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FINAL REPORT OF THE EXCAVATIONS, VOLUME II
EXCAVATIONS OUTSIDE THE MEDIEVAL TOWN WALLS

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MONOGRAPH SERIES
NUMBER 38

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**APOLLONIA-ARSUF
FINAL REPORT OF THE EXCAVATIONS,
VOLUME II**

EXCAVATIONS OUTSIDE THE MEDIEVAL TOWN WALLS

OREN TAL

With contributions by

Issa Baidoun, Gabriela Bijovsky, Itai Elad, Ian C. Freestone, Alexander Glick,
Tamar Harpak, Mark Iserlis, Ruth E. Jackson-Tal, Rafael Y. Lewis, Henk K. Mienis,
Yossi Nagar, Miriam Pines, Oz Rittner, Lidar Sapir-Hen, Itamar Taxel,
Marcio Teixeira Bastos and Hagi Yohanan

EISENBRAUNS
University Park, Pennsylvania

EMERY AND CLAIRE YASS
PUBLICATIONS IN ARCHAEOLOGY OF
THE INSTITUTE OF ARCHAEOLOGY
Tel Aviv University

Monograph Series under the auspices of the
Friends of the Institute of Archaeology of Tel Aviv University

Library of Congress Cataloging-in-Publication Data

Names: Tal, Oren, Author.

Title: Apollonia-Arsuf : final report of the excavations, Volume II / [by] Oren Tal ;
with contributions by Issa Baidoun [and sixteen others].

Description: University Park, Pennsylvania : Eisenbrauns, [2020] | Series: Tel Aviv University
Sonia and Marco Nadler Institute of Archaeology Monograph series ; volume 38 | Includes
bibliographical references and index.

Summary: "Reports findings from the 1996, 2002, 2006, 2012, 2013, and 2017 excavation
seasons at the Apollonia-Arsuf archaeological site, located on a fossilized sandstone dune
ridge on the Mediterranean coast of Israel."—Provided by publisher.

Identifiers: LCCN 00292080 | ISBN 9781575067476 (hardback)

Subjects: LCSH: Excavations (Archaeology)—Arsuf (Extinct city) | Arsuf
(Extinct city) | Israel—Antiquities.

Classification: DS110.A73 A66 1999

LC record available at <https://lcn.loc.gov/00292080>

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Printed in the United States of America

Eisenbrauns is an imprint of The Pennsylvania State University Press.

The Pennsylvania State University Press is a member of the Association of University Presses.

It is the policy of The Pennsylvania State University Press to use acid-free paper. Publications on uncoated
stock satisfy the minimum requirements of American National Standard for Information Sciences—
Permanence of Paper for Printed Library Material, ANSI Z39.48–1992.

Dedicated to the late Prof. Israel Roll (1937–2010)
A friend, educator and above all *mensh*

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MOLLUSC REMAINS (AREAS AA–DD)

Oz Rittner and Henk K. Mienis

While parts of Apollonia were excavated in the past (Roll 1999), those excavations were followed more recently when the ruins of the Crusader castle on the sandstone promontory and the adjoining city were renovated. The entire site was declared a National Park and additional areas to the east, which were off limits for a considerable time, became available for survey and excavation.

One of these new projects was carried out during two seasons in 2012 and 2013 when a team led by Oren Tal (Tel Aviv University) excavated, along with other features, a large dump (Area CC) which had been in use during the Late Byzantine period. The molluscs encountered during the excavation of that area are the subject of this report.

MATERIAL AND METHODS

Shells were collected according to size, based on on eyesight and by means of sieving the excavated material. The extracted archaeomalacological material was identified by the authors using the mollusc collection of the Steinhardt Museum of Natural History and Israel National Center for Biodiversity Studies (SMNH). Most of the material was identified immediately. In a few cases, the shells were compared with better preserved material of more recent origin present in the Steinhardt Museum of Natural History collection.

RESULTS

Since the shells were collected from a dump which had been in use during the Byzantine period, the identified material has been catalogued according to the different loci. In this way the shells from 156 different loci have been studied.

For the nomenclature of the marine shells, the names adopted by the World Register of Marine Species (WoRMS) were used; for the freshwater bivalves the nomenclature proposed on the Mussel Project Web Site (MUSSELp) was followed; while for the land snails the names used in the SMNH Mollusc Collection were employed.

The archaeomalacological material belonged to 29 taxa identified at specific level and one taxon at generic level. The studied material is here enumerated in systematic order according to families and within the same family in alphabetical order.

PHYLUM MOLLUSCA, CLASS GASTROPODA

Area	Locus	Description
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FAMILY PATELLIDAE

<i>Patella caerulea</i> (Linnaeus, 1758)		
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AA	10031	One complete shell
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<i>Area</i>	<i>Locus</i>	<i>Description</i>
<i>Patella ulyssiponensis</i> (Gmelin, 1791)		
CC	30061	One damaged shell
FAMILY CYPRAEIDAE		
<i>Cypraea pantherina</i> (Lightfoot, 1786) – Fig. 21.1: 1		
CC	30060	One heavily damaged shell
<i>Erosaria spurca</i> (Linnaeus, 1758)		
AA	118	One complete shell
AA	120	One complete shell
AA	10019	One complete shell
CC	603	One complete shell
CC	607	One complete shell
CC	615	One complete shell
CC	617	One complete shell
CC	623	One complete shell
CC	632	One complete shell
CC	641	One complete shell
CC	643	11 complete shells and one fragment
CC	656	One complete shell
CC	659	One complete shell
CC	30036	Three complete shells
CC	30052	One fragment
CC	30060	Nine complete shells (two with natural holes)
CC	30061	Three complete shells
CC	30063	Four complete shells and three broken shells
CC	30071	One complete and one broken shell
CC	30074	One complete shell
CC	30082	Two complete shells
CC	30108	One complete shell
CC	30118	Seven complete shells
CC	30119	One broken shell
CC	30122	One complete shell
CC	30123	One complete shell
CC	30131	One complete shell, one shell with the dorsum removed and one fragment
CC	30134	One complete shell
CC	30138	One complete shell
CC2	30003	One complete shell
DD2	926	One complete shell
<i>Luria lurida</i> (Linnaeus, 1758)		
CC2	30003	One fragment of a labial lip
<i>Monetaria moneta</i> (Linnaeus, 1758) – Fig. 21.1: 2		
CC	30119	One specimen without the dorsum (removed artificially)
<i>Zonaria pyrum</i> (Gmelin, 1791)		
CC	643	One complete shell
CC	30060	One complete shell with a natural hole
CC	30061	One complete shell
CC	30066	Two complete shells

