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International Live Trade in Varanus Species

Legal and illegal trade in 31 *Varanus* species
native to Indonesia and Papua New Guinea
between 2000 and 2012

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7th of July 2014

International Live Trade in *Varanus* Species

A research on legal and illegal trade in 31 *Varanus* species native to Indonesia and Papua New Guinea between 2000 and 2012

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Keywords: *Varanus*, reptiles, live, legal, illegal, international, trade, export, import, Indonesia, Papua New Guinea, captive-bred, wild-caught.

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Preface

This research is carried out as a bachelor thesis for the study Animal Management at the University Van Hall Larenstein, the Netherlands. The research will form a basis for an extensive research by TRAFFIC Southeast Asia. We would like to thank our supervisors Ms. T. Griede and Mr. H. Bezuijen, who gave us feedback and supported the process of writing the report. Furthermore we are particularly grateful for Mr. C. R. Shepherd who assigned us with the project and Ms. S. Chng who gave feedback and a lot of insight information.

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Summary

Varanus species are a popular species in the exotic pet trade. Little is known about the distribution of these species and trade could have a negative impact on the status of wild populations. Indonesia and Papua New Guinea have a large diversity of *Varanus* species and are both known as major wildlife trading countries. By analysing trade in 31 CITES-listed *Varanus* species, native to Indonesia and Papua New Guinea (PNG), trends in legal and illegal live trade are found and steps can be taken to improve the protection of the species.

Three main research questions are: “What does the legal trade in 31 *Varanus* species, originating from Indonesia and PNG between 2000 and 2012, look like?”, “What does the illegal trade in 31 *Varanus* species, originating from Indonesia and PNG between 2000 and 2012, look like?” and “Is it realistic to assume that traded *Varanus* species that are reported as captive-bred are indeed captive-bred?”.

Legal trade is annually reported to the CITES Secretariat by Parties and collected in the CITES Trade Database; a database freely accessible to everyone. Data for the 31 species are extracted for each of the *Varanus* species and raw data is then analysed to find the numbers of annual trade, which countries import most specimens and what source codes are used. Judicial sources are consulted to assess the level of protection. For data on illegal trade an internet based research is carried out and publications of seizures are consulted. Another internet based research is carried out for data on breeding ecology to assess the likelihood of specimens traded as captive-bred actually being captive-bred.

38 406 *Varanus* specimens (including 17 of the 31 *Varanus* spp. analysed) are reported as import from Indonesia. No import from PNG is reported to CITES. All 17 species are listed on CITES Appendix II. About 45% (17 046 specimens) of all import is reported as wild-caught (source code ‘W’), and 31% (12 158 specimens) reported as captive-bred (source code ‘C’). There is a significant increase in import of specimens with source code ‘C’ and a significant decrease in import of specimens with source code ‘W’. The three species for which trade numbers are highest are: *V. rudicollis* (20.3% of the 38 406 specimens), *V. timorensis* (19.7%) and *V. dumerilii* (10.5%). More than 60% of the 38 406 specimens is imported in the USA, Japan and 3 EU countries; France, Germany and the Czech Republic. Reported import sometimes exceeds reported export; even though specimens are not allowed to be imported without an export permit.

To prevent overexploitation of wild-caught specimens, four of the 17 species are protected by Indonesian law since 1999. These species are *V. indicus*, *V. gouldii*, *V. prasinus* and *V. timorensis* and may only be exported if they are captive-bred. Trade in all four protected species violates the national legislation. Other precautions to protect species are export quotas. These are set by Indonesia’s CITES Scientific Authority for six of the 17 species. However, for many species, data on wild populations are limited. Quotas are not based on population pressure and population sizes, but instead based on trade figures in previous years. The quotas are exceeded three times for three species (*V. beccarii*, *V. dumerilii*, *V. rudicollis*). Wildlife trade regulations are not fully enforced by the Indonesian authorities and in order for reptile trade to be sustainable, it is recommended that non-detriment findings are undertaken and existing regulations are sufficiently enforced.

It is hard to get an insight in the size of illegal trade in the 31 *Varanus* species. A part of the illegal trade is estimated by analysing seizures reported to CITES and other sources. Only 265 seized specimens have been reported to CITES. More than 37 000 have been reported to other sources; however these seizures could not all be related directly to Indonesia or PNG. A central reporting system for seizures is missing at the moment, this could help to gain a better insight in the illegal trade. Most smuggled specimens are discovered in cars or lorries, at airports

or during raids on homes and businesses. Most *Varanus* species have similar physical characteristics, making it difficult for Custom offices to identify and report species. This problem is exploited by traders, who intentionally misidentify species.

Reports of Ehmann, et al. (1991), Philips & Packard (1994) and Bennett (1995) on breeding ecology of the *Varanus* spp. imply that captive-breeding success is not very high. In order to be able to trade as many captive-bred *Varanus* specimens as Indonesia reports as export, a lot of breeding females should be present at breeding farms. Field studies can prove whether breeding facilities indeed have the necessary amount of breeding females in stock.

Overall, the trade in *Varanus* species needs an improvement in regulations and enforcement. Furthermore, field studies are necessary to gain insight on the status of wild populations and on the success of breeding facilities.

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1 Introduction

1.1 Problem description

Hundreds of millions of plants and animals are traded as food, pets, ornamental plants, leather, tourist curios and medicines each year (WWF, n.d.). Overexploitation of wild populations is one of the main threats to species as specimens are often harvested unsustainably or illegally (WWF, n.d.; Shepherd, et al., 2004; Warchol, 2004), driving a number of species to extinction. Besides the negative effect on wild populations, people of developing nations are also affected by the trade issues. Native people depend directly on wildlife for consumption and, by regulated, legal trade, as a way of earning cash. Illegal wildlife trade is threatening the continued availability of this resource (WWF, n.d.).

Parts of Indonesia and Papua New Guinea belong to the so called 'Wildlife trade hotspots', the trade there is particularly threatening the wildlife (TRAFFIC, 2008b). For Indonesia and Papua New Guinea (PNG) a species group that is threatened by the international trade in reptile skins and pets, is the group of monitor lizards of the genus *Varanus*; family *Varanidae* (Koch, et al., 2013). In 1990 around 27500 live monitor lizards are exported from Indonesia, in 2005 the export increased with more than 300% to 85000 traded individuals (Pernetta, 2009).

The monitor lizards are all morphologically the same, which means that they have the same build and structure although the monitor lizards can differ enormously in length and colour patterns. There are more than 70 species of *Varanus* known today (Böhme, 2003; Koch, et al., 2010). The total length can reach from 20 centimetres up to more than three meters (Mertens, 1942; Pianka, et al., 2004). Due to their size and diet preferences the monitor lizards claim an ecological role as top predators in most environments (Sweet & Pianka, 2007). For an impression of the *Varanus* species group see figures 1 and 2.



Figure 1.1 *Varanus komodoensis*, Komodo dragon

Monitor lizards belong to a heavily exploited vertebrate group (Mace, et al., 2007; Schlaepfer, et al., 2005), and are protected within the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) appendices I and II (CITES, 2013a). Appendix I includes species threatened with extinction; commercial trade in these species is not allowed. Appendix II includes species for which commercial trade is allowed, but trade must be controlled in order to avoid utilization incompatible with their survival (CITES, 2013b). The collaboration between the United Nations Environment Programme and World Conservation Monitoring Centre (UNEP-WCMC) administers the CITES Trade Database on behalf of the CITES Secretariat (UNEP-WCMC, 2014). To implement sustainable utilization of wildlife, PNG acceded to CITES in 1975 and Indonesia in 1978. Since Indonesia became a Party of CITES the country has been recorded as one of the major wildlife exporting countries (Ministry of Forestry, 2011). Parties write annual reports and provide these to the CITES Secretariat. The reports include full details of all export and import permits and certificates issued during the previous year (UNEP-WCMC,

2014). When annual reports show great amounts of trade in a certain species CITES can choose to set an annual harvest and export quota. A quota is set by making use of a Non-Detriment Finding (NDF). A thorough NDF examines levels of trade with reference to any negative or detrimental effects to the survival of wild populations, and assesses various aspects of the biology and ecology of the species, its distribution, abundance and exploitation (Schoppe, 2008). The NDF will substantiate a quota that is able to prevent the species from over-exploitation (CITES, 2013d; CITES, 2014).

An organisation that is monitoring wildlife trade is TRAFFIC. TRAFFIC is a Non-Governmental Organisation (NGO) that is established as a specialist group of the Species Survival Commission of the International Union of Conservation of Nature (IUCN). TRAFFIC monitors trade levels to ensure that trade in wild plants and animals is not a threat to the conservation of nature. Recently the need for enhanced, rigorous analysis of existing trade data of international wildlife trade became clear (Phelps, et al., 2010). These analyses will help solidifying suspicions about illegal and unsustainable trade. If the suspicions are proven to be true, this will allow better decisions to be made on sustainable levels of trade, setting trade quotas (using NDFs) and initiating the regulation of legislation (CITES, 2013d).

The Indonesian Government's regulation No. 8, 1999, "On the utilization of wild plants and animal species" states that nationally protected *Varanus* species can only be traded if they are captive-bred. Captive-bred within CITES means that the animals are second generation or subsequent offspring bred in captivity, from parents that are also bred in controlled (captive) environment (CITES, 2013c). According to Shepherd & Nijman (2007), Indonesian legislation is sufficient to regulate the trade in wildlife, however the implementation and enforcement of these laws is currently far from effective, this probably also applies to PNG. Research on breeding facilities showed that there is limited breeding success in captivity for most of the *Varanus* spp. (Koch, et al., 2013). The demand for commercial trade is however extensive (Nijman & Shepherd, 2009; Pernetta, 2009) and in order to meet this demand an increase in captive breeding is necessary. Since breeding in captivity is limited, wild founder stock is probably often used to launder illegally wild-caught animals (Bulte & Damania, 2005; Mockrin, et al., 2005; TRAFFIC, 2012; Engler & Parry-Jones, 2007). More research on laundering wild-caught specimens is necessary to underpin the assumption that source codes are misused. (UNEP-WCMC, 2014; Chng, 2014)

When trading a CITES listed animal, source codes are used to declare the source of the specimen (CITES, 2013c). For example, a specimen is traded under source code 'C', this indicates that the animal is bred in captivity. Source code 'F' resembles specimens that are first generation captive-bred (still wild-caught parents) and source code 'W' stands for wild-caught specimens. The full list of source codes used by CITES can be found in Annex I. At breeding facilities, protected species can easily be disguised by laundering them under the guise of being captive-bred (Nijman & Shepherd, 2009; Natusch & Lyons, 2011). A review written by the UNEP-WCMC, at the request of the CITES Secretariat, underpins that the misuse of source codes is a problem (UNEP-WCMC, 2014). Better enforcements of laws is necessary in order to prevent the illegal use of source codes.

Failures in enforcement of existing laws can be caused by a lack of knowledge about what is happening in trade in *Varanus* spp. To get an overall picture of what is happening in the (illegal) trade in *Varanus* species, it is necessary to gain more in-depth knowledge of *Varanus* trade and substantiate assumptions - which have been formed - with clear data.

1.2 Objective

The aim of this research is to gain insight in the legal, and illegal, international commercial live trade in 31 *Varanus* species native to Indonesia and Papua New Guinea, between 2000 and 2012.

1.3 Research questions

1. What does the legal trade in 31 *Varanus* species, originating from Indonesia and PNG between 2000 and 2012, look like?
 - 1.1 How many *Varanus* live specimens originating from Indonesia and PNG are exported every year between 2000 and 2012, overall and per species?
 - 1.2 What are the main importing countries of *Varanus* spp. originating from Indonesia and PNG between 2000 and 2012?
 - 1.3 Where are major discrepancies found between importer and exporter numbers?
 - 1.4 What are the source codes used for reporting the traded *Varanus* species?
 - 1.5 Are quotas, set in National and CITES legislation, maintained?
2. What does the illegal trade in 31 *Varanus* species, originating from Indonesia and PNG between 2000 and 2012, look like?
3. Is it realistic to assume that traded *Varanus* species that are reported as captive-bred are indeed captive-bred?
 - 3.1 What information about breeding in the wild is known for the traded *Varanus* species, of which a substantial quantity of animals is indicated as captive-bred?
 - 3.2 What information about breeding in captivity is known for the traded *Varanus* species, of which a substantial quantity of animals is indicated as captive-bred?

1.4 Term definition

1. Reported export
Number of exported specimens as reported by Indonesia and PNG.
2. Reported import
Number of imported specimens as reported by the importing country.
3. Live trade
All import and export of live animals

2 Material and Methods

2.1 Type of research and research design

This research is a combination of descriptive quantitative and descriptive qualitative research. The design used in this research is a non-experimental survey study. For research question 1 a trend analysis is carried out. (University of North Carolina, 2008; Institute for Work and Health, 2009).

2.2 Research population

The research units exists of all data regarding 31 *Varanus* spp. exported live from Indonesia and Papua New Guinea from 2000 till 2012 and seized *Varanus* spp. between 2000 and 2012, see table 2.1.

The taxonomic nomenclature that is used is the same nomenclature used by CITES For all *Varanidae* species (except for *Varanus boehmei*); the nomenclature is based on the 'Checklist of the living monitor lizards of the world (family *Varanidae*).' by W. Böhme, 2003. The nomenclature of the *Varanus boehmei* is based on 'A further new emerald tree monitor lizard of the *Varanus prasinus* species group from Waigeo, West Irian (*Squamata: Sauria: Varanidae*).' By H. Jacobs, 2003 (CITES Nomenclature Committee, 2006).

Table 2.1; The 31 *Varanus* species native to Indonesia and Papua New Guinea that will be analysed in this thesis.

<i>Varanidae, Varanus spp. originating from Indonesia and Papua New Guinea</i>				
<i>V. auffenbergi</i>	<i>V. dumerilii</i>	<i>V. lirungensis</i>	<i>V. reisingeri</i>	<i>V. togianus</i>
<i>V. beccarii</i> ¹	<i>V. finschi</i>	<i>V. macraei</i>	<i>V. rudicollis</i>	<i>V. yuwonoi</i>
<i>V. boehmei</i>	<i>V. gouldii</i> ²	<i>V. melinus</i>	<i>V. salvadorii</i>	<i>V. zugorum</i>
<i>V. bogerti</i>	<i>V. indicus</i>	<i>V. nebulosus</i>	<i>V. similis</i>	
<i>V. caerulivirens</i>	<i>V. jobiensis</i>	<i>V. obor</i>	<i>V. spinulosus</i>	
<i>V. cerambonensis</i>	<i>V. komodoensis</i>	<i>V. prasinus</i>	<i>V. telenesetes</i>	
<i>V. doreanus</i>	<i>V. kordensis</i>	<i>V. rainerguentheri</i>	<i>V. timorensis</i>	

¹ *V. beccarii* is also recognized as *V. prasinus beccarii* within CITES.

² *V. gouldii* is also recognized as *V. panoptes horni*, includes *V. panoptes* specimens that have been exported from Indonesia. (The species only occurs in Australia and therefore it is suspected that specimens exported from Indonesia are actually *V. panoptes horni* specimens.)

2.3 Data collection

2.3.1 Legal trade

To gain insight on legal trade, data of the CITES Trade Database is used as well as data on legislation and export quotas.

