

## Dorsal Colour Patterns of Asian Water Monitor, *Varanus salvator* Collected for Trade in Cirebon, Indonesia

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### ABSTRACT

The Asian water monitor, *Varanus salvator*, has been exploited for its skin and meat in Indonesia. We found evidence of trade on this species in the greater Cirebon area in the province of Jawa Barat and linked the trade to raw skin supplies for local craft markets. Skins of water monitor distributed on Java were unique in their pattern, where a series of yellowish and dark grey scales that form a round shape called *ocelli* are arranged into two compact transverse bands on the back near the front limbs. This unique pattern found in our sample may be useful to identify the origin of skins collected for trade and the subsequent craft products. However, this pattern was absent in the craft products available for display in one of the warehouses visited for this study. On the other hand, we observed stockpiles of water monitor raw skins at the warehouses and found a slight difference in the dorsal color pattern. These raw skins in stock were lacking in “double banded” pattern on the dorsal side and were likely to be originated from other areas in Indonesia, possibly Sumatra or Kalimantan. Live animals for sale at the warehouses maybe used for other purposes than to supply materials for local craft industry, for example meat consumption or feed for catfish.

Keywords: *Bivittatus*, leather, monitor lizard, source, West Java

### INTRODUCTION

International demands on reptile leather include the sourcing of raw skins of water monitor, *Varanus salvator*. Whereas exporters favor skins of water monitors from Sumatra and Kalimantan (personal observation), those from Java are seemingly unsuitable to supply for the demands. Quality of raw skins from Java is thought to be lower for their hardness and presence of scars, making them undesirable for further tanning process and designing into crafts for fashion. In this study, we found the harvesting of water monitors on Java, although it was unclear whether to supply for raw skins for local craft markets. Meat of water monitors are sometimes consumed on Java, but it seems there is no such tradition to exploit the meat to a greater level due to the religious belief of the majority of Javanese people (Pattiselanno, 2005; Uyeda *et al.*, 2014; Nijman, 2016). Whether raw skins for the supposed local demands have been harvested from populations of water monitors on Java, there is evidence that these

populations are readily exploited. In fact, we found reptile skin suppliers in the greater Cirebon area in West Java, Indonesia, where live water monitors were available for sale.

Harvest quotas for *Varanus salvator* skins and live animals between 2014 and 2018 showed that the estimated level of exploitation was relatively stable in West Java. During the 5-year period, catch quotas were set mostly at 9625 skins and live animals except in 2014, for which quota was over 12,000 individuals (KSDAE, 2018a). Realized quotas were variable, ranging from 50 in 2018 to 12250 in 2014 (Figure 1). Live animals were set at a quota of 125 individuals in 2016 and in 2018 (KSDAE, 2016; 2018b).

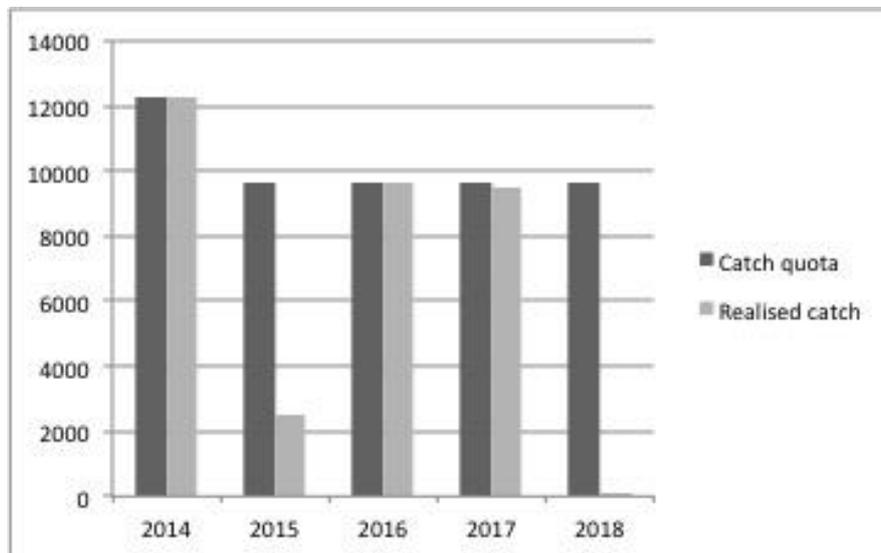


Figure 1. Yearly catch quotas for water monitors from the Province of West Java between 2014 and 2018. The quotas were set specifically to accommodate both skin and live animal harvests in the province

We aimed to investigate the link between the trades of live individual water monitors in Cirebon areas and raw skin supplies for local crafts industries. Furthermore, we attempted to gain insight on the utilization of water monitors in our study area.