<i>Area</i>	<i>Locus</i>	<i>Description</i>
CC	30071	Eight complete and two damaged shells
CC	30074	Two complete shells
CC	30119	One complete shell
CC	30131	One complete shell
FAMILY NATICIDAE		
<i>Neverita josephina</i> Risso, 1826		
CC	30036	One complete shell
FAMILY CASSIDAE		
<i>Semicassis granulata undulata</i> (Gmelin, 1791)		
CC	30061	One complete shell
CC	30100	One fragment of the outer lip with the last whorl
CC	30123	One complete shell. Probably collected alive
DD1	758	One fragment of the lip
FAMILY RANELLIDAE		
<i>Charonia variegata</i> (Lamarck, 1816)		
BB2	163	One lip of the aperture
BB2	164	One broken shell missing the apex and the body whorl
BB	444	One lip of the aperture
CC	652	One fragment of the siphon canal with part of the aperture
CC	30027	One fragment of the aperture and the outer lip
FAMILY MURICIDAE		
<i>Bolinus brandaris</i> (Linnaeus, 1758)		
AA	101	One fragment of a siphonal canal with part of the last whorl. Beach rolled
AA	102	One fragment of a siphonal canal with part of the last whorl. Beach rolled
AA	111	One shell with a missing siphonal canal. Beach rolled
AA	133	One fragment of the last whorl. Beach rolled
AA	138	One shell with a missing siphonal canal. Beach rolled
AA	10003	One half of a shell with a missing siphonal canal. Beach rolled
AA	10004	One fragment of the siphonal canal
AA	10023	One shell with a broken siphonal canal
AA	10029	One fragment of the siphonal canal with part of the first whorls. Beach rolled
AA	10031	Two shells with broken siphonal canals and one fragment
AA	10056	One shell with a broken siphonal canal
AA	10062	One fragment of a siphonal canal
AA	10075	One damaged shell
AA	10077	Two fragments of the last whorl. Beach rolled
AA2	165	One shell with a hole in the last whorl and a missing siphonal canal. Beach rolled
AA2	168	One shell with a broken siphonal canal and lip. Beach rolled
AA2	174	One shell with a missing siphonal canal. Collected alive
AA3	13007	One complete shell
BB2	157	One shell with a broken siphonal canal
BB2	162	One half of a shell. Beach rolled
BB2	164	One shell fragment. Beach rolled
CC	300	One shell with a broken siphonal canal
CC	408	One shell with a broken siphonal canal and a large hole in the last whorl

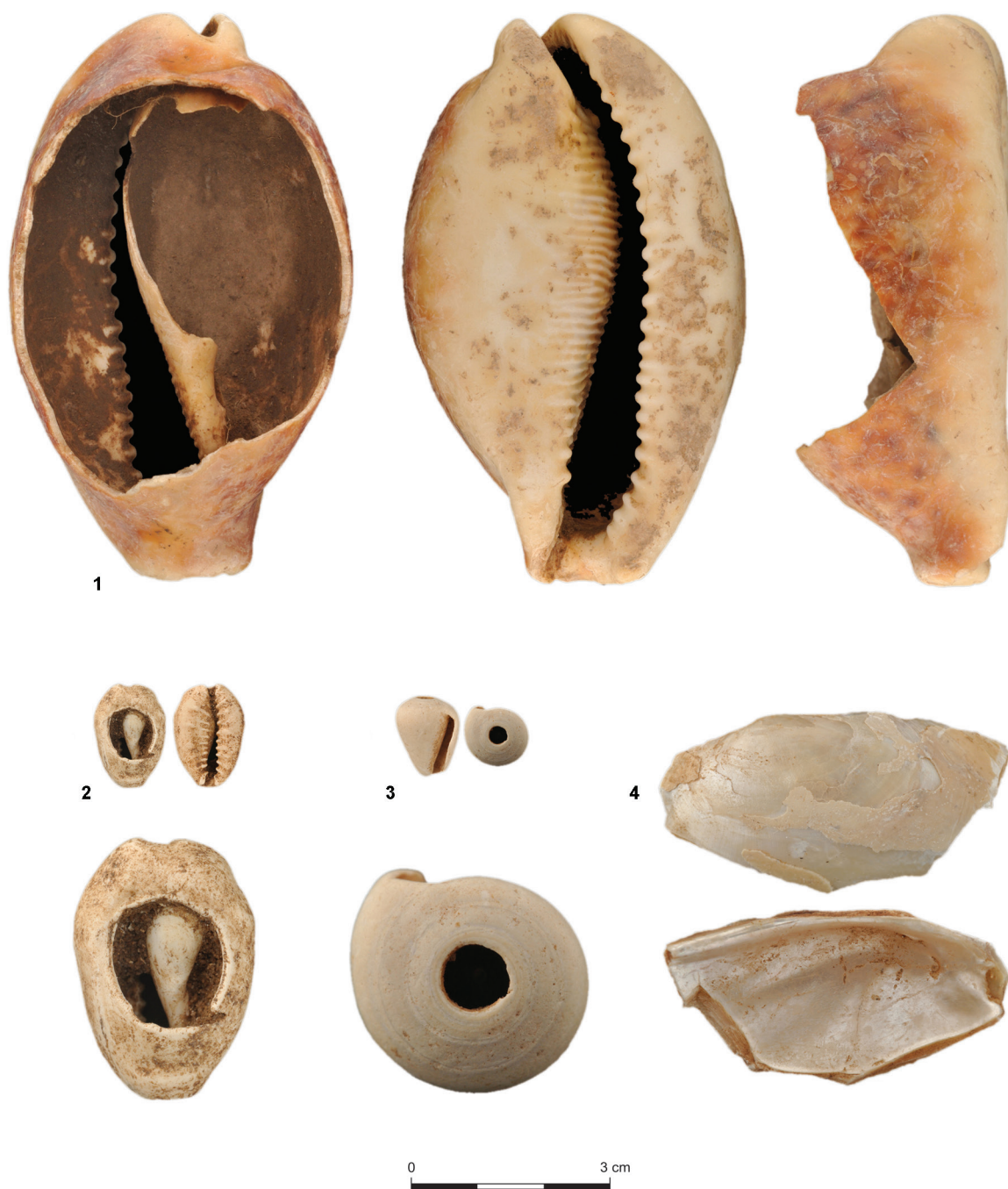


Fig. 21.1: *Cypraea pantherina*: (1) a heavily damaged shell; (2) *Monetaria moneta*: shell bead with the dorsum artificially removed; (3) *Conus mediterraneus*: showing a man-made hole in the apex; (4) *Chambardia rubens arcata*: a damaged valve with an interior showing a layer of Mother-of-Pearl.