CITES Trade Database

The CITES Trade Database can be found on the official CITES website, www.CITES.org. To gain specific data of a species, the Trade Database allows the user to fill in some factors of choice, for example for what species the data are requested, in what time period, from what countries, to which countries and with what purpose codes, source codes and importer terms. The data are then presented in a comparative tabulation or a gross/net trade report. For this research the comparative tabulation report is chosen because this is the most comprehensive type of output (CITES, 2013e). In such a tabulation the following aspects are presented: the species of interest, the years in which trade occurred in a set time period (2000 till 2012 in this report), the importing and exporting countries, import terms, source codes and purpose codes. (see table 2.2)

Table 2.2 Example of a comparative tabulation for the species *Varanus indicus*

Year	Family	Taxon	Imp.	Exp.	Origin	Importer's reported quantity	Exporter's Reported quantity	Term	Purpose	Source
2009	<i>Varanidae</i>	<i>Varanus indicus</i>	Japan	Solomon Islands			40	live	T	W
2009	<i>Varanidae</i>	<i>Varanus indicus</i>	United States of America	Solomon Islands			10	live	T	W
2009	<i>Varanidae</i>	<i>Varanus indicus</i>	Argentina	Uruguay	Solomon Islands	1	1	live	Q	W
2010	<i>Varanidae</i>	<i>Varanus indicus</i>	Canada	Indonesia			5	live	T	C
2010	<i>Varanidae</i>	<i>Varanus indicus</i>	Germany	Indonesia			5	live	T	C
2010	<i>Varanidae</i>	<i>Varanus indicus</i>	France	Indonesia		150	7	live	T	C

Legislation

The legislation data are provided by TRAFFIC and relevant legislation is also searched within the literature. Some of the legislation are searched within the Environmental legislation database on www.ecolex.org. The following terms or term combinations will be searched; 'Indonesia', 'Papua New Guinea', 'Asia', 'trade', '*Varanus*', 'wildlife', 'import', 'export', 'live', 'egg-live', 'commercial trade', 'pet trade'. Hits are used up to and including page 5, or until the 10th useful source is found. Every page has 20 hits, in total there is thus a search through a maximum of 100 hits. A useful source should include information about existing laws and legislation with regard to the 31 *Varanus* species.

Export Quotas

The export quotas per species are collected via the 'Trade Information Query Tool' - this tool is available through the UNEP-WCMC website (<http://www.unep-wcmc-apps.org/isdb/extra/>) - and by going through existing literature about the *Varanus* species. An example of a table with quotas obtained from the 'Trade Information Query Tool' is shown in table 2.3.

Table 2.3 Example table with quotas from the 'Trade Information Query Tool'

Quota	Species	Country	Year	Date of issue	Notes	Notifaction
200	<i>Varanus beccarii</i>	Indonesia	2004	23/04/2004	Live. Quota originally established for <i>Varanus prasinus beccarii</i>	www.cites.org
200	<i>Varanus beccarii</i>	Indonesia	2003		Live. Quota originally established for <i>Varanus prasinus beccarii</i>	www.cites.org
200	<i>Varanus beccarii</i>	Indonesia	2002		Live. Quota originally established for <i>Varanus prasinus beccarii</i>	www.cites.org
270	<i>Varanus beccarii</i>	Indonesia	2001		Live. Quota originally established for <i>Varanus prasinus beccarii</i>	CITES Notif. No. 2001/041
270	<i>Varanus beccarii</i>	Indonesia	2000		Live. Quota originally established for <i>Varanus prasinus beccarii</i>	CITES Notif. No. 2000/053

2.3.2 Illegal trade

The sources, used for gaining insight in the illegal trade, are 'grey' literature and various websites.

Grey literature

Grey literature includes: reports, theses, conference proceedings, technical specifications and standards, non-commercial translations, bibliographies, technical and commercial documentation, and official documents not published commercially (Alberani, 1990). These sources are found by searching online using Google and with the following terms; 'trade', 'seizure', 'import', 'export', 'live', 'egg-live', 'commercial trade', 'pet trade', 'illegal'. These terms

are used in combination with every taxonomic name of the 31 species involved. Hits, shown by Google, is used up to and including page 10, till the 25th useful source. Google shows 10 hits per search page, in total there will thus be a search through a maximum of 100 hits per species. This method applies to every time that Google is used.

Seizure data

Seizure data are collected from the CITES Trade Database – wherein the source code ‘T’ stands for confiscated or seized specimens –, but since seizure data from the trade database are often incomplete other sources is used to find more information. Other sources include seizure and prosecution sections of the TRAFFIC Bulletin and news media (these are searched by using Google with search terms: ‘*Varanus*’, ‘monitor lizard’ and ‘seizures’, ‘seized’, ‘confiscated’, ‘illegal’). Hits, shown by Google, is used up to and including page 10, till the 25th useful source is found.

2.3.3 Breeding ecology

To gain insight on breeding ecology literature, zoo publications, ISIS, IUCN-SSC, reptile breeders are used as sources for data. These sources are found by searching online on the websites of ISIS, IUCN and by using Google with various combinations of the following terms; ‘breeding’, ‘reproduction’, ‘breeders’, ‘captive’, ‘egg’. Hits, shown by Google, are used up to and including page 10, till the 25th useful source is found. To answer the question, there is a focus on *Varanus* species of which the use of source code ‘C’ (captive-bred) is substantial.

2.4 Processing and analysing data

2.4.1 Processing the data

All data collected from the CITES Trade Database are transferred into spreadsheets per species. For each species, only the records with purpose code ‘T’ (traded with a commercial purpose) are used. Re-exports – when an animal originates from Indonesia or PNG, but is exported again from another country – are excluded from the analysis.

Exporters and importers are both supposed to submit a trade report annually to CITES (CITES, 1979). Analysis are based on both reported export and reported import.

With a regression analysis significant increases or decreases are found. By making use of a moving average-analysis trends in total trade are found.

All other sources, besides the CITES Trade Database are scanned for facts as: numbers of live specimens traded, the year of the trade, source codes and exporting and importing countries.

2.4.2 Analysing the data

Data analysis is explained accordingly to the research questions:

Legal trade

Data output from the CITES Trade Database and other sources are put in an excel data sheet. This is called the master sheet. Separate excel sheets per species will be made to be able to make calculations with the data, such as summations and differences. The outcomes will be presented in tables and/or graphs. For the last sub question, at first national and CITES legislation has to be examined. Thereof species that are protected, in what way they are protected and what the export quotas are, can be extracted. All those data will be put in one Excel document to have all data together. This will be compared to the numbers of species that CITES indicated to be traded, in the Trade Database, every year and for the whole time period from 2000 till 2012. Actual numbers and numbers set in legislation are compared by putting them in tables and/or graphs.

Illegal trade

Data on illegal live trade are collected within seizure records and the grey literature. Seizure records will be extracted from the CITES Trade Database, the TRAFFIC Bulletin and the news media. Data from these sources are put in an excel work sheet with; date, location of seizure, items, purported origin, destination and references.

As much grey literature and websites – which may provide data on the illegal live trade in *Varanus* spp. – as possible will be collected. If it appears that grey literature provides additional data, these data will be listed in excel and presented in tables as well.

Breeding ecology

In published literature information about breeding in the wild and breeding in captivity is searched for the main traded species. The found data is compared with numbers of the species whereof the use of source code 'C' (captive-bred) is substantial. By comparing this information the likelihood whether specimens traded are indeed captive-bred will be examined.

3 Results

In this study the focus is on live trade in 31 species native to Indonesia and Papua New Guinea (PNG). All live specimens exported from Indonesia or PNG between 2000 and 2012 with a commercial purpose (source code ‘T’) are part of the analysis. PNG did not report any export (or import) in any of the 31 *Varanus* species to the CITES Secretariat. An overview of the 31 species is given in table 3.1.

3.1 Legal trade in *Varanus* species

Parties of CITES have to report all export in species listed on Appendix II (species for which trade must be regulated in order to prevent the species from becoming endangered) annually to the CITES Secretariat (CITES, 2013a). The trade records are added to the CITES Trade Database (UNEP-WCMC, 2014). For 17 of the 31 *Varanus* species (figure 3.1) the CITES Trade Database contained useful information regarding live trade. This does not mean there is no live trade in the other 14 species. Aside from those 17 species, there is also one export of *V. komodoensis* reported to CITES and several *V. spinulosus* transactions, but these data are not used for further analysis as they did not fit the criteria specified in the methods.

The highest volume of live trade is in *V. rudicollis*. 13 389 specimens of *V. rudicollis* are reported as export by Indonesia and 7 788 are reported by importing countries (20.3% of all *Varanus* imports). *V. timorensis* followed with 9 902 specimens exported and 7 579 imported (19.7%) and thirdly *V. dumerilii* with 8 415 specimens exported and 4 021 specimens reported by importing countries (10.5%), see figure 3.1.

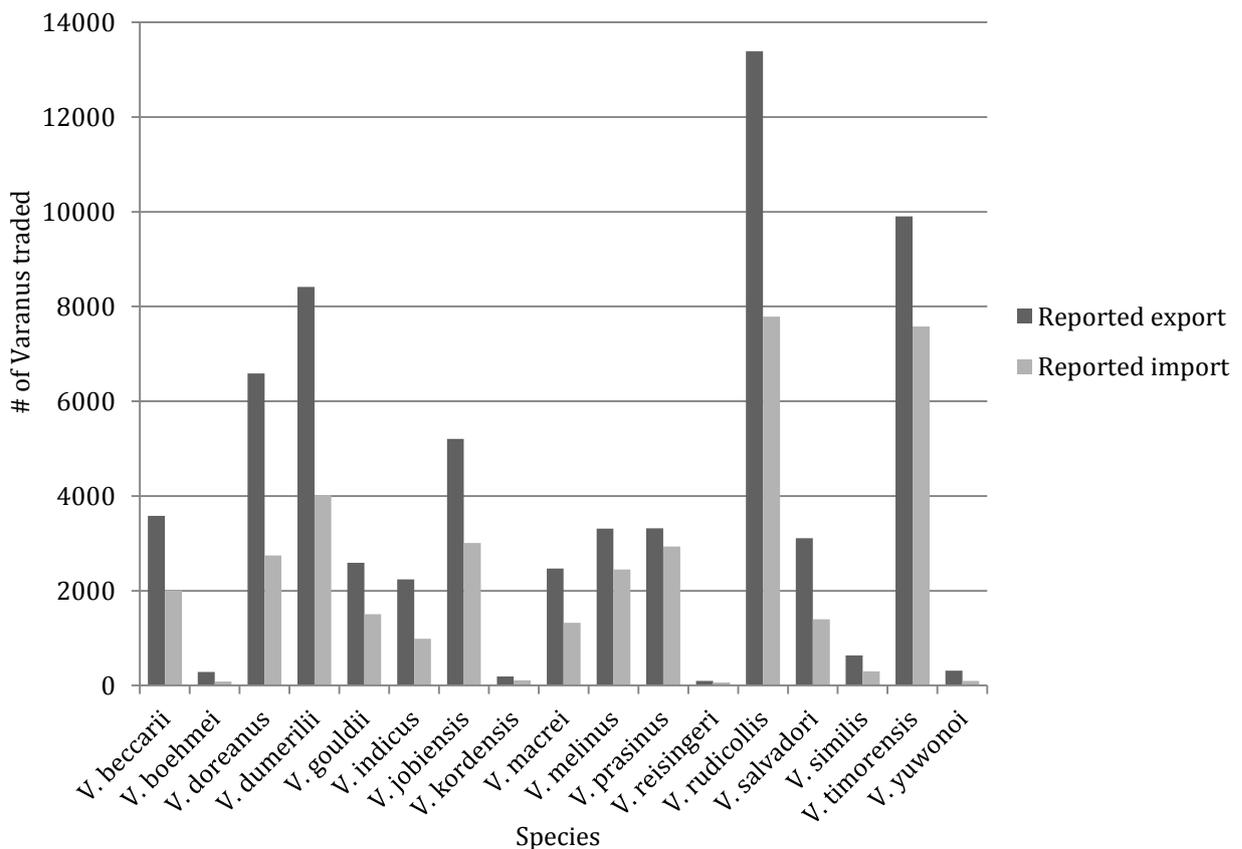


Figure 3.1 All live trade per species between 2000-2012 based on reported export and reported import

Table 3.1 International and national protection, IUCN Red List statuses, and CITES trade data on 31 *Varanus* taxa native to Indonesia and Papua New Guinea. Abbreviations are DD: Data Deficient; LC: Least Concern; VU: Vulnerable; C: Captive-bred; F: Farmed; W: Wild-caught; I: Confiscated; and U: Source unknown.

Species	CITES	IU CN	Protection Status in Indonesia	Export quota (2012) in Indonesia	Trade suspended into the EU (2012)	Export volumes reported by Indonesia (2000-2012)	Import volumes reported by importing countries (2000-2012)
<i>V. auffenbergi</i> ¹	II	-	No	-	-	No CITES records	No CITES records
<i>V. beccarii</i> ²	II	-	No	-	Wild - Indonesia	3 585 (C: 902; F: 1 600; W: 1 083)	2 007 (C: 222; F: 986; W: 792; I: 7)
<i>V. boehmei</i> ³	II	DD	No	-	-	283 (F: 283)	82 (F:82)
<i>V. bogerti</i> ⁴	II	-	No	-	Wild - PNG	No CITES records	No CITES records
<i>V. caerulivirens</i> ⁵	II	-	No	-	-	No CITES records	No CITES records
<i>V. cerambonensis</i> ⁵	II	-	No	-	-	No CITES records	No CITES records
<i>V. doreanus</i>	II	-	No	540 live - Indonesia	-	6 588 (F: 717; W: 5 871)	2 748 (C: 17; F: 207; W: 2 521; I: 3)
<i>V. dumerilii</i>	II	-	No	900 live - Indonesia	Wild - Indonesia	8 415 (C: 60; F: 1 499; W: 6 856)	4 021 (C: 34; F: 724; W: 3 263)
<i>V. finschi</i> ⁴	II	LC	Unknown	-	-	No CITES records	No CITES records
<i>V. gouldii</i> ^{8,9}	II	-	Yes	-	-	2 588 (C: 308; F: 2 280)	1 386 (C: 275; F: 111)
<i>V. indicus</i>	II	LC	Yes	-	-	2 240 (C: 2.240)	987 (C: 915; F: 36; W: 33; I: 3)
<i>V. jobiensis</i>	II	LC	No	450 live - Indonesia	Wild - Indonesia	5 205 (C:265; F: 719; W: 4 221)	3 010 (C: 275; F: 292; W: 2 434; I: 9)
<i>V. komodoensis</i>	I	VU	Yes	-	-	2 (C:2)	-
<i>V. kordensis</i> ⁶	II	-	No	-	-	193 (C: 190; F: 3)	112 (C: 108; I: 4)
<i>V. liringensis</i> ⁶	II	-	No	-	-	No CITES records	No CITES records
<i>V. macraei</i>	II	-	No	-	-	2 480 (C: 564; F: 1 916)	1 324 (C: 144; F: 1 147; W: 28; I: 5)
<i>V. melinus</i> ⁷	II	-	No	-	-	3 314 (F: 3 314)	2 447 (C: 105; F: 2 274; W: 45; I: 23)
<i>V. nebulosus</i>	I	LC	Yes	-	-	No CITES records	No CITES records
<i>V. obor</i> ⁵	II	-	No	-	-	No CITES records	No CITES records
<i>V. prasinus</i>	II	-	Yes	-	-	3 321 (C: 3 321)	2 933 (C: 2 801; F: 63; W: 63; I: 6)
<i>V. rainerguentheri</i>	II	-	No	-	-	No CITES records	No CITES records
<i>V. reisingeri</i> ⁶	II	-	No	-	-	97 (F:97)	64 (C: 9; F: 48; W: 5; I: 2)
<i>V. rudicollis</i>	II	-	No	900 live - Indonesia	-	13 389 (C: 96; F: 3 623; W: 9 670)	7 788 (C: 172; F: 1 644; W: 5 952; I: 20)
<i>V. salvadorii</i>	II	-	Yes (PNG)	270 live - Indonesia	Wild - Indonesia	3 111 (C: 40; F: 537; W: 2 534)	1 398 (C: 29; F: 215; W: 1 151; I: 3)
<i>V. similis</i> ¹⁰	II	-	No	-	-	640 (F: 640)	303 (C: 24; F: 271; I: 8)
<i>V. spinulosus</i>	II	LC	Unknown	-	(Wild - Solomon Islands)	Only exported from Solomon Islands and Costa Rica.	Only exported from Solomon Islands and Costa Rica.
<i>V. telenesetes</i> ¹¹	II	DD	Unknown	-	-	No CITES records	No CITES records
<i>V. timorensis</i>	II	-	Yes	-	-	9 902 (C: 9 902)	7 579 (C: 6 904; F: 80; W: 560; I: 32; U: 3)
<i>V. togianus</i>	II	-	Yes	-	-	No CITES records	No CITES records
<i>V. yuwonoi</i>	II	-	No	-	-	312 (C: 76; F: 236)	97 (C: 33; F: 64)
<i>V. zugorum</i>	II	-	No	-	-	No CITES records	No CITES records

¹previously traded as *V. timorensis*, ²traded as *V. prasinus beccarii* or *V. beccarii*, ³recommended to be classified as threatened according to Koch et al., 2013, ⁴only in PNG (*V. finschi* also found in Australia), ⁵probably traded as *V. indicus* (Koch, et al., 2013), ⁶probably traded as *V. prasinus*, ⁷proposal of 1997 to transfer the species from App. II to I rejected, ⁸also known as *V. panoptes (horni)* (Koch, et al., 2013) ⁹includes *V. panoptes* transactions originating from Indonesia, ¹⁰IUCN refers to *V. similis* as a subspecies of *V. scalaris* which is listed as Least Concern, ¹¹may actually be a junior synonym of *V. bogerti*.