## METHODS

We visited four reptile skin collectors in the greater Cirebon area in January and February 2020 and used live animals in one of the collectors' stocks to observe dorsal color patterns of *Varanus salvator* from a population on Java. We used a digital camera to photograph color patterns of the animals' dorsal skin and used the resulting photos to sketch out scale arrangements. Measurements of body size were taken using a stationary balance to estimate body mass and a measuring tape for Snout-Vent Length (SVL). During our visits, we also conducted casual interviews with hunters and staffs at the skin collectors' warehouses on local skin trade.

## RESULTS AND DISCUSSION

We found that water monitors were harvested occasionally in Cirebon and the neighboring areas, namely only when demands were available. Some of the animals were

supplied from nearby regencies in West Java, such as Indramayu and Karawang. If demands increased, lizards may also be supplied from Demak in Central Java (the province of Central Java). Hunters obtained specimens used in our sample from areas nearby and brought the lizards to the warehouse for direct cash. These lizards were all likely at adult stage based on their body sizes, with mean SVL of  $56.50 \text{ cm} \pm 6.40$  (range 47.00 cm - 67.50 cm,  $n=20$ ) and mean body mass of  $3.55 \text{ kg} \pm 1.55$  (range 1.95 kg - 6.50 kg,  $n=16$ ).

Two collectors kept live animals in their warehouse for sale, whereas the other two collectors were found to stock sun-dried raw skins ready for sale. We also found a display of ready-made crafts for sale in one warehouse (Figure 2), where raw skins were stockpiled (Figure 3a). The crafts available for sale are mainly wallets besides small handbags and key-hangers that are also mini-wallets (Figure 3b). We identified some wallets and key-hangers are made of leather from water monitor skins by the color patterns and shapes of individual scales. Despite being re-colored, original color patterns were still shown in the three (3) out of five (5) wallets in Figure 2b and a key-hanger in Figure 2c. Some of these wallets were uniformly colored, for example in black (Figure 2a); however the shapes of individual scales and the rows of scales observed on this craft are typical of water monitors.

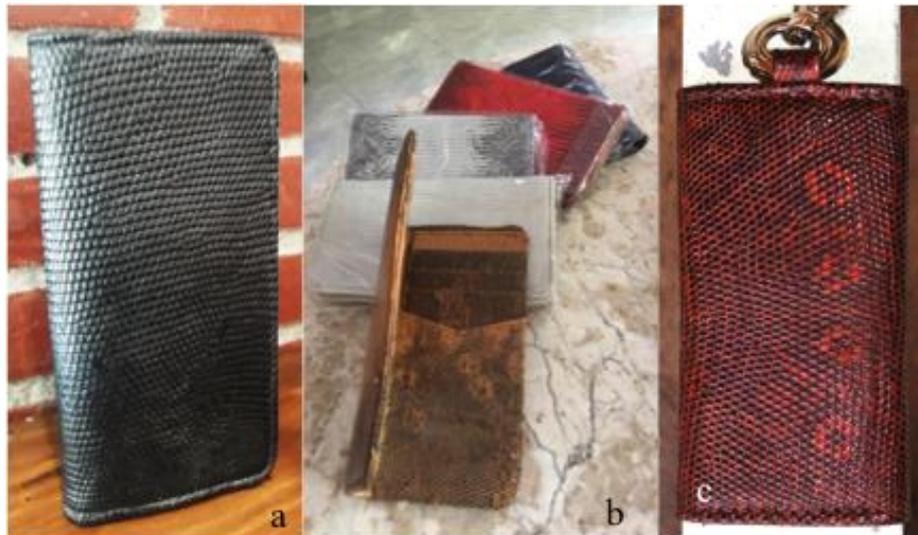


Figure 2. Crafts of water monitor leather on display in one reptile warehouse in Cirebon: (a) a wallet of non-patterned leather (b) a variety of wallet designs, some showing original color patterns (c) a key-hanger/mini-wallet showing typical color pattern of water monitor scales

There were two cutting patterns of raw skins in the stockpiles, i.e. dorsal cut and ventral cut. The skins cut at the dorsal side of the animal showed rows of ventral scales in the middle of a skin sheet (Figure 3a-red circle), while a ventrally cut skins showed rows of dorsal scales in the middle of a skin sheet (Figure 3a-blue circle, 3b, 3c). This difference in the cutting pattern of raw skins may be used to indicate locations of natural scars. Skins with natural scars on the back will be cut dorsally, thus showing the ventral scales as the “good side” in the middle of the dried sheet. If the ventral side of a raw skin was less desired because natural scars were present, the skin will be cut ventrally.

