Pterois volitans 正體中文

System: Marine

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Actinopterygii	Scorpaeniformes	Scorpaenidae

Common name scorpion volitans (English), peacock lionfish (English), Indo-Pacific red lionfish (English)

Synonym
Scorpaena volitans , (Linnaeus, 1758)
Pterois zebra , Quoy and Gaimard, 1825
Brachirus zebra , (Quoy and Gaimard, 1825)
Pterois cristatus
Pterois geniserra
Pterois muricata
Gasterosteus volitans

Similar species *Pterois miles*

Summary The Indo-Pacific red lionfish (*Pterois volitans*) is a beautiful but dangerous tropical fish that has spread to new marine environments through the aquarium trade. The lionfish has invaded the Northwestern Atlantic and the Caribbean in one of the most rapid marine finfish invasions in history. In some areas, it has the potential to displace commercially important species such as the grouper and reduce recruitment of juvenile fishes, which in turn disrupts marine ecosystem processes.

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Species Description
Pterois volitans has elongated venomous dorsal fin spines and anal fin spines. It has 13 dorsal spines, 10 to 11 dorsal soft rays, 3 anal spines, 6 to 7 anal soft rays. Coastal populations are generally darker, sometimes almost black in estuaries (FishBase 2006). The membranes of fins are often spotted. The body is white or cream coloured with red to reddish-brown vertical stripes. The vertical stripes alternate from wide to very thin and sometimes merge along the flank to form a V (Schofield and Fuller 2006). The maximum length of an adult is 38cm (FishBase 2006) and the maximum body weight is 1.1kg to 1.2kg (Fishelson 1997). Reports of a 43cm individual have been obtained in its introduced range.

Notes
Lionfish comprises a species complex whose native range encompasses the Red Sea, the Indian Ocean and the western Pacific (Schultz 1986, in González *et al*. 2009). While traditional taxonomy indicates that *P. volitans* (Linnaeus 1758) and *Pterois miles* (Bennett 1828, in González *et al*. 2009) (devil firefish) comprise two different valid species (Schultz 1986, in González *et al*. 2009), recent molecular studies suggest that there is uncertainty in determining whether the two entities represent species or populations (Kochzius *et al*. 2003, Whitfield *et al*. 2007, in González *et al*. 2009). This species profile focuses on information on *Pterois volitans*; information on *P. miles* is included where appropriate.

Lifecycle Stages
Larval stage descriptions for *Pterois miles* and *P. volitans* are incomplete with only one report by Imamura and Yabe (1996, in Morris *et al*. 2008) describing five *P. volitans* larvae collected off northwestern Australia. Scorpaenid larvae exhibit two morphologically distinct groups characterized as “morph A” and “morph B”; pteroine larvae are grouped among the morph B morphotypes, whose traits include: large head, relatively long and triangular snout, long and serrated head spines, robust pelvic spine, and pigment confined to the pectoral fins and postanal ventral and dorsal midlines (Leis and Rennis 2000, Washington *et al*. 1984, in Morris *et al*. 2008). *Pterois* sp. meristic characters are reported as 12 to 13 dorsal spines, 9 to 12 dorsal rays, three anal spines, 5 to 8 anal rays, 12 to 18 pectoral rays, one pelvic spine, five pelvic rays and 24 vertebrae (Imamura and Yabe 1996, Leis and Rennis 2000, in Morris *et al*. 2008).\n\n
The size of *P. miles* or *P. volitans* larvae at hatching is unmeasured, but is likely to be approximately 1.5 mm based on reports for *P. lunulata* (Mito and Uchida 1958, Mito 1963, in Morris *et al*. 2008). The specific planktonic larval duration of lionfish is also unknown, although it is estimated to be between 25 to 40 days based estimates for *Scorpaena* (Laidig and Sakuma 1998, Hare and Whitfield 2003, in Morris *et al*. 2008).

Uses
Pet/aquarium trade: The red lionfish is a popular species among tropical fish enthusiasts (Schofield and Fuller 2006). \n\n
Fisheries: Commercial fisheries of red lionfish exist in the lionfish’s native range (FishBase 2006) and it is reportedly a viable commercial species in its introduced range also, although encouraging such fisheries may encourage the intentional dispersal of the fish (see Management Information). \n\n
Bioprospecting: Work by Sri Balasubashini and colleagues (2006a, 2006b, in Morris *et al*. 2008) indicated that lionfish (*P. volitans*) venom produces antitumor, hepatoprotective, and antimetastatic effects in mice suggesting a promising application for cancer research.

