The Worldwide Chonotrichia Project.

José Fahrni^a, Igor Dovgal^b, Gregorio Fernandez-Leborans^c, Thorsten Stoeck^d, Hans-Werner Breiner^d, Jan Pawlowski^e.

ABSTRACT. The Chonotrichia (Ciliophora) exhibit an astounding morphological diversity. They are epibiotic, living settled on several crustacean species, all around the world. They reproduce principally by budding, and exhibit complex life cycles driven by the moulting of their host. Based on cytological observations, Jankowski (1973) has described more than 100 species belonging to some 40 genera distributed in 11 families and 3 sub-orders. Most of these species have been described from Russia, principally from the Kamchatka-Vladivostock region. Records from other parts of the world are scarce. Ultrastructural datas are known for few species and molecular datas are actually restricted to 3 species. The main goal of the Worldwide Chonotrichia Project is to establish a broad molecular taxonomy of the Chonotrichia, and to construct « The Tree of Chonotrichs ».

The project will be built on : - a database of all past and actual chonotrich records ; - environmental mass sequencing datas could provide decisive contributions; - contacts with protozoologists all around the world where chonotrichs are known to be, or were, present ; - these peoples should sample crustaceans, store them in ethanol and send them to Geneva ; - the molecular work will be done in Geneva; - collaborations for analyzing and publishing the datas. EVERYBODY IS WELCOMED.

Complex life cycles

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A huge diversity : 12 families, 112 species !!!

CHONOT



Chilodochona

RICHIA TAXONOMY	4 HE	Sli
andez-Leborans, 2001 m Jankowski, 1973)		511
amilies, 44 genera, 112 species.	R. J. /	COSTELLO - CHONOTRICH

ghtly different classifications:					
IIA TAXONOMY 2001		ALIMOV - CHONOTRICHIA TAXONOMY 2007		ADL - CHONOTRICHIA TAXONOMY 2018	0



