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New Records of *Acropora russelli* (Wallace 1994) from wallace Area, Indonesia

Syafyudin Yusuf[1,2] Agus Budiyanto[3]

[1] Center for Coral Reef Research Division of MaCSI, Hasanuddin University Indonesia
[2] Marine Science Department, Hasanuddin University, Indonesia
[3]Reseach Center for Oceanography, LIPI Jakarta, Indonesia
s.yusuf69@gmail.com

ABSTRACT

Acropora is the most common distributed genera and has the highest diversity among coral species in the world, but several species are rare and has isolated distribution. *Acropora russelli* is one of the rare species of the *Acropora*. Moreover, information on the spatial distribution of this species is limited in the world. Two locations where species have been found were Cartier Reef Timor Sea northern Australian and Loloda Island north Maluku Indonesia. This paper reports the new records in three sites of *A. russelli* in Wallacea's area are in cape of central Sulawesi on Pulau Dua Strait, Gili Meno Island in Lombok Stait and Lembata Island in Flores. All of the them was found very small pachy within free living on hard stone, dead coral dan rubble substrate. These sites were areas with strong current and clear water in the depth of 7 – 20 m. This invention will add the biodiversity list of species in the center of coral triangle biodiversity and in the world.

Keywords : New record, *Acropora russelli*, Wallacea area, Indonesia.

INTRODUCTION

Indonesia is located in the Indo-West Pacific as known as a center of biodiversity and has highest coral diversity in the world (Rosen 1984; 1988, Best et al., 1989, Suharsono, 1998, Wallace & Wastenholme, 1998; Wallace, et al, 2001). Biodiversity of flora and fauna in the Wallacea region declared for first time by Alfred Russel Wallace 1823-1913. He drew an imaginer line (known as the Wallace line) layed from the Southern Philippine Islands through in the Makassar Strait continue to the Lombok Straits as gate to Indian ocean. These two straits in Wallace line given the strong current flow, one of the major corridors of the Indonesian Through Flow (Godfrey 1996, Gordon and Fine 1996 in Turak *et al* 2012). The line was distinguishing between the Asian ecoregion continent in the western and the Australian ecoregion in the eastern (Ondara, 1981). More specifically around the island of

Sulawesi and Lombok Strait which is the boundary line of Wallacea has a high biodiversity of coral species, eg. 80 genera of scleractinian coral, then the farther away from the area, it will be decreasing the amount of coral genus (Suharsono, 1996).

Studies on the taxonomy of corals in Indonesia have been carried out by Best (1974, 1976) which examined in detail for the Faviid in Spermonde Islands, (Best et al 1989 Snellius II Expedition). Especially the Fungiid were described taxonomically by Hoeksema (1989), also in South Sulawesi Spermonde Islands. Well described and geographic distribution of the genus *Acropora* from Indonesia (Wallace 1998 and Wolstenholme, 1998). Indonesian reefs and other country of the Coral Triangle region are have reputation as the center of marine biodiversity for the Indo-Pacific and the location of the world's greatest coral biodiversity (Stehli and Wells, 1971; Potts 1984, 1985; Rosen, 1984, 1988; Mcmanus, 1995; Best et al., 1989 *in* Wallace and Wolstenholme, 1998), and the Indonesian Archipelago has rarely been the taxonomic review of corals (Wallace and Wolstenholme, 1998). Wallace (1997) has been described of six new species of the genus Acropora were describe from Indonesia, these were *A. togianensis, A. derawanensis, A. batunai, A. sukarnoi, A. hoeksemai, and A. indonesia*.