There have only been IUCN assessments for three of the 17 species (see table 3.1). These species are: *V. boehmei* (Data Deficient), *V. indicus* (Least Concern) and *V. jobiensis* (Least Concern). Remarkably no assessments have been made for the top three traded species and little is known about the distribution and population sizes. Although only little is known, export quotas are already set for *V. rudicollis* and *V. dumerilii*, and *V. timorensis* is nationally protected by Indonesian law (table 3.1). By analyzing the data of the 17 species of the CITES Trade Database anything unusual, potential problems and trends can be found.

3.1.1 Live trade in *Varanus* species per year

Information about overall live trade (all species together) and per species is discussed in the following paragraphs to search for trends.

Total live trade in the 17 *Varanus* species

Live trade is reported in all twelve years (see figure 3.1). Export numbers are highest in 2004 (7 455) and in 2011 (7 407) and import numbers are highest in 2006 (4 074) and in 2010 (3 880). Indonesia has not yet submitted trade records for 2012.

As suspected reported export numbers are always higher than reported import numbers between 2000 and 2011. This could be due to exporting countries reporting permits issued, whereas importers report permits that are actually used (CITES, 2013e; Chng, 2014). Over the years export numbers significantly increase by an average of 54 specimens per year ($p=0.005$, $R^2=0.56$), while import numbers do not increase or decrease significantly, see figure 3.2.

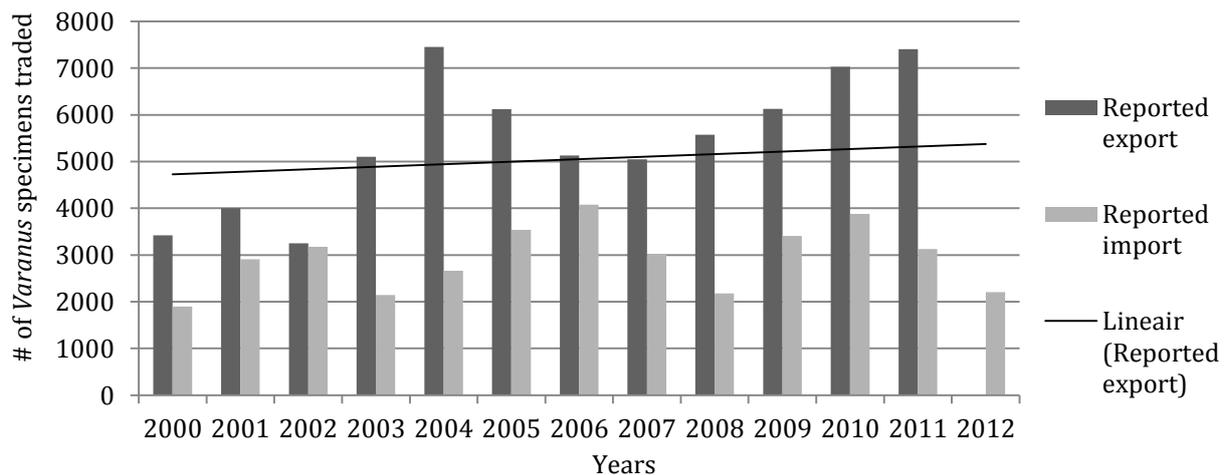


Figure 3.2 Total live trade in 17 *Varanus* spp. from 2000 - 2012, as reported by exporting and importing countries, reported export increase significantly ($\beta=54.34$ specimens per year; $p=0.005$; $R^2=0.56$), a linear regression analysis is used.

Live trade for individual *Varanus* species

Although the combined export numbers for all species are always higher than import numbers, this is not the case for every species individually.

Not all species are traded in all 12 years, e.g. species like *V. boehmei* and *V. kordensis* that are traded since 2005 (see table 3.2). *V. melinus* (traded since 2001) is not traded before, because the species was only discovered in 1997 (Auliya, 2003).

Table 3.2 The volume of live trade per species; minimum and maximum numbers of specimens traded and the year in which trade started (within the timeframe of 2000 - 2012). Based on reported export and reported import.

Species	Export			Import		
	Between 2000 - 2012 first export reported in	Minimum # of specimens traded	Maximum # of specimens traded	Between 2000 - 2012 first import reported in	Minimum # of specimens traded	Maximum # of specimens traded
<i>V. beccarii</i>	2000	137	531	2000	18	208
<i>V. boehmei</i>	2005	22	59	2006	2	30
<i>V. doreanus</i>	2000	447	644	2000	96	291
<i>V. dumerilii</i>	2000	354	1032	2000	112	675
<i>V. indicus</i>	2001	4	465	2000	0	209
<i>V. jobiensis</i>	2000	334	566	2000	161	352
<i>V. kordensis</i>	2007	12	88	2008	5	42
<i>V. macraei</i>	2003	114	371	2003	76	219
<i>V. melinus</i>	2000	5	453	2001	5	417
<i>V. gouldii</i>	2001	17	396	2002	52	289
<i>V. prasinus</i>	2000	0	573	2000	0	467
<i>V. reisingeri</i>	2009	20	53	2009	2	25
<i>V. rudicollis</i>	2000	896	1364	2000	360	960
<i>V. salvadorii</i>	2000	195	340	2000	67	175
<i>V. similis</i>	2008	47	214	2008	32	100
<i>V. timorensis</i>	2000	181	1843	2000	112	996
<i>V. yuwonoi</i>	2005	24	80	2006	3	22

Export of *Varanus* species

Reported export significantly increases for six species (see table 3.3). This is a concern as many wild populations of *Varanus* species are believed to be under threat of extinction. Especially for *V. doreanus* and *V. jobiensis*, that are traded for more than 80% as wild-caught, an increase in trade can have major effects. For all of these species, except for *V. yuwonoi*, it seems that there is an increase at first, then a decrease between 2004-2006 after which it rises again. Of course it is not certain that all reported export is actually traded, therefore in the next paragraph the significant changes in reported import per species is discussed. Based on reported export there are no species for which live trade has a significant decrease.

Table 3.3 *Varanus* spp. that show a significant increase in reported export between 2000-2012.

Species	p	R ²
<i>V. doreanus</i>	0.018	0.44
<i>V. jobiensis</i>	0.036	0.37
<i>V. macraei</i>	0.010	0.64
<i>V. melinus</i>	0.011	0.54
<i>V. prasinus</i>	0.001	0.68
<i>V. yuwonoi</i>	0.002	0.88

Import of *Varanus* species

In three out of 17 species there is a significant increase ($p < 0.05$) in import numbers (see figure 3.3). Import of *V. indicus* increases with an average of 10 specimens per year, for *V. prasinus* import increases with an average of 38 specimens per year and import of *V. timorensis* increases with an average of 52 specimens per year. Only *V. prasinus* has an increase in both export and import numbers. It is remarkable that there is no reported live trade (export and import) in this species in 2002. For *V. indicus* no import is recorded in 2002 as well. *V. timorensis* on the other hand, has a peak in import numbers in 2002. All three species have a dip in import in 2008.

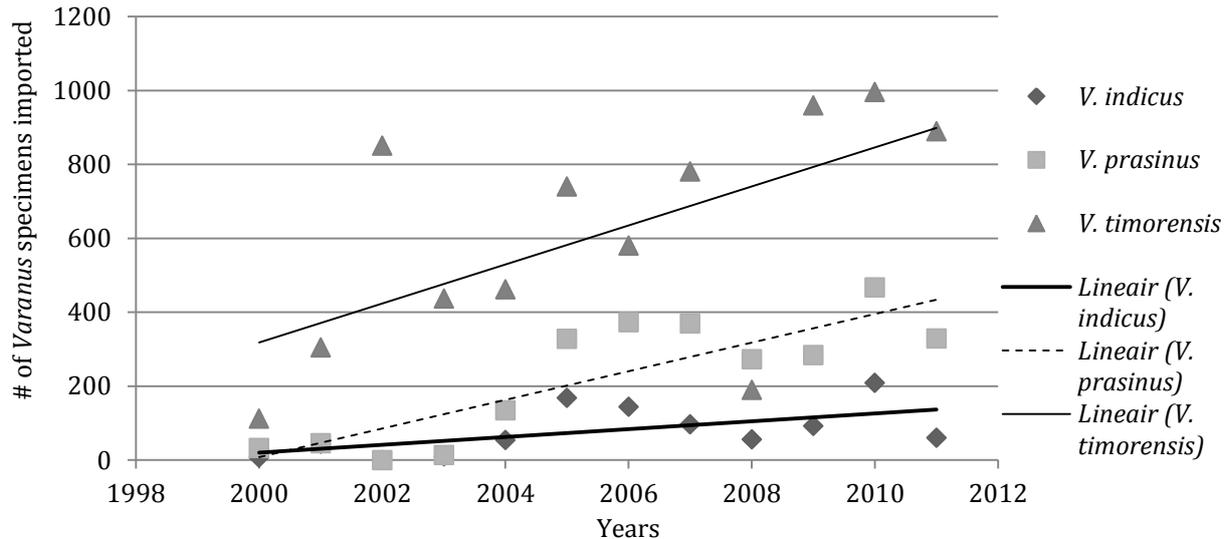


Figure 3.3 Significant increases in import for *V. indicus* ($\beta = 10.65$ specimens per year; $p=0.049$; $R^2=0.34$), *V. prasinus* ($\beta = 38.73$ specimens per year; $p<0.001$; $R^2=0.71$) and *V. timorensis* ($\beta=52.80$ specimens per year; $p=0.030$; $R^2=0.39$), a linear regression analysis is used.

In four out of 17 species a significant decrease ($p<0.05$) in import numbers occurs (see figure 3.4). One of those species is *V. doreanus*, a species for which export numbers significantly increase. Import of *V. doreanus* decreases with an average of 12 specimens per year, for *V. dumerilii* import decreases with an average of 34 specimens per year and import of *V. salvadorii* decreases with an average of 7 specimens per year. Import in *V. kordensis* also decreases but this species is only traded since 2008.

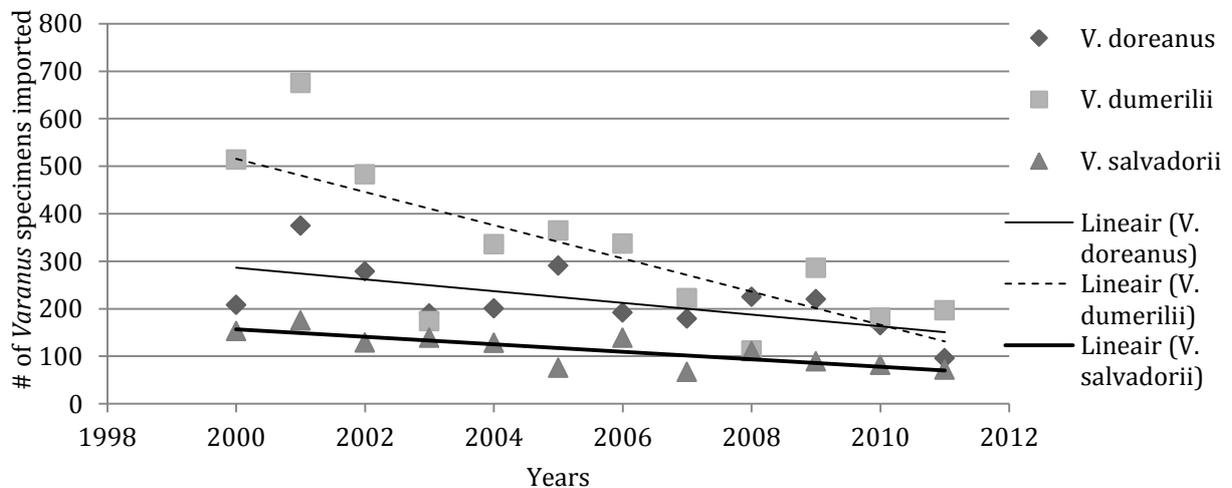


Figure 3.4 Significant decreases in import for *V. doreanus* ($\beta=-12.32$ specimens per year; $p=0.028$; $R^2=0.40$), *V. dumerilii* ($\beta=-34.94$ specimens per year; $p=0.004$; $R^2=0.58$) and *V. salvadorii* ($\beta=-7.93$ specimens per year; $p=0.002$; $R^2=0.64$), a linear regression analysis is used.

3.1.2 Main importing countries

To get an overall picture of *Varanus* live trade, it is not only necessary to know if live trade in species is increasing or decreasing, but also what the importing countries of the species are to determine which countries form the basis of the live trade in *Varanus* species.

The top five main importing countries are the USA, France, Japan, Germany and the Czech Republic, see table 3.4. The rest of the countries together account for 9% of the total live trade.

Table 3.4 Top five main importing countries, the number of species for which the country is a top five importer and the number of species for which the country is the number one importer.

Country	Average import per year	Percentage of total live trade	Top five importer for X species	Top importer for X species
US	1 900	63.8 %	17	15
FR	380	12.0 %	14	2
JP	280	9.7 %	14	-
DE	100	3.6 %	14	-
CZ	95	3.0 %	8	-

For all seventeen *Varanus* species, the United States of America (USA) is one of the five main importing countries. The USA is even the number one importing country for fifteen of the seventeen species. The only two species for which this does not apply are *V. boehmei* and *V. yuwonoi*; two species in which only a small number of specimens is traded in general. The numbers of import are more or less stable for the USA, Japan Germany and the Czech Republic. Live trade in France mostly occurred between 2005 and 2010, with a large peak in import in 2010 when 1 220 specimens are imported (see figure 3.5).

