With environmental protection dominating agenda, scientific research into coral gathers pace

By Vincenzo Liverino, President
CIBJO Coral Commission

While the period separating the previous CIBJO Congress, which took place in Bahrain in November 2019, and the 2021 congress that is being conducted virtually at present, will be remembered largely for the COVID-19 pandemic, the coral sector continues to grapple with two longer-term crises, namely climate change and ocean acidification. Those, however, are not the only issues on our agenda.

At the outset, however, since there are different understandings as to what constitutes "precious coral" in the jewellery community and the scientific community, a clarification is in order.

Vincenzo Liverino, President of the CIBJO Coral Commission.

CIBJO defines precious corals as "those that are used in jewellery and decoration, specifically red, pink and white varieties with porcelain like lustre after polishing."

They are limited to few species belonging to the Corallidae family, consisting of the three following groups: *Corallium, Pleurocorallium* and *Hemicorallium*. They have a specific gravity of approximately 2.8 and a hardness of 3½ on the Mohs scale. (Coral Book, clause 3.1.1.1.)

Other coral species are also used as adornments, but CIBJO does not define them as "precious." These in CIBJO's vernacular are "common corals," and they include materials with soft and hard skeletons, including sponge coral, bamboo coral, black, golden and blue coral. The last is found in coral reefs.

Precious corals, which belonging to the Corallidae family, including Mediterranean coral, oxblood coral and angel skin coral, are typically harvested at greater depths than common corals. In the jewellery industry, they are generally set in precious metals, often with other gemstones.

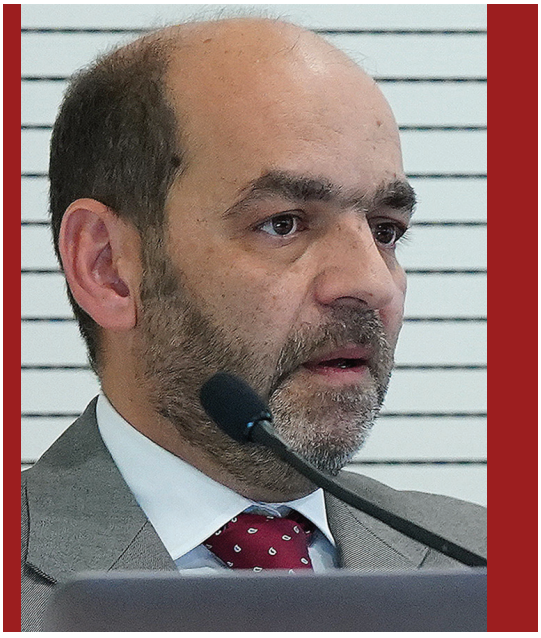
In contrast, however, marine biologists and conservationists use the expression precious coral as a collective term for all cnidarians that may be used for adornment or decoration. These include both what CIBJO has defined as precious coral and common coral.

The distinction is important from an environmental perspective. This is because the precious coral materials that are used in jewellery are not from the reef-building coral species that have been severely impacted by climate change, nor do they live in the same marine ecosystems.

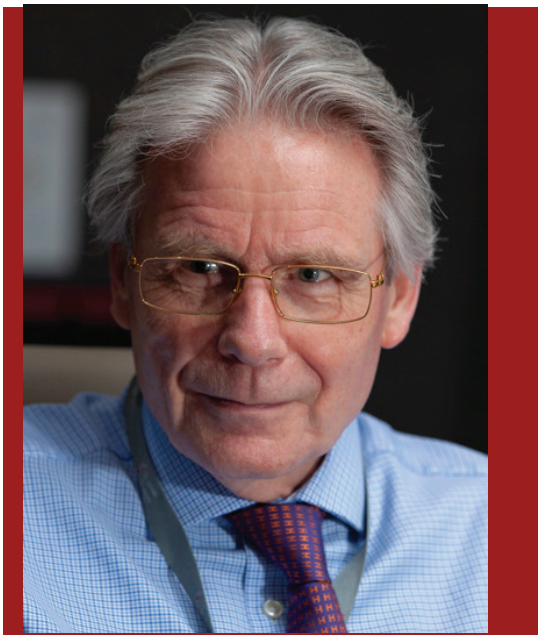
With the exception of the CITES-protected blue coral, *Heliopora coeruela*, a blue-coloured porous reef coral with a calcareous skeleton that usually requires resin impregnation to be used as ornament, the jewellery industry does not use reef corals at all.

MEDITERRANEAN CORAL COLOUR DESCRIPTORS

As proposed during the Coral Commission meeting at the CIBJO Congress in 2019, a research effort was undertaken by the ICA GemLab in Bangkok, coordinated by Kenneth Scarratt, the CIBJO Coral Commission Vice President, to understand the colour variations of Mediterranean coral, *Corallium rubrum*, which lives in the Mediterranean Sea and adjacent Atlantic shores. The goal was to devise a simple and easy to communicate colour description system that would assist both the trade and jewellery consumers.



