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Inia geoffrensis, Amazon River Dolphin

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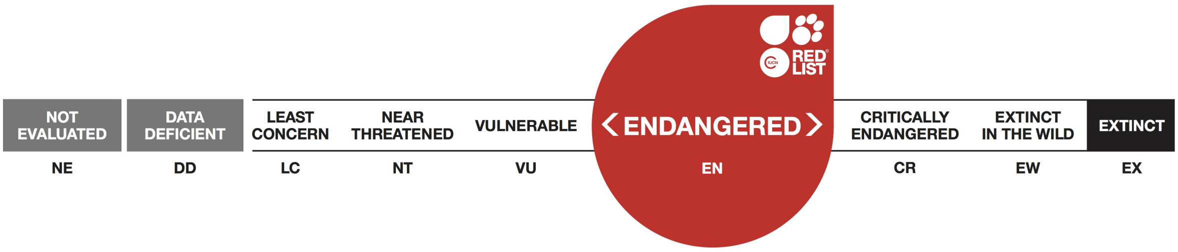

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Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Mammalia	Cetartiodactyla	Iniidae

Taxon Name: *Inia geoffrensis* (Blainville, 1817)

Common Name(s):

- English: Amazon River Dolphin, Pink Dolphin
- French: Dauphin De L'Amazone, Dauphin Rose
- Spanish: Bufeo, Delfin Rosado, Tonina

Taxonomic Source(s):

Committee on Taxonomy. 2017. List of marine mammal species and subspecies. Available at: www.marinemammalscience.org. (Accessed: 31 August 2018).

Taxonomic Notes:

This assessment follows the Society for Marine Mammalogy's Committee on Taxonomy (2017) which recognizes a single species in the genus, *Inia geoffrensis*, the Amazon River Dolphin, with two subspecies: *I. g. boliviensis* (d' Orbigny 1834), the Bolivian Bufeo, and *I. g. geoffrensis* (Blainville 1817), the Common Boto. The Bolivian Bufeo occurs in the Iténez-Guaporé, Mamoré, and Rio Grande River basins in Bolivia (Tavera *et al*. 2010) and along almost the entire length of the Madeira River in Brazil (Gravena *et al*. 2014a,b). The Common Boto occurs in the Amazon River system of Brazil, Peru, Ecuador, and Colombia, in the Araguaia-Tocantins River system in eastern Brazil which has no connection to the Amazon River basin (Hrbek *et al*., 2014, Siciliano *et al.* 2016a), and in the Orinoco Basin of Venezuela and Colombia (Best and da Silva 1989b, Trujillo *et al*. 2010a). To emphasize the taxonomic uncertainty concerning how many species should be recognized in the genus, and the fact that these dolphins inhabit several river basins in addition to the Amazon*,* this assessment does not use the common name Amazon River Dolphin but instead uses the genus name *Inia*.

A new species *I. boliviensis* (d'Orbigny 1834) was described from a specimen collected in the Rio Itenez (or Guapore in Brazilian Portuguese) near or at Forte Principe da Beira, Brazil. This putative species also occurs in rivers in Cochabamba, Santa Cruz, Beni, and Pando Departments of the Bolivian Amazon basin and in the Madeira River of Brazil. It does not overlap with other *Inia* populations in several morphological characters including rostral length, and it has significant differences in the number of teeth (da Silva 1994). The *boliviensis* form is considered to have been reproductively isolated by a long series of rapids for an estimated 3.1 million years (Hollatz *et al*. 2011). Mitochondrial DNA (mtDNA) and nuclear introns have been interpreted as suggesting that these dolphins are on a separate evolutionary trajectory and therefore may deserve recognition as a phylogenetic species (Banguera-Hinestroza *et al.* 2002, Ruiz-García *et al.* 2008). However, Gravena *et al.* (2014a,b), with better sampling of the Madeira River system above and below the Teotônio Rapids (the proposed barrier to movement of individuals and gene flow), found that these rapids did not appear to obstruct gene flow from the upstream to the downstream population. Gravena *et al.* (2015) nevertheless concluded that *Inia* along the Madeira River possess the unique mtDNA of the putative species *I. boliviensis* (one line of evidence for recognizing species-level difference), and they argued that even if there is hybridization in the contact zone in the

Madeira River, *Inia* below Teotônio remain distinct and follow an independent evolutionary path.

The nominal species *Inia araguaiaensis* was described from the Araguaia-Tocantins River basin (Hrbek *et al*. 2014), which is not connected to the Amazon River basin. Examination of tissue samples and osteological material from the Araguaia River and from Marajó Island revealed diagnostic molecular and morphological characters that justified separation of *I. araguaiaensis* from its proposed sister taxon (*I. geoffrensis*) from the Amazon Basin (Hrbek *et al.* 2014, Siciliano *et al.* 2016b). These dolphins are also known from the Guamá River. The Committee on Taxonomy (2017) reasoned that because Hrbek *et al.* (2014) only examined samples from two extremes of the distribution of *Inia* it was unclear if the molecular differences observed represented real species-level separation. In addition, the Committee concluded that diagnostic osteological differences were based on the examination of very few specimens (only two for the nominal species and nine for *I. geoffrensis)* and did not account for effects of the significant sexual dimorphism. A few more specimens were examined by Siciliano *et al.* (2016b) confirming the findings of Hrbek *et al*. (2014) and expanding the distributional limits of the taxon to 500km further north. Additional research is needed to clarify the taxonomic status of *I. araguaiaensis,* and dolphins in the Araguaia-Tocantins River basin are grouped with *I. geoffrensis* in the present assessment.

