***Echinostoma chankensis* nom. nov., other *Echinostoma* spp. and *Isthmiophora hortensis* in East Asia: Morphology, molecular data and phylogeny within Echinostomatidae**

Anna V. Izrailskaia, Vladimir V. Besprozvannykh, Yulia V. Tatonova

**Supporting Information (Table S1)**

**Table S1.**

Sequences analyzed in this study

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Species | Life cycle stage | Country | Sources | Genbank accession number | | | |
| 28S rDNA | ITS2 rDNA | *cox1* mtDNA | *nad1* mtDNA |
| *Echinostoma chankensis* nom. nov. | adult | Russia | our data | **MT577829** | **MT577831** | **MT577585** | **MT592856** |
| *Echinostoma cinetorchis* Ando, Ozaki, 1923 | adult | Russia | our data | **MT577827-MT577828** | **MT577832-MT577833** | **MT577586-MT577587** | **MT592854-MT592855** |
| adult | South Korea | Lee et al., 2016b | KX817344-KX817348 | - | - | - |
| - | South Korea | Lee et al., 2016b | - | - | - | KU519288-KU519292 |
| *Echinostoma miyagawai* Ishii, 1932 | adult | Russia | our data | **MT577825-MT577826** | **MT577834-MT577835** | **MT577588-MT577589** | **MT592852-MT592853** |
| juvenile | New Zealand | Georgieva et al., 2017 | KY436408 | - | - | KY436400 |
| adult | Thailand | Nagataki et al., 2015 | - | - | - | KP455612-KP455625 |
| adult | Czech Republic | Georgieva et al., 2014 | KP065593 | - | - | KP065624-KP065625  KP065639-KP065640 |
| cercaria | Czech Republic | Georgieva et al., 2014 | - | - | - | KP065626-KP065638  KP065641 |
| adult | Ukraine | Tkach et al., 2016 | KT956916 | - | - | - |
| adult | China | Li et al., 2018b | MH748722 | MH796365 | MH748721 | - |
| adult | China | Li et al., 2019 | - | - | MH393928 | MH393928 |
| adult | China | Fu et al., 2019 | - | - | MN116740 | MN116740 |
| *Isthmiophora hortensis* (Asada, 1926) | adult | Russia | our data | **MT577830** | **MT577836** | **MT577590** | **MT592857** |
| adult | Japan | Sato et al., 2006 | AB189982 | AB189982 | AB189980 | - |
| adult | South Korea | Lee et al., 2007 | - | - | AF096227 | - |
| adult | East Asia | Morgan & Blair, 1998a | - | - | - | AF025835 |
| *Echinostoma paraulum* Dietz, 1909 | cercaria | Germany | Georgieva et al., 2014 | KP065604 | - | - | KP065677-KP065679  KP065681 |
| adult | - | - | - | KP065680 |
| *Echinostoma paraensei* Lie, Basch,1967 | adult | USA | Lotfy et al., 2008 | EU025867 | - | - | - |
| adult | USA | Morgan & Blair, 1995 | - | EPU58100 | - | - |
| adult | Brazil | Morgan & Blair, 1998a | - | - | - | AF025834 |
| cercaria | - | - | - | AF026282 |
| adult | Brazil | Maldonado et al., 2001 | - | AF336232 | - | - |
| *Echinostoma novaezealandense* Georgieva et al., 2017 | adult | New Zealand | Georgieva et al., 2017 | KY436407 | - | - | KY436397-KY436399 |
| *Echinostoma revolutum* (Fröhlich, 1802) Rudolphi, 1809 | adult | Germany | Morgan & Blair, 1998a | - | - | - | AF025832 |
| metacercaria | - | - | - | AF026286-AF026288 |
| cercaria | UK | Kostadinova et al., 2003 | - | - | - | AY168933-AY168934 |
| adult | Thailand | Nagataki et al., 2015 | - | - | - | KP455626-KP455633 |
| cercaria | Czech Republic | Georgieva et al., 2014 | KP065595  KP065597-KP065598 | - | - | KP065642-KP065652  KP065654-KP065658 |
| adult | KP065596, KP065599 | - | - | KP065653 |
| cercaria | Iceland | Georgieva et al., 2013 | - | - | - | KC618451-KC618461 |
| adult | USA | Detwiler et al., 2012 | - | - | - | JQ670862 |