<i>Area</i>	<i>Locus</i>	<i>Description</i>
CC	617	One specimen missing part of the last whorl
CC	643	Two shells with broken siphonal canals
CC	659	One fragment
CC	30004	One shell with a broken siphonal canal
CC	30015	Two shells with broken siphonal canals
CC	30037	One fragment of the last whorl
CC	30038	One shell with a broken siphonal canal
CC	30048	One fragment of a siphonal canal. Beach rolled
CC	30060	Three broken shells. Beach rolled
CC	30061	Three shells with broken siphonal canals
CC	30063	One shell with a broken siphonal canal
CC	30065	One broken shell. Beach rolled
CC	30069	One shell with a broken siphonal canal
CC	30071	One broken shell
CC	30074	One shell with a broken siphonal canal
CC	30118	One fragment of a siphonal canal and part of the last whorl and one fragment of a siphonal canal
CC	30119	One fragment of a siphonal canal
DD	40001	One shell fragment
DD1	753	One shell missing the siphonal canal. Beach rolled
DD1	779	One broken shell without a siphonal canal and lip and four shell fragments
DD2	927	One fragment of a siphonal canal with part of the adhering last whorl. Beach rolled
Area	877	One shell with a damaged last whorl
<i>Hexaplex trunculus (Linnaeus, 1758)</i>		
AA	101	One complete shell
AA	137	One piece of the siphonal canal and adhering last whorl. Beach rolled
AA	138	One piece of the siphonal canal and adhering last whorl. Beach rolled
AA	10031	One shell fragment
AA	10032	One fragment of the siphonal canal. Beach rolled
AA	10038	One fragment of the first whorls. Beach rolled
AA	11010	One shell with a broken siphonal canal
AA1	252	One small piece of the columella. Beach rolled
AA2	12022	One fragment of the spire. Beach rolled
BB	416	One shell with a damaged apex and a large hole in last whorl. Beach rolled
BB	450	One shell showing three holes caused by a predator. Beach rolled
BB2	162	One fragment of the last whorl. Beach rolled
CC	30015	One broken shell
CC	30036	One shell with a broken siphonal canal
CC	30060	Three shells (two damaged). Beach rolled
CC	30067	One shell with the aperture damaged during the excavation
CC	30071	One complete shell
CC	30074	One complete shell. Beach rolled
CC	30115	One broken shell
CC	30126	One damaged shell. Beach rolled
DD1	750	One part of the last whorl including the siphonal canal. Beach rolled
DD1	752	One fragment of the siphonal canal. Beach rolled
DD1	754	One fragment of the siphonal canal. Beach rolled

<i>Area</i>	<i>Locus</i>	<i>Description</i>
DD1	777	One fragment of the siphonal canal. Beach rolled
DD1	779	14 shell fragments
DD1	801	One small piece of the columella. Beach rolled
DD2	908	One shell with a hole in the last whorl. Beach rolled
DD3	854	One fragment of the siphonal canal and attached part of the last whorl. Beach rolled
<i>Stramonita haemastoma (Linnaeus, 1767)</i>		
AA	114	One shell, the lip is broken and missing. Beach rolled
AA	129	One shell, the lip is broken and missing
AA	10027	One fragment of the last whorl
AA	10031	One broken shell
AA	10034	One broken shell
AA1	207	One part of the last whorl with the siphonal canal. Beach rolled
AA2	12009	One fragment of the last whorl
BB2	162	One broken shell, last whorl missing. Beach rolled
CC	623	One complete shell
CC	30015	One complete shell
CC	30036	One damaged shell
CC	30060	Two damaged shells. Beach rolled
CC	30061	One broken shell
CC	30071	One broken shell and two fragments
CC	30105	One complete shell
DD1	789	One complete shell
DD1	801	One part of the columella and penultimate whorl. Beach rolled
DD2	907	One shell with only part of the last whorl, aperture and siphonal canal. Beach rolled
DD2	909	One fragment missing the last whorl. Beach rolled
DD2	910	One part of the columella and penultimate whorl. Beach rolled
FAMILY COLUMBELLIDAE		
<i>Columbella rustica (Linnaeus, 1758)</i>		
AA	10077	One complete shell
BB2	164	One complete shell
FAMILY NASSARIIDAE		
<i>Tritia circumcinctus (A. Adams, 1852)</i>		
AA	10070	One complete shell
FAMILY CONIDAE		
<i>Conus mediterraneus Hwass, 1792 – Fig. 21.1: 3</i>		
AA	10003	One shell with a broken lip
AA	10031	One complete shell with a man-made hole in the apex
CC	649	One shell with a broken lip
CC	30074	One damaged shell
CC	30148	One shell with a broken lip
FAMILY ENIDAE		
<i>Buliminus labrosus labrosus (Olivier, 1804)</i>		
CC	30060	Four complete shells (one broken)
CC	30061	Five complete shells

<i>Area</i>	<i>Locus</i>	<i>Description</i>
CC	30081	One complete shell
CC	30082	One complete shell
CC	30118	One complete shell

FAMILY HYGROMIIDAE*Monacha obstructa* (L. Pfeiffer, 1842)

CC	643	One damaged shell
CC	30061	One complete shell

Monacha syriaca (Ehrenberg, 1831)

CC	643	One complete shell
CC	30063	Two complete shells
CC	30131	One broken shell

FAMILY HELICIDAE*Helix engaddensis engaddensis* Bourguignat, 1852

CC	30060	One shell fragment
CC	30063	One shell with a damaged aperture and one shell with a damaged last whorl
CC	30082	One complete shell

Levantina spiriplana caesareana (Mousson, 1854)

CC	30052	One complete specimen, three damaged specimens and one shell fragment
CC	30060	One damaged shell
CC	30061	Seven shells (six damaged)
CC	30063	Two shells with damaged outer lips
CC	30071	One complete shell and one fragment