Assessment Information

Red List Category & Criteria:	Endangered A2acd+3cd+4acd ver 3.1
Year Published:	2018
Date Assessed:	June 21, 2018

Justification:

Inia was listed on the IUCN Red List as Vulnerable in 1996. This was changed to Data Deficient in 2008 because the information available on threats, ecology, and population numbers and trends was "limited" (Reeves *et al*. 2011). However, improved information on all of these aspects is now available and it is clear that the species qualifies for a threatened category.

Although it has long been recognized that *Inia* die from entanglement ('bycatch') in fishing gear over much of their range and that their habitat in many areas has been modified and degraded by human activities in addition to fishing (dam construction, port development, mining, ship traffic, etc.), a relatively new threat has emerged since 2000: the deliberate killing of dolphins for bait in a fishery that expanded rapidly until at least the second decade of this century. That threat has contributed to a precipitous decline in dolphin abundance in the central Brazilian Amazon and a less certain decline in the western Colombian Amazon. These declines, and others inferred or suspected elsewhere in the species' range, are directly due to human activity, and since the human population in Amazonia, Orinoquia, the Tocantins River basin (which includes the Araguaia River), and the rest of *Inia*'s range is growing rapidly and fisheries that cause dolphin mortality, either accidentally (bycatch) or deliberately (killing to obtain bait) are likely to continue not only in Brazil but also in the other range states, there is no reason to expect the pressures on the species to diminish unless major changes are made in the political, economic, and human demographic landscape.

In a closely monitored index area within the 11,240 km² Mamirauá Reserve (Brazil), the *Inia* population was estimated to have declined by 70.4% over the last 22 years (da Silva *et al*. 2018), a period of slightly less than one generation (24.8 years; Moore *et al*. 2018). The authors and reviewers of this assessment discussed in detail whether extrapolation of a similar decline rate to other parts of the species range would be justified. The only other area with quantitative data on trend is in the Amazon mainstem near the Colombia-Peru border, where Williams *et al*. (2016) found evidence suggestive of a decline in abundance between 1993 (well before the direct killing for bait is believed to have begun) and 2007. Although there are no credible estimates of abundance or trend in the vast majority of the species' range, an overall decline of at least 50% in the total rangewide population over the 75-year (3-generation) period beginning around 2000 is plausible.

The two areas for which trends are available together represent a very small proportion of the species' total range. However, the likely primary causes of the declines in those areas – directed hunting for bait and as retaliation for perceived competition for fish resources, and accidental mortality due to human fishing practices – are present throughout much of the range of *Inia*. Other persistent threats that are likely to influence the species' conservation status include habitat fragmentation due to dams and other forms of water basin management, pollution, and a reduction in the availability of prey due to competition with humans. Unfortunately, there is no reason to expect documentation of absolute abundance and trends, or the true scale of the threats facing *Inia*, to become available in the immediate future or even in coming decades, and this makes precautionary reasoning in the assessment of status particularly appropriate.

Based on the above and the other evidence summarized below, it is concluded that *Inia* is Endangered due to a suspected reduction of 50% or more in total population size over a period of three generations (75 years) that includes the past and the future (from 2000, when directed killing for bait began to proliferate, to 2075): criterion A4. There is evidence of (i) declines in abundance (subcriterion a); (ii) population fragmentation and the deterioration of habitat quality as a result of water basin management (e.g., dam construction), human demographic changes, and economic development (subcriterion c); and (iii) exploitation – i.e., directed hunting to obtain bait and for predator control, together with incidental mortality in fishing gear (subcriterion d). All of the causes of the suspected reduction in population size are continuing and some of them (those related to subcriterion c in particular) may not be reversible due to the increasing human population and the associated increase in demand for resources throughout most of the species' range.

It is emphasised that if the decline rate estimated for the small part of the central Amazon region (Mamirauá area) were representative of the entire range of *Inia*, and if declines were to persist, the species would qualify for Critically Endangered. Because of this possibility, the status should be reconsidered as soon as ongoing research provides improved documentation of trends in population size and extent and severity of threats (e.g., bycatch and killing of dolphins for bait). Also, separate assessments of subspecies and subpopulations, regardless of the clarity of their taxonomic status, is strongly encouraged.