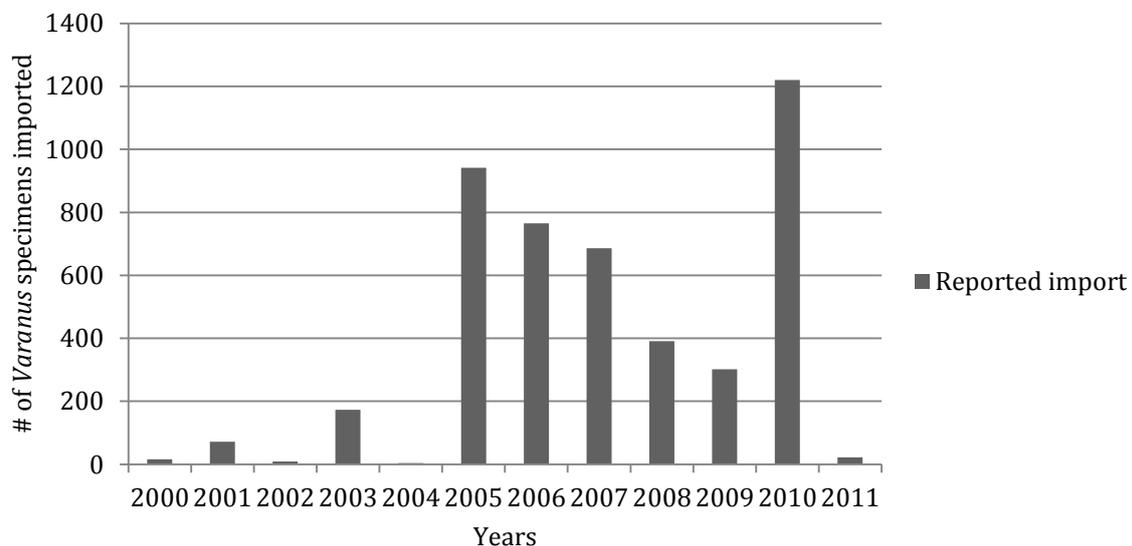


Figure 3.5 Import of *Varanus* specimens in France per year and change of source codes, based on importer records by France.

3.1.3 Major discrepancies

Discrepancies per year

Exporting countries should report the same numbers of specimens traded per year as importing countries. In reality this is almost never the case due to different ways of reporting by importing and exporting countries (CITES, 2013e; Chng, 2014). This results in export numbers that are almost always higher than reported import numbers. In some years it is the other way around and all importing records are higher than reported export for a certain year. For example, import numbers of *V. timorensis* are higher than export numbers in 2002, 2007, 2009 and 2011, see table 3.5.

Table 3.5 The discrepancy between reported numbers by importer and reported numbers by exporter, where importers report higher numbers of animals.

Species	2000	2001	2002	2005	2006	2007	2009	2011	Total
<i>V. dumerilii</i>			107						107
<i>V. indicus</i>	7	17							24
<i>V. melinus</i>				11					11
<i>V. gouldii</i>			84						84
<i>V. prasinus</i>		24			11		6		41
<i>V. timorensis</i>			294			126	74	1	495

Discrepancies per country

Per country reported import numbers are sometimes higher than export numbers. This could be because animals are reported by the importing country the year after Indonesia reported the export permit. It could also be that the animals are imported without an export permit (illegal). Reported import exceeds reported export by 870 specimens. The country that had the most discrepancies is France (72.1% of 870 specimens). Besides France some other countries also report higher import than export. These are the Czech Republic, Austria, the United Kingdom, Hong Kong, South-Africa, and Malaysia, see table 3.6.

Table 3.6 The discrepancy between reported numbers by importer and reported numbers by exporter, where importers report higher numbers of animals, per country.

Country	Discrepancy between reported import and reported export	Percentage
France	627	72.1 %
The Czech Republic	113	13.0 %
Austria	36	4.1 %
The United Kingdom	31	3.6 %
Hong-Kong, SAR	30	3.5 %
South-Africa	24	2.8 %
Malaysia	9	1.0 %

3.1.4 Source codes

When an animal is exported or imported it is 'labelled' with a source code which declares the origin of the animal. For *Varanus* species source codes 'C' (Animals bred in captivity), 'F' (Animals born in captivity (F1 or subsequent generations) that do not fulfil the definition of 'bred in captivity'¹) and 'W' (specimens taken from the wild) are the most frequently used source codes.

The total number of wild-caught specimens decreased with an average of 114 specimens per year ($p < 0.001$). The total number of captive-bred specimens ('C') increased with an average of 136 specimens per year ('C': $P < 0.001$) see figure 3.6. 2012 is excluded in this analyse since not all trade is reported yet.

¹ For the Resolution from the Conference of the Parties 10.16, see <http://cites.org/eng/res/10/10-16C15.php>.

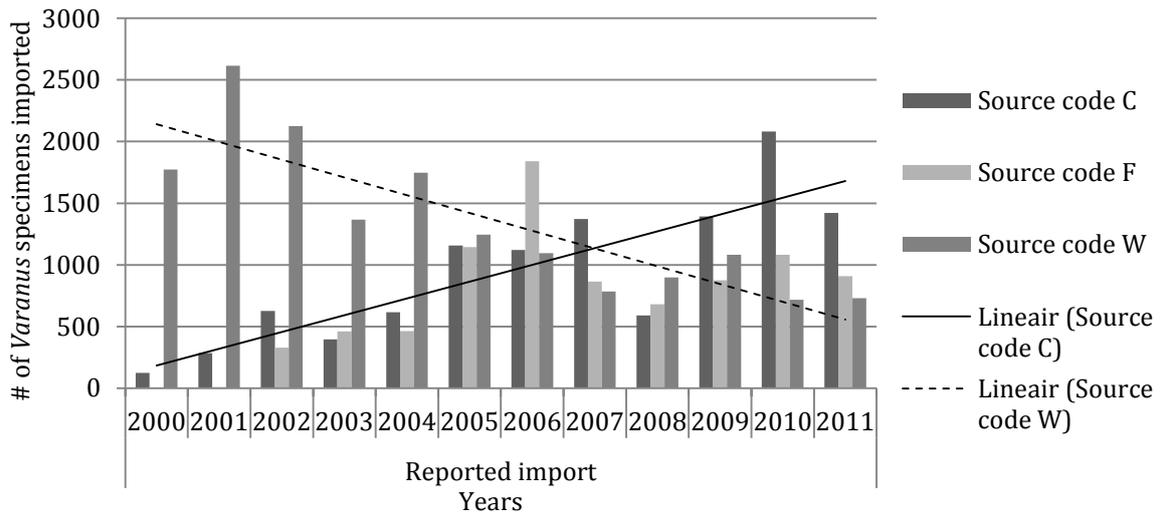


Figure 2.6 Total import; the number of wild-caught *Varanus* specimens decreased ($\beta=-144.17$ specimens per year; $p<0.001$; $R^2=0.74$). The number of trade in 'C'-specimens increased ('C': $\beta=136.29$ specimens per year; $p<0.001$; $R^2=0.71$).

The ratio of wild-caught specimens and captive-bred specimens also shifted. From 2000 until 2005/2007 the percentage of wild-caught specimens decreases almost linearly. A turning point in the import of wild-caught specimens occurs between 2005 and 2007; import of wild-caught specimens remains around 30% of all import (see figure 3.7). Import of specimens with source code F seems to be increasing in the early years, but also remains around 30% from the year 2005 and on. The import of captive-bred ('C') specimens has no turning point at all, the import of those specimens continues to increase over the years

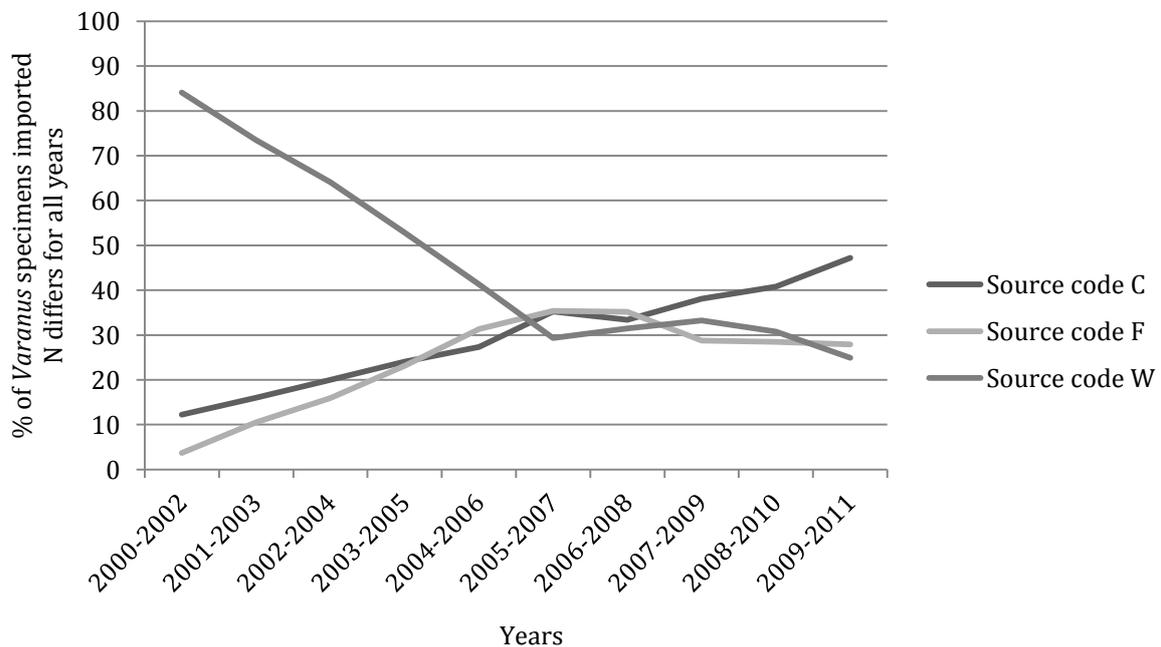


Figure 3.7 The moving average per three years. A turning point in import of wild-caught specimens between 2005-2007 and a continuous increase in import of captive-bred specimens ('C').

For 16 of the 17 species at least 50% of the traded specimens are reported with one source code (e.g. +- 80% of the *V. dumerilii* specimens is traded as wild-caught). For four species this source code is 'C'. For six species this is source code 'F' and for five species it is source code 'W' (see table 3.7). Only for *V. beccarii*, the use of source codes is more or less divided equally (for both reported import and export. Specific cases are discussed in the following paragraphs.

Table 3.7 Percentage of source codes used for declaring the source of traded specimens. Colored cells mean that that is the source code that is mostly reported for that species. An empty cell means that no animals are traded with that specific source code.

Soort		% C	% F	% W	% Seized	% Unknown
<i>V. beccarii</i>	Export	25,2	44,6	30,2		
	Import	11,1	49,1	39,5	0,4	
<i>V. boehmei</i>	Export		100			
	Import		100			
<i>V. doreanus</i>	Export		10,9	89,1		
	Import	0,6	7,5	91,7	0,1	
<i>V. dumerilii</i>	Export	0,7	17,8	81,5		
	Import	0,9	18	81,2		
<i>V. gouldii</i>	Export	11,9	88,1			
	Import	19,8	80,2			
<i>V. indicus</i>	Export	100				
	Import	92,7	3,7	3,3	0,3	
<i>V. jobiensis</i>	Export	5,1	13,8	81,1		
	Import	9,1	9,7	80,9	0,3	
<i>V. kordensis</i>	Export	98,45	1,55			
	Import	96,4			3,6	
<i>V. macraei</i>	Export	22,7	77,3			
	Import	10,9	86,6	2,1	0,4	
<i>V. melinus</i>	Export		100			
	Import	4,3	92,9	1,8	0,9	
<i>V. prasinus</i>	Export	100				
	Import	95,5	2,15	2,15	0,2	
<i>V. reisingeri</i>	Export		100			
	Import	14,1	75	7,8	3,1	
<i>V. rudicollis</i>	Export	0,7	27,1	72,2		
	Import	2,2	21,1	76,4	0,3	
<i>V. salvadorii</i>	Export	1,29	17,26	81,45		
	Import	2,1	15,4	82,3	0,2	
<i>V. similis</i>	Export		100			
	Import	7,92	89,44	2,64		
<i>V. timorensis</i>	Export	100				
	Import	91,1	1,1	7,4	0,4	0,04
<i>V. yuwonoi</i>	Export	24,4	75,6			
	Import	34	66			

Species with an interesting mix of source codes

For *V. beccarii* Indonesia and importing countries mostly used source code 'W' in the years 2000 up to 2004 (between 40% and 100%). In 2003 and 2004 Indonesia and importing countries started to use source code 'F' for declaring live trade in *V. beccarii*. Since 2007 source code 'C' is also used for declaring traded specimens (see figure 3.8). It is remarkable that in 2007 Indonesia only reported captive-bred animals and that this shifted to only 'F'-specimens in 2008 and 2009.

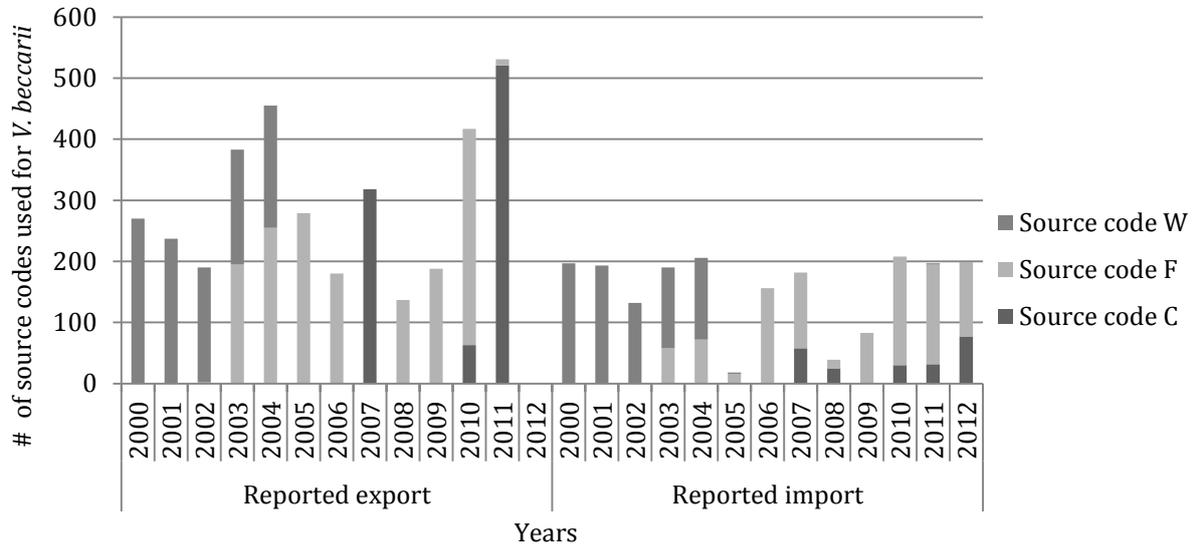


Figure 3.8 Use of source codes for *Varanus beccarii* as reported by Indonesia and by importing countries

V. boehmei specimens are all reported as 'F' by both Indonesia and importing countries. There are only 82 *V. boehmei* specimens reported in live trade.

V. gouldii - including *V. panoptes* - specimens are mostly traded with source code 'F', until 2004. Since 2004, both Indonesia and importing countries also use source code 'C' but there is no clear increase or decrease in the number of specimens traded with this source code. Live trade reported, by importing countries, reveals a decrease in 'F'-specimens after 2007, however in 2012 this slightly increases again so it is yet unknown whether this decrease will continue (see figure 3.9).