Theba pisana (Müller, 1774)

CC	30061	Four shells (one damaged)
CC	30063	Three complete shells

CLASS BIVALVIA

<i>Area</i>	<i>Locus</i>	<i>Description</i>
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FAMILY GLYCYMERIDIDAE*Glycymeris nummaria* (Linnaeus, 1758) – Fig. 21.2

AA	101	One valve with a damaged ventral margin
AA	104	One complete valve with remains of mortar and a natural hole and one valve fragment
AA	111	Four valves (one with natural hole), one with a damaged ventral margin and one slightly broken valve with a natural hole
AA	114	Three valves and one fragment
AA	116	Two valves with natural holes (one slightly broken)
AA	118	Three valves with damaged ventral margins (one with a natural hole)
AA	120	One valve with a broken ventral margin
AA	10011	Two fragments
AA	10014	One damaged valve
AA	10018	One complete valve
AA	10031	One complete valve, eight damaged valves (three with a natural hole) and eight fragments
AA	10052	One damaged valve with a natural hole, two broken valves and four fragments
AA	10066	One damaged valve



Fig. 21.2: A typical recent *Glycymeris nummaria* beach.

Area	Locus	Description
AA	10067	One broken valve and one fragment
AA	10077	One damaged valve and one fragment
AA	10078	One fragment
AA1	202	One slightly broken valve, one valve with a natural hole and four fragments
AA1	207	One complete valve with a small natural hole and four small fragments
AA1	252	One valve with a hole caused by a predator
AA2	12009	One complete and one damaged valve
AA7	205	One complete valve with a natural hole and one fragment
BB	442	Two complete valves, two slightly broken valves and two fragments of valves with natural holes
BB	443	One fragment of a valve
BB	444	Two valves with damaged ventral margins and one unbonal fragment with a natural hole
BB	446	One complete valve with a small natural hole
BB2	162	One complete valve
BB2	164	One complete valve
CC	408	One slightly broken valve
CC	600	One complete valve, two broken valves and four fragments
CC	602	One complete valve and two broken valves
CC	613	Four complete valves, four broken valves and two fragments
CC	615	One broken valve
CC	617	One complete valve and two broken valves (one recently broken probably during the excavation and one with natural hole)
CC	618	One complete valve and two damaged valves

<i>Area</i>	<i>Locus</i>	<i>Description</i>
CC	619	One complete valve and two broken valves with natural holes
CC	621	One complete valve and two broken valves with natural holes
CC	623	12 complete valves (two with natural holes), four broken valves and two fragments
CC	627	One complete valve, six damaged valves (four with natural holes) and two broken valves
CC	632	One slightly broken valve and one partial valve
CC	641	Six complete valves (two with natural holes) and nine damaged valves (two with natural holes)
CC	642	One damaged valve
CC	643	38 complete valves (14 with natural holes), five valves with damaged ventral margins (three with natural holes), 26 damaged valves (nine with natural holes) and three fragments
CC	656	One broken valve
CC	659	Two complete valves (one with a natural hole) and three valves with broken ventral margins
CC	693	One complete valve with a natural hole
CC	30036	Seven complete valves, six damaged valves (four with natural holes), five broken valves and 13 fragments
CC	30050	Two damaged valves (one with natural hole)
CC	30052	One complete valve with a natural hole, 14 damaged valves (eight with natural holes), one broken valve and one fragment
CC	30056	One complete valve
CC	30060	47 complete valves (27 with natural holes), 104 damaged valves (48 with natural holes) and 24 fragments
CC	30061	22 complete valves (11 with natural holes), 65 damaged valves (29 with natural holes) and nine fragments
CC	30063	56 complete valves (24 with natural holes), 99 damaged valves (53 with natural holes) and 14 fragments
CC	30065	Ten complete valves (two with natural holes), 25 damaged valves (eight with natural holes), 11 broken valves and seven fragments
CC	30066	Two damaged and two broken valves
CC	30067	Two damaged valves
CC	30069	Three damaged valves (one with a natural hole) and one broken valve
CC	30071	44 complete valves (15 with natural holes), 66 damaged valves (40 with natural holes), 40 broken valves and 27 fragments
CC	30073	One damaged valve
CC	30074	37 complete valves (six with natural holes), 56 damaged valves (eight with natural holes), 14 valves with broken ventral margins and 23 fragments
CC	30079	12 complete valves (three with natural holes), 14 damaged valves (two with natural holes) and one fragment
CC	30081	Three complete valves, two valves with a broken ventral margin and two fragments
CC	30082	24 complete valves, 37 damaged valves (13 with natural holes), 25 valves with broken ventral margins, one broken valve and 11 fragments
CC	30089	One complete valve, four valves with broken ventral margins, four damaged valves and one fragment
CC	30100	Seven complete valves, 20 damaged valves and two broken valves
CC	30106	Two complete valves, six valves with broken ventral margins and two broken valves
CC	30114	Five complete valves, six damaged valves (one with a natural hole), three valves with broken ventral margins (one with a natural hole) and three fragments
CC	30118	43 complete valves (17 with natural holes), 36 valves all with broken ventral margins, 18 damaged valves (four with natural holes) and 17 fragments
CC	30119	Three complete valves, 12 valves with broken ventral margins (three with natural holes), four broken valves and three fragments
CC	30122	One damaged valve and one fragment
CC	30123	Four complete specimens (two with natural holes and one with remains of mortar), five broken valves and one fragment
CC	30130	Three complete valves and one fragment
CC	30131	Nine complete valves (five with natural holes), 12 valves with broken ventral margins (five with natural holes), eight damaged valves and one fragment

<i>Area</i>	<i>Locus</i>	<i>Description</i>
CC	30134	Four complete valves (two with natural holes), five valves with broken ventral margins and four fragments
CC	30135	Three valves with broken ventral margins
CC	30138	One complete and one broken valve
CC	30145	One complete valve
CC	30148	17 complete valves (two with natural holes), 17 damaged valves (six with natural holes), seven valves with broken ventral margins and six fragments
CC	30154	One valve with a broken ventral margin
CC	30161	Seven complete valves and seven damaged valves with natural holes
CC2	31001	One complete valve with a natural hole and two fragments
DD	40001	Three complete valves, four valves with broken ventral margins and one fragment
DD	40002	Two complete valves, four valves with broken ventral margins and one fragment
DD	40005	Two valves with the inner part filled with mortar and two fragments
DD1	751	One complete valve with a natural hole
DD1	779	16 small fragments of valves
DD1	802	50+- fragments of valves covered with mortar and 16 fragments of valves
DD2	900	One valve with a small natural hole
DD2	901	Two complete valves, one with a natural hole
DD2	903	One complete valve
DD2	906	Two valves (one with a natural hole) and one slightly broken valve
DD2	914	One slightly broken valve
DD2	926	One valve with a natural hole
DD2	990	One complete valve and one slightly broken valve
DD2	991	Six complete valves (four with natural holes), partial valve with a natural hole and one fragment of a valve
DD3	857	One valve with a natural hole