Rui Galopim de Carvalho, Vice President of the CIBJO Coral Commission.



Kenneth Scarratt, Vice President of the CIBJO Coral Commission.

Figure 1

After studying the colours of a significant number of samples provided by the trade, the ICA GemLab was able to discern 20 to 30 different shades. However, after considerable testing, it was proposed to reduce the number to five colour categories. There are "Deep Red," "Red," "Deep Pink," "Pink" and "Light Pink." They are illustrated in Figure 1. The observed colours are considered the centre point for each of five colour descriptive terms.

Using a more technical approach, the colours can be defined using the data obtained from a recording spectrophotometer and converting them in the CIELAB colour space (L*a*b*), as presented in Figure 2. In the illustration, the corresponding data for the colour comparison samples are printed along with theoretical colour circles, relative to CIE D65 illuminant, created from the same data.

Figure 3 shows the % reflectance spectra for the five designated comparison coral samples in the visible range (400-700 nm).

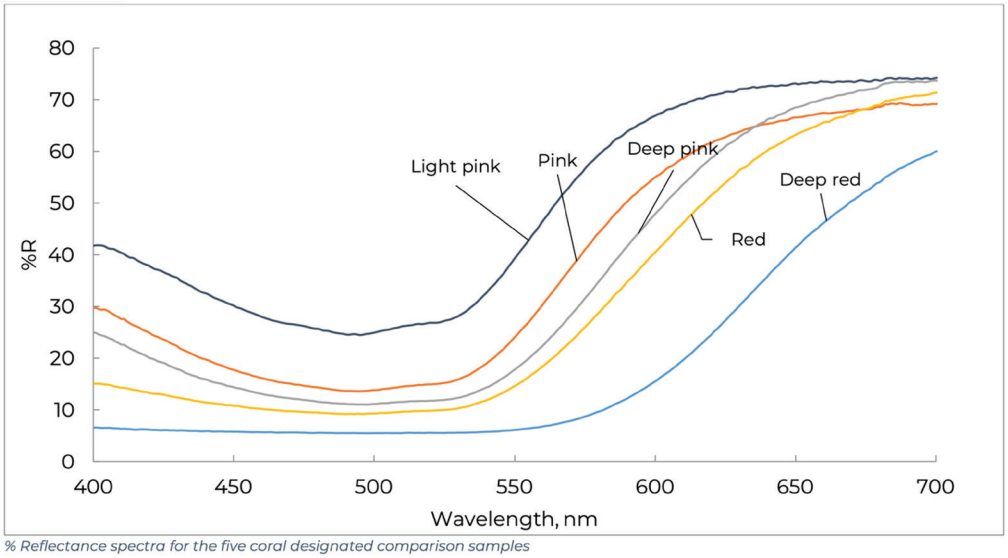
It is the opinion of the research team that the specific five colours categories can be relatively easily reproduced as physical samples by the trade, and used both at the wholesale and retail levels. The fact that they are the only five colour categories make it possible for any stakeholder to acquire or to gather a matching master set.

From a practical perspective, provided that a comparison set is at hand, the determination of the colour descriptor of a coral sample can be done by comparison under a recommended CIE standard daylight illuminant (CIE D65 at approximately 6500 Kelvin of colour temperature.

Figure 2

Color	L	a	b	Color circle (D65, standard observer 10 deg)
Light Pink	72.26	26.48	17.53	
Pink	62.62	34.22	21.95	
Deep Pink	57.88	38.04	21.63	
Red	53.83	36.78	24.76	
Deep Red	37.47	30.08	14.77	

Figure 3



% Reflectance spectra for the five coral designated comparison samples

Viewing should be from a comfortable distance for visual inspection (≈ 35 centimetres).

If the observed colour is uneven, the descriptive term used should be that of the colour comparison sample with the closest match. Thus, if a sample appears to be closer to Deep Red than the Red, the colour descriptor should be Deep Red.

If the observed colour is uneven to the point where the colour appearances of two or more of the colour comparison samples are observed, then it is permissible to use a "….. to……" description, such as Deep Red to Red, or Deep Red to Deep Pink.

CORAL TRANSPLANTATION UPDATE

As was first announced at the 2017 CIBJO Congress in Bangkok, a very ambitious precious coral conservation initiative by the Kuroshio Biological Research Foundation and the Precious Coral Protection and Development Association was begun in 2016, in a protected zone around Birou island off Japan. There, numerous branches of *Corallium japonicum* (oxblood coral) and *Pleurocorallium konojoi* (white coral) were transplanted in the ocean, using 60-kilogram reef-growing blocks positioned underwater at depths of 100 metres.