| adult | Poland | Ledwon et al., 2016 | KT971136 | - | - | KT726380 |
| cercaria | Canada | Gordy et al., 2019 | - | - | - | MH369214-MH369217  MH369209, H369206  MH369192-MH369104 |
| adult | USA | Tkach et al., 2016 | KT956915 | - | - | - |
| adult | Poland | Ledwon et al., 2014b | - | KM520150 | - | - |
| adult | North American | Sorensen et al., 1998 | - | AF067850 | - | - |
| adult | Thailand | Saijuntha et al., 2014 | - | KF894682 | - | - |
| adult | Bangladesh | Mohanta et al., 2019 | - | LC224085 | - | LC224097-LC224105 |
| adult | Germany | Morgan et al., 1995 | - | ERU58102 | - | - |
| adult | USA | Detwiler et al., 2010 | - | GQ463128-GQ463130 | - | GQ463059-GQ463061  GQ463074-GQ463075  GQ463077-GQ463083 |
| redia | - | - | - | GQ463056-GQ463058  GQ463062-GQ463073  GQ463076  GQ463084-GQ463090 |
| metacercaria | China | Yang et al., 2014b | - | KM980472-KM980477 | - | - |
| adult | China | Yang et al., 2015b | - | KP342419-KP342426 | - | - |
| cercaria | France | Huguenin et al., 2019 | - | MK168694-MK168696 | - | - |
| adult | Thailand | Saijuntha et al., 2011 | - | - | GU324944 | - |
| - | - | Saijuntha, 2013b | - | - | KF793281-KF793291 | - |
| *Echinostoma caproni* Richard, 1964 | adult | Egypt | Detwiler et al., 2010 | - | GQ463131 | - | - |
| adult | Egypt | Marcilla et al., 2003b | - | AJ564382 | - | AJ564378 |
| adult | Madagascar | Morgan et al., 1995 | - | ECU58098 | - | - |
| adult | Madagascar | Morgan et al., 1998a | - | - | - | AF025836-AF025838 |
| cercaria | Kenya | Laidemitt et al., 2019 | - | - | - | MK534406, MK534417 |
| *Echinostoma robustum* Yamaguti, 1935 | redia | USA | Detwiler et al., 2010 | - | GQ463132-GQ463133 | - | GQ463053-GQ463054 |
| adult | - | - | - | GQ463055 |
| adult | Bangladesh | Mohanta et al., 2019 | - | - | - | LC224086-LC224096 |
| *Echinostoma trivolvis* Cort, 1914 | adult | USA | Sorensen et al., 1998 | - | AF067851-AF067852 | - | - |
| adult | UK | Olson et al., 2003 | AY222246 | - | - | - |
| adult | USA | Detwiler et al., 2012 | - | - | - | JQ670850-JQ670861 |
| redia | USA | Detwiler et al., 2010 | - | GQ463124-GQ463126 | - | GQ463047-GQ463047  GQ463050, GQ463113 |
| adult | - | - | - | GQ463049  GQ463051-GQ463052 |
| adult | USA | Morgan & Blair, 1995 | - | ETU58097 | - | - |
| adult | USA | Morgan & Blair, 1998a | - | - | - | AF025831 |
| cercaria | Canada | Gordy et al., 2019 | - | - | - | MH369218-MH369222 |
| *Echinostoma friedi* Toledo et al., 2000 | adult | Spain | Marcilla et al., 2003b | - | AJ564383 | - | AJ564379 |
| *Echinostoma cf friedi* Toledo et al., 2000 | cercaria | UK | Kostadinova et al., 2003 | - | - | - | AY168937 |
| *Echinostoma bolschewense* Kotova, 1939 | cercaria | Slovakia | Georgieva et al., 2014 | KP065591-KP065592 | - | - | KP065608-KP065623 |
| *Artyfechinostomum sufrartyfex* Lane, 1915 | adult | India | Tandon et al., 2013b | KF781303 | - | - | - |
| adult | India | Tandon et al., 2006b | - | EF027100 | - | - |
| adult | India | Dahal et al., 2018b | - | MH237730 | - | - |
| metacercaria | - | MH237731 | - | - |
| *Artyfechinostomum malayanum* (Leiper, 1911)Railliet, 1925 | adult | Thailand | Tantrawatpan et al., 2013 | - | JF412727-JF412730 | - | - |
| cercaria | Thailand | Saijuntha et al., 2011 | - | - | GU324939  GU324941-GU324942 | - |
| cercaria | Thailand | Saijuntha, 2011b | - | - | - | JF412731-JF412732 |
| adult | - | - | - | JF412734 |
