" package)
- Image calibration and analysis to measure reflectance, colour and patterns (MicaToolbox)
- Software (R, ImageJ, Python, MATLAB)
- Light measurements (spectrometry)
- Spectral data management and analysis
- Underwater photography and documentation
- Marine species identification (Mediterranean and Tropical ecosystems)

Funding and awards

26/07/2021 **Walter Benjamin Research Fellowship** – DFG foundation (Germany) – € 72,000 salary for two years (no support for conducting research) to study the hunting display of the broadclub cuttlefish. Please note that I did not accept this grant yet, as I prioritise European funding schemes.

24/07/2019 **Reinhold-und-Maria-Teufel-Foundation PhD Award –** € 5,000 prize for outstanding quality of dissertation in the field of biology. Title: "Visual detection of a cryptic predator by its prey fish."

08/03/2019 **BMC biology image competition 2018 Award** (Overall category, runner up). Picture title: "Hungry dugongs have no table manners". Cuff L., Lou Y. et al. (2019) BMC ecology image competition 2018: the winning images. BMC Ecology 19, 11.

01/07/2016 **Reinhold-und-Maria-Teufel-Foundation Travel Grant –** € 1,000 for ISBE conference (UK).

Fieldwork experience

2016 – 2021 **Research** | STARESO (Corsica, France)
Underwater work with SCUBA - 5 trips of 4 to 6 weeks each
Goal: large scale underwater field experiments, photography, spectrometry, specimens capture

2016 & 2020 **Research** | HYDRA (Elba, Italy)
Underwater work with SCUBA - 2 trips of 1 week each
Goal: specimens capture, underwater photography

2016/17/19 **Research and teaching** | Mangrove Bay (Red Sea, Egypt)
Underwater work freediving and with SCUBA - 3 trips of 2 weeks each
Goal: field courses on tropical marine ecology, underwater photography

2018 – 2019 **Research and teaching** | Coral Eye (Bangka island, Indonesia)
Underwater work with SCUBA - 3 trips of 2 to 8 weeks each
Goal: field courses on marine biodiversity, SCUBA training, underwater photography

Teaching activities

2019 – 2021 **Visual ecology** | Tübingen (Germany)

2016 – 2021 **Biostatistics** | Tübingen (Germany)

2016/17/19 **Tropical marine ecology** | Mangrove Bay (Egypt)

2018 **Tropical marine biodiversity** | Coral eye (Indonesia)

2021 **Mediterranean marine biodiversity** | Tamariu (Spain)

2020 – 2021 **Marine biology methods** | Tübingen (Germany)

2019 – 2021 **Advanced biostatistics** | Tübingen (Germany)
Advisor for data analysis across disciplines, for PhD students and PIs

Supervising or advising students

2016 – 2021 Number of PhD: 3 / Master students: 4 / Bachelor students: 11

2014 – 2015 Number of PhD: 0 / Master students: 1 / Bachelor students: 0

Institutional responsibilities

2020 – 2021 **External supervisor** for one MSc student (Mem. Uni of Newfoundland, Canada)

2018 – 2021 **Panel member** for selection of three PhD and one Post Doc candidate (Uni Tübingen, Germany)

Current collaborations

Dr Martin J. How, *The visual ecology of the hunting display of the broadclub cuttlefish,* Ecology of Vision Group, Faculty of Science, University of Bristol (United Kingdom)

Ass. Prof. Pierre-Paul Bitton, *Eye conspicuousness in cryptic marine predators,* Visual Ecology Group, Department of Psychology, Cognitive and Behavioural Ecology, Memorial University of Newfoundland (Canada)

Dr Federica Poli, *Sexual selection in benthic marine fish*, Prof. Maria B. Rasotto's Group, Institute of Biology, University of Padova (Italy)

Laura-Sophia Limmer, *Childhood stress in Palaeolithic hominins*, Prof. Katharina Harvati's Group, Palaeoanthropology Institute, University of Tübingen (Germany)

Publication record

Articles: **11**; citations: **23**; h-index: **3** (Scopus). Publications grouped by personal contribution.
Published with supervised students, * Published without main supervisor, [SS = *significance statement*]

- *Lead author, conceptualisation, data collection, data analysis, manuscript writing*

1. **Santon M.**, #Deiss F., Bitton P.-P., Michiels N.K. (**2021**). A context analysis of bobbing and fin-flicking in a small marine benthic fish. Ecol. Evol. 11, 1254-1263.
[SS: Behavioural study showing that pursuit-deterrent behavioural traits of small benthic fish are not restricted to the visual presence of a predator only, and that additional nonexclusive functions for such traits may exist. The statistical methods used include Bayesian models that account for zero-inflation and temporal autocorrelation.]

2. **Santon M.**, Bitton P.-P., Dehm J., Fritsch R., Harant U.K., Anthes N., Michiels N.K. (**2020**). Redirection of ambient light improves predator detection in a diurnal fish. Proc. Royal Soc. B. 287, 20192292.
[SS: This unique study shows that small diurnal benthic fish can redirect ambient light with their irises to improve detection of their cryptic predators. This process is here defined as "diurnal active photolocation". The methods used are innovative: Small hats were glued on heads of fish, complex behavioural trials were conducted with SCUBA using floating aquaria installed in the field, and custom-made visual models were implemented.]

3. **Santon M.**, Münch T.A., Michiels N.K. (**2019**). The contrast sensitivity function of a small cryptobenthic marine fish. J. Vis. 19(2).
[SS: This is the first ever published study that describes the Contrast Sensitivity Function of a marine fish. Experiments used a virtual optokinetic arena ideated for mice that was calibrated by the applicant for use with fish.]