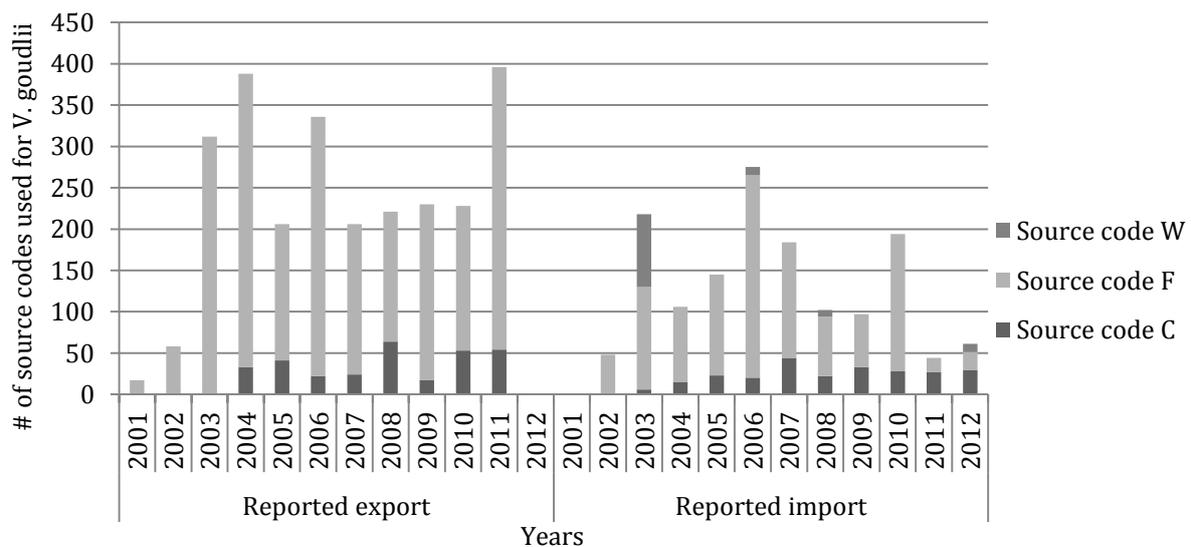


Figure 3.9 Use of source codes for *Varanus gouldii* as reported by Indonesia and by importing countries

Species with a sudden shift in source codes

Live trade in *V. doreanus*, *V. dumerilii*, *V. jobiensis*, *V. rudicollis* and *V. salvadorii* shows shifts in reported source codes, figure 3.10 resembles this shift for all five species. There is an increase in use of source code 'F', which starts between 2002-2005 (different starting year per species). Reported import reveals a decrease in live trade in all five species. Source code 'C' is used in reporting specimens of all species in 2010. For some 2010 is the first (and only) year in which specimens are reported with source code 'C'.

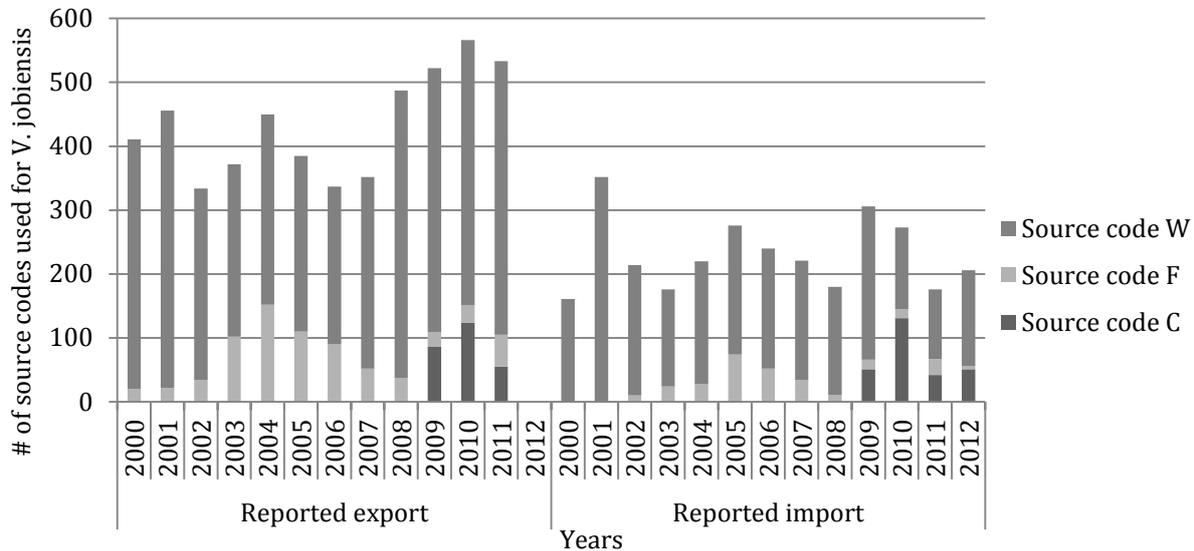


Figure 3.10 Use of source codes for *Varanus jobiensis* as reported by Indonesia and by importing countries

Indonesia started using source code 'C' for declaring export of *V. macraei* in 2010, and in 2011 almost all live trade in *V. macraei* is reported as captive-bred. Importing countries already reported import with source code 'C' in previous years; in 2004, 2007 and 2009. The number of *V. macraei* imported as 'C' increased in 2010. After 2010 import in captive-bred specimens decreases again but the numbers are still slightly higher than before 2010 (see figure 3.11).

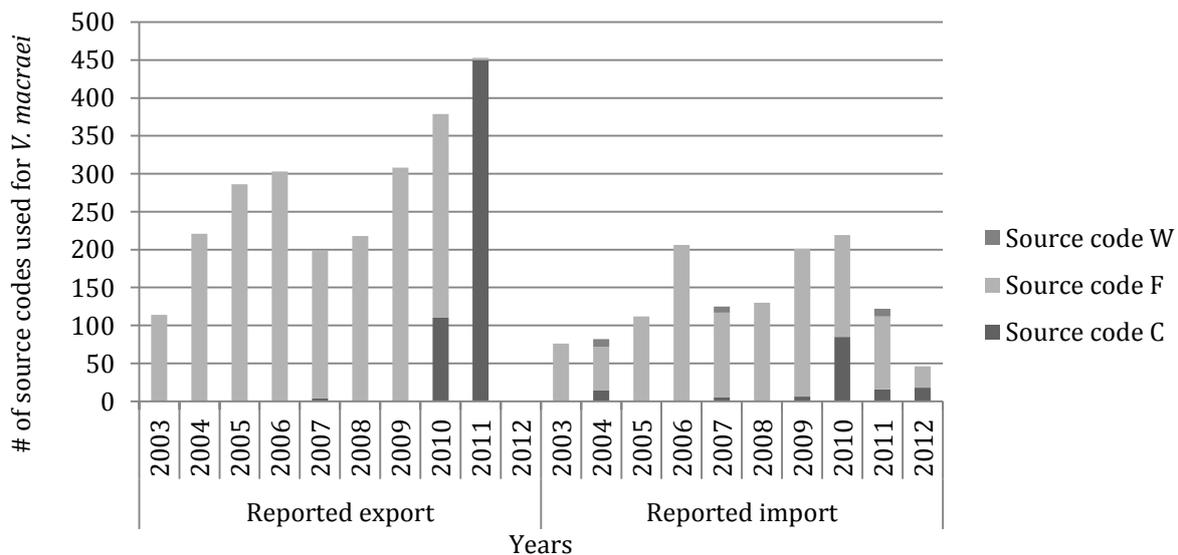


Figure 3.11 Use of source codes for *Varanus macraei* as reported by Indonesia and by importing countries

V. yuwonoi is only traded between 2005/2006 and 2012. Between 2005 and 2007 the species is mostly reported as captive-bred by exporting and importing countries. There is a clear shift between 2007 and 2008; since 2008 the live trade completely changed from 'C'-specimens to 'F'-specimens (see figure 3.12).

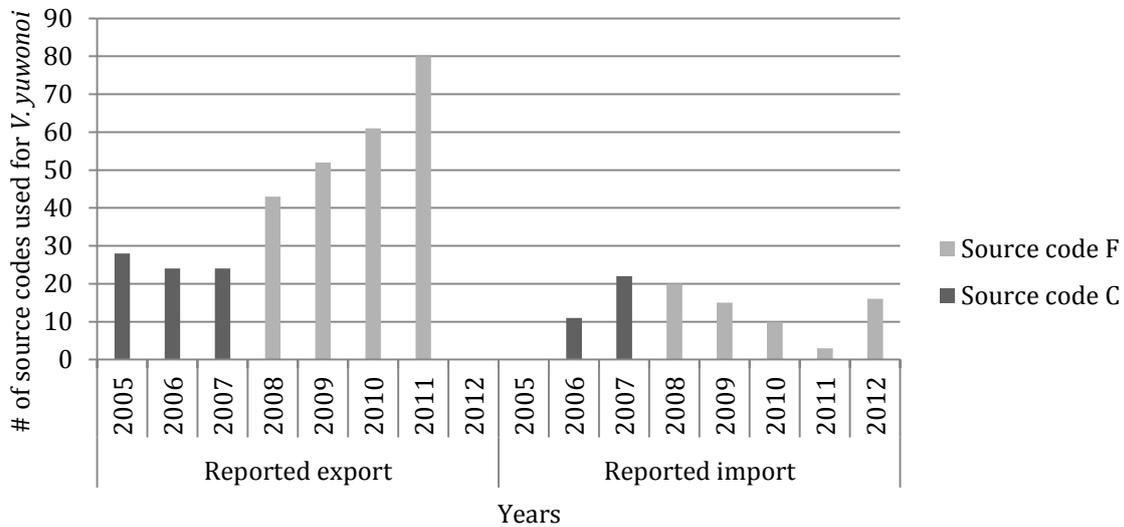


Figure 3.12 Use of source codes for *Varanus yuwonoi* as reported by Indonesia and by importing countries

Species with discrepancies between importer and exporter reported source codes

Only for one species (*V. boehmei*) the use of source codes of reported export and reported import did not change over the years; 100% is reported as captive-bred. For all other species there are discrepancies in use of source codes. Only live trade in *V. timorensis* has a clear discrepancy between reported trade by Indonesia and importing countries; while Indonesia reported all exported specimens as 'C' in all years, importing countries also reported 'F' and 'W' specimens. In the early years, between 2000 and 2005, there are still quite a few specimens reported as wild-caught, whereas after 2005 almost no specimens are reported with source code 'W' (see figure 3.13).

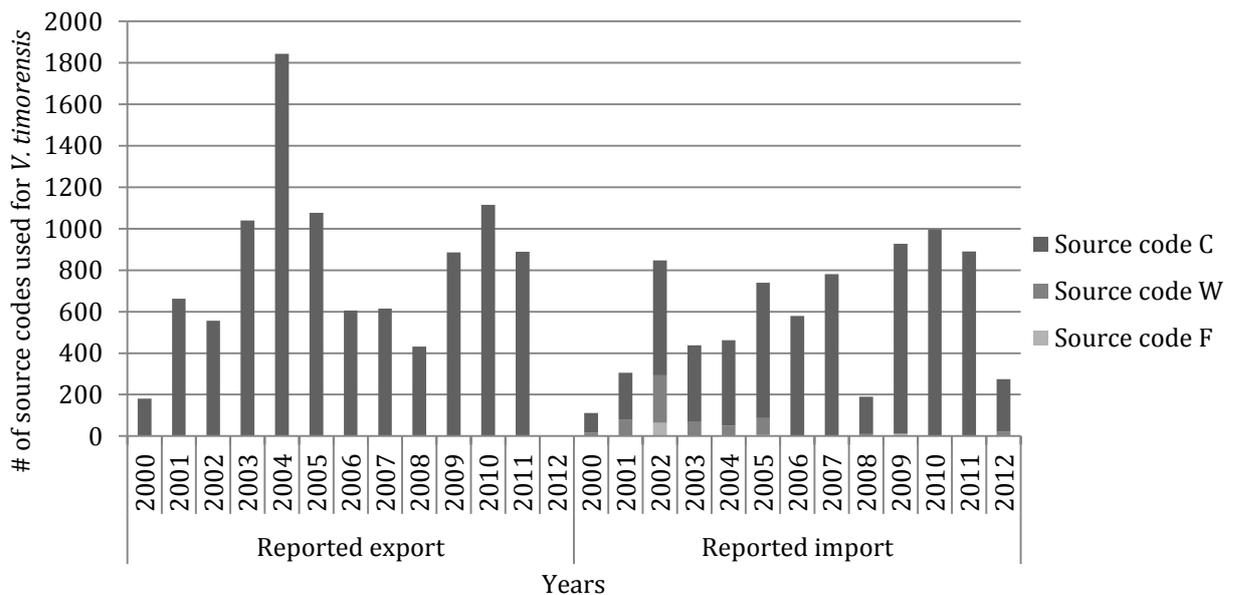


Figure 3.13 Use of source codes for *Varanus timorensis* as reported by Indonesia and by importing countries

Source codes per country

There is a difference in source codes reported per country. The top five countries, the USA, France, Japan, Germany and the Czech Republic, are analysed.

The number of specimens imported in the USA, reported with source code 'C', significantly increases with an average of 69 specimens per year. The number of specimens traded with source code 'W' decreases significantly with 117 specimens per year, see figure 3.14. Since the USA is the top importer of *Varanus* species, the decrease of import in wild-caught specimens decreases the pressure on wild populations. This only happens when captive-bred specimens are indeed captive-bred; which is further discussed in chapter 3.3. The number of specimens imported with source code 'F' does not have a significant increase or decrease for the USA.

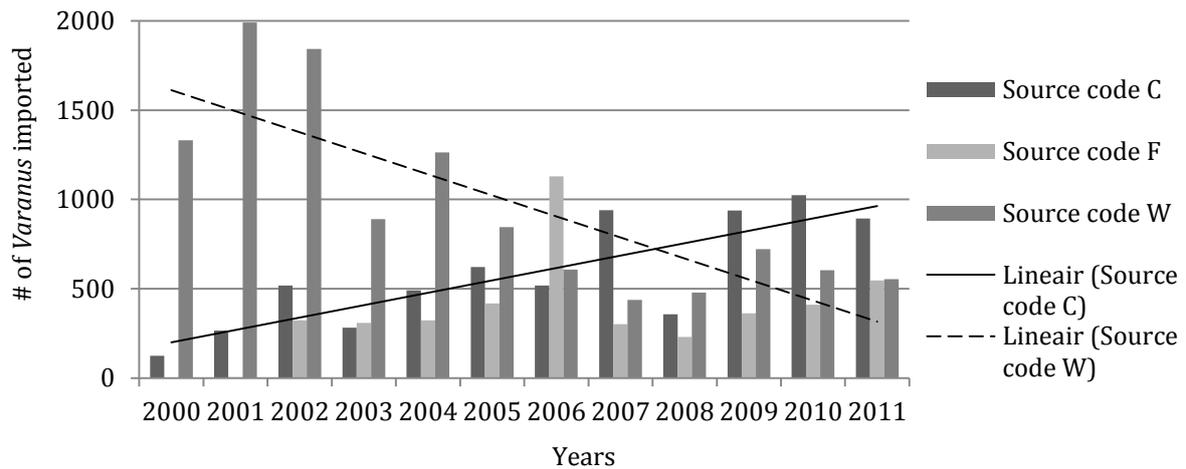


Figure 3.14 Import of *Varanus* specimens in the USA per year and change of source codes, based on importer records by the USA. A significant decrease in source code 'W' ($\beta=-117,75$ specimens per year; $p=0.002$; $R^2=0.65$) and a significant increase in source code 'C' ($\beta=69.38$ specimens per year; $p<0.001$; $R^2=0.68$), a linear regression analysis is used.

In France, Germany and Japan there is no significant increase or decrease in the number of specimens imported with a specific source code and numbers stay relatively stable. In the Czech Republic the number of imported specimens increased, since 2005, with an average of 31 specimens per year, see figure 3.15. But live trade only occurred between 2005 and 2012 and there are not enough data to determine whether the positive trend in use of source code 'C' is significant.