FAMILY IRIDINIDAE**Chambardia rubens arcuata* (Cailliaud, 1823) – Fig. 21.1: 4

AA	10031	One small shell fragment
AA1	11052	One valve with a broken ventral margin
BB	442	One broken valve
CC	612	One broken valve
CC	622	One fragment of a valve

FAMILY SPONDYLIDAE*Spondylus gaederopus* Linnaeus, 1758

AA	112	One valve with a heavily damaged ventral margin
BB	444	One valve with a heavily damaged ventral margin
CC	30036	One broken valve
CC	30060	One damaged valve (broken during excavation)
CC	30061	One damaged valve
CC	30074	One valve
CC	30082	One valve

FAMILY CARDIIDAE*Acanthocardia tuberculata* (Linnaeus, 1758)

BB	442	One broken valve
----	-----	------------------

* Until recently this species was known as *Chambardia rubens arcuata*, an invalid emendation of the original orthography *arcuata*.

<i>Area</i>	<i>Locus</i>	<i>Description</i>
CC	643	One complete and one broken valve
CC	30060	Four shell fragments
CC	30061	Two complete valves and two fragments
CC	30065	Two shell fragments
CC	30071	One complete valve
CC	30074	Two damaged valves
CC	30082	One complete and one broken valve
CC	30114	One complete valve with a natural hole
CC	30118	Two complete valves and one broken valve
CC	30119	One complete valve
CC	30122	One broken valve
CC	30148	One broken valve with a natural hole and two fragments
CC	30161	One complete valve
<i>Acanthocardia</i> sp.		
CC	30061	One complete heavily abraded valve
<i>Cerastoderma glaucum</i> (Poirer, 1789)		
CC	30063	One complete valve
FAMILY DONACIDAE		
<i>Donax trunculus</i> Linnaeus, 1758		
CC	30060	Two damaged valves
CC	30071	One complete valve
CC	30074	One complete valve
CC	30145	One complete valve
FAMILY VENERIDAE		
<i>Paphia rhomboides</i> (Pennant, 1777)		
CC	30065	One shell fragment

DISCUSSION

COMPOSITION

The studied material from 156 loci from the Byzantine dump at Apollonia-Arsuf consisted of more than 2039 shells or shell fragments (one sample was so numerous in fragments that it has been entered as 50+ fragments). From the ecological point of view, these shells may be classified as follows:

Gastropoda	293
Marine	247
Terrestrial	46
Bivalvia	1746
Marine	1741
Freshwater	5

According to these numbers, the bulk of the material (97.5 %) consisted of marine molluscs, which is quite understandable for a Mediterranean coastal site.

GEOGRAPHIC ORIGIN

From a zoogeographical point of view, the molluscs originated from four different areas:

Apollonia-Arsuf and surroundings: six species of terrestrial snails (46 items):

<i>Buliminus labrosus labrosus</i>	12
<i>Monacha obstructa</i>	2
<i>Monacha syriaca</i>	4
<i>Helix engaddensis engaddensis</i>	4
<i>Levantina spiriplana caesareana</i>	17
<i>Theba pisana</i>	7

Mediterranean Sea (1986 items)

<i>Patella caerulea</i>	1
<i>Patella ulyssiponensis</i>	1
<i>Erosaria spurca</i>	80
<i>Luria lurida</i>	1
<i>Zonaria pyrum</i>	19
<i>Neverita josephina</i>	1
<i>Semicassis granulata undulata</i>	4
<i>Charonia variegata</i>	5
<i>Bolinus brandaris</i>	59
<i>Hexaplex trunculus</i>	43
<i>Stramonita haemastoma</i>	23
<i>Columbella rustica</i>	2
<i>Tritia circumcinctus</i>	1
<i>Conus mediterraneus</i>	5
<i>Glycymeris nummaria</i>	1698
<i>Spondylus gaederopus</i>	7
<i>Acanthocardia tuberculata</i>	28
<i>Acanthocardia</i> species	1
<i>Cerastoderma glaucum</i>	1
<i>Donax trunculus</i>	5
<i>Paphia rhomboides</i>	1

Red Sea or even further away in the Indian Ocean (2 items):

<i>Monetaria moneta</i>	1
<i>Cypraea pantherina</i>	1

Egypt, River Nile (five items):

<i>Chambardia rubens arcata</i>	5
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These data clearly show that most of the shell material (97.4%) consisted of local Mediterranean species, as would have been expected for this coastal site. Most of the shells are highly abraded specimens and fragments which were washed ashore to the site at the foot of the promontory. Among these shells, *Glycymeris nummaria* was by far the most common: 85.5% of the Mediterranean shells belonged to this species. Like today (Fig. 21.2), during Byzantine times it was probably the most abundant species on the beach, which well-collaborates the results of the age of the *Glycymeris* valves currently washed ashore (Sivan *et al.* 2006).

The fact that *Erosaria spurca*, a local Mediterranean Cowry species, turned out to be the second most abundant species is interesting. It was more common in the dump than any of the three Muricid species which

had been exploited intensively at Apollonia-Arsuf for the production of purple dye (Karmon 1999). It is a well-known fact that Cowry shells have been used extensively as shell beads by either removing the dorsum of the shell or by punching one or two holes in the extremities on either side of the shell. In this way shells could be strung or sewn onto a piece of cloth. However, in the case of *Erosaria spurca* from the dump, 71 out of a total of 80, i.e., 78.5%, of the Cowries consisted of complete shells which had not been manipulated.

Two marine species originated from much farther away. *Cypraea pantherina* (Fig. 21.1: 1) is a large Cowry species restricted in its distribution to the Red Sea (Heiman 2002). It is a relatively common species in the Gulf of Aqaba/Elat, Gulf of Suez and in the Red Sea proper. The single shell of this species from the dump is missing its dorsum (roughly broken) and the missing parts were not found among the studied material.