| *Neoacanthoparyphium echinatoides* Filippi, 1854 | cercaria | Slovakia | Tkach et al., 2016 | KT956922 | - | - | - |
| *Patagifer bilobus* Rudolphi, 1819 | adult | Ukraine | Tkach et al., 2016 | KT956945 | - | - | - |
| *Patagifer vioscai* Lumsden, 1962 | adult | USA | Tkach et al., 2016 | KT956946 | - | - | - |
| *Moliniella anceps* (Molin, 1859) Hubner, 1939 | metacercaria | Lithuania | Tkach et al., 2016 | KT956921 | - | - | - |
| *Echinoparyphium rubrum* Cort, 1914 | adult | USA | Pulis et al., 2011 | JF820595 | - | - | - |
| metacercaria | JF820594 | - | - | - |
| cercaria | USA | Tkach et al., 2012 | JX262943 | - | - | - |
| *Echinoparyphium poulini* Georgieva et al., 2017 | adult | New Zealand | Georgieva et al., 2017 | KY436409 | - | - | - |
| *Echinoparyphium cinctum* Rudolphi, 1802 | adult | Ukraine | Tkach et al., 2001 | AF184260 | - | - | - |
| *Echinoparyphium recurvatum* (Linstow, 1873) Dietz, 1909 | cercaria | Slovakia | Tkach et al., 2016 | KT956913 | - | - | - |
| adult | Mexico | Sereno-Uribe et al., 2015 | - | KJ435270-KJ435274 | - | - |
| metacercaria | - | KJ435275-KJ435277 | - | - |
| cercaria | - | KJ435278-KJ435282 | - | - |
| cercaria | UK | Kostadinova et al., 2003 | - | AY168931 | - | AY168938 ,AY168940  AY168944 |
| redia | Norway | Soldanova et al., 2017 | - | - | - | KY513265 |
| metacercaria | - | - | - | KY513266-KY513269 |
| *Hypoderaeum conoideum* (Bloch, 1782) Dietz, 1909 | cercaria | Czech Republic | Georgieva et al., 2014 | KP065607 | - | - | - |
| adult | Ukraine | Tkach et al., 2016 | KT956918-KT956919 | - | - | - |
| adult | China | Yang et al., 2015 | - | KJ944311-KJ944313 | - | - |
| metacercaria | - | KJ944314-KJ944316 | - | - |
| adult | China | Yang et al., 2014b | - | KM980460-KM980462  KM980480  KM980482-KM980483 | - | - |
| metacercaria | - | KM980463-KM980465 KM980478-KM980479  KM980481 | - | - |
| adult | Spain | Marcilla et al., 2003b | - | - | - | AJ564381 |
| adult | France | Miquel et al., 2018 | - | - | - | MH282580 |
| cercaria | Bulgaria | Kostadinova et al., 2003 | - | - | - | AY168949 |
| *Echinoparyphium ellisi* (Johnston, Simpson, 1944) Johnston, Angel, 1949 | adult | New Zealand | Georgieva et al., 2017 | KY436410 | - | - | KY436405-KY436406 |
| *Echinoparyphium poulini* Georgieva et al., 2017 | adult | New Zealand | Georgieva et al., 2017 | - | - | - | KY436401-KY436404 |
| *Echinoparyphium mordvilkowi* Skrjabin, 1915 | redia | Lithuania | Staneviciute et al., 2015 | KJ542642 | - | - | - |
| *Echinoparyphium aconiatum* Dietz, 1909 | cercaria | Czech Republic | Tkach et al., 2016 | KT956912 | - | - | - |
| cercaria | Finland | Kostadinova et al., 2003 | - | - | - | AY168945-AY168947 |
| *Cathaemasia hians* Rudolphi, 1809 | cercaria | Czech Republic | Tkach et al., 2016 | KT956947 | - | - | - |
| cercaria | Spain | Wilson et al., 2005 | - | AY761146 | - | - |
| *Ribeiroia ondatrae* Looss, 1907 | adult | USA | Tkach et al., 2016 | KT956956 | - | - | - |
| cercaria | USA | Wilson et al., 2005 | - | AY761142 | - | - |
| *Ribeiroia marini* Faust, Hoffman, 1934 | cercaria | Puerto Rico | Wilson et al., 2005 | - | AY761147 | - | - |
| *Rhopalias macracanthus* Chandler, 1932 | adult | USA | Tkach et al., 2016 | KT956959 | - | - | - |
| *Petasiger exaeretus* Dietz, 1909 | adult | Hungary | Cech et al., 2017 | KY284007, KY284009 | - | - | - |
| metacercaria | KY284001 | KY283996-KY283998 | - | - |