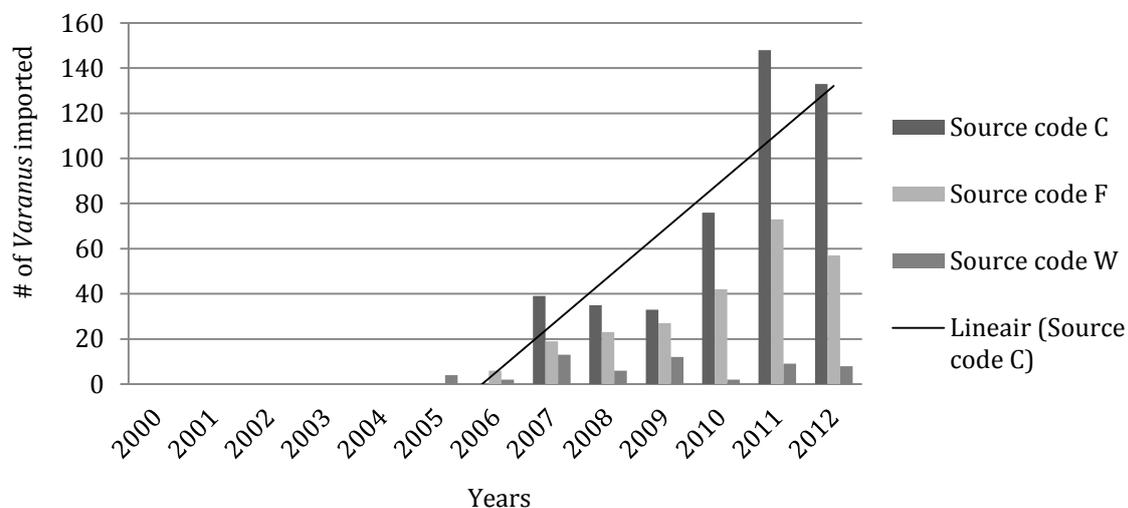


Figure 3.15 Import of *Varanus* specimens in the Czech Republic per year and change of source codes, a significant increase ($\beta=31.23$ specimens per year) in live trade is found using a linear regression analysis.

3.1.5 Export quotas and legislation

Legislation in source countries

Since no exports or imports are reported by Papua New Guinea this section focuses on Indonesia.

For some species export quotas have been set by Indonesia's CITES Scientific Authority, the Indonesian Institute of Sciences (LIPI) and some are nationally protected. According to Shepherd & Nijman (2007) the implementation and enforcement of these national laws is currently far from effective and it is not known whether export quotas are actually maintained. CITES quotas for export from Indonesia are set for six of the 17 *Varanus spp.*: *V. beccarii*, *V. doreanus*, *V. dumerillii*, *V. jobiensis*, *V. rudicollis* and *V. salvadorii* (see appendix I). Quotas are exceeded by reported export for all six species and by reported import for *V. beccarii*, *V. dumerillii* and *V. rudicollis*. Because not all reported export is necessarily exported, only the import numbers are taken into account (see table 3.8).

Table 3.8 Exceeded CITES quotas for export from Indonesia

Species	Year of exceeding	CITES Quota	Reported import
<i>Varanus beccarii</i>	2004	200	206
<i>Varanus dumerillii</i>	2002	400	483
<i>Varanus rudicollis</i>	2006	900	960

Of those six species, there are four species where wild-caught specimens from Indonesia are suspended from being imported into the EU; *V. beccarii* (since 1997), *V. dumerillii* (1998), *V. jobiensis* (1998) and *V. salvadorii* (1999). In two cases this suspension is trespassed; in 2000 Spain imported 4 wild-caught *V. jobiensis* specimens and in 2007 Austria imported 7 wild-caught specimens of the same species. For two species from PNG there is an import suspension of wild-caught specimens into the EU; *V. bogerti* (1997-2009) and *V. telenesetes* (1997-2013). No EU suspensions for these species are found in 2002.

Four of the 17 *Varanus spp.* are protected by Indonesian law, these are: *V. indicus*, *V. gouldii*, *V. prasinus* and *V. timorensis* (three other national protected species are *V. komodoensis*, *V. nebulosus* and *V. togianus*). According to Nijman & Shepherd (2009) the Indonesian Government's regulation No. 8, 1999, "On the utilization of wild plants and animal species", the following two paragraphs of article 10 define which generations of protected wild animals may or may not be traded:

1. The result of captive breeding of protected wild animals, which can be traded, is the second generation and the subsequent generations of the captive breeding.
2. Second generation and following generations resulted from the captive breeding of protected wildlife animals, are declared as unprotected wild animal species.

This indicates that nationally protected species can only be legally traded if they are at least second generation (F2) captive-bred.

Analysis of the CITES Trade Database show that reported live trade of these four species is not 100% indicated as captive-bred in accordance with Resolution Conf. 10.16 of CITES (source code 'C'), especially the use of source code 'C' for *V. gouldii* specimens is remarkably low (see table 3.9).

Table 3.9 Use of source codes for national protected species

Species	Export or import numbers	Use of source codes in % of reported specimens		
		C	F	W
<i>V. gouldii</i>	Exp.	11.9	88.1	0
	Imp.	19.8	80.2	0
<i>V. indicus</i>	Exp.	100	0	0
	Imp.	92.7	3.7	3.3
<i>V. prasinus</i>	Exp.	100	0	0
	Imp.	95.5	2.2	2.2
<i>V. timorensis</i>	Exp.	100	0	0
	Imp.	91.1	1.1	7.4

Legislation in importing countries

All Signatories to CITES must have national legislation implementing CITES, i.e. relating to wildlife trade. This may pertain to import/export of CITES-listed species, export of native and non-native species, who may seize illegally obtained specimen falling under CITES, etc. In this chapter the trade legislation is described for the two most important importers of *Varanus* spp. This includes the largest importer: the USA and the two countries in which import numbers are higher than export numbers: France and the Czech Republic. Since France and the Czech Republic belong to the EU, the European regulations, which are the same in all EU Member States, are set out.

United States of America (USA)

The USA is one of the main importing countries of wildlife trade worldwide. In 1987 the USA was believed to account for one-third of the trade (Hemley, 1987). In 1990 the USA accounted for an estimated one-fifth of the world market (Alagappan, 1990). The CITES regulations for wildlife trade are brought under the Endangered Species Act (ESA, 1973) and the United States Fish and Wildlife Service (FWS) is responsible for administering and enforcing the ESA. Within the ESA native and non-native species can be listed as Endangered or Threatened. Once a species is listed, Section 9 of the ESA makes it unlawful for any person to “take” individuals of an endangered animal species. The term “take” means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or to attempt to participate. Under section 10 the Service can issue permits that allow limited take of listed species under very specific conditions for scientific purposes, or to otherwise enhance the propagation or survival of a species. (United States Fish Wildlife Service, 2013) Of the 17 species only *V. komodoensis* is listed as Endangered, none of the other species are listed as either Endangered or Threatened.

A review of Allagappan, M. (1990) on enforcement of CITES within the USA stated that the ESA has deficiencies and the FWS agents are not obligated to refuse clearance of shipments, even if there are reasonable grounds to believe CITES is violated. Whether this is still the case is unclear but no suspected violations are found based on the reported data and no discrepancies are detected from the CITES Trade Database analysis.

European Union

As a result of the European internal market and the lack of systematic border controls within the EU, the provisions of CITES have to be implemented the same in all EU Member States. CITES is implemented in the EU through a set of regulations known as the EU Wildlife Trade Regulations (European Commission, 2014a).

Permits, certificates or notifications are required for trade to and from the EU, in animal or plant species listed in one of the four Annexes (Annex A, B, C and D, see table 3.10) of Council Regulation (EC) No 338/97 (European Commission, 2014b; European Commission, 2014c). All of the 31 *Varanus* spp. are listed in Annex B, except *V. komodoensis* and *V. nebulosus*,

these species are listed in Annex A (European Union, 2012). The required documents will only be issued if certain conditions are met, and they must be presented to the Customs service before a shipment is allowed to enter or leave the EU. Whether or not these conditions are met will be verified by the designated Management Authority of the individual EU Member State in co-operation with its national Scientific Authority (European Commission, 2014b).

Table 3.10 The four Annexes of Council Regulation (EC) No 338/97

Annex	Species on the Annex
Annex A	<ul style="list-style-type: none"> • All CITES Appendix I-listed species, except where an EU Member State has entered a reservation. • Some CITES Appendix II- and III-listed species, for which the EU has adopted stricter domestic measures. • Some non-CITES-listed species.
Annex B	<ul style="list-style-type: none"> • All other CITES Appendix II-listed species, except where an EU Member State has entered a reservation. • Some CITES Appendix III-listed species. • Some non-CITES-listed species.
Annex C	All other CITES Appendix III-listed species, except where an EU Member State has entered a reservation
Annex D	Some CITES Appendix III-listed species. Some non-CITES-listed species.

Import of a specimen of an Annex A- or B-listed species: an export permit needs to be issued by the exporting country and an import permit issued by the CITES Management Authority of the EU Member State of destination. Documents must be obtained before the introduction into the EU and must be presented to the customs office at the point of first introduction (European Commission, 2014b).

3.2 Illegal trade in *Varanus* species

Wildlife crime is a worldwide problem. For traders involved it is much more appealing to trade wildlife than for instance drugs, which has much higher penalties (Le Duc, 1996; Holden, 1998). The large profit margins coupled with low penalties and low transport costs have made the reptile trade a lucrative business (Hoover, 1998). In Southeast Asia, unsustainable and illegal trade in wildlife threatens the conservation of numerous species (Nooren & Claridge, 2001; Shepherd, et al., 2004; Grieser-Johns, et al., 2005; Nijman & Shepherd, 2007; Nijman & Shepherd, 2011; Shepherd & Nijman, 2007) with Indonesia as one of the region's major exporting countries of wildlife (Soehartono & Mardiasuti, 2002; Nijman, 2010).

Indonesia's CITES Scientific Authority, the Indonesian Institute of Sciences (LIPI) sets quotas for harvest and export after consultation with various stakeholders (Amir, et al., 1998). Prior to setting a quota, CITES requires that a non-detriment finding (NDF) has to be carried out to assess the sustainable off-take for any species or population (CITES, 2013d). However, reliable NDF studies require information on population and reproductive biology, which is unavailable for most species traded in Indonesia; quotas for many species are based on trade figures in previous years instead (Auliya, 2010).

Captive breeding remains economically unprofitable for a large number of reptile species. A lot of species that are found in live trade are still wild-caught, although traders claim that the animals are captive-bred (Auliya, 2003; Le Duc, 1996; Nijman, et al., 2012). The laundering of wild-caught specimens is hard to detect, as it is difficult to distinguish wild from captive-bred specimens (Auliya, 2003). This problem is exploited by traders, who intentionally misidentify species and make false declarations of the contents of shipments (TRAFFIC, 1999; Laidlaw, 2005). Wildlife can be illegally traded in many ways; for instance by changing the items' appearance or concealing them within legal shipments, false customs declarations, using fraudulent permits, and through diplomatic baggage, which can get around customs checks (Cook, et al., 2002). Another devastating fact is that only one third of all captured reptiles meant for the pet trade, actually enter the trade chain. The remainder often perishes under cruel conditions (Research for the Environment, 2013).

Incomplete understanding of species being traded and poor monitoring and enforcement at key trade hubs are one of the reasons why illegal trade still occurs (Natusch & Lyons, 2012). Nijman, et al. (2012), state that although trade in wild-caught specimens is illegal it is traded in an open manner, with blatant disregard for the law. According to the authors this clearly demonstrates a serious lack of enforcement. As a result, harvest and export continue to greatly exceed quotas and according to many individuals involved, this has resulted in significant local declines in traded species, indicating that harvest levels are unsustainable (Nijman, et al., 2012). Papua is believed to be the largest supplier of live reptiles and amphibians in Indonesia. This is partly because of the high demand for taxa that are banned for export from Australia but are still available from Papua (Yuwono, 1998).

Current Indonesian legislation appears non-transparent and incomplete to conserve Indonesia's currently recognized monitor lizard species (Koch, et al., 2013). And although wildlife law enforcement did become better and stricter, another challenge for enforcement developed recently: the Internet. The Internet presents new challenges via virtual markets that yet have to be regulated properly (Wu, 2007)

The extent of illegal trade can only be estimated and although the total numbers are not known, a small proportion of illegal trade is known through published confiscations and seizures. Custom services and other authorities sometimes come across illegal shipments and they can confiscate or seize those. A lack of a functioning central mechanism for reporting wildlife confiscations can also cause discrepancies (Phelps, et al., 2010). TRAFFIC does publish a TRAFFIC Bulletin twice a year. In this journal the latest news on related legislation, investigations, seizures and original reports is published (TRAFFIC, 2008). For an overview of all seizures of the 31 *Varanus* species reported to CITES between 2000 and 2012 see table 3.11.

Table 3.11 Seizures of *Varanus* specimens reported in the CITES Trade Database under source code 'I'

Year	Taxon	Importer	Exporter	Importer's Reported Quantity	Purpose code ¹
2009	<i>Varanus beccarii</i>	United States of America	Indonesia	5	T
2011	<i>Varanus beccarii</i>	United States of America	Indonesia	2	T
2009	<i>Varanus doreanus</i>	United States of America	Indonesia	1	T
2011	<i>Varanus doreanus</i>	United States of America	Indonesia	2	T
2002	<i>Varanus gouldii</i>	Czech Republic	Unknown	3	T
2009	<i>Varanus gouldii</i>	United States of America	Indonesia	13	T
2011	<i>Varanus gouldii</i>	United States of America	Indonesia	8	T
2008	<i>Varanus indicus</i>	United States of America	Solomon Islands	61	T
2009	<i>Varanus indicus</i>	United States of America	Indonesia	3	
2002	<i>Varanus jobiensis</i>	United Kingdom	Indonesia	6	T
2009	<i>Varanus jobiensis</i>	United States of America	Indonesia	7	T
2011	<i>Varanus jobiensis</i>	United States of America	Indonesia	2	T
2009	<i>Varanus kordensis</i>	United States of America	Indonesia	4	T
2006	<i>Varanus macraei</i>	Indonesia	New Zealand	1	
2009	<i>Varanus macraei</i>	United States of America	Indonesia	5	T
2009	<i>Varanus melinus</i>	United States of America	Indonesia	15	Z
2011	<i>Varanus melinus</i>	United States of America	Indonesia	8	Z
2012	<i>Varanus melinus</i>	Germany	Switzerland	1	T
2009	<i>Varanus prasinus</i>	United States of America	Indonesia	3	T
2011	<i>Varanus prasinus</i>	United States of America	Indonesia	3	T
2011	<i>Varanus reisingeri</i>	United States of America	Indonesia	2	T
2011	<i>Varanus rudicollis</i>	United States of America	Indonesia	20	T
2011	<i>Varanus salvadorii</i>	Poland	Switzerland	1	
2011	<i>Varanus salvadorii</i>	United States of America	Indonesia	3	
2009	<i>Varanus similis</i>	United States of America	Indonesia	8	T
2009	<i>Varanus spinulosus</i>	United States of America	Solomon Islands	20	T
2000	<i>Varanus spp.</i>	United Kingdom	Senegal	8	T
2002	<i>Varanus spp.</i>	Czech Republic	Unknown	18	T
2009	<i>Varanus timorensis</i>	United States of America	Indonesia	32	Z
Total				265	

¹Purpose codes indicate the purpose of trade; T=commercial, Z=zoo

Next to the seizures reported to the CITES Secretariat, seizures are also reported and published in other sources (e.g. newspapers and the TRAFFIC Bulletin). A total of more than 37 000 specimens of 12 species have been reported seized in these sources, see table 3.12 (for the extensive table, see Appendix II). Ten of these species are included on CITES Appendix II, these species are: *V. beccarii*, *V. cerambonensis*, *V. dumerilii*, *V. jobiensis*, *V. macraei*, *V. melinus*, *V. panoptes*, *V. prasinus*, *V. rudicollis* and *V. salvadorii*. Two of the species are even CITES Appendix I species; *V. komodoensis* and *V. nebulosus*. A lot of the seizures do not report the species' taxonomic name, but only the class *Varanus*; indicating that identification of species is a problem.

