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WG 5 – Mammals
CASE STUDY 2
Tursiops aduncus
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NON-DETRIMENT FINDING FOR *TURSIOPS ADUNCUS* IN THE SOLOMON ISLANDS

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INTRODUCTORY NOTE ON DEFINITION OF "SPECIES"

In preparing this case study, the authors assumed that the non-detriment finding should apply to the population being exploited and not to the entire global population of the species. This is consistent with the CITES definition of "species", which encompasses "any species, subspecies or geographically separate population thereof." In CITES terminology, a "geographically separate population" includes the concept of "stock" traditionally used in fishery contexts, which applies in this case.

I. Background information on the taxa

Much of the biological data on the Indo-Pacific bottlenose dolphin was summarized by Hammond *et al*. (2008) for the Global Mammal Assessment and IUCN Red List, by Brownell and Reeves (2008) for a meeting of the CITES Animal Committee in April 2008, and by Wang and Yang (in press) in a species review for the revised *Encyclopedia of Marine Mammals*. Also, relevant information on the species was reviewed and summarized in detail, with a specific focus on the Solomon Islands region, at a technical workshop organized by the IUCN/SSC Cetacean Specialist Group in Apia, Samoa, in August 2008 (report in preparation = Samoa workshop).

1. BIOLOGICAL DATA

1.1 Scientific and common names

Tursiops aduncus (Ehrenberg, 1832), Indo-Pacific bottlenose dolphin

1.2 DISTRIBUTION

Discontinuous in coastal warm temperate to tropical marine waters of the Indo-Pacific region, from the southern tip of Africa in the west, along the northern rim of the Indian Ocean (including the Red Sea, Arabian Gulf and Indo-Malay Archipelago to as far east as the Solomon Islands and New Caledonia) and western side of the Pacific to the southern half of Japan and the southern coast of Australia (Kemper 2004). Within that range, these dolphins occur in coastal waters along continental coastlines as well as around some oceanic islands. Overall distribution appears naturally fragmented, according to the CITES meaning of the term, i.e. the case where most individuals within a taxon are found in small and relatively isolated sub-populations, which increases the probability that these small sub-populations will become extirpated and the opportunities for re-establishment are limited.

The range countries, according to Hammond et al. (2008), are: Australia, Bangladesh, Brunei Darussalam, Cambodia, China, Djibouti, Egypt, Eritrea, India, Indonesia, Iran (Islamic Republic of), Japan, Kenya, Kuwait?, Madagascar, Malaysia, Mozambique, Myanmar, New Caledonia(?), Oman, Pakistan, Papua New Guinea, Philippines, Qatar(?), Saudi Arabia, Singapore, Solomon Islands, Somalia, South Africa, Sri Lanka, Sudan(?), Taiwan, Tanzania, Timor, United Republic of Tanzania, Thailand, Timor-Leste, United Arab Emirates, United States (Guam and Northern Marianas) (?), Viet Nam and Yemen. In addition, the species is known from Israel, Jordan, and Saudi Arabia (Gulf of Aqaba). It is also assumed to occur is Iraq and Bahrain in the Persian Gulf (Arabian Gulf). Occurrence in New Caledonia was recently confirmed.

Distribution within Solomon Islands

Two survey programmes have provided information on the distribution of *T. aduncus* in the Solomon Islands. The first of these was a large-scale, interdisciplinary marine assessment in the western provinces in 2004 that covered >2400 nmi and included a dedicated marine mammal component (Kahn 2006). Visual and acoustic survey effort for cetaceans spanned 36 days and involved 160 active survey hours of passage between site-based activities (Benjamin Kahn, pers. comm. to R.R. Reeves, 2 October 2008). A total of 1228 nmi was covered by dedi-

cated visual effort and 49 listening stations with dual hydrophones were deployed. A substantial part of the survey effort (~67 hours) was in the "coastal habitat zone" considered to be the principal habitat for *T. aduncus*. Despite this considerable effort, the only confirmed visual sighting of *T. aduncus* during the 2004 survey programme was of a group of 11 individuals off the north-western coast of New Georgia Island (Kahn 2006; Benjamin Kahn, pers. comm. to R.R. Reeves, 2 October 2008).