The first stage of the project registered a remarkable survival rate of 99.1 percent after 936 days, and coral growth was documented.

The second stage of the project, which began in 2019, involves transplantable substrates being released in potential fishing areas. About 33 percent of these hand-sized, dish-shaped coral branch-bearing substrate plates are expected to survive, and it hoped that this will eventually result in the reforestation of the seabed with full sized precious corals within several years.

*Corallium japonicu*m and *Pleurocorallium konojoi* are still listed in Appendix III of CITES. It lists species that are not endangered, but have been included at the request of a country seeking the cooperation of other countries to prevent what it considers to be unsustainable or illegal exploitation. The the main objective is monitoring.

The Japanese project is an important step toward ensuring the sustainability of this important natural resource.

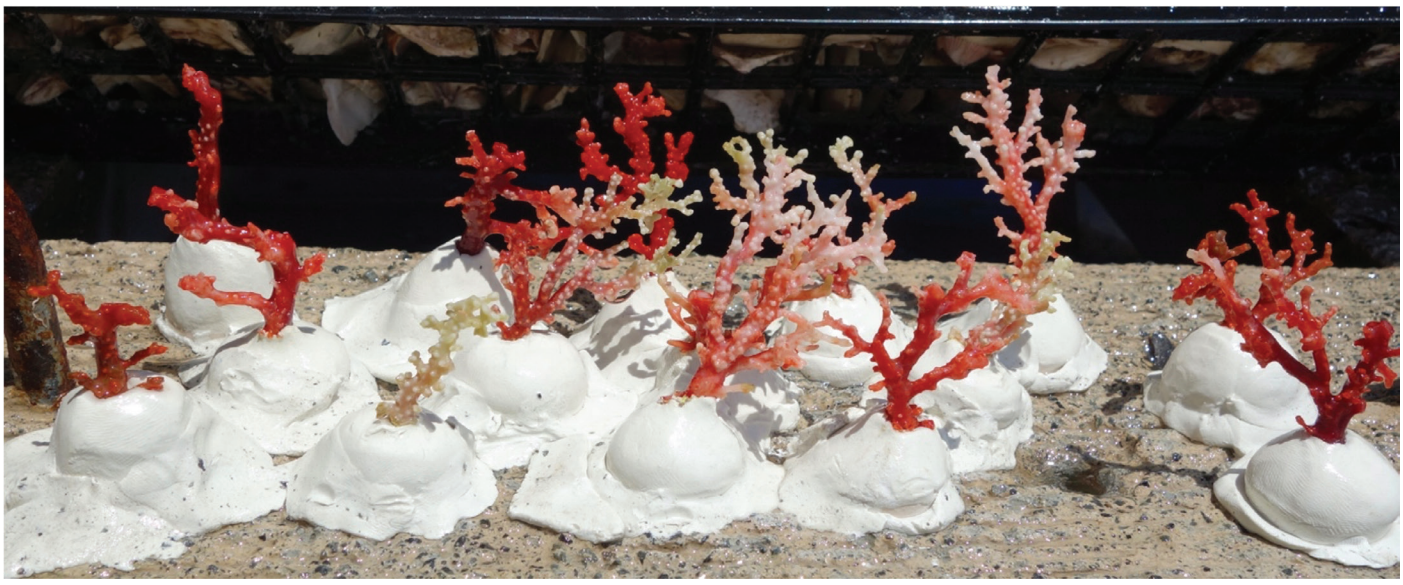
A different species, *Corallium rubrum*, is the focus of study at the Marine Biology Department of the Centre Scientifique de Monaco (CSM), in Monte Carlo. There, a world-renowned team, which includes Dr. Sylvie Tambutté, a member of CIBJO's Coral Commission Steering Committee, is looking at the various aspects of the functioning of coral ecosystems. Among them are impacts of global stressors, like rising water temperatures or ocean acidification.

Another very important project undertaken at CSM is part of its contribution to the Global Coral Reef Monitoring Network. This involves the setting up of *Corallium rubrum* culture rooms, where microcolonies are grown on glass slides and their growth rates and the bio-crystallization of their skeletons' calcium carbonate are studied. By controlling variables like the pH balance, water temperature, feeding regimes and light, the scientists are provided with more data to understand coral growth.

Curiously, it seems that glass plate growth rates are higher than those for branching colonies.