Indonesia is directly involved in six seizures, either as exporting country or as part of the trade route where the seizure took place. Trade routes include Southeast Asia in more than 70% of the seizures. The origin and/or destination are almost never reported. A lot of the illegal trade is discovered by checking cars or lorries, at airports, or. In some cases the specimens are smuggled by boat or sold at (black)markets. Several manners of concealing the animals are described in seizure reports; the animals are most often concealed in plastic or wooden boxes, crates or cages. Specimens have also been found in bags or gunny sacks, coolers or freezers and even in plastic tubes and cloths and some are even wrapped in nets.

Table 3.12 Seizures of *Varanus* spp. from other sources¹ than the CITES Trade Database

Year	Species	# seized specimens
2000	<i>Varanus</i> spp.	8
2001	<i>V. komodoensis</i>	Unknown
	<i>Varanus</i> spp.	566
2002	<i>Varanus</i> spp.	13
	<i>V. rudicollis</i>	1
	<i>V. dumerilii</i>	4
2003	<i>Varanus</i> spp.	2.6t ⁺
2004	<i>V. prasinus</i>	68
	<i>V. salvadorii</i>	2
	<i>Varanus</i> spp.	3
2005	<i>Varanus</i> spp.	2t ⁺
2006	<i>Varanus</i> spp.	14
2007	<i>V. nebulosus</i>	748
	<i>Varanus</i> spp.	12
2008	<i>V. nebulosus</i>	9321
	<i>Varanus</i> spp.	7267 ⁺
2009	<i>V. dumerilii</i>	2
	<i>V. nebulosus</i>	3566
	<i>Varanus</i> spp.	9604
2010	<i>V. nebulosus</i>	422
	<i>Varanus</i> spp.	329 ⁺
2011	<i>V. beccarii</i>	2
	<i>V. jobiensis</i>	3
	<i>V. macraei</i>	2
	<i>V. nebulosus</i>	46
	<i>V. prasinus</i>	7
	<i>V. salvadorii</i>	2
	<i>Varanus</i> spp.	5249 ⁺
2012	<i>V. cerambonensis</i>	1
	<i>V. jobiensis</i>	1
	<i>V. melinus</i>	3
	<i>V. komodoensis</i>	6
	<i>V. panoptes</i>	4
	<i>V. prasinus</i>	3
	<i>Varanus</i> spp.	65

¹ (Traffic, 2013; ASEAN Wildlife Enforcement Network, 2008-2012; The Hindu, 2008; The Star Online, 2008; New Strait Times, 2008; Asia-Pacific News, 2008; Associated Press, 2009; Earthtimes.org, 2009; Indian Express.com, 2010; New Strait Times, 2010), (Abc.net.au, 2011; New Strait Times, 2011; The Indian Express, 2011; The Daily Telegraph, 2012; Reuters, 2012)

3.3 Probability of live trade in captive-bred *Varanus* species

Monitor lizards are solitary creatures. Monitors only seek a partner during the breeding season. All *Varanus* species are oviparous and prior to mating, the female spends a great deal of energy in the production of eggs. For this reason females are usually less active than males, grow at slower rates and achieve smaller sizes (sexual dimorphism). In most species, female monitors reach a peak of activity as they begin to search for suitable nesting sites (Bennett, 1995; Laidlaw, 2005). Because of the high activity level in breeding season, wildlife traders can easily find and catch the female monitors (and sometimes their nests). Targeting adult females has a detrimental effect on wild populations as entire clutches and egg producing females are removed (Laidlaw, 2005; Bennett & Thakoordyal, 2003). There are also a lot of juveniles and eggs taken from the wild that otherwise had a low probability of surviving in the wild; this is called ranching (TRAFFIC, 2013).

The age of sexual maturity is only known for a few species. For these species the age of sexual maturity lies between one and eight years (King & Green, 1993). Clutch sizes are positively correlated with body length and thus also differ for all species (King & Green, 1993). Although captive animals are able to produce two or more clutches a year, there is no evidence of multiple clutching in the wild (King & Green, 1993); it might occur in the wild when climate and food resources are optimal (Bennett, 1995). Eggs are laid between an average of 30 to 45 days after mating. Monitor lizards lay their eggs in hidden nests, mostly at an elevated location to prevent the embryos from dying due to flooding. Some species even lay eggs within termite mounds (King & Green, 1993). Mortality in youngsters is very high in the first year and the small amount of data available suggest that many eggs may fail to hatch at all (in captivity and in the wild) (Ehmann, et al., 1991; Phillips & Packard, 1994; Bennett, 1995). A lot of reptile forums and websites also state that in captivity clutches are found, but (full-grown) embryos almost never hatch or the eggs are not even fertilized.

Although 53,5% of live trade in *Varanus* specimens reported to CITES is reported captive-bred (source code 'C', 26,9%, and 'F', 26,6%), it is believed that only a very small proportion is actually captive-bred (Auliya, 2003; Le Duc, 1996; Nijman & Shepherd, 2009; UNEP-WCMC, 2014). Breeding ecology of the most important species, in live trade, is analysed to assess the probability of live trade in specimens actually being captive-bred. The species analysed are the top three traded species (*V. rudicollis*, *V. timorensis* and *V. dumerilii*) and two species in which a lot of specimens are traded as captive-bred (*V. prasinus* and *V. beccarii*), see table 3.13.

Table 3.13 An analysis of the breeding ecology of *V. beccarii*, *V. dumerilii*, *V. prasinus*, *V. rudicollis*, and *V. timorensis*.

Species	Sexually mature ¹	Clutch size wild ²	Clutch size captive ³	Multiple clutching (in captivity) ⁴	Maximum number of eggs per female per year (based on captive clutch sizes)
<i>V. beccarii</i>	2 years	7-35 eggs	Up to 6 eggs	Yes, up to three times	18
<i>V. dumerilii</i>	Unkn.	23 eggs	Up to 25 eggs	Yes.	25
<i>V. prasinus</i>	2 years	2-5 eggs	Up to 8 eggs	Yes, up to four times.	32
<i>V. rudicollis</i>	Unkn.	Unkn	Up to 14 eggs	Yes, up to three times	42
<i>V. timorensis</i>	3 years	4-12 eggs	Up to 11 eggs	Unkn.	11

¹ & ² (Bennett, 1995; King & Green, 1993; King, et al., 2004; Monitor-Lizards.net A, sd; Monitor-Lizards.net B, sd; Nijman & Shepherd, 2009; Pianka, 2006; Valoras, 1998)

³ & ⁴ (Bayless, sd; Biocyclopedia, 2012; Eidenmueller, 1998; Jacobs, 2002; Lincoln Park Zoo, 2001; Mendyk, 2008; Radford & Paine, 1989; The Zoological Park Organization, sd)

For *V. beccarii* Indonesia reported a total export of 531 captive-bred specimens in 2011. In order to breed these specimens a minimum of 30 breeding females is needed. But, not all reported export is necessarily exported. Based on the reported import, the minimum number of breeding females needed is less. The minimum number of female specimens would than be 11 (199 specimens are reported as import in 2011).

For *V. dumerilii* there is a minimum of 40 specimens needed in order to breed the number of specimens reported as export (988 in 2011). Only a minimum of eight breeding females would be necessary based on the reported import (only 197 specimens in 2011). For *V. prasinus* this would be a minimum of 15 females (457 specimens reported as export in 2011) and only a minimum of ten females based on the reported import (329 specimens in 2011). For *V. rudicollis* the minimum number of females, based on reported export (1 133 specimens), would be 27. Based on reported import (569 specimens) there are only 14 breeding females needed. And for *V. timorensis* this would be a minimum of 81 breeding females (889 specimens reported as export, 890 specimens reported as import).

Although the breeding females may lay a lot of eggs, it is not likely, at all, that all eggs will survive. The actual number of females necessary for breeding the number of traded specimens can therefore not be determined with any certainty.

4 Discussion

The aim of this research is to gain insight in the legal and illegal international, commercial, live trade in 31 *Varanus* species native to Indonesia and Papua New Guinea (PNG) from 2000 till 2012. A large part of the research focuses on analysing all live trade reported to the UNEP-WCMC Secretariat of CITES. Additionally an internet based research is carried out to find data on illegal trade and breeding ecology. Although a complete insight cannot be given (due to for instance illegal trade that is not intercepted), a lot of (new) information is found and the aim of the research is achieved. A total of 65 655 specimens of 17 species is reported as export between 2000 and 2012. The total number of specimens reported as import is much lower; 38 406 specimens. In illegal trade a total of 265 seizures are reported to the CITES Secretariat. Seizures are also reported and published in other sources and these sources contained data for more than 37 000 seized specimens. Only six of these seizures are directly related to Indonesia; but since the origin of the species is often Indonesia or PNG, it might be that the rest of the seized specimens do originally come from Indonesia or PNG.

The data in the CITES Trade Database contains a lot of discrepancies between reported export and import. These discrepancies have five possible causes. The first cause is that exporting countries often report permits issued while importing countries report permits used (CITES, 2013e). Secondly, exporting and importing countries have different ways of reporting, they often use different units, terms, source codes and purpose codes (CITES, 2013e). The third cause is that CITES Parties are required to submit annual reports to the CITES Secretariat by 31st October of the year following the year in which the trade occurred (CITES, 2013e). This means that importers might report a shipment in the calendar year after the year in which the exporter issues the permit or reports it to CITES, causing discrepancies. The fourth cause is misuse of taxonomic names by the exporting or importing country. CITES relies exclusively on the reporting by member countries and local Custom offices do not often have adequate identification protocols or methods to rightfully identify and report species. Traders often deliberately misidentify species to bypass the Custom offices, laws and legislation (Laidlaw, 2005; TRAFFIC, 1999). The last cause found is that specimens have been imported without an export permit (illegal for Appendix I and II species (CITES, 2013b)) but this cannot be proven with the data only.

Indonesia's CITES Scientific Authority, the Indonesian Institute of Sciences (LIPI), has set quotas for six (*V. beccarii*, *V. doreanus*, *V. dumerilii*, *V. jobiensis*, *V. rudicollis* and *V. salvadorii*) of the 17 species. However, for many species, data on wild populations are limited, and quotas are based on trade figures in previous years (Auliya, 2010) instead of on population pressure and population sizes. For all six species, reported export exceeded the quotas. This could be due to one of the causes for discrepancies mentioned above. More concerning is when reported import exceeds the quotas. This happened in 3 different years for 3 different species; in 2002 the quota of *V. dumerilii* is exceeded by 83 specimens, in 2004 the quota of *V. beccarii* is exceeded by 6 specimens and in 2006 the quota of *V. rudicollis* is exceeded by 60 specimens. The reporting of the import permits for those specimens could have taken place the year after the year in which the export permit was issued. Exceeding of export quotas can also indicate inadequate quota management and administration; The Scientific Authority must work with the Management Authority to monitor the actual level of export. Exceeding quotas may result in the suspension of trade through the Review of Significant Trade, recommendations by the Standing Committee or stricter domestic measures by importing countries. (CITES Secretariat, 2008). Thus far, no stricter measurements have been taken to prevent the export of *Varanus* species from Indonesia by CITES.

Species that are nationally protected by Indonesia (*V. indicus*, *V. gouldii*, *V. prasinus* and *V. timorensis*) may only be traded as captive-bred (Shepherd, 2014; Nijman & Shepherd, 2009). Reported trade in the four protected species is not only with source code 'C'. Trade in *V. gouldii*,

for instance, even consisted of more than 80% 'F'-specimens. Maybe Indonesian Custom offices are not aware that 'F'-specimens do not fulfill the captive-bred requirements and thus are not allowed to be exported.

Total trade in wild-caught specimens is decreasing while trade in captive-bred specimens is increasing. For four species the live trade is mostly in captive-bred specimens (source code 'C'). The shift from wild-caught to captive-bred is a positive shift because the less wild-caught specimens are traded, the less the impact of trade on wild populations. There are, however, a lot of recent publications, by CITES, WWF, TRAFFIC and other wildlife trade related organisations, that point out not all trade in captive-bred specimens is indeed captive-bred. They state that the laundering of wild-caught specimens is a serious problem (Natusch & Lyons, 2011; UNEP-WCMC, 2014; Nijman & Shepherd, 2009; TRAFFIC, 2013). The success rate of captive-breeding with monitor lizards is not very high. Considering that a lot of the eggs are not even fertilized, have difficulties hatching and that many youngsters do not make it to one year of life (in both captivity and in the wild) (Ehmann, et al., 1991; Phillips & Packard, 1994; Bennett, 1995) it is hard to believe that Indonesia can trade as many captive-bred specimens per year (e.g. in 2010 more than 2 000 specimens). Surveys conducted at several breeding farms in Indonesia could not confirm any successful breeding (Auliya, 2009; Nijman & Shepherd, 2009) and most of the trade in captive-bred specimens is believed to be wild-caught (Auliya, 2003; Le Duc, 1996; Nijman, et al., 2012). All live trade that has been reported to CITES as captive-bred thus might be illegal. More studies are recommended to evaluate the current stock and abilities of breeding farms.

There are no exports reported to CITES by PNG. The seizure data do contain one seizure in Merauke, PNG; 6 specimens of unknown *Varanus* species are confiscated. The shipment, however, originated from Indonesia and it appears that no *Varanus* specimens are exported from PNG between 2000 and 2012.

The USA used to be one of the main importing countries of wildlife trade worldwide (Alagappan, 1990; Hemley, 1987). Today this is believed to be the EU (TRAFFIC, 2007). The USA is still the main importer of *Varanus* specimens native to Indonesia and PNG. The live trade in wild-caught specimens ('W') to the USA decreased while live trade in captive-bred specimens ('C') increased. Since the USA is the main importer the shift from wild-caught to captive-bred specimens is also seen in the total trade. The decrease in wild-caught specimens can be considered as a success since United States' agencies have been acting to reduce the amount of trade in wild-caught reptiles (Green, 2005).

Aside from the USA, France, Japan, Germany and the Czech Republic are other countries that are main importers of *Varanus* specimens. France, Germany and the Czech Republic – all members of the EU - are all known for their major part in wildlife trade (Auliya, 2003; Kecse-Nagy, et al., 2006; WWF/TRAFFIC, 2002; EuropeseUnie, 2014). The EU is an important market for the trade in protected species (WWF/TRAFFIC, 2002). Japan, the fifth major importing country of *Varanus* species is also known for wildlife trade. A report for TRAFFIC East Asia-Japan even describes the trade in wild animals and plants as 'part of Japan's global ecological footprint' (Ishihara, et al., 2010).

The CITES Trade Database contains data for 19 of the 31 species, but only useful data for 17 species (see figure 3.1). The two species for which the data are not further analysed are *V. komodoensis*, an Appendix I species that is not allowed to be traded for commercial purposes (only one export is reported) and *V. spinulosus* for which a few transactions are reported to CITES but none from Indonesia or PNG.

Seizure data, that are found during the internet based research, contains data for two extra species (not found in the CITES Trade Database); *V. nebulosus* and *V. cerambonensis*. There are a lot of *V. nebulosus* seizures, but Koch et al. (2013) state that this species is mainly popular for its

skin. The seized *V. nebulosus* specimens are probably intended for skin trade. *V. nebulosus* is also listed as an Appendix I species and commercial trade is therefore prohibited.