A second, separate survey programme in the Solomon Islands dedicated specifically to *T. aduncus*, led by R.H. Defran, began in 2005. This programme has focused on coastal waters along the northern shore of Guadalcanal Island, and less intensively covered the northern and southern portions of the Florida Islands and the near-shore waters of Savo Island (R.H. Defran, presentation to Samoa workshop). Nearly all sightings from this programme have been very near shore (within a kilometre) in waters <50 m deep.

A major difficulty in establishing the actual distribution is that both the common bottlenose dolphin (*T. truncatus*) and the Indo-Pacific bottlenose dolphin are known to occur in the South Pacific and the two species can be distinguished at sea only by experienced observers, and then only if viewing conditions are favourable. T. truncatus have not been confirmed to occur in near-shore waters in the Solomon Islands so it is uncertain whether the distribution of the two species actually overlaps in this region.

1.3 Biological characteristics

1.3.1 *Life history*

Most of what is known about the life history of *T. aduncus* comes from studies of photo-identified dolphins at sites in Australia and Japan. Estimates for most parameters have fallen within the ranges reported for the better-studied and more widely distributed *T. truncatus* (Wells and Scott 1999, 2002). The one parameter that appears to differ notably is age at sexual maturation of females. Female *T. aduncus* in Shark Bay, Western Australia, give birth for the first time at 12-15 years of age (Connor *et al*. 2000). The implications of this comparatively late onset of maturity for potential population growth are difficult to evaluate in the absence of information on female reproductive lifespan and age-specific fecundity. Also, some variability in this parameter between populations of a species is to be expected.

Other life history parameters of *T. aduncus* based on studies in Australia and Japan are mean annual birth rate 0.065-0.071, mean fecundity rate 0.239, mean recruitment rate 0.068, first-year mortality

rate 0.133-0.300, calf mortality rate 0.44-0.46, male age at sexual maturity 10-15 years, interbirth interval 3-6 years and maximum age 40+ years in the Australian animals (Samoa workshop report).

These dolphins are social and live in groups of perhaps 5-10 individuals. Such groups are parts of wider "fission-fusion" societies, "a continuous mosaic of overlapping home ranges for both males and females" (Connor *et al*. 2000). Social groups may include kin but are not based on familial relationships, except for the mother-calf association which can extend well beyond nutritional weaning and last as long as 3-6 years. The exception to this rule is the prolonged period (3-6 years) of mother-calf association, which extends past nutritional weaning and involves an extended period of learning by calves. These dolphins exhibit complex feeding patterns that appear to be transmitted from mother to young and in some cases throughout societies by observational learning.

1.3.2 *Habitat types*

Indo-Pacific bottlenose dolphins are found primarily in continental shelf waters (<200 m deep) near shore and in areas with rocky or coral reefs, sandy or soft bottoms, or seagrass beds. Although they may be concentrated in areas where there is estuarine influence, they do not seem to enter far into the muddy, turbid waters of estuaries. Small populations also occur in the inshore waters of some small oceanic islands. The species distribution is centred in tropical to warm temperate waters of the Indian and western Pacific oceans, but populations also exist in cooler waters in Japan, northern China and southern Australia. Sea surface temperatures where *T. aduncus* have been observed varied from 12°C (possibly less) to more than 30°C.

1.3.3 *Role of the species in its ecosystem*

Little is known about predation on *T. aduncus* but sharks are likely to be a major cause of mortality for some populations.

1.4 Population

There is no estimate of the size of the population of *T. aduncus* around the Solomon Islands.