The Little Black Book



- 2 orders, 2 sub-orders, 10 families ; - lack Fam. Spirochonidae ?	- 3 orders, 2 sub-orders, 11 families.	- 2 orders, 11 families.	Balaenophilus unisetus
	Order Chilodochonida p. 664)		Tisbe sp. (harpacticoid)
	01. Family Chilodochonidae	Exogemmida Jankowski, 1972	Class Malacostraca
Suborder Lobochonina	Chiladachana		Order Mysidacea
01. Family Lobochonidae	Contochana	01. Family Chilodochonidae Wallengren, 1895	Boreomysis arctica
Lobochona limnoriae Dons, 1940.	cryptochond	Chilodochona	Onden Annakin ada
 prorates Mohr, Le Veque & Matsudo, 1965. Spirochong gystalling Canu, 1886. 	Order Exogemmida (p. 665)		Order Amphipoda
02 Esmily Elichonidae	Subardar Laborhaning	02 Family Lobochonidae Jankowski 1967	Acanthogammarus
Aurichona armata Jankowski, 1973.	Suborder Lobochonina	Loboshona	Ampithoe
03. Family Phyllochonidae	02. Fam. Lobochonidae		Anisoaammarus
Phyllochona vexillata Jankowski, 1972.	Oenapharachana (p. 666)	02. Easily Eilishaaidaa laakayahi (070	Carinogammaru s
04. Family Segmentochonidae	Taxachana	03. Pamity Phichonidae Jankowski, 1973	
Segmentochona spiralis (Bonnier in Giard, 1894) Jank., 1989.	Physochona	Filichona	Carinurus solskii
= Stylochona spiralis bonnier in Giard, 1894.	Eleutherachana		Chaetogammaru s olivii
US. Family Heliochonidae Heliochong alternans lankowski 1972	03 Eem Filichonidae	04. Family Phyllochonidae Jankowski, 1972	Chelura terebrans
 elegans Jankowski, 1972. 	Aurichana	Phyllochona	Coniurus
 pontica jankowski, 1973. 	Filichona		Currente
 sessilis Plate, 1888. Katarakana anarata (Kata 1891) kakawaki 1072. 	04. Fam. Phyllochonidae	05. Family Helichonidae Jankowski, 1972	Cyamus
= Stylachona soiralis subsp. caranata Kent. 1881.	Phyllochona (p. 667)	Heliochona	Dikerogammarus
 crinita Jankowski, 19 72. 	05. Fam. Heliochonidae		Eucarinogammarus
 exilis Jankowski, 1973. 	Heliochana	06. Family Spirochonidae Stein, 1854	Eulimnoaammarus
 peregra Jankowski, 1973. peregra (Mateuda & Mohr 1955) Jankowski, 1972. 	Subardan Salarahaning (, com	Spirochona	Cammarus
 Heliochona psychra Matsudo & Mohr, 1965. 	Suboraer Spirochonina (p. 667)		Guillinulus
 scheutenii (Stein, 1854) Jankowski, 1972. 	06. Fam. Spirochonidae		Garjaewia
 Spirachona scheutenii Stein, 1854. 	Cavichona	Cryptogemmida Jankowski, 1975	Gmelinoides
- thjaha Jankowski, 1972.	Serpentichana (p. 669)		Ommatogammarus
??? Family Spirochonidae	Order Cryptogenmida (= sca	07. Family Isochonidae Jankowski, 1973	Odontogammarus
	Order cryptogenninda (p. 669)	Isochona	Dallasoa sansolloidos
Suborder Chilodochoninae	07. Fam. Isochonidae (p. 670)	(+ 00. Family Isochonopsidae Bat., Crum., 1988	Pullused curicelloldes
06. Family Chilodochonidae	Inchachana (p. 571)	Isochonopsis)	Pallasea cancellus
Chiladachana aranei Jankowski, 1 973.	Isochonopsis		Paragarjaewia
 carcini Jankowski, 1973. nalinuri Jankowski, 1973. 	Cyamichona (p. 672)	08. Family Actinichonidae Jankowski, 1973	Parapallasea
- qvennerstedti Wallengren, 1895.	Thalassachana	Actinichona	Order Isopoda
 Chilodochona microchilus Wallengren, 1 895. 	inermichona		Limnoria
Vasichona paguri Jankowski, 1972.	US. Fam. Actinichonidae	09 Family Stylochonidae Mohr 1948	
rder. Cryntogemmida	Carinichona	Stylochona	Paralimnoria andrewsi
ruer eryptogenninua	Rhizochona (p. 673)		Order Nebaliacea (80
07. Family Isochonidae	Actinichona Kastachanansis	40. Eastly Estimistanidas Indowski 4072	Nebalia
Cyamichona megapterae Jankowski, 1971.	Crassichona	To. Panny Echnichondae Jankowski, 1973	Nehalia hines
Isochona crassa Jankowski, 1973.	09. Fam. Stylochonidae	Echinichona	Nebalia apoffrovi
 tisbica Jankowski, (in press). 	Stylochona		
08. Family Actinichonidae	Spinichona (p. 674)	11. Family Inversochonidae Jankowski, 1973	Nebalia herbstii
Cristic hona tesselata Jankowski, 1973. Kastanak angenia multingan Datlain, 1977	Electichana	Inversochona	Order Decapoda
09 Emily Shipchonides	Armichona		Cancer pagurus
Armichona hexadenta Jankowski, 1973.	Oxychanina		Carcinus aestuarii
 insecta Jankowski, 1973. 	Eriochona Paraaswebana		Carcinus maonas
Eriochona horrida Jankowski, 1973.	Pterochana		Curcinus muenus
Flectichona crenata Jankowski, 1973. Stulachona chiralic subra, elabra Jankowski, 1973.	Ctenochona (p. 675)	ADL et al., 2018.	Chionoecete s opilio
 spiralis subsp. nebalina Kent, 1881. 	10. Fam. Echinichonidae	Journal of Eukaryotic Microbiology 2019 66 4-119	Crangon dalli
10. Family Inversochonidae	Eurychona	Revisions to the Classification Nomenclature and	Ebalia tumefacta
Ceratochona scandens Jankowski, 1973.	Echinichona	Diversity of Eukarvotes.	Hyas araneus sen hoeki
Chonosaurus galeatus Jankowski, 1973.	11 Fam Invertochonide-		lie engine e degue d
inversocnona peregra jankowski, 1975. Kentrachona nebaliae Rompel, 1894.	Pleachana (p. 676)	Chonotrichia : p. 62	Liocarcinu s depurator
	Kentrochona		Pagurus pubescens
	Ceratochona		Palinurus elephas
A. W. JANKOWSKI: PROTISTA - CILIATA - CHONOTRICHIA	Chonosaurus (p. 676)		Pachyaransus
IN : COSTELLO MJ., EMBLOW Ch. and WHITE R. (editors)		ADL_Chono_classific_2018_3.docx	Scullarus arctus
European Register of Marine Species. 2001.	ALIMOV A.F. (ed.)		Scynurus urctus
A check-list of the marine species in Europe,	Handbook of Zoology. Protista / Chonotricha.		
and a bibliography of guides to their identification.	Nauka. St. Petersburg. 2007. Pt. 2. pp. 663-676.		From · - IANKOWS