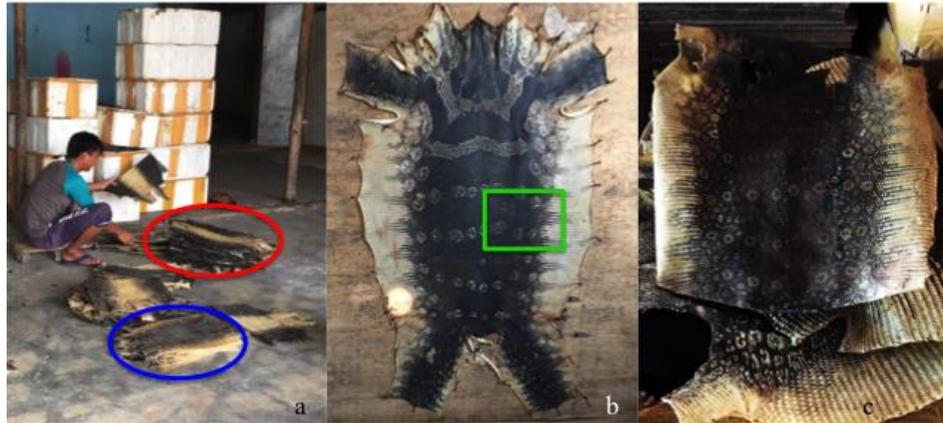


Figure 3. (a) Dried skins in stockpiles (b) dorsoventral pattern of a sun-dried water monitor skin in our sample (c) a sheet of raw skin in stock

Figure 3b showed a sheet of raw skin during drying process under direct sunlight. The skin was removed from the animal and nailed on a panel when still wet. After eight hours or more of exposure to sunlight, the skin was dry and removed from the panel for storage. The green rectangle in this image indicates the area on the skin sheet being cut to create a pocket in the brown wallet in Figure 2b. This wallet was designed to show the dark-and-light contrasts of the original pattern in a water monitor skin. Both dorsal and ventral parts of the skin were used for this wallet, whereas only dorsal skin pattern was shown in the key-hanger in Figure 2c.

We observed from our sample that skins of water monitor were unique in their dorsal color patterns. All specimens showed a sequence of yellow and black scales forming a round shape called *ocellus* (Latin, means “eye”). An *ocellus* of round or nearly round in shape may consist of 19-32 yellowish and dark grey scales. Figure 4b shows that six (6) to seven (7) scales form an imperfect configuration of *ocellus*, which may be termed as a “spot”.

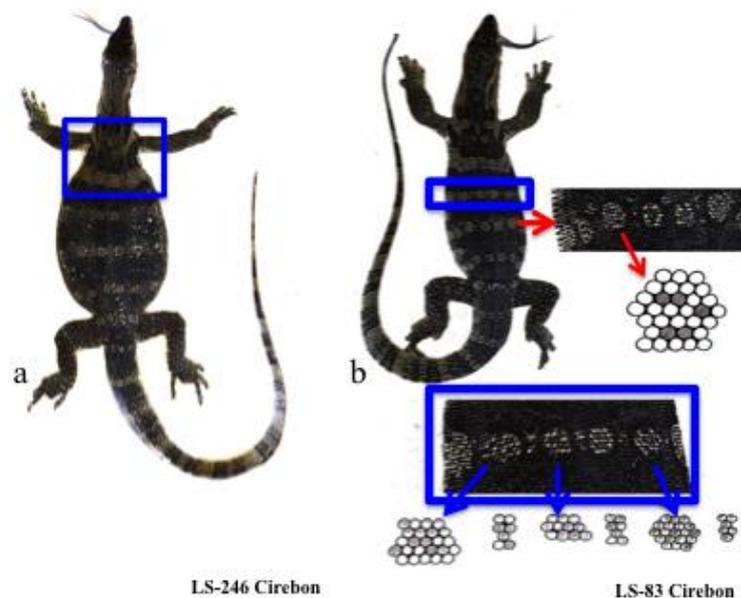


Figure 4. A consistent pattern in the specimens observed in one reptile collector warehouse in Cirebon: (a) “double banded” (b) *ocelli* of various sizes and scale arrangements in the third and fourth rows