Monetaria moneta (Fig. 21.1: 2) is also a Cowry species that has been found in the Red Sea area but is absent from the Gulf of Aqaba/Elat, instead being found more to the south in the Red Sea proper (Heiman 2002). However, in the Indian Ocean from the coast of East Africa eastwards far into the Pacific Ocean, it is an abundant species. Therefore, the possibility that the single manipulated shell arrived at Apollonia-Arsuf from somewhere in the Indian Ocean cannot be ruled out.

Five of the species whose remains were found in the dump still live among the ruins of Apollonia-Arsuf (Mienis and Rittner 2015). Only *Levantina spiriplana caesareana* has disappeared probably due to radical renovations at the archeological site carried out in the last decade. Although *Monacha obstructa*, *Monacha syriaca*, *Helix engaddensis engaddensis* and *Theba pisana* are typical species for the coastal area, *Buliminus labrosus labrosus* and *Levantina spiriplana caesareana* have been introduced to the site most probably with stones brought for building purposes to Apollonia-Arsuf from limestone quarries somewhere in the hills to the east. Both *Buliminus* and *Levantina* hide in crevices in limestone rocks.

The freshwater mussel *Chambardia rubens arcuta* was brought to the site most likely by ship from the Nile River in Egypt, although recently it has been discovered that it also lived for some time in North Sinai in the so-called Pelusiac Branch of the Nile and the Eastern Canal (Mienis 2015).

This zoogeographic information demonstrates that the people of Apollonia-Arsuf maintained connections with areas such as Egypt, the Red Sea and maybe even the Indian Ocean.

CLIMATE

The geographical distribution of the land snails in Israel is closely related to the climatic characteristics of a certain area, i.e., in most cases the amount of yearly rainfall determines the range of a certain species (Heller 2009). In the case of the six species of land snails found in the dump of Apollonia-Arsuf, all are characteristic of a typical Mediterranean climate, i.e., dry summers and rainy winters. According to this information the climate during the Byzantine period was most likely more or less the same as the climate today.

It is unfortunate that micro molluscs, i.e., specimens with a shell size of less than 5 mm, do not appear in the studied material, especially since those tiny species are more indicative of a certain climate. The subterranean living snails forms an exception because they are far less affected by the climate than most other species. One and the same subterranean species may be encountered in areas characterized by an annual rainfall of 1,200 mm, such as on Mount Hermon, but also in areas with 50 mm or less, such as in the Negev. Such species belonging to the genera *Ceciloides* and *Calaxis* are known from Apollonia-Arsuf (Mienis and Rittner 2015), but were most likely missed in the dump when sieves with too large of mesh size were used.

EXPLOITATION OF THE MOLLUSCS

The nature of the excavated site, being a dump, does not allow the placement of the more unique specimens in the right context. Therefore, these species can only be mentioned along with their already known past usages and together with a logical explanation for their presence in the dump.

ORNAMENTATION

Throughout the history of mankind, shells in the form of shell beads and pendants have been exploited in the making of ornaments. Such beads were not always strung; there are also cases known where they were attached to pieces of cloth as adornments (Mienis 1988).

Among the shells found in the dump, several of them were identified as having been manipulated into beads or pendants. The single shell of *Monetaria moneta* (Fig. 21.1: 2) had its dorsum artificially removed in order to use it as a shell bead.¹ This was common practice in ancient times (Jackson 1916b), and it is still in practice to a much lesser degree today in East Africa (McMillan 1968; Cambridge 1969). The shells of this particular species have not only been used as beads, but also as a currency ('money cowry'), especially in West Africa (Jackson 1916b; Fearer Safer and McLaughlin Gill 1982). Although coins were minted far before the Byzantine period, the use of *Monetaria moneta* and its related species *Monetaria annulus* in the trade market was still much in practice at that time and for a millennium to come. On the African continent where this species played a major role in any kind of trade, the shells were collected from the Eastern part of the continent and then brought to the West and North African areas where this species is absent and, therefore, was in great demand. These shells were also brought to the Mediterranean area from somewhere in the Indian Ocean area, where the species is much more commonly found than in the Red Sea. The value of these shells in Africa started to drop only from the 18th century when ships loaded with 'money cowries' arrived in Africa in order to trade the shells for slaves. In some parts of Africa 'money cowries' were legal tender until the 19th century.

Any cowry shell may have served also as an amulet for luck, especially for fertility (Schilder 1952). The single heavily damaged shell of *Cypraea pantherina* (Fig. 21.1: 1) found at Apollonia might have served as such a fertility amulet before it broke, because that Red Sea species was mentioned in particular for that purpose by Schilder (1923: as *Cypraea vinosa*, a junior synonym of *Cypraea pantherina*).

Among the numerous local cowries of Mediterranean origin, *Erosaria spurca*, *Luria lurida* and *Zonaria pyrum* have shells with natural holes or even their dorsum roughly removed (man-made holes). It is not clear whether they were collected in this state of preservation on the beach by the inhabitants of Apollonia or if the damage was caused during trials to turn these specimens into shell beads.

Among the five shells of *Conus mediterraneus* (Fig. 21.1: 3) recovered from the dump, one specimen shows a man-made hole in the apex of the shell. This is the common method used for centuries in the Levant to turn a cone shell into a shell bead.

Among the numerous valves of *Glycymeris nummaria* found in the dump, there are quite a few which have holes in the umbo of the valve. It is often difficult to judge whether such a hole was made by human manipulation of the valve or caused in a natural way after the death of that bivalve. However, in either instance the valve could have been used as a shell pendant.

"CASSID" LIPS

Among the preserved shells were four specimens of *Semicassis granulata undulata*, a local gastropod species from the Mediterranean Sea often found on the beach in small numbers after winter storms. Two are complete shells; another consists of the fairly heavy outer lip with a small part of the last whorl (body-whorl) still attached to it and one represents a fragment of such a lip. The latter is usually classified as a 'Cassid' lip, a mysterious item found among the shells at numerous archaeological sites whose purpose, maybe as an ornament, is still a riddle (Reese 1989).

¹ The removal of the dorsum creates a hole which allows the use of the shell as an ornament because without a hole somewhere in the shell it is impossible to string it or to attach it to a piece of cloth.