Previously Published Red List Assessments

2011 – Data Deficient (DD)
http://dx.doi.org/10.2305/IUCN.UK.2011-1.RLTS.T10831A3220342.en

2008 – Data Deficient (DD)

1996 – Vulnerable (VU)

1994 – Vulnerable (V)

1990 – Vulnerable (V)

1988 – Vulnerable (V)

Geographic Range

Range Description:

Inia occur throughout the Amazon and Orinoco river basins in Brazil, Bolivia, Colombia, Ecuador, Peru, and Venezuela, from the deltas upstream to where impassable rapids, waterfalls, lack of water, and possibly low temperatures block their movement (Best and da Silva 1989a,b). In Brazil, they have been recorded in the central region, in the Araguaia-Tocantins River basin and in several tributaries such as the das Mortes and Verde, Paranã, Vermelho, Peixe, Crixas-Açú, and Água Limpa rivers and the dos Tigres and Rico lakes, all in the state of Goiás. They occur in Lake Montaria in the state of Mato Grosso, the Araguaia-Tocantins River basin, as well as mangrove habitats in Marajó Bay (Araújo and Wang 2012, Araújo and da Silva 2014, Hrbek *et al*. 2014, Siciliano *et al*. 2016a,b). *Inia* have also been observed in the following rivers and tributaries of the Amazon basin in Brazil – Juruá, Purus, Madeira, Tapajós, Xingu (only below Belo Monte falls), Içá, Caquetá-Japurá, Negro-Branco and Trombetas. In addition, in Brazil they have been reported along the Madeira mainstem above and below the Teotônio rapids (Gravena *et al.* 2014a). In Bolivia, they have been reported from the Beni (and Orton tributaries), Iténez or Guaporé (the Brazilian name) Basin (Verde, Machupo and Iporuporé tributaries), and Mamoré Basin and its tributaries -- Pirai, Grande, Ichilo, Chapare, Ibaré, Matucaré, Tijamuchi, Apere, Yacuma, and Yata (Pilleri and Gihr 1977, Aliaga-Rossel *et al.* 2006, Aliaga-Rossel 2010). In Colombia, they occur in the Orinoco and Amazon systems – in the Caquetá-Japurá River, from the Araracuara rapids to the mouth of the Apaporis River at the border with Brazil, the Putumayo-Içá River from Puerto Leguizamo to the east, and in the Amazon River. In the Orinoco, they are found in the rivers Meta, Arauca, Casanare, Bita, Vichada, Tomo, Tuparro, Orinoco, Guaviare (and the Guayabero affluent), Inírida, and Atabapo. *Inia* have been seen crossing the first set of rapids at Puerto Ayacucho (Atures-River Orinoco) during high water as well as the Cordoba rapids in the Caquetá River during low water (Trujillo *et al.* 2010c). In Ecuador, they are widely distributed in the main rivers and some lacustrine systems at elevations below 260 m in the rivers Payamino (near Napo River), Napo, Pastaza, Tigre, and Santiago (Best and da Silva 1993, Trujillo and Diazgranado 2002, Utreras *et al*. 2013). In the Ecuadorian Amazon, the only important river system in which *Inia* have not been recorded is the Morona River (Utreras 2001). In Peru, they can be found in the Ucayali and Marañon (and Samiria affluent) tributaries flowing generally north, and in the Napo, Tigre, and Pastaza tributaries flowing generally south (partial list from Best and da Silva 1989a,b; Leatherwood 1996, McGuire and Aliaga-Rossel 2010, Campbell *et al*. 2017). In Venezuela, they occur in the Orinoco system – in the delta region upstream at Ciudad Bolivar, Caicara del Orinoco, and near Puerto Ayacucho as well as in the Apure, Portuguesa, Guanare, Guaritico, Capanaparo, Cinaruco, and Caura rivers (Portocarrero-Aya *et al.* 2010). They occur in the Cassiquiare Canal, which connects the Orinoco with the Negro River (a tributary of the Amazon in Brazil), and also above and below the two sets of rapids at Puerto Ayacucho, which may (or may not) separate the Amazon and Orinoco populations (as summarized in Pilleri and Gihr 1977, Best and da Silva 1989a,b; Meade and Koehnken 1991).

The map shows where the species occurs or may occur. States for which confirmed records of the species exist are included in the list of native range states.

Country Occurrence:

Native: Bolivia, Plurinational States of; Brazil; Colombia; Ecuador; Peru; Venezuela, Bolivarian Republic of

Distribution Map

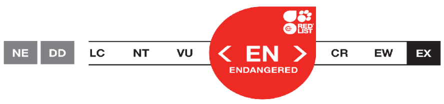
Inia geoffrensis

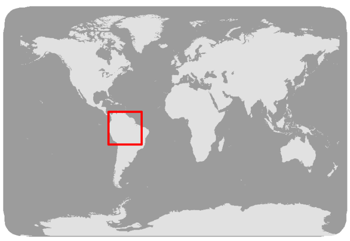
Range

Extant (resident)

Compiled by:

IUCN (International Union for Conservation of Nature)





The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

Population

There is limited information on population structure of *Inia* throughout their range. The taxonomy is not completely resolved and the taxonomic status of the currently recognized subspecies *I. g. boliviensis* and the putative new species *I. araguaiaensis* needs further evaluation.