About 114 species from genus *Acropora* in worldwide which have the largest number of species, 91 of which were identified in Indonesia (Wallace *et.al*, 2001). This genus has a vital structure in the composition and abundance of coral reef ecosystems vary depending on the dynamics of coral communities (Connell, et.al 1997 in Wallace, et.al, 2001). Acroporidae is one of the tribe of hard corals (Scleractinia) has the most species. Although only four genera namely *Acropora, Montipora, Anacropora*, and *Astreopora*, but Acroporidae have many species of the genus *Acropora* and the *Montipora. Acropora* dominant role of species composition and abundance of coral reefs in Indonesia at this time (Suharsono et al, 1985; Boeschoten, et al., 1989; Suharsono, 1992 in Wallace *et al*., 2001).

Distribution of species of the genus *Acropora* in the Indonesian archipelago show a duality reminiscent of the Wallace's line patterns (Wallace, 1999). It is estimated there are still many locations that have not been studied and is believed to have a new species and endemic species or even a new distribution location for a species that has been found so far. Wallace & Wolstenholme (1998) recorded a new distribution of *Acropora russelli* in around the

Halmahera island and Timor Seas Ocean west of Australia. The last other record from Irian Jaya (Papua) (Wallace, *et al*. 2012). Information of *Acropora russelli* distribution is still limited because it's rare species in the world. Therefore this paper aims to complete location information discovery of *A. russelli* and it's ecological natural habitat record in Wallace area of Indonesian Archipelago.

METHODS

Coral specimens of *Acropora russelli* were collected independently by S.Yusuf and Agus. Budiyanto from three locations in Indonesian reefs among 1998-2011. Collection and recording of the specimen were collected in Marine Rapid Assessment Program in the Togian Banggai Islands Central Sulawesi by The nature Conservancy in 1998. The other coral specimen was from Lombok Strait in 2004 in order to Coral Reefs survey of the West Lombok Distric. The third live specimen from the Lamalera Strait in Flores Islands within LIPI project survey in 2011. Habitat features and dominant benthics were recorded for each site. For each specimen encountered, a sample portion of the colony was taken. Two of life coral speciemen from Lombok and Lamalera sites were illustrated by a field photograph of these part of colonies. One specimen from Central Sulawesi and Lombok Strait were illustrated by skeleton photo only, it was not suitable characterised or represented in the collection to have a field photograph. After the dive, specimens were bleached in sodium hypochlorit, rinsed in fresh water and dried (Wallace and Wolstenholme, 1998). Specimen from Central Sulawesi and Lombok were store in Macsi Hasanuddin University laboratory and the Lamalera specimen store in P2O LIPI Ancol Jakarta. Specimens were identified to base on Wallace & Wolstenholme (1998); Wallace (1999); Wallace *et al* (2012).

RESULTS AND DISCUSSION

Characteristics of the Genus *Acropora* Oken, 1815

The genus *Acropora* mostly branching lifeform, table form, irregular branch and submassive. They have small corallites without columella (*exstratentacular)* with an axial or leading

corallites larger than more numerous radial corallites bunded from it. Regular and unregular coenosteum and look like spons structure, reticulate, spinose or pseudocostate or costate coenestum. The *Acropora* as known specific lifeform, the *axial corallite* on the top and radial corallites distributed in radial, diameter 0.7 to 1.3 mm (Wallace & Wolstenholme, 1998).

Morphological characteristic of *Acropora russelli* (Wallace 1994)

Field Characteristics

Their colonies are indeterminate, arborescent and have tertiary branching order absent, predominantly free living (Wallace *et. al*, 2012) or any attachment to the substratum (Wallace 1994). Colonies are free-living to the hard substratum; in matted assemblages sometimes intertwined with the agariciid coral *Leptoseris sp* (one case). Known colour pale brown or blue brown; branching horizontally or oblique branches with a diameter greater than 5 mm (Wallace & Walstenholme 1998).

Skeleton Characteristic

Axial coralit diameter of *A. russelli* about 1.4 - 2.0 mm, calix diameter 0.6 to 1.0 mm, the length of the primary septa more than ¾ - 1 R, there have no secondary septa or tiny septa small or only a point. Radial corallites are small, have two synapticular rings; they are one size or graded. In the inner wall well developed. The radial corallites are appresed tubular form and oval rounded openings, the primary septa to 2/3 R. Their coenosteum are elaborate shape have same form on and between radials, dense of spinules (Wallace & Walstenholme 1998; Wallace *et al*. 2012; Veron 2000; Wallace 1999).