Habitat Description
Pterois volitans is a tropical marine fish which usually occurs in waters with temperatures of between 22°C and 28°C. Lower temperature ranges have been observed in the USA (14°C to 24°C) (Meister *et al*. 2005). The depth range of this species is 10 to 175 meters (Schofield & Fuller 2006). The red lionfish favours coral reefs and rocky outcrops (DaCosta-Cottam *et al*. 2009), although it has been observed over coral patches, near sandy bottoms and in mangrove, seagrass and even canal habitats (Schofield 2009; González *et al*. 2009). It is also found in lagoons and harbours (FishBase 2006). It hides in unexposed places during the daytime often with its head down, practically immobile. \n
Richter (2009) hypothesises that the range of the lionfish will reach the Gulf of Mexico and expand south along the eastern coast of South America until it reaches a southern latitude where it cannot tolerate low temperatures (Hare and Whitfield 2003, in Richter 2009). The southernmost sighting has been in Columbia, though there is potential for the lionfish to extend past that (Schofield 2009, in Richter 2009). The northern limit of the range is North Carolina; a functional expansion northward is unlikely unless the lionfish population undergoes a rapid evolution to thermal tolerance; some juveniles have been seen as far north as Long Island Sound, although they cannot become established due to cold winters (Richter 2009). Temperature is a possible factor limiting; the mean chronic lethal minimum is 10°C and the mean temperature of feeding cessation is 16°C, indicating that the lionfish might over-winter on the southeast United States continental shelf, with a northern limit of Cape Hatteras (Kimball *et al*. 2004).

Reproduction
Lionfish reach sexual maturity at around 18cm or 140g to 160g (approximately 1 to 2 years of age); they are external fertilizers that produce a pelagic egg mass following a courtship and mating process (Fishelson 1997; Florida Museum of Natural History 2006; DaCosta-Cottam *et al*. 2009). Reportedly females may produce up to 30 000 eggs a month, each of which will hatch in four days. The Pteroines, including *P. miles* and *P. volitans*, are gonochoristic; males and females exhibit minor sexual dimorphism only during reproduction (see Fishelson 1975, in Morris *et al*. 2008). Lionfish courtship has been well described by Fishelson (1975, in Morris *et al*. 2008) who provided a detailed description for the pigmy lionfish (*Dendrochirus brachypterus*) and reported similar courtship behaviors for *Pterois* spp. According to Fishelson, lionfish courtship, which includes circling, side winding, following, and leading, begins shortly before dark and extends well into nighttime hours; following the courtship phase, the female releases two buoyant egg masses that are fertilized by the male and ascend to the surface; the eggs and later embryos are bound in adhesive mucus that disintegrates within a few days, after which the embryos and/or larvae become free floating. \n\n
P. miles and *P. volitans* ovarian morphology is similar to that reported for *D. brachypterus* (Fishelson 1978, in Morris *et al*. 2008) in that these fishes exhibit cystovarian type ovaries (Hoar 1957, in Morris *et al*. 2008) with ooctyes developing on stalks or peduncles. The oocytes are terminally positioned near the ovary wall, which secretes the encompassing mucus shortly before spawning. \n\n
The seasonality of lionfish reproduction throughout their native range is unknown; invasive lionfish collected off North Carolina and in the Bahamas suggests that lionfish are reproducing during all seasons of the year (Morris *et al*. 2008).