narus nmarus marus nmarus marus celloides cellus a andrewsi aliacea (80 %) bsti apoda ırus enas s opilic facta ıs ssp. hoek depurator escens ephas

CRUSTACEA AS HOSTS

RUSTACEA

JANKOWSKI (1973) FERNANDEZ-LEBORANS (2001

All around the World! But only 8 SSU-sequences !



Life_cycles_1.docx







AMA

Actinichona





ERING SEA

PRIBILOF ISLANDS

The Aleutian Islands (USA) strech 1670 km westward from the Alaskan Peninsula to the outermost island of Attu, only 1200 km miles from what was then Japan's most northern naval base at Paramushiro in the Kurile Islands. The principal US base was at Dutch Harbour, on the island of Unalaska.

The **Commander Islands (FRU)** or Komandorski Islands

Sub

Orde

A.W

COSTE

Jankowski-Costollo_2001_4.docx

The islands consist of Bering Island (95 km by 15 km), Medny Island (55 km by 5 km) and fifteen smaller ones (islets and rocks), the largest of which are Tufted Puffin Rock (Kamen Toporkov or Ostrov Toporkov), 15 hectares, and Kamen Ariy, which are between 3 km and 13 km west of the only settlement, Nikolskoye. Administratively, they compose the Aleutsky District of Kamchatka Krai, in Russia.

16.1_Isochona_sp._OOSW-1_small_subunit_ribosomal_RNA_gene 17.1_Isochona_sp._OOSW-2_small_subunit_ribosomal_RNA_gene AF530529.1_Uncultured_ciliate_clone_AT1-2_18S_ribosomal_RNA_gene

Phyllogenomic tree of some phyllopharyngid ciliates (---)including the actually known Chontrichia sequences.

Ribosomal, 18S.

- Suctoria in green; Dysteridae in blue ; - Chonotrichia in red (with S. gemmipara in black); out-groups : one Suctoria and some Oligohymenophorea.

The chonotrich sequences (with S. gemmipara) clearly group together; The chonotrich sequences are basal to the sequences of the dysterids (the accepted ancestors of the Chonotrichia) -The two "isoepi" sequences are closely related to Isochona (same genus ?) ; -The position of the "AT1-2" sequence is actually difficult to underststand.





CHONOTRICHIA ON LICE / ON WHALES



COULD YOU SAMPLE FOR ME?