Previous Record and Collection

First recording and collecting of *A. russelli* within life specimens was held by Dr. Russell Kelley from Cartier Reef Timor Sea in North West Australia in 1992 at 18-25 m depth, on GPS position 12^{o} 33 'S, 132^{o} 34' E. These specimens was first described by Carden Wallace and published in 1994, which made for the holotype: G40795. Paratypes: G40782, G40794, G40796-7 (Wallace 1994). The second found of this species was in Doi Island north of Loloda Island in Halmahera Indonesia that was the first invention from Indonesian reefs which made the paratype collection number was G51486-97 (Wallace 1994).

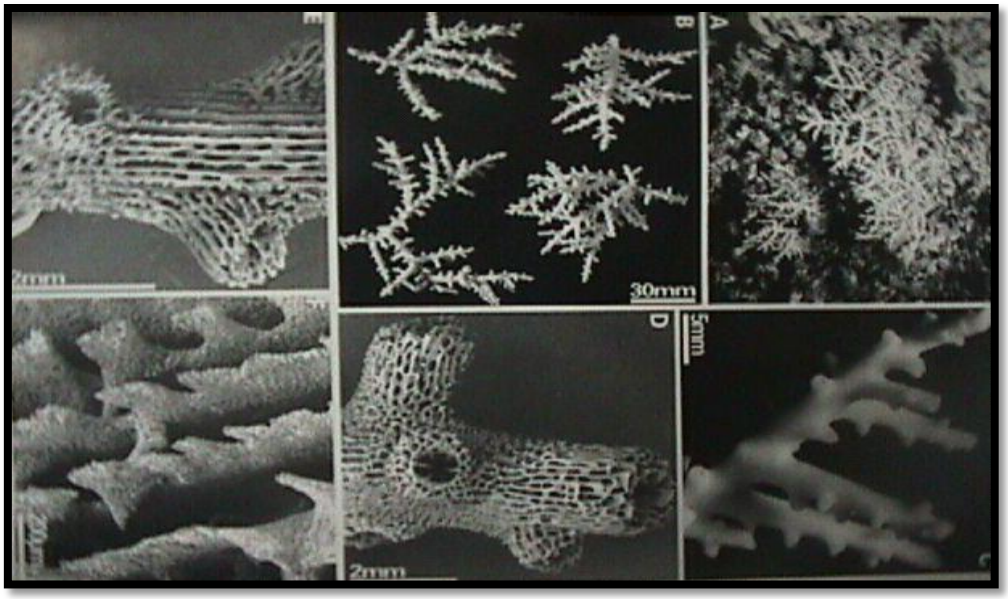

Figure 1. *Acropora russelli* (A) Doi Island north of Loloda Island Halmahera; (B,C,E,F) G51487; (D) G51493; (B) portion of colony; (C) portion of branches; (D) electron micrograph showing axial and radial corallites; (E) electron micrograph showing radial corallites; (F) electron micrograph showing coenosteum between radial corallites (Wallace and Wolstenholme. 1998)

New Site Record of *A. russelli*

After the first and the second invention of *A. russelli* in *Cartier* Reef Australia and in Loloda Island, Halmahera Indonesia, then *A. russelli* life specimen was invetored also on 1998 in Pulo Dua Island, Central Sulawesi. Pulo Dua is in the east peninsula that located between the Banggai and Togian Islands. The GPS position of *A. russelli* invention was S 0^{o}49' 36"; E 123^{o}27' 49". These life specimens were inventored by author (Syafyudin Yusuf), and considered to be the third record in the world in 1998 and the second record from Indonesian waters (D. Fenner: *personal communication*). This species was discovered during a Marine Rapid Assessment of Togian Banggai sponsored by Conservation International at 1998.