There is no range-wide estimate of abundance or trends in abundance. Surveys have been conducted since 1979 in various areas within the species' range in Bolivia, Brazil, Colombia, Ecuador, Peru, and Venezuela. Some of these studies resulted in estimates of abundance for relatively small areas. The estimates varied from a few dozen to a few thousand individuals (e.g., Vidal *et al*., 1997, Gómez-Salazar *et al.* 2012b, Pavanato *et al.* 2016, Williams *et al.* 2016) depending on the size of the survey area, but the interpretation of these estimates in the context of this assessment is difficult given potential biases associated with the different survey methods used and the limited understanding of the movements and the population structure of the species across different parts of its range including the entire Amazon system, the Araguaia-Tocantins system, and the Orinoco system. A multi-season survey of dolphins in the 11,240 km² Mamirauá reserve between 1999 and 2001 (i.e., before the rapid decline referred to below) estimated *Inia* abundance at 13,000 (Martin and da Silva 2004a). A range-wide program to estimate abundance was carried out from 2006 to 2016, involving 26 expeditions and covering nearly 28,000 km of rivers in all range states. Some of the results of this program revealed that density was low in rivers in Ecuador and in parts of the Orinoco River whereas densities were relatively high in rivers such as the Itenez/Guaporé at the border of Brazil and Bolivia and the Samiria River in Peru (Gómez-Salazar *et al.* 2012a,b; Pavanatto *et al*. 2016, Williams *et al.* 2016).

Trends in abundance have been assessed in only two small geographical locations (relative to the vast total range of the species), as follows. Standardized transect surveys were conducted in the Amazon River in Colombia in 1993 (covering 259.7 km²) (Vidal *et al.* 1997), 2002 (276.7 km²) (Gómez-Salazar *et al.* 2012a,b), and 2007 (592.6 km²). In analysing these data, Williams *et al*. (2016) used a Bayesian framework to estimate the probability of a decline conditional on a range of priors for process variance to accommodate the fact that the data were collected from three independent survey programs rather than from a single coordinated program, and as a way of attempting to account for uncertainty associated with seasonal movements. The probability of a decline was estimated to be greater than 0.75. A bootstrapped regression analysis to estimate the rate of decline revealed "no compelling evidence of population growth or decline for this species using this method."

Standardized transect surveys conducted monthly since 1994 in the Brazilian Amazon (in and around the 11,240 km² Mamirauá Sustainable Development Reserve) revealed that between 2000 (the year in which a rapidly expanding fishery for the Piracatinga (*Calophysus macropterus)*, a species of economically valuable catfish, using dolphin carcasses as a source of bait began in Brazil) and January 2017 there was an annual average rate of decline in *Inia* encounters of 6.7% (95% confidence interval 5.7-7.7%) in the Mamirauá study area, which implies a halving of the population each decade (da Silva *et al.* 2018). Further exploration of these data revealed that the overall decline between 2000 and 2017 was driven primarily by a precipitous decline between 2000 and the following decade.

There is evidence that the survival of *Inia* that spend at least some of their time in the Mamirauá study area but range more widely may have been affected by the Piracatinga fishery. Time-dependent models estimated that apparent annual survival rate of dolphins after the first reports of directed hunting

(0.899; standard error (SE) 0.007) was significantly lower than in years prior to the hunting (0.968; SE 0.009). This decline in apparent survival suggests that current (or at least recent) removal rates exceed conservation limits and are unsustainable (Mintzer *et al*. 2013).

Current Population Trend: Decreasing

Habitat and Ecology (see Appendix for additional information)

The biology and ecology of *Inia* are strongly related to the seasonal variation in water levels (Martin and da Silva 2004b, Martin *et al.* 2004, Gómez-Salazar *et al.* 2012b). Their physical adaptations allow them to swim into the flooded forests in the high-water season (Layne 1958, Best and da Silva 1989a) in search of prey among the roots and trunks of partially submerged trees (da Silva 1984). Mark/recapture studies have shown that some individuals are resident to specific areas year-round (Martin and da Silva 2004a, Gómez-Salazar *et al.* 2011), whereas others move several tens to hundreds of kilometres within the rivers, but there does not appear to be any seasonal migration as such (Martin and da Silva 2004a).

The use of habitat by *Inia* is affected by the water level for all age classes, however habitat preferences differ among age and sex classes (Martin and da Silva 2004b, Mintzer *et al.* 2016). Sexual segregation is common; females with dependent calves spend more time inside the flooded forest and in lakes and small tributaries during the high-water season, while most adult males at any one time occur in the main rivers. The preference of nursing females for lake systems is likely due to factors favourable to calves, such as low current, abundance of small fish, and protection against predation such as by large sharks (Martin and da Silva 2004b). The predominant presence of mother-calf pairs and juveniles in lakes has been observed in much of the species' range (Trujillo 1997, McGuire and Winemiller 1998, Denkinger 2001). Also, Mintzer *et al*. (2016) proposed that bays are important habitat for early life stages due to the high productivity, low current, and availability of ample water during the low-water season. Genetic analyses of control region mitochondrial DNA and microsatellites of samples obtained from the Mamirauá Reserve suggested that females have a restricted distribution while males mediate gene flow among groups (Hollatz *et al*. 2011).

