

IMPOSEX IN MARINE GASTROPODS FROM THE ATLANTIC COAST OF SOUTH AFRICA

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INTRODUCTION

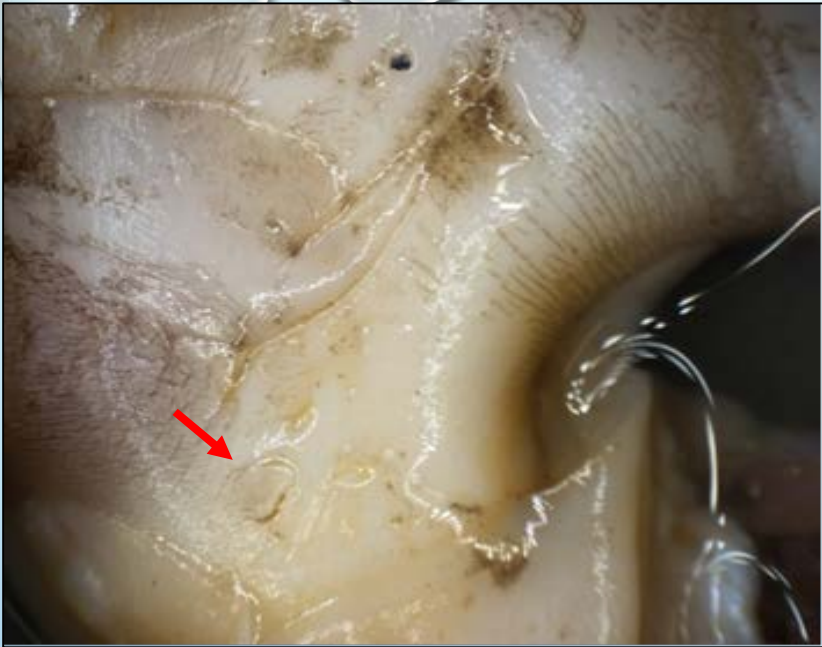
- SA MARINE ECOSYSTEMS ARE UNDER THREAT FROM NUMEROUS ANTHROPOGENIC ACTIVITIES
- OCEAN HAS BECOME A SINK FOR VARIOUS POLLUTANTS
- DISADVANTAGE TO MANKIND – AFFECTS PUBLIC HEALTH, MARINE RESOURCES, AND MARINE ORGANISMS
- ORGANISMS THAT SURVIVE IN POLLUTED WATERS – ACCUMULATE
- POSES A RISK TO THOSE WHO CONSUME THEM – PREDATORS AND HUMANS
- POLLUTANTS THREATEN ALL LEVELS OF BIOLOGICAL ORGANISATION (FROM MOLECULAR – ECOSYSTEM LEVEL)
- IMPACTS SPECIES RICHNESS, COMPOSITION, AND FOOD WEB STRUCTURE, AND CAUSES THE DEGRADATION OF ECOSYSTEM SERVICES - AFFECTS THE ECONOMICS OF A COUNTRY

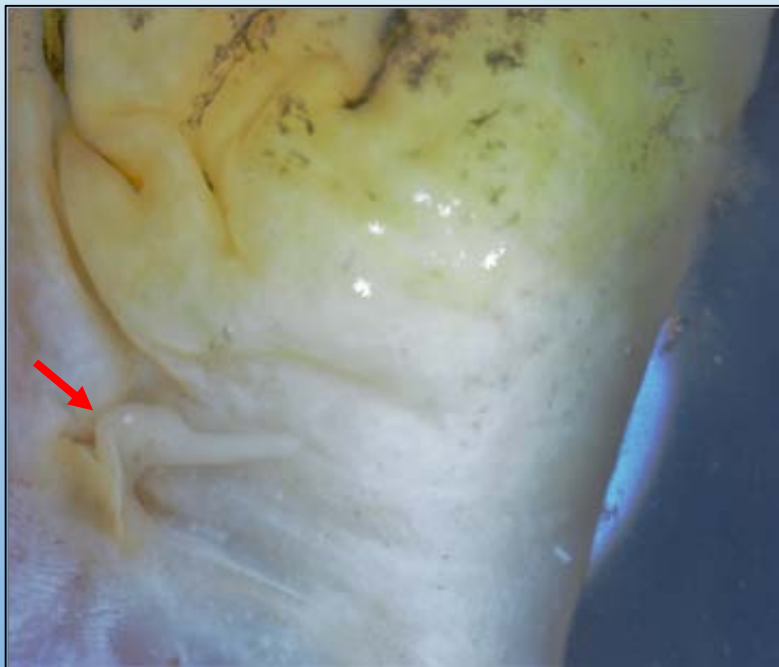
TBT (TRIBUTYL TIN)