SHELL TRUMPETS

Among the material are five shell fragments of *Charonia variegata*, a species which is relatively large in most areas of the Mediterranean but remains relatively small in the Eastern Mediterranean. Therefore, it is often classified under the subspecific name *Charonia variegata seguenzae* (Aradas and Benoit 1871). It is better known by its vernacular name, ‘Triton’ or ‘Trumpet’ shell. The genus *Charonia* shows a circum-(sub)tropical distribution and it has been exploited as a shell-trumpet wherever it is found (Jackson 1916a). Åstrom (1990) and Reese (1990) have reviewed finds of such shells from sanctuaries and graves in the Eastern Mediterranean. Since then, other specimens were excavated from different sites in Israel; examples are a fragment from Hellenistic Jerusalem (Mienis 1992), a complete specimen from a Byzantine house in Jerusalem (Mienis 2000), two fragments at Tel Kabri (Mienis 2002) and another large fragment at an Islamic site in Ramla (yet unpublished). In spite of the fact that it is a fairly large species, the extremely large body whorl is relatively thin and that part is often heavily damaged. The finds of the five fragments at Apollonia-Arsuf well-represent such damage. Unfortunately, they lack any signs of modification; therefore, it is impossible to know whether they had been used as shell trumpets.

PURPLE DYE

Three species of Muricid snail, which have been intensively exploited for the production of purple dye, have been recovered from the dump. *Bolinus brandaris* was represented by 59 items, *Hexaplex trunculus* by 43 and *Stramonita haemastoma* by 23. The majority of these 125 items consisted of old beach rolled fragments. It is possible that they were once part of the living snails used for purple dyeing during the Persian and Hellenistic periods at Apollonia as described by Karmon (1999). However, it is rather doubtful that purple dyeing was still carried out even at a very low level during the Byzantine periods at Apollonia/Sozousa.

MOTHER-OF-PEARL

Chambardia rubens arcuta (Cailliaud 1823) (Fig. 21.1: 4) is a fairly large freshwater mussel originating from the River Nile in Egypt. The presence of this species in archaeological sites in Israel is well-documented in numerous papers dealing with finds from sites from the Natufian to well into the Early Islamic period (Reese, Mienis and Woodward 1986; Mienis 2005). The meat of this mussel species is edible, and the beautiful rose-colored Mother-of-Pearl from the interior of the valves has been exploited for a multitude of items in Egypt (Falkner 1981; 1982; Boessneck, Driesch and Ziegler 1989). Unfortunately, the five fragments found in the dump do not show any trace of manipulation; therefore, the reason why *Chambardia* had been brought to Apollonia can only be guessed.

FOOD

Land snails at archaeological sites are not only useful for reconstructing past climates, they may also reveal something about food habits in the past. It is, for example, a well-known fact that even today Christians in Israel eat land snails (Bar 1977; Mienis 2014). Larger species like *Helix engaddensis*, as well as all subspecies belonging to the *Levantina spiriplana*-complex and *Theba pisana* are collected in the fields (*Helix* and *Theba*) or among the rocks (*Levantina*) after rainy days when these snails appear in large numbers. Sometimes even relatively small species such as *Xeropicta vestalis joppensis* are collected for food (Mienis 1985a). Most of these species are native to Apollonia-Arsuf and its vicinity. The only exception is *Levantina spiriplana caesareana*, but as has already been explained, that species

together with another rock living species, *Buliminus labrosus labrosus*, most probably reached the region of Apollonia with stones quarried in the hills more to the east. Yet the small number of shells of such edible land snails found in the dump rules out almost at once the possibility that they formed the leftovers of snail meals (Mienis 1985b). It is therefore better that they should be classified as components of the local environment which might have been exploited occasionally now and then on a small scale as an additional food source.

Another possibility is that living specimens of *Levantina spiriplana caesareana* were brought intentionally as a food source to Apollonia-Arsuf in order to grow them in gardens, as is often done with species of *Helix*, *Levantina* and subspecies of the *Cornu aspersum*-complex in monasteries all over Israel today; however, this does not explain the presence of other mountainous but non-edible species like *Buliminus labrosus labrosus*, *Paramastus episomus* and *Euchondrus septemdentatus* found among the ruins of Apollonia (Mienis and Rittner 2015).

BUILDING MATERIAL

Some of the valves of *Glycymeris nummaria* found in the dump were filled with a whitish mortar-like substance. This is usually a firm sign that such valves were used as building material. At many archaeological sites not only along the coast but also inland, thick layers of marine shells have been found under floors or in walls. Whole valves or fragments of *Glycymeris nummaria* formed, in many cases, over 90% of fills. The remaining 10% usually consisted of other common species washed ashore along the Mediterranean coast. Such building material has an insulating effect, and so floors and walls treated in this way are far less humid. A mixture of seashells and mortar has also often been used to fill spaces between roughly cut stones. This can still be seen not only at Apollonia, but also at other coastal sites such as Yavneh-Yam more to the south and Tel Dor to the north.

CONCLUSIONS

Archaeomalacological remains, i.e., shells found at archaeological sites, may provide archaeologists with a wealth of information (Mienis 2004). In the case of the shells found in the dump dating from the Byzantine period at Apollonia-Arsuf/Sozousa, they have provided information concerning: trade routes revealed by the zoogeographic origin of the shells; the climate according to the presence of certain terrestrial snails; the possible usage of shells as ornaments in the form of shell beads and pendants, 'Cassid' lips, shell trumpets and Mother-of-Pearl; the use of these species as food; and last but not least, their exploitation as building materials.

The reliability of the information provided by the malacologist to the archaeologist depends heavily on the quality and quantity of the preserved material for further study. The preservation of three shells of edible land snails may provide some information concerning changes in the climate, while the preservation of hundreds of edible land snails may be interpreted as firm evidence that the species in question was indeed exploited as a food source. Although the studied material from the dump provided important data, if shells of species smaller than 5 mm had been collected, the results would have been more reliable.

REFERENCES

- Åström, P. 1990. Triton Shells in East Mediterranean Cults – Introduction. *Journal of Prehistoric Religion* 3–4: 5–6.
 Bar, Z. 1977. Human Consumption of Land Snails in Israel. *Basteria* 41: 43–58.
 Boessneck, J., Driesch, A. von den and Ziegler, R. 1989. Die Tierreste von Maadi and Wadi Digla. In: Rizkana, I. and Seeher, J., eds. *Maadi III: The Non-lithic Small Finds and the Structural Remains of the Predynastic Settlement*. Mainz am Rhein: 87–128.

