# ASSESSING THE POTENTIAL OF SUEZ CANAL SHIPPING TRAFFIC AS AN INVASION PATHWAY FOR NON-INDIGENOUS SPECIES IN CENTRAL MEDITERRANEAN HARBOURS

A. Deidun [1], F. Andaloro [2], C. Berti [2], P. Consoli [2], M. D'Alessandro [3], V. Esposito [2], G. Scotti [2], G. Galofaro [4], T. Romeo [2] and K. Agius [1]*

[1] Physical Oceanography Research Group, University of Malta - karl.agius.05@um.edu.mt

[2] Institute for Environmental Protection and Research

[3] University of Messina

[4] University of Catania

## Abstract

The shipping traffic visiting seven Central Mediterranean ports within Sicily and Malta over a period of one year (2013) and the ballast water volumes it transported was quantified and classified according to port of origin in order to assess the influence of traffic navigating through the Suez Canal on the marine biota of the same geographical area. Scraping and benthic sediment collection exercises were also conducted within the same ports and a list of non-indigenous species is reported.

*Keywords: Alien species, Mediterranean Sea, Suez Canal*

**Introduction**

Shipping is the leading vector for trade in the world and alone is currently responsible for moving round over 80% of the world commodities (UNCTAD/RMT, 2014). Concurrently, the global shipping sector moves around approximately three to five billion tons of ballast water internationally every year (GLOBALLAST, 2015). Although ballast water operation is essential for any type of vessel to carry out safe and efficient cargo operations, such a process also constitutes a serious threat to ecological, economic and human health systems due to the inadvertent introduction of invasive aquatic species within new marine regions. In the Mediterranean Sea, these dynamics and concerns are even more pronounced due to its status as a biodiversity hotspot and its' simultaneous importance as a shipping transit route, crystallized within the recent expansion of the Suez Canal, completed on the 6$^{th}$ of August 2015, which should double vessel traffic within the Canal, with the current average of 49 transits per day expected to increase to 97 passages per day (SCA, 2015).This paper aims to makes a preliminary consideration of the real potential of Suez Canal shipping traffic as an invasion pathway for non-indigenous marine species to a number of Central Mediterranean ports.

**Materials & Methods**

A total of 5 harbours in Sicily (Catania, Siracusa, Lampedusa, Augusta, Porto Empedocle) and 2 in Malta (La Valletta, Marsaxlokk) in the Central Mediterranean have been investigated in the current study. Maritime traffic data has been gathered from the harbour masters in Sicily and from the Transport Authority ofMalta during 2013 and organized in a database. From the total cohort of vessels within the database, only the data for the vessel category 'Tankers' was extracted since this was recognized as the main vector for the spread of alien species, by virtue of the enormous amount of ballast water that couldpotentially betransported by such vessels. Two extremes (7% and 54% of Gross Registered Tonnage [GRT]) have been adopted by different authors for measuring the minimum and maximum volumes of ballast water that could potentially be discharged within destination ports. For each individual port, the total volume of ballast water coming in, as well as the fraction of ballast hailing directly from ports beyond the Suez Canal, was calculated. Within the framework of the BIODIVALUE project (www.biodivalue.com), four of the Central Mediterranean ports (Valletta, Marsaxlokk, Augusta, Siracusa) under investigation were chosen for sediment and hard bottom (fouling assemblage) pilot sampling. The origin of all identified marine species was classified as Suez, Black Sea, Atlantic and Mediterranean. Fouling assemblages settled on jetties and wharves falling within a 0.5m x 0.5m quadrat were scraped off and collected underwater within a fine-mesh bag. Soft bottom sediments were sampled by means of a van Veen grab (15 litres).

**Results**

For 2013, the fraction of tankers hailing directly from the Suez Canal (i.e. not making prior stops before reaching the ports under investigation) ranges from 0% for the ports of Catania, Porto Empedocle, Lampedusa and Valletta, to 2% for Augusta and Siracusa and 3% for Marsaxlokk. Applying the 7%-54% of GRT criterion, this traffic was responsible for transporting between 24 and 191 tons of ballast water at the Siracusa port, between 50 and 385 tons at Augusta and between 30 and 218 tons at Marsaxlokk. A total of 13 non-indigenous macrozoobenthic species belonging to the Mollusca and to the Polychaeta were recorded from the four ports at which scraping exercises were conducted. The highest (9) number of such species was recorded at Marsaxlokk, where the only introduction attributed to aquaculture (*Crassostrea gigas*) from the total of 13 non-indigenous species was recorded. No species was recorded from all the four ports, although a number (*Brachidontes pharaonis, Notomastus aberans, Branchiomma bairdi, Pista unibranchia* and *Monticellina dorsobranchialis)* were recorded from three of the same ports. The highest (3109) number of such individuals was recorded from Augusta, although this total was dominated by collections of *B. pharaonis*, which made up for 96% of total non-indigenous individual abundance recorded at this port.

**Discussion**

The investigated ports, being visited the most by tankers in general and by those hailing directly from the Suez Canal, exhibited the highest rates of colonisation by non-indigenous macrozoobenthic species. The total (including indirect) influence of tankers transiting through the Suez Canal on the Central Mediterranean ports under investigation was probably under-estimated in the current study. This is because tankers hailing from other Mediterranean ports before visiting the ports under investigation (representing the majority of all recorded tankers) probably transited through the Canal at a preceding stage, thus contributing to the discharge of ballast water into the Mediterranean Sea. The current study makes the case for an urgent entry into force of agreements such as the IMO's Ballast Water Management Convention so as to stem the incessant flow of exotic species within busy waterways as the Mediterranean and strengthens the call made by the international biological community for a renewed monitoring effort of the real impact of the enlarged Suez Canal on the marine biota of the Mediterranean.

## References

1 - BWMC, 2004. International convention for the control and management of ship's ballast water and sediment. *IMO pubblications*, London.

2 - EQUASIS, 2014. The world Merchant fleet. Equasis statistics. *Equasis publications*. Fearnleys, 2002;

3 - GLOBALLAST, action programme, 2015. Available at: http://globallastlearning.com/login/index.php (accessed 23 August 2015).

4 - SCA, Suez Canal Authority, 2015. available at: http://www.suezcanal.gov.eg/

5 - UNCTAD/RMT, 2014. Review of Maritime Transport 2014. *United Nations pubblications*. New York and Geneva.