The sequences of 7-8 *ocelli* (Latin, means “eyes”) are arranged into transverse bands (Figure 3b). The first two bands located close to the front limbs are somewhat dense in their arrangement of *ocelli* than the other four rows on the body (Figure 4a). This pattern is consistent with the other 19 specimens in our sample, such as LS-83 (Figure 4b) although with a variation in the first row of *ocelli*. The presence of two dense rows of *ocelli* is known to be relatively consistent and unique to individuals distributed on Java and the Nusa Tenggara Islands, Indonesia, leading to the designation of a subspecies name, i.e. *Varanus salvator bivittatus* (Koch et al., 2007). The word “bivittatus” (Latin) may be interpreted as “double banded”.

The unique pattern of “double banded” maybe useful to identify the origin of skins collected for trade and the subsequent craft products; however, this pattern was absent in the craft products displayed in the warehouse display we visited in Cirebon. We believe that for a reason of aesthetics, wallet designers preferred the pattern of *ocelli* with a gap between the two. “Double banded” pattern might be found unappealing for customers and therefore was not preferred. Otherwise, some wallets are purposely designed without original color patterns, in order to emphasize on the scale shapes and arrangements. Original color patterns might be undesirable at some selected raw skins and therefore removed by bleaching during leather production.

We randomly sampled twenty (20) sheets of dried raw skin that were in stock at two of the four warehouses in Cirebon. To our knowledge, these skins (Figure 3c) were slightly different in their color pattern to those of the twenty (20) lizards in our sample. The pattern of “double banded” was absent from these skin sheets and we assumed that the skins were stocked from Sumatra or Kalimantan, where leather exporters would generally look for raw skins of water monitors. It is interesting to note, that a different subspecies of water monitor is distributed on Sumatra and Kalimantan, i.e. *V. salvator macromaculatus*. This group of water monitor may be identified as slightly different from *V. salvator bivittatus* in their dorsal color pattern, with 4-7 rows of transverse *ocelli* or spots accentuated with dots and marbling in between. The “double banded” pattern is usually absent (Koch et al., 2007). In contrast, all specimens in our sample had six rows of *ocelli* or spots with no other pattern between the rows or between two *ocelli*. All twenty specimens in our sample also had “double banded” pattern on their back.

## CONCLUSIONS

Despite our knowledge on the presence of “double banded” pattern in the individual water monitors harvested on Java for local trade in Cirebon, craft products such as wallets cannot be identified as being made out of leather sourced from around the area. At this point, however, we conclude that crafts displayed in one warehouse were made out of leather sourced from prevailing harvest populations of water monitors in Indonesia. Raw skins from Sumatra and Kalimantan are likely sourced to supply materials for local craft industry, given our finding of raw skins without the “double banded” pattern in stock at the warehouses. Live animals seem to be sold for other purposes, possibly for consumption by human or to provide feed for farmed catfish commonly found in the area.

It remains uncertain, whether water monitor skins were not sought for craft materials. Thus, more in-depth studies on the color pattern as well as scale shapes and their arrangements may help in identifying raw material sources for crafts made of leather from water monitor skins.

## ACKNOWLEDGEMENTS

We thank all hunters and staffs of reptile collection centers in Cirebon who welcome us at their work places as well as in their homes. We also thank staffs at BBKSDA Jawa Barat, especially Slamet Priambada, Ade Kurniadi, and Momo Supomo at Resort Konservasi Wilayah XXII Cirebon. The study would not be completed without their supports, including for our logistics in Cirebon. EB thanks Noor Laina Maireda and Alfonsus Toribio Eko Saputro for their help in the field and camaraderie. The study was conducted as a part of the reptile trade monitoring project in Cirebon administered by the Herpetological Society of Indonesia (Panggalang Herpetologi Indonesia).

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**Journal of Tropical Ethnobiology**

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NUMBER 2

JULY 2020

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