| *Petasiger phalacrocoracis* Yamaguti, 1939 | metacercaria | Hungary | Cech et al., 2017 | KY283999-KY284000  KY284004-KY284005 | - | - | - |
| adult | KY284006, KY284008 | - | - | - |
| adult | Ukraine | Tkach et al., 2016 | KT956926 | - | - | - |
| adult | Israel | Dzikowski et al., 2004 | - | AY245709 | - | - |
| metacercaria | Hungary | Molnar et al., 2015 | - | KJ720683-KJ720684  KM972991-KM972993 | - | - |
| - | - | - |
| adult | - | KM972996-KM972997 | - | - |
| *Petasiger radiates* (Dujardin, 1845) Tkach et al., 2015 | adult | Hungary | Cech et al., 2017 | KY284010 | - | - | - |
| adult | Ukraine | Tkach et al., 2016 | KT956927 | - | - |  |
| cercaria | India | Aravindhan et al., 2017b | - | MG183690 | - | - |
| adult | Hungary | Molnar et al., 2015 | - | KM972998-KM973000 | - | - |
| *Petasiger variospinosus* Odhner, 1910 | cercaria | - | Moema et al., 2019 | - | KX034047 | - | - |
| *Neopetasiger islandicus* (Kostadinova, Skirnisson, 2007) | cercaria | Iceland | Georgieva et al., 2012 | - | - | - | JQ425587 |
| redia | JQ425592 | - | - | JQ425588, JQ425590 |
| adult | - | - | - | JQ425589 |
| adult | USA | Tkach et al., 2016 | KT956924 | - | - | - |
| cercaria | Canada | Gordy et al., 2013 | - | - | - | KT831342 |
| *Neopetasiger neocomense* Fuhrmann, 1927 | adult | Czech Republic | Georgieva et al., 2012 | - | - | - | JQ425591 |
| *Isthmiophora melis* Schrank, 1788 | adult | Poland | Hildebrand et al., 2015 | KT359583 | KT359584 | KT359580-KT359581 | - |
| redia, cercaria | UK | Kostadinova et al., 2003 | - | AY168932 | - | AY168948 |
| adult | Ukraine | Tkach et al., 2000 | AF151941 | - | - | - |
| *Chaunocephalus ferox* Rudolphi, 1795 | adult | Ukraine | Greben et al., 2016 | KT447522 | - | - | - |
| *Drepanocephalus spathans* Dietz, 1909 | adult | Mexico | Hernandez-Cruz et al., 2017 | MF351545-MF351546 | KY636237-KY636238  KY636246-KY636261  KY636264  KY636268-KY636269 | - | KY636284-KY636294 |
| cercaria | USA | Griffin et al., 2012 | JN993270 | - | - | - |
| cercaria | Canada | Gordy et al., 2019 | - | - | - | MH368951-MH368952 |
| *Drepanocephalus auritus* Kudlai et al., 2015 | adult | USA | Kudlai et al., 2015 | KP683124 | KP683117-KP683124 | - | - |
| cercaria | USA | Pinto et al., 2016 | - | KP053259-KP053260 | - | KP053262-KP053263 |
| cercaria | USA | Alberson et al., 2017 | - | KY677965-KY677977 | - | KY677939-KY677951 |
| *Drepanocephalus mexicanus* Lamothey Pérez-Ponce de León, 1988 | adult | Mexico | Hernandez-Cruz et al., 2017 | MF351542-MF351544 | KY636239-KY636245  KY636262-KY636263  KY636265-KY636267  KY636270  KY636272-KY636277 | - | KY636280-KY636283  KY636295-KY636298 |
| *Euparyphium capitaneum* Dietz, 1909 | adult | USA | Kudlai et al., 2015 | KP009618-KP009620 | KP009616-KP009617 | - | - |
| adult | Mexico | Hernandez-Cruz et al., 2017 | - | KY636278-KY636279 | - | - |
| *Euparyphium cf murinum* Tubangui, 1931 | adult | Uganda | Tkach et al., 2016 | KT956917 | - | - | - |
| *Euparyphium albuferensis* Esteban et al., 1997 | adult | Spain | Marcilla et al., 2003b | - | AJ564384 | - | AJ564380 |
| Outgroup | | | | | | | |
| *Fasciola hepatica* Linnaeus, 1758 | adult | Saudi Arabia | Olson et al., 2003 | AY222244 | - | - | - |
| adult | Spain | Mas-Coma et al., 2001 | - | AJ272053 | - | - |
| adult | Egypt | Omar et al., 2013 | - | - | AB510491 | - |
| adult | Peru | Gomez-Puerta et al., 2019 | - | - | - | MH681800 |

a Reference are provided in Document S2 (Supporting Information)

b Unpublished