1.4.1 *Global Population size*

There is no estimate of the global population size as the species has not been studied in most of its range. However, there are estimates for a few specific areas and these were summarised by Wang and Yang (in press) and at the Samoa workshop. For example, in Japanese waters, there is an estimate of 218 dolphins in the Amakusa-Shimoshima

population and at least 160 have been photo-identified in the Mikura Island population. In Australian waters, there are local estimates for the populations of Shark Bay (>600); Point Lookout, off Queensland (700-1000); and Moreton Bay (334). In eastern Africa, a resident population in a small area near Zanzibar (Tanzania) was estimated to consist of 136-179 dolphins.

1.4.2 *Current global population trends*
___increasing ____decreasing ___stable _X_unknown

1.5 Conservation status

1.5.1 *Global conservation status (according to IUCN Red List)*
___Critically endangered ___Near Threatened
___Endangered ___Vulnerable
___Least concern ___Data deficient

1.5.2 *National conservation status for the case study country*
None.

1.5.3 *Main threats within the case study country*
___No Threats
___Habitat Loss/Degradation (human induced)
___Invasive alien species (directly affecting the species)
_X_Removals [hunting/gathering]
_X_Accidental mortality (e.g. Bycatch)
___Persecution (e.g. Pest control)
___Pollution (affecting habitat and/or species)
___Other_____
___Unknown

2 SPECIES MANAGEMENT WITHIN THE COUNTRY FOR WHICH CASE STUDY IS BEING PRESENTED

2.1 Management measures
None.

2.1.1 *Management history*
None.

2.1.2 *Purpose of the management plan in place*
No management plan is in place.

2.1.3 *General elements of the management plan*
Not applicable.

2.1.4 *Restoration or alleviation measures*
Not applicable.

2.2 Monitoring system
None.

2.2.1 *Methods used to monitor harvest*
There is no monitoring of the "harvest".

2.2.2 *Confidence in the use of monitoring*
Not applicable.

2.3 Legal framework and law enforcement
There is no national or international legislation related specifically to the conservation of *T. aduncus*. CITES provides a framework for the regulation of international trade.

3 UTILIZATION AND TRADE FOR RANGE STATE FOR WHICH CASE STUDY IS BEING PRESENTED

3.1 **Type of use** (origin) **and destinations** (purposes) (e.g. commercial, medicinal, subsistence hunting, sport hunting, trophies, pet, food).
The dolphins in trade and being considered in this case study are taken from the wild in the Solomon Islands and are used mainly for commercial purposes. Thus far, exported dolphins have been purchased and imported by resort hotels or aquatic parks for display and/or interactive (swim-with-the-dolphins) programmes.

3.2 Harvest

3.2.1 *Harvesting regime*
Direct or incidental catches of *T. aduncus* in the Solomon Islands are known from at least 1990 (Akimichi 1992; Kurihara and Oda 2007; R. L. Brownell, Jr. pers. comm. to R.R. Reeves 4 October 2008). These are in addition to the live-capture removals reported since 2003. A traditional drive hunt for small cetaceans occurs in some villages on the island of Malaita but there are no published accounts of *T. aduncus* being taken in this hunt.

3.2.2 *Harvest management/ control* (quotas, seasons, permits, etc.)
It was reported in early 2008 that the Government of the Solomon Islands had issued a permit for the export of up to 80 *T. aduncus* per year (CITES Secretariat document AC 23 Doc. 8.5). The Samoa workshop was advised by John Leqata of the Ministry of Fisheries that 100 live dolphins (regardless of species) were currently permitted (August 2008) to be exported annually from the Solomon Islands. This number is consistent with the report by Anita (2007) that stated: "The Government has established an annual export quota of one hundred (100) animals per year."