4. **Santon M.**, Bitton P.-P., Harant U.K., Michiels N.K. (**2018**). Daytime eyeshine contributes to pupil camouflage in a cryptobenthic marine fish. Sci. Rep. 8, 7368.
[SS: This study uses spectrometric data from the lab and the field to implement visual models that show how eyeshine in cryptic predators can reduce the conspicuousness of otherwise black circular pupils.]

- *Conceptualisation, data analysis, manuscript writing*

5. Rieger M., Mailaender S., Stier L., ***Santon M.**, Staggenborg J., Anthes N. (**2021**). Optimising flower fields as an effective farmland eco-scheme also during non-breeding. J. Appl. Ecol.
[SS: This study shows how farmland birds vary in habitat selection during the non-breeding season, and suggests new minimum standards for sown flower fields to qualify as effective eco-schemes also to wintering wildlife.]

6. Poli F., Marino I.A.M., ***Santon M.**, Bozzetta E., Pellizzato G., Zane L., Rasotto M.B. (**2021**). Spatial asymmetry of the paternity success in nests of a fish with alternative reproductive tactics. Sci. Rep. 11, 3091.
[SS: This is one of the first studies that describes how nest structure affects paternity success and might thus work as an indirect cue of male relative siring success in a small marine benthic fish with guard-sneaker mating tactics.]

7. #Neiße N., **Santon M.**, Bitton P.-P., Michiels N.K. (**2020**). Small benthic fish strike at prey over distances that fall within theoretical predictions for active sensing using light. J. Fish Biol. 97, 1201-1208.
[SS: First study that quantifies predation distances of small benthic fish striking prey in their natural environment.]

8. Bitton P.-P., Yun Christmann S.A., **Santon M.**, Harant U.K., Michiels N.K. (**2019**). Visual modelling supports the potential for prey detection by means of diurnal active photolocation in a small cryptobenthic fish. Sci. Rep. 9, 8089.
[SS: Using visual modelling, this study shows how "diurnal active photolocation" can be used by small fish to increase detection of their prey by redirecting ambient light with their irises.]

9. Harant U.K., **Santon M.**, Bitton P.-P., Wehrberger F., Griessler T., Meadows M.G., Champ C.M., Michiels N.K. (**2018**). Do the fluorescent red eyes of the marine fish *Tripterygion delaisi* stand out? In situ and in vivo measurements at two depths. Ecol. Evol. 8, 4685-4694.
[SS: By implementing visual models using spectrometric data collected in the field, this study describes under which conditions red fluorescent irises of small marine fish can stand out against the background by generating perceptible achromatic contrast from conspecifics' visual perspective.]

- *Conceptualisation, data collection, data analysis*

10. Locatello L., **Santon M.**, Mazzoldi C., Rasotto M.B. (**2017**). The marbled goby, *P. marmoratus*, as a promising species for experimental evolution studies. Org. Divers. Evol. 17, 709-716.
[SS: This study proposes a novel breeding and rearing experimental model for small marine benthic fish.]

11. Locatello L., Mazzoldi C., **Santon M.**, #Sparaciari S., Rasotto M.B. (**2016**). Unexpected female preference for smaller males in the marbled goby *P. marmoratus*. J. Fish Biol. 89, 1845-1850.
[SS: On the importance of secondary sexual traits in female mate choice in a small marine benthic fish.]

Manuscripts in preparation

1. Limmer L.S., *__Santon M.__, Harvati K., El Zaatari, S. (**2021**). Children of Neanderthals and UP modern humans show similar levels of enamel defects but differences in the ontogenetic distribution of stress. - *Pending submission to Nat. Ecol. Evol.*

2. **Santon M.**, Michiels N.K., Anthes N. GLMMs made easy: A guided R-routine to implement linear models.

3. **Santon M.**, Michiels N.K., Bitton P.-P. Pupil concealment in cryptic marine predators.

4. Hancock G., *__Santon M.__, How M. On the mesmerising display of the broadclub cuttlefish (*Sepia latimanus*)

Conferences and workshop

2020 **Goby meeting** | Stanberg (Germany) | Oral presentation
The counterintuitive world of prey-predator visual interactions in small marine fish

2018 **International congress of Neuroethology** | Brisbane (Australia) | Poster
Daytime eyeshine conceals the pupil of a marine fish

2017 **Visionarium XVI** | Tvärminne zoological station (Finland) | Oral presentation
Diurnal active photolocation enhances detection of cryptic predators in a marine fish

2017 **Behaviour |** Estoril (Portugal) | Oral presentation
Diurnal active photolocation enhances detection of cryptic predators in a marine fish

2017 **3rd European Conference on Scientific Diving** | Madeira (Portugal) | Oral presentation
Active sensing using light? Active photolocation enhances detection of cryptic predators

2016 **Visionarium XV** | Tvärminne zoological station (Finland) | Poster
Active photolocation enhances detection of cryptic predators

2016 **International Society of Behavioural Ecology (ISBE)** | Exeter (United Kingdom) | Poster
Active photolocation helps small fish to spot cryptic predators

Reviewer activity

2021 **Scientific reports:** 1 manuscript

2020 **Evolution and Ecology:** 2 manuscripts

2020 **Journal of Experimental Biology:** 1 manuscript

Licences and additional qualifications

2019 **Dive Master certification** | Bangka Island (Indonesia) | Current dive counts: >1200 for research purposes

2015 **Boat** l**icence for sailing and motorboats** | Ravenna (Italy)