SAMPLING:

marine (freshwater) sediments, gravels, stones, woods,.. Biotope:

Collecting: dredge, mini-dredge, net, strainer, sieve, ... Washing: rough, quick.

rough, quick; if possible, try to separate different species in different tubes; Sorting:

Ethanol ≈ 90 ; (no methanol, no formaldehyde). Medium:

Number (referring to: date, environment, geolocalization, ...). Label:

SENDING:

DHL, CHRONOPOST, With:

- J. Pawlowski, Dpt. Genetics & Evolution, Geneva University, 30, Quai Ernest-Ansermet
- CH 1205 Geneva SWITZERLAND
- paid by the recipient (please, inquire for a code) Cost:

MY WORK IN GENEVA:

- Binocular observation;
- Micro-dissection (with watchmakre's tweezers and iridectomy cissors);
- (microphotography: live, phase contrast, DIC, ...); - for each hosted crustacea: gills fragments assigned for eventual:
- Protargol and Feulgen stainings, SEM, .
- DNA extraction (Guanidin, ...). - Molecular technics: PCR-amplification (18S -CIL- ; COI, ...); sequencing, analysis.

CHONOTRICHIA / NEBALIACEA

Species of Chonotrichia living on diverses species of Nebaliacea

Chonotrichia	Nebalia bipes
– Actinochona cuspidata, A. gaucho – Armichona gibbosa, A. hexadenta, A. insecta – Carinichona globulus – Ceratochona cimex, C. scandens	Reconne
 Chonosaurus galeatus, C. rex Coronochona pectinata 	A A A A A A A A A A A A A A A A A A A
 Crassichona insolita Cristichona pacifica, C. tesselata 	
 Ctenochona ternipara Dentichona marginata Extinishena margina 	
 Echinichona regina, E. simplex Eriochona glacialis, E. horrida Eurochona vitrea 	
- Flectichona crenata, F. filicauda	
 Isochona antennaria, I. crassa, I. peltifera, I. pleonicola, L. rotundata 	
 Kentrochona nebaliae, K. robusta Kentrochona nebaliae, K. robusta 	
 – Kentrochonopsi s mulupara – Oxychona multifida, O. suprema 	



Stylochona

63		
	From LANKOWCKI (1072) & FERMANDEZ LERODAN	10/2001)
	From : JANKOWSKI (1973) &-FERNANDEZ-LEBORAN	IS (2001).

C. megapterae, Jankow., 1971
 From : - JANKOWSKI (1973) - FERNANDEZ-LEBORANS (2001).
Chonos_whales_2.docx



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- ...



In: Sveshnikov V.A. (ed.): Symbiosis in marine animals. Moskow. pp. 7-13

pecies of Segmentochona would thus be expecte

Chelura terebrans

Segmen 2.deck

norians (Isopoda) in sea-immersed wood The diet of C. terebrans consists largely of Limnoria fecal pellets; this keeps the burrows clean, and novements increase water circulation in the burrow e amphipod family Cheluridae (3 genera) has a world-wide distribution and the description of nev Paraoxychona inver

- Pleochona coronata
- Pterochona pacifica Rhizochona armata
- Stylochona glabra, S. maxillaris, S. nebalina, S. setaria, S. villosa



Nebalia bipes is orange or yellowish green and about one cm long. It has a loosely attached thin shell composed of two halves joined longitudinally which protect most of the segments. The upper pair of antennae are stumpy and branched while the lower pair are much longer, especially in the male where they can be as long as the body. The eyes are red and on stalks and there is a rostral spine projecting forward between them. There are eight pairs of appendages concealed under the shell and four longer pairs of abdominal appendages half concealed. The tail continues with two further pairs of stubby appendages and ends in a fork.

It lives in coastal waters at depths of 5–60 m, under stones or among decaying organic matter where it is common and sometimes abundant. Its predators include the fish Merlangius merlangus

Chonos-Nebaliacea.docx







Molecular Systematics & Environmental Genomics

VIII ECOP – ISOP JOINT MEETING ROMA 2019 (28 July – 2 August)