There is only one seizure of *V. cerambonensis* found, but this species is never reported traded with purpose code 'T' and it is thus not likely that this is a popular species in live trade. This is, however, inconsistent with posts by members of various reptile forums^{2,3} which share pictures and stories of their (pet) *V. cerambonensis* specimens and a captive care guide by R. G. Sprackland in 2009. Koch et al. (2013) state that *V. cerambonensis* is probably traded with a different taxonomic name (*V. indicus*) Misuse of taxonomic names is one of the explanations why not all 31 species are found in the CITES Trade Database. Some of the species for which this happens are *V. caerulivirens*, *V. cerambonensis*, *V. lirungensis*, *V. rainerguentheri* and *V. obor* that are all traded as *V. indicus*. *Varanus kordensis* and *Varanus reisingeri* are suspected to be traded as *Varanus prasinus* and the *V. auffenbergi* species that is often traded as *V. timorensis* (Koch, et al., 2013; Phelps, et al., 2010; Ziegler, et al., 1998).

For the remaining five species (*V. bogerti*, *V. finschi*, *V. telenesetes*, *V. togianus*, and *V. zugorum*) it is most likely that no live trade occurs or is very limited.

Live trade in all 17 *Varanus* species increases. This is no surprise since the exotic pet trade is increasing worldwide (Bush, et al., 2014; RSPCA, 2004; BornFree, sd). The top three traded species are 1. *V. rudicollis*, 2. *V. timorensis* and 3. *V. dumerilii*. Together they make up for more than 50% of the 38 406 specimens imported. Live trade in *V. timorensis* specimens increases, decreases for *V. dumerilii* specimens and stays relatively stable for *V. rudicollis*. Surprisingly there are only IUCN assessments for a few of the 31 *Varanus* species and no assessments have been carried out for the top three traded species. In fact, of the 17 species found in the database, only three species have been assessed and one of these three is reported as 'Data Deficient'. There have been studies already on the distribution of several *Varanus* species but a lot of research is still necessary in order to prove that trade in these species is influencing wild populations.

Not all seizures and confiscations are published or reported to TRAFFIC and no exact number can be given on this subject. An obligatory, adequate reporting system for seizures is a tool that would improve the reporting and would also improve and facilitate analysis of the reported data.

The focus of this research is commercial trade (purpose code 'T'); fraudulent trade could be taking place with another source code and further research is necessary. Furthermore there are 21 transactions originating from Indonesia that only mentioned the class level; '*Varanus spp.*', but no specific taxonomic name. Phelps et al. (2010) state that this is a known problem for the USA where only 14% of all reported import of live-animals is identified at species level. This is a problem that needs to be solved in order to improve international enforcement of national legislation and CITES regulations.

² <http://www.edmontonreptiles.com/forum/showthread.php?23135-Varanus-cerambonensis/page2&s=9511cf96c9fae16fab04bae8c170ae84>

³ <http://www.captivebredreptileforums.co.uk/monitors-big-small/27715-varanus-cerambonensis.html>

5 Conclusion

The main research questions of this research are to find out what legal and illegal trade, in the 31 *Varanus* species native to Indonesia and Papua New Guinea (PNG) between 2000 and 2012, look like and whether it is realistic to assume that traded captive-bred *Varanus* species are indeed captive-bred.

Legal trade is immense! Between 2000 and 2012 a total of 38 406 specimens are reported by importing countries, these specimens were all exported by Indonesia. No trade is reported by Papua New Guinea. The species mostly traded are *Varanus rudicollis*, *Varanus timorensis* and *Varanus dumerilii*; together making up for more than 50% of all reported import (38 406 specimens). Reported export is found to be often much higher than reported import. In some cases it is, remarkably, the other way around and reported import is higher than reported export.

Overall trade in wild-caught specimens is decreasing with an average of 114 specimens per year while trade in captive-bred specimens ('C') is increasing with an average of 136 specimens per year. There is no clear increase or decrease in trade in specimens with source code 'F'.

Export quotas are set for six species and four species are nationally protected. Three of the export quotas are exceeded by reported import and trade also violates national laws. A complete insight in illegal trade cannot be given; not all illegal trade is intercepted and the actual number of illegal trade remains unknown. Of all illegal trade that is intercepted, a part is reported to the CITES Secretariat or to other organizations or newspapers. A total number of 265 specimens, of the 31 *Varanus* species, are seized and reported to the CITES Secretariat and 37 000 seized specimens are reported to other sources. Only a few of these seizures are directly related to Indonesia. For more than 70% of the seizures the trade routes do include a South-East Asian country.

Captive breeding is not known to have a high success rate. The breeding ecology of *Varanus* species shows that a female cannot produce a lot of offspring per year. The number of reported trade in captive-bred specimens is therefore suspicious. Breeding facilities should have a lot of breeding females in captivity to be able to breed as many as they state.

Overall, the trade in *Varanus* species needs an improvement in regulations and enforcement. Furthermore, field studies are necessary to gain insight on the status of wild populations and on the success of breeding facilities.

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Appendix I

Tabel i Quotas & reported export and import per species

Species		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
<i>Varanus beccarii</i>	Export Quota	270	270	200	200	200	-	-	-	-	-	-	-
	Reported export	270	237	190	383	455	-	-	-	-	-	-	-
	Reported import	197	193	132	190	206	-	-	-	-	-	-	-
<i>Varanus doreanus</i>	Export Quota	540	540	500	500	500	500	500	500	540	540	540	540
	Reported export	447	514	475	553	644	543	505	532	546	585	640	604
	Reported import	208	375	279	190	201	291	192	179	225	220	165	96
<i>Varanus dumerilii</i>	Export Quota	900	900	400	400	400	400	400	400	900	900	900	900
	Reported export	908	853	376	354	577	656	574	527	1032	839	731	988
	Reported import	514	675	483	174	336	365	337	222	112	286	181	197
<i>Varanus jobiensis</i>	Export Quota	450	450	300	300	300	300	300	300	450	450	450	450
	Reported export	411	456	334	372	450	385	337	352	487	522	566	533
	Reported import	161	352	214	176	220	276	240	221	180	313	273	178
<i>Varanus rudicollis</i>	Export Quota	900	900	900	900	900	900	900	900	900	900	900	900
	Reported export	896	935	932	1228	1364	1258	1053	1144	1242	1094	1110	1133
	Reported import	516	736	900	518	721	674	960	360	492	434	542	569
<i>Varanus salvadorii</i>	Export Quota	270	270	200	200	200	200	200	200	270	270	270	270
	Reported export	234	272	261	197	256	225	195	215	340	330	274	312
	Reported import	153	175	129	139	128	76	139	67	111	89	82	72

Appendix II

Table ii All reported seizures of *Varanus* spp. between 2000 & 2012

Date of seizure or prosecution	Seizure location	Trade Route	Count	Species	Nationality of convicted
15-Mar-00	Australia	Australia - Germany	8	<i>Varanus</i> spp.	German
Jan-01	Unknown	More than 25 countries involved	Unknown	<i>V. komodoensis</i>	Four Germans and one Russian
24-Jul-01	Sanya, Hainan, China	Thailand - China	566	<i>Varanus</i> spp.	Two Chinese and one Thai
11-Jan-02	London, UK	Orlando, US - London UK	5	<i>V. rudicollis</i> , <i>V. dumerilii</i>	British
14-Jul-02	London, UK	Nigeria - South Korea	13	<i>Varanus</i> spp. (CITES I/II)	Unknown
Jan-03	Orlando, US	Singapore - Orlando, US	Unknown	<i>Varanus</i> spp.	Singaporean
11-Feb-03	Hanoi, Vietnam	Malaysia - Hanoi, Vietnam	2.6 t	<i>Varanus</i> spp.	Unknown
21-Jan-04	Prague, Czech Republic	Indonesia - Czech Republic	22	<i>V. prasinus</i> , <i>V. salvadorii</i> , <i>Varanus</i> spp.	Czech
4-Nov-04	Hong Kong	Thailand - Hong Kong SAR	1	<i>varanus</i> spp.	Hong Kong resident
28-Nov-04	Zagreb, Croatia	Indonesia - Malaysia - The Netherlands - Croatia	50	<i>V. prasinus</i>	Croatian
5-Apr-05	Vietnam	Southern Mekong Delta, Vietnam - China	2 t	<i>Varanus</i> spp. (CITES II)	Unknown
16-Mar-06	Ninoy Aquino Airport, Philippines	Philippines - Penang, Malaysia	14	<i>Varanus</i> spp. (CITES I/II)	Unkown
14-Mar-07	Jalan Gambang, Malaysia	U/K	748	<i>V. nebulosus</i>	Malaysian
12-Nov-07	Hong Kong	Indonesia - Hong Kong, SAR - China	12	<i>Varanus</i> spp.	Unknown
2-Jan-08	Malaysia	Unknown	35	<i>V. nebulosus</i>	Unknown
1-Feb-08	Shantou, China	South-east Asia - China	5776	<i>Varanus</i> spp. (CITES I/II)	Unknown
14-Mar-08	Thailand	Unknown	30	<i>Varanus</i> spp.	Russian
30-Mar-08	Pahang, Malaysia	Unknown	222	<i>V. nebulosus</i>	Unknown
10-Oct-08	Northeast Thailand	Thailand - Lao PDR - China or Viet Nam	200+	<i>Varanus</i> spp.	Unknown
20-Oct-08	Malaysia	Unknown	1261	<i>Varanus</i> spp.	Unknown
21-Oct-08	Kuantan, Malaysia	Malaysia - China, Hong Kong SAR and Thailand	1244	<i>V. nebulosus</i>	Unknown

4-Nov-08	Muar, Malaysia	Unknown	51	<i>V. nebulosus</i>	Unknown
7-Nov-08	Segamat, Malaysia	Malaysia - China	7093	<i>V. nebulosus</i>	Unknown
18-Dec-08	Kuala Lumpur, Malaysia	Unknown	676	<i>V. nebulosus</i>	Unknown
11-Jan-09	Kuantan, Malaysia	Unknown	2330	<i>V. nebulosus</i>	Unknown
15-Apr-09	Pahang, Malaysia	Unknown	1202	<i>V. nebulosus</i>	Unknown
Apr-09	Pahang, Malaysia	Unknown	36	<i>V. nebulosu, V. dumerilii</i>	Unknown
21-Aug-09	Khanh Hoa Province, Viet Nam	Unknown	4	<i>Varanus</i> spp.	Unknown
26-Aug-09	Kompong Cham Province, Cambodia	Unknown	4800	<i>Varanus</i> spp.	Unknown
13-Sep-09	Terengganu State, Malaysia	Unknown	4800	<i>Varanus</i> spp.	Malaysian
Jan-10	Raghubir Nagar, India	Unknown	40	<i>Varanus</i> spp.	Indian
19-May-10	Dien Bien, Viet Nam	Unknown	Unknown	<i>Varanus</i> spp.	Unknown
2/3-Sep-10	Tuen Mun, Hong Kong SAR	Unknown	288	<i>Varanus</i> spp. (CITES I/II)	Hong Kong residents
6-Sep-10	Barangy Ising, Philippines	Unknown	1	<i>Varanus</i> spp.	Unknown
21-Sep-10	Kampung Gajah, Kluang, Malaysia	Unknown	422	<i>V. nebulosus</i>	Unknown
Nov-10	Malaysia	Unknown	Unknown	<i>Varanus</i> spp.	Malaysian
19-Mar-11	Van Ninh, Khanh Hoa, Viet Nam	Unknown	4	<i>Varanus</i> spp.	Unknown
29-Apr-11	Da Lat, Lam Dong, Viet Nam	Unknown	Unknown	Unknown	Unknown
12-May-11	Quang Bing, Viet Nam	Lao PDR - Vietnam	5	<i>V. nebulosus</i>	Unknown
15-May-11	Bukit Serok, Muadzam Shah, Malaysia	Unknown	41	<i>V. nebulosus</i>	Unknown
18-Jun-11	Bu Gia Map, Viet Nam	Unknown	2	<i>Varanus</i> spp. (CITES II)	Unknown
5-Jul-11	Nong Khai, Thailand	Thailand - Lao PDR - Viet Nam	173	<i>Varanus</i> spp. (CITES II)	Unknown
21-Jul-11	Merauke, Papua New Guinea	Indonesia	6	<i>Varanus</i> spp.	Indonesian
20-Aug-11	Nong Khai, Thailand	Thailand - China or Vietnam	100	<i>Varanus</i> spp. (CITES II)	Unknown
11-Sep-11	Nong Khai, Thailand	Unknown	3	<i>Varanus</i> spp.	Unknown
13-Sep-11	Prachuap Khiri Khan, Thailand	Unknown	2721	<i>Varanus</i> spp.	Unknown
14-Sep-11	Pranburi, Thailand	Thailand - Lao PDR	1940	<i>Varanus</i> spp.	Unknown
14-Nov-11	Phon Phisai, Thailand	Unknown	300	<i>Varanus</i> spp.	Unknown

16-Nov-11	Indonesia	Indonesia - Unknown	16	<i>V. prasinus</i> , <i>V. jobiensis</i> , <i>V. salvadorii</i> , <i>V. beccarii</i> , <i>V. macraei</i>	Russian
Feb-12	Sydney, Australia	Unknown	2	<i>V. prasinus</i>	Unknown
11-Feb-12	Suvarnabhumi Airport, Thailand	Thailand - China	9	<i>V. jobiensis</i> , <i>V. melinus</i> , <i>V. cerambonensis</i> , <i>V. gouldii</i>	Taiwanese
28-Feb-12	Fujian, China	Shantou, China - Fuzhou, China	11	<i>Varanus</i> spp.	Unknown
Mar-12	Bulgaria	Czech Republic - Bulgaria	6	<i>Varanus komodoensis</i>	Unknown
22-Apr-12	Nongkhai, Thailand	Unknown	2	<i>Varanus</i> spp.	Lao PDR
May-12	Zhanjiang, China	Unknown	49	<i>Varanus</i> spp. (CITES I/II)	Unknown
20-May-12	Nongkhai, Thailand	Unknown	2	<i>Varanus</i> spp.	Unknown
28-May-12	Ubonratchatani, Thailand	Unknown	1	<i>Varanus</i> spp.	Thai
22-Aug-12	Sawangan-Depok, West Java, Indonesia	Indonesia	1	<i>V. prasinus</i>	Unknown
Total			37144+		

Annex I

Table iii Source codes used by CITES

Source Code	Description
W	Specimens taken from the wild
R	Ranched specimens: specimens of animals reared in a controlled environment, taken as eggs or juveniles from the wild, where they would otherwise have had a very low probability of surviving to adulthood
D	Appendix-I animals bred in captivity for commercial purposes in operations included in the Secretariat's Register, in accordance with Resolution Conf. 12.10 (Rev. CoP15), and Appendix-I plants artificially propagated for commercial purposes, as well as parts and derivatives thereof, exported under the provisions of Article VII, paragraph 4, of the Convention
A	Plants that are artificially propagated in accordance with Resolution Conf. 11.11 (Rev. CoP15), as well as parts and derivatives thereof, exported under the provisions of Article VII, paragraph 5 (specimens of species included in Appendix I that have been propagated artificially for non-commercial purposes and specimens of species included in Appendices II and III)
C	Animals bred in captivity in accordance with Resolution Conf. 10.16 (Rev.), as well as parts and derivatives thereof, exported under the provisions of Article VII, paragraph 5
F	Animals born in captivity (F1 or subsequent generations) that do not fulfil the definition of 'bred in captivity' in Resolution Conf. 10.16 (Rev.), as well as parts and derivatives thereof
U	Source unknown (must be justified)
I	Confiscated or seized specimens (may be used with another code)
O	Pre-Convention specimens

Source: Resolution Conf. 12.3 (Rev. CoP16)