During the low-water season, *Inia* are often concentrated below channel confluences (Best and da Silva 1989a,b, Leatherwood 1996, Vidal *et al*. 1997, McGuire and Winemiller 1998, Leatherwood *et al*. 2000). In the main rivers they occur most often within 150 m of the banks, with lower densities in the centre of large rivers (Martin *et al*. 2004a, Gómez-Salazar *et al.* 2012a). As the water starts rising, their affinity for confluences diminishes, probably because the animals move into appended lakes and flooded forests (Leatherwood *et al*. 2000, Aliaga-Rossel 2002, Martin and da Silva 2004a,b) which become more important habitats during the high-water season due to their high productivity and prey diversity (Martin and da Silva 2004b). When the water is receding, dolphins leave the lakes and the shallow habitats, perhaps in order to avoid getting trapped (Martin and da Silva 2004a,b, Mintzer *et al*. 2016).

Due to intense intraspecific interactions, *Inia* bear marks and scars that have potential for being used in photo-identification studies (Martin and da Silva 2006). However, Trujillo (1994), McGuire and Henningsen (2007), and Gómez-Salazar *et al.* (2014) found that only a small proportion of the population could be identified correctly, not only due to the turbidity of the water, but also because of the behaviour, morphology, and ecological characteristics of the species (McGuire and Henningsen 2007, Gómez-Salazar *et al.* 2014). Great effort is required to obtain accurate data.

Inia feed on more than 43 species of fishes (Best and da Silva 1993, da Silva 2009).

Systems: Freshwater

Use and Trade

Indigenous people in some parts of the Amazon may have hunted *Inia* for food in the past but such hunting is not known to have been common or widespread. There is no market for or frequent use of dolphins for human consumption, at least in the Brazilian Amazon (Alves *et al.* 2012) and in the Orinoco basin (Trujillo *et al.* 2010b).

Since the 1950s and into at least the 1970s, numerous *Inia* were live-captured and exported, mostly to the U.S.A. and Europe (Allen and Neill 1957, Layne 1958, Layne and Caldwell 1964, Caldwell and Caldwell 1989). Two animals went to Japan (Tobayama and Kamiya 1989). Some have also been brought into captivity in South America. In Venezuela, the Valencia Aquarium kept wild-caught dolphins in captivity for display from the 1970s and into at least the mid-1990s (Boede 1990, Boede *et al.* 1998). No live-captures or exports have been reported in recent years.

In markets around Amazonian cities in Brazil, it is possible to find products labeled as being from Botos, such as eyes and genitals, dry or in perfume solutions, to be used as love charms. This is despite the fact that such commercialization of *Inia* products violates Federal law. Recent molecular studies have revealed that these products are mainly either from domestic animals such as pigs and sheep (Gravena *et al.* 2008) or from Guiana Dolphins (*Sotalia guianensis*) from the coasts of Pará and Amapá States that were caught in fishing nets and sold by the fishermen (Santos *et al*. 2018).

Inia have been used as bait in a fishery for a scavenging catfish, the Piracatinga, in Brazil since 2000 (Estupinan *et al.* 2003, da Silva *et al.* 2011). In the Japurá River, on the border with the Mamirauá and Amanã Sustainable Development Reserves, Iriarte and Marmontel (2013a) confirmed 114 Piracatinga fishing events in eight communities during one year, from which 32 events (31%) used dolphins as bait. Near Mamirauá Reserve, on the Solimões River, all interviewed Piracatinga fishermen (N=17) confirmed using dolphins as bait for this activity, while on the Purus River, 70% of 40 Piracatinga fishermen interviewed in 24 communities also confirmed using them as bait (Brum *et al.* 2015). Records of these practices throughout the Amazon mainstem (between Manaus and Tabatinga) and the widespread sale of Piracatinga in the region (Cunha *et al.* 2015) suggest extensive use of *Inia* as a source of fish bait not only in Brazil but also in other parts of the species range (see the Threats section).

Threats **(see Appendix for additional information)**

Longstanding threats to *Inia* include incidental mortality in fishing gear, deliberate killing for fish bait or predator control, damming of rivers, and environmental pollution from organochlorines and heavy metals (see Best and da Silva 1989a,b; da Silva 2009, IWC 2007, Trujillo *et al.* 2010b).

Incidental mortality has not been systematically monitored in most areas but is known to be a major threat throughout the species' range (Best and da Silva 1989b, Trujillo *et al.* 2010b). Similar to other small cetaceans, *Inia* are vulnerable to entanglement in a variety of nets (lampara seine nets, fixed gill nets, drifting gill nets) (Best and da Silva 1993, Martin *et al*. 2004, Siciliano *et al.* 2016a). They also die in drop traps intended to catch large fish or Amazonian Manatees (*Trichechus inunguis*) in the flooded forest in Peru (Reeves *et al.* 1999). Carcasses of dolphins with evidence of fishery involvement have been observed in the Japurá and Amazon rivers and in the Orinoco River basin (Iriarte and Marmontel 2013b, Trujillo *et al.* 2010b). The proportion of carcasses found by observers is believed to be very small because most of them would be expected to be taken by scavengers or disposed of by fishermen within hours of death. In Tefé, at least 176 dolphins were estimated to have died in 2010 due to interactions with fisheries (Brum 2011, Brum and da Silva 2016).