Nutrition
Pterois volitans is an ambush predator that preys on small and juvenile fish, crustaceans (crabs and shrimps), molluscs and isopods. Lionfish are relatively quick to adapt to novel prey types, and quickly learn to avoid toxic prey (Fishelson 1997); in its invaded system in Caribbean reef ecosystems it uses its oversized, ornate pectoral fins to herd and ambush small reef fishes and crustaceans (Albins & Hixon 2008; Albins 2008). Analysis of gut contents and aquarium feeding trials confirm that the lionfish preys on a wide variety of native animals, including bony fishes and crustaceans, and that lionfish are capable of consuming large numbers of prey and large-sized prey relative to their body size (Albins 2008). For example, analysis of gut contents of 291 lionfish caught off the coast of Quintana Roo, Mexico, revealed the following prey items: bluehead wrasse, yellowhead wrasse, clown wrasse, creole wrasse, lizard fish, filefish, cardinal fish, blue chromis, brown chromis, fairy basslet, peppermint basslet, masked goby, goldspot goby, glass goby, rusty goby, spotted goatfish, trumpet fish, Spanish hogfish, spotted goatfish, slender filefish, redband parrot fish, hamlet fish, octopus, banded coral shrimp and night shrimp (D. Ponce-Taylor Pers. Comm.; Y.G. Hernandez Pers. Comm.). Assessments of invasive lionfish feeding suggest that lionfish are largely piscivorous, but also feed on a number of crustaceans; the particular taxa of highest importance in invasive lionfish diet will likely vary by habitat type and prey availability (Morris *et al*. 2008). A diet study of Bahamian lionfish was conducted by Morris and Akins (In Press) that showed that lionfish primarily eat teleost fishes (they documented 41 species in 21 families) as well as some crustaceans (about 15% of the diet by volume) (in Schofield 2009). \n
In the Red Sea, individuals of the closely related *P. miles* were reported to feed on assorted taxa of benthic fishes including damselfish, cardinal fish, and anthias (Fishelson 1975 1997, in Morris *et al*. 2008). However, in the Pacific Ocean, *P. lunulata* were observed to feed primarily on invertebrates including penaeid and mysid shrimps (Matsumiya *et al*. 1980, Williams and Williams 1986, in Morris *et al*. 2008). \n\n
Lionfish stomachs can expand over 30 times in volume when consuming a large meal; lionfish are capable of long-term fasting and are able to withstand starvation for periods of over 12 weeks without mortality (Fishelson 1997, in Morris *et al*. 2008). Lionfish (ranging from 30 to 300g) consume approximately 2.5% to 6% of their body weight per day (at 25°C to 26°C) in their native range; adults (ranging from 300 to 400 g) consume approximately 8.5 g of prey per day, which translates to 230 kg per year for 80 adult fish on a 1 kilometer stretch of coral reef (Fishelson 1997). Preliminary observations suggest that lionfish in their invaded range consume piscine prey at rates greater than in their native range (Morris *et al*. 2008).

General Impacts
For a detailed account of the environmental impacts of *Pterois volitans* please read: *Pterois volitans* (Indo-Pacific Red Lionfish) Impacts Information. The information in this document is summarised below.\n\nInvasive lionfish are a concern to coastal managers due to their potential threat to fisheries resources, native fish communities and human health (Morris *et al*. 2008).\n\n
Ecosystem change: While few ecological studies have been conducted (but see Albins & Hixon 2008) it is clear that the lionfish's presence in the Caribbean is a worrying one. Lionfish are highly piscivorous and reduce the recruitment of juvenile fishes, which in turn disrupts marine ecosystem processes and reduces reef biodiversity (Albins and Hixon 2008; Morris *et al*. 2008). \n\n
Reduction in native biodiversity: If their populations are allowed to continue growing unchecked, lionfish have the potential to severely reduce reef biodiversity, with the possible extinction of several species; although it is still too early to be definitive, anecdotal evidence from the Bahamas corroborates this premise (Dell 2009).\n\n
Predation: Albins and Hixon (2008) showed that lionfish can drastically reduce recruitment of native fishes on small patch reefs in the Bahamas. They are potentially capable of decimating indigenous reef fish populations in the Caribbean due to their lack of natural predators and voracious appetite (Valdez Mascari & Aguiar 2009). \n\n
Competition: Not only do lionfish consume large quantities of juvenile fish (such as grouper and yellow-tail snapper) but they also out-compete native species (such as scamp, gag, and yellow-mouth grouper) for food (Morris *et al*. 2008; Dell 2009). \n\n
Economic/Livelihoods: In addition, by reducing populations of commercially important species such as grouper (Albins and Hixon 2008) they may as a consequence damage the economy of island communities which are dependent on such fishing industries. \n\n
Human health: Lionfish are venomous with their spines containing apocrine-type venom glands (Morris *et al*. 2008). Lionfish venom has been found to cause cardiovascular, neuromuscular, and cytolytic effects ranging from mild reactions such as swelling to extreme pain and paralysis in upper and lower extremities (Kizer *et al*. 1985, in Morris *et al*. 2008). The toxin in lionfish venom contains acetylcholine and a neurotoxin that affects neuromuscular transmission (Cohen and Olek 1989, in Morris *et al*. 2008). Lionfish spines can prove dangerous to divers, snorkelers and aquarium enthusiasts (Morris *et al*. 2008; Schofield 2009). Stings are not fatal, but intensely painful and often requiring hospitalisation (Morris *et al*. 2008). Lionfish stings can be treated by heating the afflicted part in hot water (to 45° C) for 30 to 90 minutes and applying corticoids to the area (FishBase 2006); medical attention should be sought immediately (Cayman Islands Government Undated).