Anita (2007) reported: "Harvesting and Export Permits can only be held by persons or tribes of dolphin harvesting communities. There is no restriction on traditional harvesting and utilization of this resource [cetaceans] but communities are encouraged to maximize income by engaging in this export quota." He also reported the commercial value of *Tursiops aduncus* in 2007 to be $(US)25,000-30,000. Anita (2007) did not consistently recognise the distinction between the live-capture fishery for Indo-Pacific bottlenose dolphins and the traditional drive hunt targeting a variety of other small cetaceans.

3.3 Legal and illegal trade levels
Two events of legal export of live dolphins from the Solomon Islands are on record: one in 2003 (28 animals to Mexico) and one in 2007 (28 animals) to the United Arab Emirates.

II. Non-detriment finding procedure (NDFs)

Provide detailed information on the procedure used to make the non-detriment finding for the species evaluated.

1. IS THE METHODOLOGY USED BASED ON THE IUCN CHECKLIST FOR NDFS?

___yes √_X_no

2. CRITERIA, PARAMETERS AND/OR INDICATORS USED
The IUCN/SSC Cetacean Specialist Group (CSG) established the following standard (Reeves *et al*. 2003) which has been widely cited and is regarded here as a reasonable basis for determining "non-detriment":

> As a general principle, dolphins should not be captured or removed from a wild population unless that specific population has

> been assessed and it has been determined that a certain amount of culling [offtake] can be allowed without reducing the population's long-term viability or compromising its role in the ecosystem. Such an assessment, including delineation of stock boundaries, abundance, reproductive potential, mortality, and status (trend) cannot be achieved quickly or inexpensively, and the results should be reviewed by an independent group of scientists before any captures are made.

Based on that standard, the Samoa workshop developed a more explicit set of necessary elements for a NDF for the Solomon Islands dolphin live-capture fishery (summarized in point 6, below).

It may not be necessary to obtain all of the required data empirically for the population being assessed. For example, default or inferred values may be used to estimate reproductive potential and natural mortality rates. Also, multiple approaches may be considered for assessing population structure and abundance (see point 6). However, at least one credible estimate of abundance for the population from which removals are being contemplated is essential, a credible analysis of population structure must be carried out, and other known or likely anthropogenic factors besides live-capture need to be critically examined even though past catch records may be difficult to collect or reconstruct.

3. MAIN SOURCES OF DATA, INCLUDING FIELD EVALUATION OR SAMPLING METHODOLOGIES AND ANALYSIS USED

A workshop was organized and conducted under the auspices of the CSG in Samoa in August 2008 to address explicitly the scientific and technical issues relating to the conservation of populations of small cetaceans, especially Indo-Pacific bottlenose dolphins. Participants included representatives of both relevant ministries in the Solomon Islands (Environment, Conservation and Meteorology; Fisheries and Marine Resources); the lead scientist in the ongoing cetacean survey programme in the Solomon Islands; and scientists with particular expertise, including the biology, ecology and behaviour of both species of bottlenose dolphins, genetic analysis of population structure, and population estimation from line-transect and mark-recapture survey data. The workshop considered all of the results of small cetacean survey work in the Solomon Islands to date and drew comparisons with studies on Indo-Pacific bottlenose dolphins in Japan, Australia, China, Taiwan and New Caledonia.

4. EVALUATION OF DATA QUANTITY AND QUALITY FOR THE ASSESSMENT

The data currently available from the Solomon Islands are inadequate for a rigorous NDF assessment (see below).

5. MAIN PROBLEMS, CHALLENGES OR DIFFICULTIES FOUND ON THE ELABORATION OF NDF

Little is known about the distribution, population structure, past catches and numbers of Indo-Pacific bottlenose dolphins in the Solomon Islands. The limited data available from the two survey programmes undertaken to date suggest that the species is patchily distributed in near-shore waters and not abundant. To date, only about 113 individuals have been photo-identified along most of the northern coastline of Guadalcanal Island in the ongoing survey programme led by R.H. Defran (presentation to Samoa workshop). The coastal distribution and apparently low numbers are consistent with observations in other locations where the species has been more closely studied.