The deliberate killing of *Inia* for use as bait in the Piracatinga fisheries (Estupinan *et al.* 2003, da Silva and Martin 2007, 2017; Gómez-Salazar *et al.* 2008, Trujillo *et al.* 2010b, da Silva *et al.* 2011, Mintzer *et al.* 2013, Iriarte and Marmontel 2013a, Brum *et al.* 2015) is probably the most serious human-caused threat to this species, though incidental drowning in monofilament fishing nets is also likely to cause widespread mortality. The directed hunt, which appears to have begun in Brazil, has been noticed since around 2000 when it was believed to be expanding to other regions. The government of Brazil reported the killing of 354 dolphins in 2006 but this number is thought to be an underestimate because it was solely based on interviews with fishermen (IWC 2007). Estimates of the numbers of dolphins killed are very difficult to obtain, and those that have been attempted have varied between 300 dolphins/year in just one area (Tefé, Brazil) to more than 4,000 dolphins/year for the whole Brazilian state of Amazonas (Serrano *et al.* 2007, da Silva *et al.* 2011, Brum *et al.* 2014). An evaluation of the Piracatinga fishery suggested that almost 1,200 tons of this fish was traded from Brazil to Colombia every year and that a substantial proportion of the catch was made using dolphins for bait. The main market was formerly in Colombia, but for the years 2008-2014 this fish was also sold in the states of Amazonas, São Paulo, Bahia, Minas Gerais, and elsewhere in Brazil under the name of “Douradinha” among others (Flores *et al.* 2008, Trujillo *et al*. 2010b,c; Brum *et al*. 2015, Cunha *et al*. 2015).

Despite a ban on commercial Piracatinga fishing introduced by the Brazilian government in 2015, there is evidence that this activity continues (da Silva and Martin 2017). It is important to emphasize that this directed hunting is in addition to the longstanding problems of bycatch (see above) and control killing (see below) and the directed hunting to obtain bait may be widespread in areas where Piracatinga are common, mainly in areas close to Colombia, the main market center (Trujillo *et al.* 2010b, Brum *et al.* 2015). Killing of dolphins for use as bait has also been confirmed in Venezuela (Aya *et al.* 2010, Diniz 2011) and reported in media and unpublished reports in Peru (F. Trujillo, unpublished data) and Bolivia (M. Escobar-WW, G. Rey Ortiz, C. Coca Mendez, L. Cordova and P.A. Van Damme, pers. comm).

Inia are also killed deliberately in some areas because they damage fishing nets and are regarded as competitors for fishery resources (Reeves *et al*. 1999, Araújo and Wang 2012, Williams *et al.* 2016, Siciliano *et al.* 2016a). At least one dolphin found dead at Tefé Lake, Brazil, had injuries consistent with an intentional human attack (Loch *et al.* 2009). Similar conflicts have been reported in Colombia (Bonilla *et al.* 2008, Trujillo *et al.* 2010b).

Fishing with explosives, although illegal in most countries, was common in some areas of the Amazon Basin. In Venezuela, this practice is still in use and has been reported as a threat to river dolphins due to the concussive effects (Aya *et al.* 2010). Fishermen also reportedly attempt to kill dolphins that are attracted to fishing operations to prey on stunned or dead fish (Best and da Silva 1989a). At least in Peru, fishermen attempt to kill dolphins by injecting live fish with toxins and tossing them into the water near the animals (Reeves *et al.* 1999, McGuire and Aliaga-Rossel 2010). The killing of 22 *Inia* in Caballo Cocha, Peru, was reported in 2008 (F. Trujillo, unpub. data).

Water development projects are another major concern and an increasing threat to *Inia* (Araújo and Wang 2014, da Silva *et al.* 2015, Pavanato *et al*. 2016). In the Brazilian Amazon alone, 91 dams are planned that, if constructed, would flood about 10 million hectares, representing approximately 2% of the Legal Amazon region and about 3% of the Brazilian portion of the Amazon forest. Added to these, 74 dams are already in operation and 31 are under construction. Over 400 dams could be constructed in the Amazon basin eventually (Finer and Jenkins 2012). Despite the high number of operating dams and projects in the Amazon region today and knowing that dolphins occur above and below rapids in some rivers, of the 83 rivers with operating hydroelectric dams in Brazil only 13 had any kind of study involving *Inia* (da Silva *et al*. 2015). Most of these studies have shown that the dams fragmented, isolated, and eliminated connectivity of dolphin populations (da Silva *et al*. 1998, Araújo and Wang, 2014, Pavanato *et al*. 2016). Dams in the Amazon basin, and the Guri and Tocoma dams in the Caroní, an Orinoco tributary, have probably degraded downstream habitat due to their effects on flow and temperature regimes although in the short term, observations of dolphins feeding on concentrations of fish immediately downstream of some dams may be seen as "beneficial," especially if protective measures are better enforced there (Araújo and Wang 2014). Additional dams are bound to restrict dolphin movements, contribute to more fragmentation of populations, and continue to alter and degrade the habitat by opening commercialization networks, improving navigability, and increasing road access (Best and da Silva 1989a, Williams *et al.* 2016).