Management Info
For a detailed account of managment of *Pterois volitans* please read: *Pterois volitans* (Indo-Pacific Red Lionfish) Management Information. The information in this document is summarised below.\n\n
Preventative measures: Where the lionfish has not yet become properly established, preventative controls may include education of fishermen and other locals and encouraging the public to kill the fish on-sight and record positional data (Richter 2009). Some countries have urged recreational divers and snorkelers to record locations of lionfish sightings; other governments and programs have given monetary incentives to fishermen to catch and record positional data of lionfish (REEF 2009, in Richter 2009). \n\n
Monitoring: Determining the extent of the lionfish invasion is necessary for effective management (Richter 2009). Organizations such as the Reef Environmental Educational Foundation (REEF) and the United States Geographical Survey-Nonindigenous Aquatic Species (USGS-NAS) have collected data of GPS locations, dates, water depth, and locality description of lionfish sightings (Richter 2009).\n\n
Biocontrol: Groupers, a known natural predator of the lionfish, could hold the key to controlling this invasive species, however, this remains uncertain and unfortunately Atlantic populations of grouper are suffering from over-fishing (IUCN 2009). There is hope that through the establishment of Marine Protected Areas (MPAs) sufficient levels of groupers will return, providing an effective and natural means to control lionfish (IUCN 2009).\n
Physical: In order to control and manage the lionfish invasion, culling programs have been introduced in the Cayman Islands, Bermuda and the Bahamas (*4th UK CBD Report* 2009; Adam-Whitmore 2009). \n\n
Integrated Pest Management: \nAlthough bio-economic evaluations are necessary to determine the most effective management scheme, Richter (2009) suggests the establishment of a lionfish fishery may prove to be effective (Richter 2009). With the advent of an invasive species fishery, there are certain precautions, however; with the introduction of a potentially economically viable fishery, there lies the risk that people who reap the economic benefits may seek to maintain wild populations of the lionfish (Carlton, Pers. Comm., in Richter 2009).

Pathway
Eggs and larvae of the red lionfish may be transported via ballast water (Whitfield 2002).

Principal source:

Compiler: National Biological Information Infrastructure (NBII) & IUCN/SSC Invasive Species Specialist Group (ISSG)
Updates with support from the Overseas Territories Environmental Programme (OTEP) project XOT603, a joint project with the Cayman Islands Government - Department of Environment

Review:

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ALIEN RANGE

[3] ATLANTIC - WESTERN CENTRAL
[1] BARBADOS
[1] BERMUDA
[4] CAYMAN ISLANDS
[4] COLOMBIA
[2] CUBA
[1] DOMINICAN REPUBLIC
[1] HAITI
[1] JAMAICA
[12] MEXICO
[2] BAHAMAS
[1] BELIZE
[1] BES ISLANDS (BONAIRE, SINT EUSTATIUS AND SABA)
[1] COASTS OF THE CARIBBEAN
[2] COSTA RICA
[1] CURACAO
[1] GREATER ANTILLES
[1] HONDURAS
[1] LESSER ANTILLES
[1] NICARAGUA

[1] PANAMA
[1] TURKS AND CAICOS ISLANDS
[1] VENEZUELA
[1] WEST INDIES

[1] PUERTO RICO
[23] UNITED STATES
[2] VIRGIN ISLANDS, U.S.

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Summary: The electronic tool kits made available on the Cefas page for free download are Crown Copyright (2007-2008). As such, these are freeware and may be freely distributed provided this notice is retained. No warranty, expressed or implied, is made and users should satisfy themselves as to the applicability of the results in any given circumstance. Toolkits available include 1) FISK- Freshwater Fish Invasiveness Scoring Kit (English and Spanish language version); 2) MFISK- Marine Fish Invasiveness Scoring Kit; 3) MI-ISK- Marine invertebrate Invasiveness Scoring Kit; 4) FI-ISK- Freshwater Invertebrate Invasiveness Scoring Kit and AmphISK- Amphibian Invasiveness Scoring Kit. These tool kits were developed by Cefas, with new VisualBasic and computational programming by Lorenzo Vilizzi, David Cooper, Andy South and Gordon H. Copp, based on VisualBasic code in the original Weed Risk Assessment (WRA) tool kit of P.C. Pheloung, P.A. Williams & S.R. Halloy (1999).
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Summary: This compilation of information sources can be sorted on keywords for example: Baits & Lures, Non Target Species, Eradication, Monitoring, Risk Assessment, Weeds, Herbicides etc. This compilation is at present in Excel format, this will be web-enabled as a searchable database shortly. This version of the database has been developed by the IUCN SSC ISSG as part of an Overseas Territories Environmental Programme funded project XOT603 in partnership with the Cayman Islands Government - Department of Environment. The compilation is a work under progress, the ISSG will manage, maintain and enhance the database with current and newly published information, reports, journal articles etc.