- ANTIFOULING AGENT (PREVENTS THE FORMATION OF BIOFILMS)
- USED ON MARINE STRUCTURES – OCEAN-GOING VESSELS
- USED SINCE 1960S - COST-EFFECTIVENESS AND BIOCIDAL PROPERTIES
- HIGHLY PERSISTENT POLLUTANT
- UNCONTROLLED USAGE – ENVIRONMENTAL IMPACTS
- ITS APPLICATION OF HAS BEEN BANNED BY THE IMO (INTERNATIONAL MARITIME ORGANISATION) SINCE 1 JANUARY 2008
- PRESENCE IN VARIOUS COASTAL HABITATS INDICATES CONTINUED USAGE

IMPOSEX

- SUPERIMPOSITION OF MALE REPRODUCTIVE ORGANS ON FEMALE GASTROPODS (MARINE SNAILS)
- ASSOCIATED WITH TBT POLLUTION
- MARINE GASTROPODS ARE USEFUL BIOLOGICAL INDICATORS OF TBT POLLUTION - THE RELATIVE SIZE OF THE FEMALE'S IMPOSED PENIS CORRELATED TO BOATING ACTIVITY
- VARIOUS INDICES (%IMPOSEX, RPLI AND RPSI) ARE USED TO QUANTIFY IMPOSEX - THE INTENSITY OF TBT POLLUTION
- CONCENTRATIONS OF MORE THAN 2 – 4 ng/L ARE CAPABLE OF INHIBITING BREEDING ACTIVITY, CAUSE STERILITY, SUBSEQUENT POPULATION DECLINE, AND ULTIMATELY LOCAL EXTINCTION
- AFFECTS COASTAL ECOLOGY





STUDY

- IMPOSEX SURVEY ASSOCIATED WITH TBT IN SEDIMENT ALONG 920 KM OF SOUTH AFRICA'S ATLANTIC COASTLINE FROM CAPE AGULHAS – PORT NOLLOTH
- 1 389 INDIVIDUALS OF 13 MARINE GASTROPOD SPECIES, AND SEDIMENT SAMPLES FROM 25 SITES WHERE SAMPLED AND ANALYSED (SITES PRESUMED IMPACTED AND NOT IMPACTED BY TBT POLLUTION)
- RESULTS HAVE SHOWN THAT TBT AND DBT (BREAKDOWN PRODUCT) LEVELS ARE RELATED TO BOATING ACTIVITY, INCLUDING IMPOSEX PREVALENCE.
- IMPOSEX WAS PREVALENT AND HIGH TBT AND DBT LEVELS WERE RECORDED FROM SITES WITHIN SALDANHA BAY
- UNFORTUNATELY NO SQG IN SA TO COMPARE



Legend

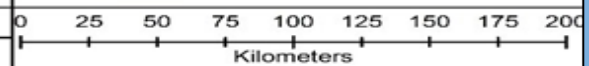
- ▲ Sampling Sites
- Towns
- Marine Protected Areas
- Provinces