- Cambridge, P. 1969. Cowries in Aden and Africa. *The Conchologists' Newsletter* 28: 78–79.
- Falkner, G. 1981. Mollusca. In: Martin, G.T., ed. *The Sacred Animal Necropolis at North Saqqâra: The Southern Dependencies of the Main Temple Complex* (Excavations at North Saqqâra Series; Excavation Memoir 50). London: 140–144.
- Falkner, G. 1982. Molluskenfunde der Ausgrabungen des Deutschen Archäologischen Instituts Kairo im Satetempel auf Elephantine. In: Boessneck, J. and von den Driesch, A., eds. *Studien an subfossilen Tierknochen aus Ägypten* (Münchener Ägyptologische Studien 40). Munich: 152–172.
- Fearer Safer, J. and McLaughlin Gill, F. 1982. *Spirals from the Sea: An Anthropological Look at Shells*. New York.
- Heiman, E.L. 2002. *Cowries of East Sinai*. Jerusalem.
- Heller, J. 2009. *Land Snails of the Land of Israel: Natural History and a Field Guide*. Sofia and Moscow.
- Jackson, J.W. 1916a. Shell Trumpets and Their Distribution in the Old and New World. *Memoirs and Proceedings of the Manchester Literary and Philosophical Society* 60: 1–22.
- Jackson, J.W. 1916b. The Use of Shells for the Purposes of Currency. *Memoirs and Proceedings of the Manchester Literary and Philosophical Society* 60: 1–72.
- Karmon, N. 1999. Muricid Shells of the Persian and Hellenistic Periods. In: Roll, I. and Tal, O. *Apollonia-Arsuf: Final Report of the Excavations, I: The Persian and Hellenistic Periods (with Appendices on the Chalcolithic and Iron Age II Remains)* (Tel Aviv University, Monograph Series of the Institute of Archaeology 16). Tel Aviv: 269–280.
- McMillan, N. 1968. The Preparation of Cowry-shells for Use as Counters. *The Conchologists' Newsletter* 25: 51.
- Mienis, H.K. 1985a. Enkele verdere gegevens betreffende de consumptie van landslakken in Israël. *Correspondentieblad van de Nederlandse Malacologische Vereniging* 225: 63–65.
- Mienis, H.K. 1985b. Four Shells – Four Stories. *Trowel and Patish* 2: 2–4.
- Mienis, H.K. 1988. The Marine Molluscs. In: Bar-Yosef, O. and Alon, D. Nahal Hemar Cave. *‘Atiqot* 18: 47–49.
- Mienis, H.K. 1992. Molluscs. In: de Groot, A. and Ariel, D.T., eds. *Excavations at the City of David 1978–1985 Directed by Yigal Shiloh III: Stratigraphical, Environmental, and Other Reports* (Qedem 33). Jerusalem: 122–130.
- Mienis, H.K. 2000. Molluscs from the Excavation of Horvat Raqit, Carmel. *De Kreukel* 36: 89–90.
- Mienis, H.K. 2002. Archaeozoological Remains. II. Molluscs. In: Kempinski, A., Scheftelowitz, N and Oren, R., eds. *Tel Kabri: The 1986–1993 Excavation Seasons* (Tel Aviv University, Monograph Series of the Institute of Archaeology 20). Tel Aviv: 402–408.
- Mienis, H.K. 2004. When Shells begin to Talk. Archaeomalacology: An Important Tool for the Archaeologist with Examples from the Excavation of Mallaha, Hula Valley, Israel. In: Öztürk, B. and Salman, A., eds. 1st National Malacology Congress (with International Participation). *Turkish Journal of Aquatic Life* 2: 111–116.
- Mienis, H.K. 2005. Nile Mussels in the Kitchen of the Monastery of Martyrius, Judaean Desert. *The Archaeo+Malacology Group Newsletter* 8: 2–3.
- Mienis, H.K. 2014. Shells from Area Z. In: Geva, H., ed. *Jewish Quarter Excavations in the Old City of Jerusalem Conducted by Nahman Avigad, 1969–1982. Volume VI: Areas J, N, Z and Other Studies*. Jerusalem: 373–376.
- Mienis, H.K. 2015. Freshwater Molluscs of African Origin, Which Inhabited the Pelusiatic Branch of the Nile River and the Eastern Canal in North Sinai, Egypt, and the Possible Role of these Ancient Water Bodies in the Settlement of Species of Nilotic Origin in Israel. *Ellipsaria* 17: 23–25.
- Mienis, H.K. and Rittner, O. 2015. A Note Concerning the Land Snails of the National Park Apollonia (Tel Arshaf), Israel. *Triton* 31: 27–34.
- Reese, D.S. 1989. On Cassid Lips and Helmet Shells. *Bulletin of the American Schools of Oriental Research* 275: 33–39.
- Reese, D.S. 1990. Triton Shells in Eastern Mediterranean Cults – Triton Shells from East Mediterranean Sanctuaries and Graves. *Journal of Prehistoric Religion* 3–4: 7–14.
- Reese, D.S., Mienis, H.K. and Woodward, F.R. 1986. On the Trade of Shells and Fish from the Nile River. *Bulletin of the American Schools of Oriental Research* 264: 79–84.
- Roll, I. 1999. Introduction: History of the Site, Its Research and Excavations. In: Roll, I. and Tal, O. *Apollonia-Arsuf Final Report of the Excavations I: The Persian and Hellenistic Periods (with Appendices on the Chalcolithic and Iron Age II Remains)* (Tel Aviv University, Monograph Series of the Institute of Archaeology 16). Tel Aviv: 1–62.

- Schilder, F.A. 1923. *Cypraea vinosa* Gmel. in Geschichte und Urgeschichte. *Archiv für Molluskenkunde* 55: 204–206.
- Schilder, M. 1952. Die Kaurischnecke. *Die neue Brehm-Bücherei* 46: 1–48.
- Sivan, D., Potasman, M., Almogi-Labin, A., Bar-Yosef Mayer, D.E., Spanier, E. and Boaretto, E. 2006. The *Glycymeris* Query along the Coasts and Shallow Shelf of Israel, Southeast Mediterranean. *Palaeogeography, Palaeoclimatology, Palaeoecology* 233/1–2: 134–148.

SECTION FOUR

REGIONAL STUDIES