'FOSSIL' PRECIOUS CORALS

The dead *Corallium rubrum* coral deposits of Sciacca in Sicily, Italy, which were a prominent source for the coral industry in the final quarter of the 19th century, are a



Corallium japonicum being prepared for transplantation. © Kuroshio Biological Research Foundation

Polishing 400 to 500-year-old Sciacca coral in Torre del Greco, Italy. © Vincenzo Liverino

known historical resource. Similar deposits of sedimentary accumulations of dead coral branches were also reported in other parts the Mediterranean basin, such as in the waters off Alboran in Spain.

As was recently published by the Swiss Gemmological Institute SSEF, carbon-14 dating of some Sciacca corals fashioned as beads indicated that they were 400 to 500 years old, meaning they could be traced to the 16th and 17th centuries.

An earlier study conducted in Lecce at the Centre for Dating and Diagnostics (CEDAD) of the University of Salento, Italy, by Dr. Margherita Superchi and Elena Gambini, turned up even older samples, with the oldest dating back to between 7570 and 7070 BCE. Even though these were found as sediments deposited with other debris on the seabed, there had been no geological transformation of the coral branches, and no evidence of a fossilisation process. What this means is that the word "fossil" is not really accurate in describing these dead coral branches.

Similar studies were recently conducted at the Koshi University in Japan, focusing on the local *Pleurocorallium elatius, Corallium japonicum* and *Pleurocoralium konojoi,* all popular precious coral species. The research team, led by Prof. Tomoyo Okumura, collected and dated coral branches at depths of 100 to 200 metres deep in the Ashizuri fishing field, off the southwest coast of Kochi Prefecture. Carbon-14 dating indicated materials spanning a period from modern times to about 5500 BCE. This means that the local seabed was populated with these species right after the Last Glacial Period.

The Koshi University study further indicated that more than two thirds of precious corals in the Japanese market were, in fact, dead, and thus not harvested from living colonies.

It was interesting to verify that most of the studied samples were radiocarbon dated as existing before 1871, which is the year when the Japanese coral resources were first discovered.

REAFFIRMING CIBJO'S CARBON INITIATIVE

In our previous special report, released in 2019 ahead of the CIBJO Congress in Bahrain, we affirmed our commitment to addressing climate change as a main concern of both our trade and our society. We urged for immediate action on Sustainable Development Goal 13, which involves combatting climate change and its impacts.

With the less than impressive progress at November's COP26 United Nations Climate Change Conference in Glasgow, Scotland, we call once again on businesses and individuals in our sector to measure their carbon footprint, offset it through the purchase of carbon credits, and pursue practices that reduce considerably their impact on the environment.

In 2014, CIBJO's Marketing and Education Commission launched the Jewellery Industry Greenhouse Gas Measurement Initiative, calling on members and their constituents to become carbon neutral, or at least to understand their carbon impact.

Simple steps like reducing the use of plastics, improve recycling behaviour, optimising climatisation efficiency, introducing energy saving systems in illumination and machinery, promoting remote meetings or adapting traveling and commuting habits, may help businesses to reduce expenditure while reducing the environmental pressure.

Precious corals, reef corals, marine and terrestrial biodiversity and our own survival are at stake. It is our duty to do our share, just because it is the right thing to do.

HOME GEMMOLOGY WEBINARS

During the first lockdown of the COVID pandemic in 2020, CIBJO decided to support the popular Home Gemmology webinar series, devised and presented by Rui Galopim de Carvalho, the Coral Commission Vice President. The webinars began on March 20, 2020.

This educational programme, offered free of charge, was initially undertaken to entertain, educate and cheer up industry colleagues all over the world during a trying period. Mr. Galopim de Carvalho was eventually joined by Edward Johnson as co-host. Mr. Johnson is the host of CIBJO's Jewellery Industry Voices series.

Among the 48 live sessions, to which more than more than 27,000 people registered, three were dedicated to corals, "Precious Corals, an Overview," on March 24, 2020; "Precious Corals from the Mediterranean," on April 28, 2020, and "Angel's Skin Coral," on July 7, 2020.

All included discussions on CIBJO's nomenclature, as well as the history and gemmology of the biogenic gem material.

The coral-related sessions and the full Home Gemmology programme are available for viewing at http://www.cibjo.org/webinars/3/.

CIBJO CONGRESS 2021

The CIBJO Congress is taking place this year in a virtual format over a period of two weeks. The first week was from November 1 through November 4, and the second week will be from November 15 through November 18.

The Coral Commission Session is being held during the second week of the Congress, on Tuesday, November 17, 2021, from 4 PM-5:00 PM, Central European Time.

The session is open to members of the Coral Commission and CIBJO national association and commercial member representatives. However, members of the jewellery industry who wish to attend may request a special invitation by emailing communications_1@cibjo.org.

The dedicated CIBJO Congress 2021 website is located at www.cibjo.org/congress2021/.

COVER PHOTO

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