Date Compiled: 2016/01/15

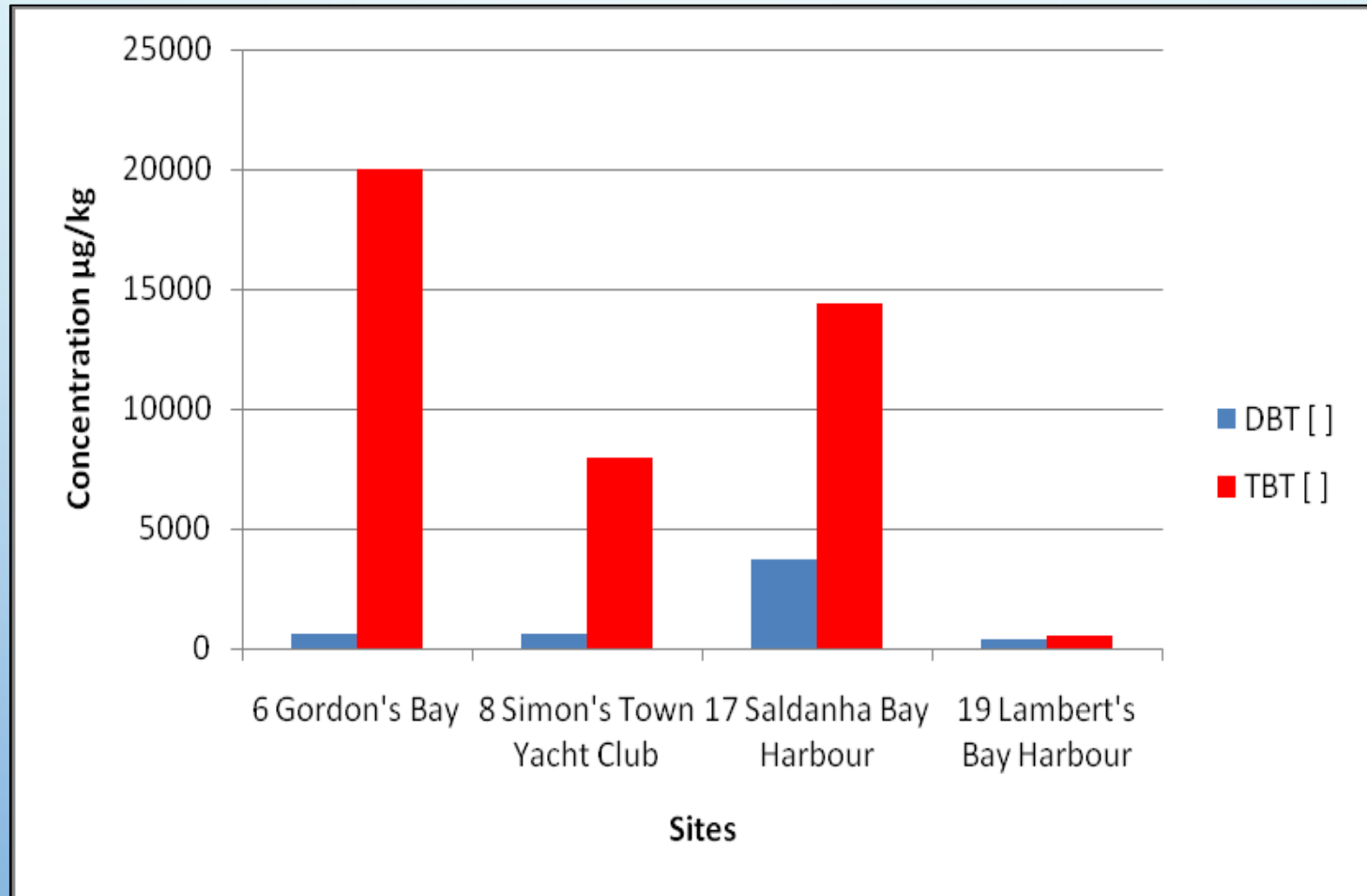
Compiled by: L de Swardt

Datum: WGS 1984

Scale (on A4): 1:2 800 000



STUDY



Site Name	Boating Activity	Species	N	% Imposex	RPLI	RPSI	DBT (µg Sn/kg dm)	TBT (µg Sn/kg dm)
Langebaan Zone A (WCNP)	Low boating	<i>Bullia laevissima</i>	27	12	2.8	0.002	<5	<2
		<i>Bullia rhodostoma</i>	30				<5	<2
		<i>Burnupena cincta</i>	30				<5	<2
		<i>Burnupena lagenaria</i>	30				<5	<2
		<i>Burnupena papyracea</i>	30				<5	<2
Langebaan Zone B (WCNP)	No boating	<i>Afrolittorina knysnaensis</i>	30				<5	<2
		<i>Nucella dubia</i>	21				<5	<2
Langebaan Zone C (WCNP)	No boating	<i>Burnupena cincta</i>	21				<5	<2
Tsarsbank (WCNP)	No boating	<i>Afrolittorina knysnaensis</i>	30				<5	<2
		<i>Burnupena catarrachta</i>	30				<5	<2
Saldanha Bay	High boating	<i>Bullia digitalis</i>	30	100	13.2	0.23	<5	<2
		<i>Burnupena cincta</i>	30	31.6			<5	<2
Saldanha Bay Harbour	High boating	<i>Afrolittorina knysnaensis</i>	30	50	48.3	11.2	3740	14400
Jacobsbaai	No boating	<i>Afrolittorina knysnaensis</i>	30				<5	<2
		<i>Burnupena catarrachta</i>	30				<5	<2
		<i>Clionella sinuata</i>	30				<5	<2

IMPLICATIONS FOR SALDANHA BAY AND AQUACULTURE

- SALDANHA BAY IS SOUTH AFRICA'S LARGEST AND DEEPEST NATURAL PORT AND HAS UNDERGONE EXTENSIVE HARBOUR DEVELOPMENT
- LOCATION OF CURRENT SHELLFISH AQUACULTURE, EARMARKED FOR LARGE EXTENSIONS
- THE PRESENCE OF A SHIPYARD, HARBOURS, FISHING PORTS, MARINAS, ORE TERMINAL, OIL TERMINAL, TOGETHER WITH SOME SHIP MOORING AREAS AND DREDGING ARE POTENTIAL SOURCES OF TBT POLLUTION