Chemical contamination is another potential threat to *Inia*. Mercury is often used to separate gold from soil and rock in mining operations along the Amazon. A study of mercury in the sediments and floating plants in the Tucuruí Reservoir in the Tocantins River, Brazil, emphasized the risk of mercury accumulation in the bed of non-flowing waters. Total mercury content in dolphin milk from one individual sampled near the city of Manaus (176 ng/ml = 0.176 ppm) was considered close to the minimum level of methylmercury toxicity in human adults (Rosas and Lehti 1996). Recent evaluations of mercury in river dolphins have been carried out in the Amazon and Orinoco basins. Concentration values of total mercury in river dolphin muscle from the Amazon and Orinoco basins varied from 0.003 to 3.990 $mg.kg^{-1}$ Hg, with the highest values found for *Inia* from the Orinoco (Trujillo *et al*. unpublished data).

High concentrations of organochlorine compounds (DDT, PCB, HCH, HCB, Mirex) and organobrominated compounds (PBDE) were also found in *Inia* samples from different areas of Brazil, including the Solimões, Japurá, Negro, and Madeira rivers (Torres *et al.* 2007, José Lailson pers. comm. 2018). All milk samples (n=62) from dolphins in the Mamirauá Reserve contained evidence of organochlorine accumulation (PCBs were present in 100% of the samples, DDT in 64%, HCHs in 95%, HCB in 64%, and Mirex in 66%) (José Lailson pers. comm. 2018). Pesticide concentrations measured in these samples were similar to those verified in the milk of other aquatic mammals and humans, indicating substantial exposure of calves to organochlorines at a critical developmental stage. The effects of bioaccumulation of mercury and other chemical contaminants in dolphins are unknown but the high levels recorded in the Amazon ecosystem are a reason for concern.

The Tocantins-Araguaia Basin has been significantly altered over the past few decades by dams, deforestation for cattle ranching, logging, road building, and the use of Agent Orange to clear pathways for power lines (Siciliano *et al.* 2016b). In addition, unregulated feeding and touching of wild dolphins by visitors and locals occurs near Mocajuba on the lower Tocantins River (Melo-Santos *et al*. 2015). Human feeding can be a health risk for the dolphins and also increase their risk to vessel strikes.

Conservation Actions (see Appendix for additional information)

In July 2014, the Federal Government of Brazil published a rule (Normative Interministerial n° 6/2014) establishing a five-year moratorium on the fishing and marketing of the Piracatinga in Brazilian waters, effective from January 2015, intended to reduce the pressure on dolphins and other wild species (especially caimans, *Caiman* spp.) used for bait in this fishery (ICMBio-CEPAM 2017, IWC 2016). The report of the annual meeting of the International Whaling Commission's Scientific Committee in 2016 stated the following (IWC 2017:355): "The Ministry of Environment (MMA) is responsible for evaluating the success of the moratorium. A working group was established by the MMA … to define procedures and monitor the fishing and marketing of piracatinga during the moratorium period. … three inspections to assess compliance with the ban were completed in 2016 and included: 'Routine Operation' in the municipalities of Iranduba, Itacoatiara, Manacapurú and Manaus in February, 'Operation Golden Dragon' in the municipalities of Maraã, Tefé and Fonte Boa in March-April and 'Operation Federal Rios' in the municipalities of Jutaí, Tabatinga, Coari, Fonte Boa and Tefé also in March-April." The report went on to note (IWC 2017:355): "Brazil has established a National Action Plan for the Conservation of Small Cetaceans which lists *Inia geoffrensis* as an endangered species. This plan is intended to reduce human impacts and increase knowledge on small cetaceans in Brazil. Furthermore, the Brazil Government is cooperating with Colombia and Peru to support sustainable development of fishing activities. Several meetings and workshops involving these countries have included discussions on the catch and sale of piracatinga." Based on documentation of high levels of mercury in Piracatinga, the government of Colombia announced in August 2017 a permanent ban on the trade of this fish within the country.

The status of *Inia* has been evaluated in different range states during the last 10 years following the IUCN criteria and those national assessments have classified the species as Endangered (Trujillo *et al*. 2006, Aguirre *et al*. 2009, Tirira 2011, Rodríguez and Rojas-Suarez 2015). Additionally, a South American River Dolphins Action Plan (Trujillo *et al*. 2010a) and national action plans has been produced for Bolivia (2012), Ecuador (Utreras *et al.* 2013), and Colombia (Trujillo *et al*. 2014). Action plans for Peru and Venezuela are in preparation. In Colombia, there are also regional action plans for the Orinoco and Amazon basins (Trujillo *et al*. 2008, Mosquera *et al*. 2016). In Brazil, the "National Action Plan for the Conservation of Aquatic Mammals – Small cetaceans" was published in 2011.

Credits

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External Resources

For Images and External Links to Additional Information, please see the Red List website.

Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
5. Wetlands (inland) -> 5.1. Wetlands (inland) - Permanent Rivers/Streams/Creeks (includes waterfalls)	Resident	Suitable	Yes
5. Wetlands (inland) -> 5.2. Wetlands (inland) - Seasonal/Intermittent/Irregular Rivers/Streams/Creeks	Resident	Suitable	Yes
5. Wetlands (inland) -> 5.5. Wetlands (inland) - Permanent Freshwater Lakes (over 8ha)	Resident	Suitable	Yes
5. Wetlands (inland) -> 5.6. Wetlands (inland) - Seasonal/Intermittent Freshwater Lakes (over 8ha)	Resident	Suitable	Yes

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity	Impact Score
1. Residential & commercial development -> 1.1. Housing & urban areas	Future	Minority (50%)	Negligible declines	No/negligible impact: 2
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
3. Energy production & mining -> 3.1. Oil & gas drilling	Ongoing	Majority (50-90%)	Slow, significant declines	Medium impact: 6
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
3. Energy production & mining -> 3.2. Mining & quarrying	Ongoing	Majority (50-90%)	Slow, significant declines	Medium impact: 6
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.1. Intentional use: (subsistence/small scale) [harvest]	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7
	Stresses:	1. Ecosystem stresses -> 1.3. Indirect ecosystem effects 2. Species Stresses -> 2.1. Species mortality		
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.2. Intentional use: (large scale) [harvest]	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7
	Stresses:	1. Ecosystem stresses -> 1.3. Indirect ecosystem effects 2. Species Stresses -> 2.1. Species mortality		
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.3. Unintentional effects: (subsistence/small scale) [harvest]	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7
	Stresses:	1. Ecosystem stresses -> 1.3. Indirect ecosystem effects		

		2. Species Stresses -> 2.1. Species mortality		
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.4. Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7
	Stresses:	1. Ecosystem stresses -> 1.3. Indirect ecosystem effects 2. Species Stresses -> 2.1. Species mortality		
6. Human intrusions & disturbance -> 6.2. War, civil unrest & military exercises	Past, unlikely to return	Minority (50%)	Negligible declines	Past impact
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
7. Natural system modifications -> 7.2. Dams & water management/use -> 7.2.10. Large dams	Ongoing	Majority (50-90%)	Slow, significant declines	Medium impact: 6
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
7. Natural system modifications -> 7.2. Dams & water management/use -> 7.2.9. Small dams	Ongoing	Majority (50-90%)	Slow, significant declines	Medium impact: 6
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
9. Pollution -> 9.2. Industrial & military effluents -> 9.2.1. Oil spills	Future	Unknown	Unknown	Unknown
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
9. Pollution -> 9.2. Industrial & military effluents -> 9.2.2. Seepage from mining	Ongoing	Unknown	Unknown	Unknown
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
9. Pollution -> 9.3. Agricultural & forestry effluents -> 9.3.3. Herbicides and pesticides	Ongoing	Unknown	Unknown	Unknown
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Actions in Place
In-Place Research, Monitoring and Planning
Action Recovery plan: Yes
Systematic monitoring scheme: No
In-Place Land/Water Protection and Management
Conservation sites identified: Yes, over part of range
Occur in at least one PA: Yes
In-Place Education
Included in international legislation: Yes

Conservation Actions in Place
Subject to any international management/trade controls: Yes

Conservation Actions Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Actions Needed
1. Land/water protection -> 1.1. Site/area protection
1. Land/water protection -> 1.2. Resource & habitat protection
3. Species management -> 3.1. Species management -> 3.1.1. Harvest management
5. Law & policy -> 5.1. Legislation -> 5.1.1. International level
5. Law & policy -> 5.1. Legislation -> 5.1.2. National level
6. Livelihood, economic & other incentives -> 6.3. Market forces

Research Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Research Needed
1. Research -> 1.1. Taxonomy
1. Research -> 1.2. Population size, distribution & trends
1. Research -> 1.3. Life history & ecology
1. Research -> 1.5. Threats
2. Conservation Planning -> 2.3. Harvest & Trade Management Plan
3. Monitoring -> 3.1. Population trends
3. Monitoring -> 3.2. Harvest level trends
3. Monitoring -> 3.3. Trade trends
3. Monitoring -> 3.4. Habitat trends

Additional Data Fields

Distribution
Continuing decline in area of occupancy (AOO): Unknown
Extreme fluctuations in area of occupancy (AOO): Unknown
Continuing decline in extent of occurrence (EOO): Unknown
Extreme fluctuations in extent of occurrence (EOO): Unknown

Distribution
Continuing decline in number of locations: Unknown
Extreme fluctuations in the number of locations: No
Population
Continuing decline of mature individuals: Yes
Extreme fluctuations: No
Population severely fragmented: Yes
Continuing decline in subpopulations: Unknown
Extreme fluctuations in subpopulations: No
Habitats and Ecology
Continuing decline in area, extent and/or quality of habitat: Yes
Generation Length (years): 22.9
Movement patterns: Not a Migrant

The IUCN Red List Partnership

The IUCN Red List of Threatened Species™ is produced and managed by the IUCN Global Species Programme, the IUCN Species Survival Commission (SSC) and The IUCN Red List Partnership.

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