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Summary: In 1993, Canada, Mexico and the United States signed the North American Agreement on Environmental Cooperation (NAAEC) as a side agreement to the North American Free Trade Agreement (NAFTA). The NAAEC established the Commission for Environmental Cooperation (CEC) to help the Parties ensure that improved economic efficiency occurred simultaneously with trinational environmental cooperation. The NAAEC highlighted biodiversity as a key area for trinational cooperation. In 2001, the CEC adopted a resolution (Council Resolution 01-03), which created the Biodiversity Conservation Working Group (BCWG), a working group of high-level policy makers from Canada, Mexico and the United States. In 2003, the BCWG produced the &#65533;Strategic Plan for North American Cooperation in the Conservation of Biodiversity.&#65533; This strategy identified responding to threats, such as invasive species, as a priority action area. In 2004, the BCWG, recognizing the importance of prevention in addressing invasive species, agreed to work together to develop the draft CEC Risk Assessment Guidelines for Aquatic Alien Invasive Species (hereafter referred to as the Guidelines). These Guidelines will serve as a tool to North American resource managers who are evaluating whether or not to introduce a non-native species into a new ecosystem. Through this collaborative process, the BCWG has begun to implement its strategy as well as address an important trade and environment issue. With increased trade comes an increase in the potential for economic growth as well as biological invasion, by working to minimize the potential adverse impacts from trade, the CEC Parties are working to maximize the gains from trade while minimizing the environmental costs. Available from: English version: http://www.cec.org/Storage/62/5516_07-64-CEC%20invasives%20risk%20guidelines-full-report_en.pdf [Accessed 15 June 2010]
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Summary: Abstract: The presence of the fish *Pterois volitans* (Linnaeus, 1758) in Cuban waters is confirmed. This invasive species has been recorded since 2000 in the East coast of United States, Bermudas and Puerto Rico. About its introduction there are several hypothesis, but the most probable seems o be the releasing into the ocean by aquarists. In this paper we provide areas in the Cuban archipelago where it have been collected or observed. Confirmed. This invasive species has been recorded since 2000 in the East coast of United States, Bermudas and Puerto Rico. About its introduction there are several hypothesis, but the most probable seems o be the releasing into the ocean by aquarists. In this paper we provide areas in the Cuban archipelago where it have been collected or observed.

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Summary: English:
The species list sheet for the Mexican information system on invasive species currently provides information related to Scientific names, family, group and common names, as well as habitat, status of invasion in Mexico, pathways of introduction and links to other specialised websites. Some of the higher risk species already have a direct link to the alert page. It is important to notice that these lists are constantly being updated, please refer to the main page (http://www.conabio.gob.mx/invasoras/index.php/Portada), under the section Novedades for information on updates.
Invasive species - fish is available from: http://www.conabio.gob.mx/invasoras/index.php/Especies_invasoras_-_Peces [Accessed 30 July 2008]
Spanish:
La lista de especies del Sistema de informaci&#65533;n sobre especies invasoras de m&#65533;xico cuenta actualmente con informaci&#65533;n aceca de nombre cient&#65533;fico, familia, grupo y nombre com&#65533;n, as&#65533; como h&#65533;bitat, estado de la invasi&#65533;n en M&#65533;xico, rutas de introducci&#65533;n y ligas a otros sitios especializados. Algunas de las especies de mayor riesgo ya tienen una liga directa a la p&#65533;gina de alertas. Es importante resaltar que estas listas se encuentran en constante proceso de actualizaci&#65533;n, por favor consulte la portada (http://www.conabio.gob.mx/invasoras/index.php/Portada), en la secci&#65533;n novedades, para conocer los cambios.
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