- THE SOUTH AFRICAN GOVERNMENT SEES GREAT POTENTIAL IN THE DEVELOPMENT OF MARINE AQUACULTURE TO ALLEVIATE POVERTY IN CERTAIN COMMUNITIES - SALDANHA BAY - DEMONSTRATES GREAT POTENTIAL



IMPLICATIONS FOR SALDANHA BAY AND AQUACULTURE

- SALDANHA BAY NB SITE USED FOR THE CULTURE OF PACIFIC OYSTERS (*Crassostrea gigas*) AND THE MEDITERRANEAN MUSSEL (*Mytilus galloprovincialis*)
- BIVALVES HAVE THE ABILITY TO BIOACCUMULATE TRIBUTYLTIN UNDER LOW POLLUTION LEVELS
- OYSTERS MAY BE SEVERELY AFFECTED BY A COMPLETE LACK OF REPRODUCTION AND JUVENILE RECRUITMENT AND THE APPEARANCE OF SHELL CALCIFICATION OF ADULT OYSTERS LEAD TO STUNTED GROWTH (THE LETHAL DOSE OF TBT TO THE PACIFIC OYSTER, *Crassostrea gigas*, LARVAE IS $1.557\mu\text{g/L}$ and ADULTS IS $282.2\mu\text{g/L}$)

IMPLICATIONS FOR SALDANHA BAY AND AQUACULTURE

- SEAFOOD SUCH AS FISH, MUSSELS, AND CRABS COLLECTED FROM AQUATIC ENVIRONMENTS CONTAIN VARIOUS AMOUNTS OF BUTYLTINS AND HUMANS ARE LIKELY EXPOSED VIA DIETARY INTAKE
- PRESENCE OF IMPOSEX AND MEASURED TBT POLLUTION IN SALDANHA BAY HARBOUR IS OF MAJOR CONCERN

CONCLUSION

- SEAFOOD CONTAMINATED BY TBT CAN CAUSE A RISK TO LOCAL POPULATION AND TOURISM AS THERE ARE POTENTIAL HUMAN HEALTH IMPLICATIONS ASSOCIATED WITH THE CONSUMPTION OF THESE MARINE ORGANISMS
- THE UNDESIRABLE EFFECTS OF TBT HAVE AFFECTED BIOTA IN PROTECTED AREAS AND IT SHOULD BE MONITORED IN ORDER TO UNDERSTAND ITS IMPLICATIONS ON THESE ECOSYSTEMS



“For most of history man has had to fight nature to survive, in this century he is beginning to realise that, in order to survive, he must protect it “. – Jaques Yves Cousteau

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