6. RECOMMENDATIONS

The following outline was developed by the Samoa workshop as a template for assessment of island-associated populations of small cetaceans, including Indo-Pacific bottlenose dolphins in the Solomon Islands [information in brackets refers to current situation in Solomon Islands]:

I. Definition and geographic boundaries of the population (unit to conserve)

a. Ecological and oceanographic considerations
b. Gaps in distribution or low-density areas
c. Movement or site fidelity (and inferred demographic isolation) using photo-identification, genetics, radio-tracking, and/or data and information on habitat use.

[To date, some preliminary data have been obtained on movements by individual dolphins based on photo-identification.]

II. Current estimate of abundance, with associated uncertainty

Obtained from either a line-transect survey or a mark-recapture analysis. The latter requires at least two appropriately designed sampling episodes.

[To date, some photo-identification data are available that could be used for a minimum abundance estimate for a portion of the Solomon Islands. The Samoa workshop provided a rationale for using photographic mark-recapture in preference to a line-transect approach, and also developed a work plan and schedule for carrying out an appropriate mark-recapture study in the Solomon Islands.]

III. Selection of a value for maximum potential population growth (or replacement) rate

Often using appropriate default values derived from similar species and populations (0.04 for odontocete populations; observed rates of population growth have all been under 0.03 – killer whales, common bottlenose dolphins)

[No direct information on this parameter is likely to be available from the Solomon Islands for some time. Therefore, a default value will be needed.]

IV. Understanding human-caused mortality

a. Determine whether there has been, or is, non-deliberate mortality (e.g. bycatch, vessel strikes) and if so, estimate levels of such mortality
b. Review and incorporate consideration of recent "historical" or ongoing deliberate removals (e.g. by hunting, live-capture)

[There is no evidence of deliberate removals of Indo-Pacific bottlenose dolphins in the Solomon Islands drive hunts although this does not mean the possibility can be ruled out. Captures, apparently in purse seines, have been documented within the last 20 years; it is unclear whether these were incidental or deliberate. It is unlikely that it will be possible to quantify removals in a meaningful way because there has been no catch monitoring.]

V. Integrated assessment of potential impact on population from human-caused mortality

VI. Analysis of the data and information listed above using one or a combination of the following techniques

a. Rule-of-thumb approach (e.g. 1% of best abundance estimate)
b. Potential Biological Removal or equivalent (e.g. 1.1 to 1.8% of best abundance estimate)
c. Population Viability Analysis

[Cetacean conservation schemes developed by various countries and intergovernmental bodies use values between about 1% and 2% of abundance as removal thresholds for sustainability (Samoa workshop report). This may be used as a guide in determining non-detriment for live-capture removals in the Solomon Islands, but on the understanding that total removals, and not just deliberate live-captures, need to be taken into account.]

VII. Follow-up monitoring and periodic reassessment to track population trajectory

Much more and better-quality information than presently available will be needed on the distribution, population structure, removals (bycatch, hunted, live-captured) and numbers of Indo-Pacific bottlenose dolphins in the capture region before a credible NDF can be made and additional collections for export, or exports of animals already collected, are authorized. External technical assistance will be needed to ensure that study designs, data collection procedures and analyses are sufficiently rigorous. Substantial financial investments, either by the companies involved in the trade, by government agencies, or by both, will also be necessary. As indicated by Reeves *et al*. (2003; see above), considerable time will be needed to collect sufficient data, complete the analyses, and carry out the population assessment. The Samoa workshop in August 2008 (report in preparation) proposed that a minimum of four field seasons over two years would be needed to generate a robust abundance estimate for Indo-Pacific bottlenose dolphins in the Solomon Islands, which could then be used as part of an informed determination of whether a given level of live-captures for export would or would not cause detriment to the survival of the species (i.e. population). The Samoa workshop report will contain more details on the elements of assessment mentioned above.

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