Subsequent findings of these species was in on Gili Air Island (one of the Three Gilis), Lombok Strait (position S 08^{o} 20' 75.0 S; 116^{o} 03' 77.3 "E) by Syafyudin Yusuf. This fourth finding of live specimen of *A. russelli* was in Wallace line which given the strong current flow through Lombok Strait, one of the major corridors of the Indonesian Through Flow (Godfrey

1996, Gordon and Fine 1996). These species was inventored when diving at east coast of Gili Air Reef under project of coral reef survey as a part of the West Lombok Distric Department of Marine Affairs and Fisheries project in 2004.

Further, in July 2011 the research collaboration of National Education Ministry (Kemendiknas) and Indonesian Scinece Institute (LIPI), again the live specimen of *A. russelli* was found on fringing reef of Lembata Island in Flores by Agus Budiyanto from LIPI. The GPS position of these sites were Tanjung Barat Lembata : S 08.30876˚ - E 123.35950˚ dan Lembata Strait : S 08.38444˚ - E 123.37637˚.

New Site Ecological Habitat of *A. russelli*

Pulau Dua is located close to the mainland peninsula of Central Sulawesi. It has a coastal fringing reef with shallow reef flat next to shore with narrow spur and groove zone about 50–100 m out, then gradually sloping to depth of about 20 m, depth range 1–25 m; visibility approximately 10–15 m; temperature30–31°C; slight current. Sandy bottom in 10–20 m with numerous isolated large coral bommies; soft corals dominant substratum, but mainly confined to shallows (less than 10 m); hard coral cover was 25% in 4–6 m, 36% in 10–11 m and 13% in 20–21 m; average hard coral cover 24.7%, while the soft corals dominate around 29-48 %, and the other organisms such as sponges and gorgonian corals were 10-25 %. (Yusuf and Allen 2001).

Acropora russelli was free living on the clean hard substrate and spread out horizontally. It has strong current in the peninsula strait make the subsbtratum to be clean from sedimentation. Conditions in the surrounding environment has topographical relief in the form of large block rocks 0-18 m depth which had other sessile biotas eg. soft corals, algae, gorgonacea, sponges, tunicates and others.

On **Gili Air Island Lombok Strait**, *Acropora russelli* was inventored and collected from 12 m depth, on a moderate slope and expose to strong currents of straits. It was unattacheble on dead coral with brown filament algae and sands. It was limited colonies, only five pieces of

small colonies found on these substrate. On this substratum, the colonies of *A. russeli* were free living without attachement where had been on degraded reefs habitats which about 80 % of the dead corals, instead of hard corals and soft corals only about 10 % and sandy coverage 10 % respectively. All dead corals covered by algae filaments, had few makroalgae of '*Halimeda*'. The life coral species were dominant of blue tip of *Acropora granulosa* which the famous as 'Lombok blue corals'. This invention in the Lombok strait, especially in one of the Three Gilis, namely Gili Air, precisely at the point 08^{o} 20 '75.0 S; 116^{o} 03' 77.3"E. These location is also the area of narrow strait between the island of Gili Air and Gili Meno, when oseanography characteristic has strong current and clear water. The *Acropora russelli* specimen were in the reef slope of fringing reef within 65^{o} reef slope elevation.

Lamalera Strait in Timor-Flores Chanel,

On the Lamalera Strait, living *A. russelli* specimen was inventored from semi-open bay face to Lamalera Strait. The *A. russelli* was attached and standing short style colonies on dead coral substrate with algae coverage, sheltered reef slope at 7-8 m depth. This strait is the fertile water of plankton which have migration chanel of many cetacean species. The coral reef of Lembata was dominated by degradation reef on the slope, but dense on the reef edge at 2-3 m depth. Oceanographic condition was dominated by tidal strong current, strong caused by narrow strait relatively.

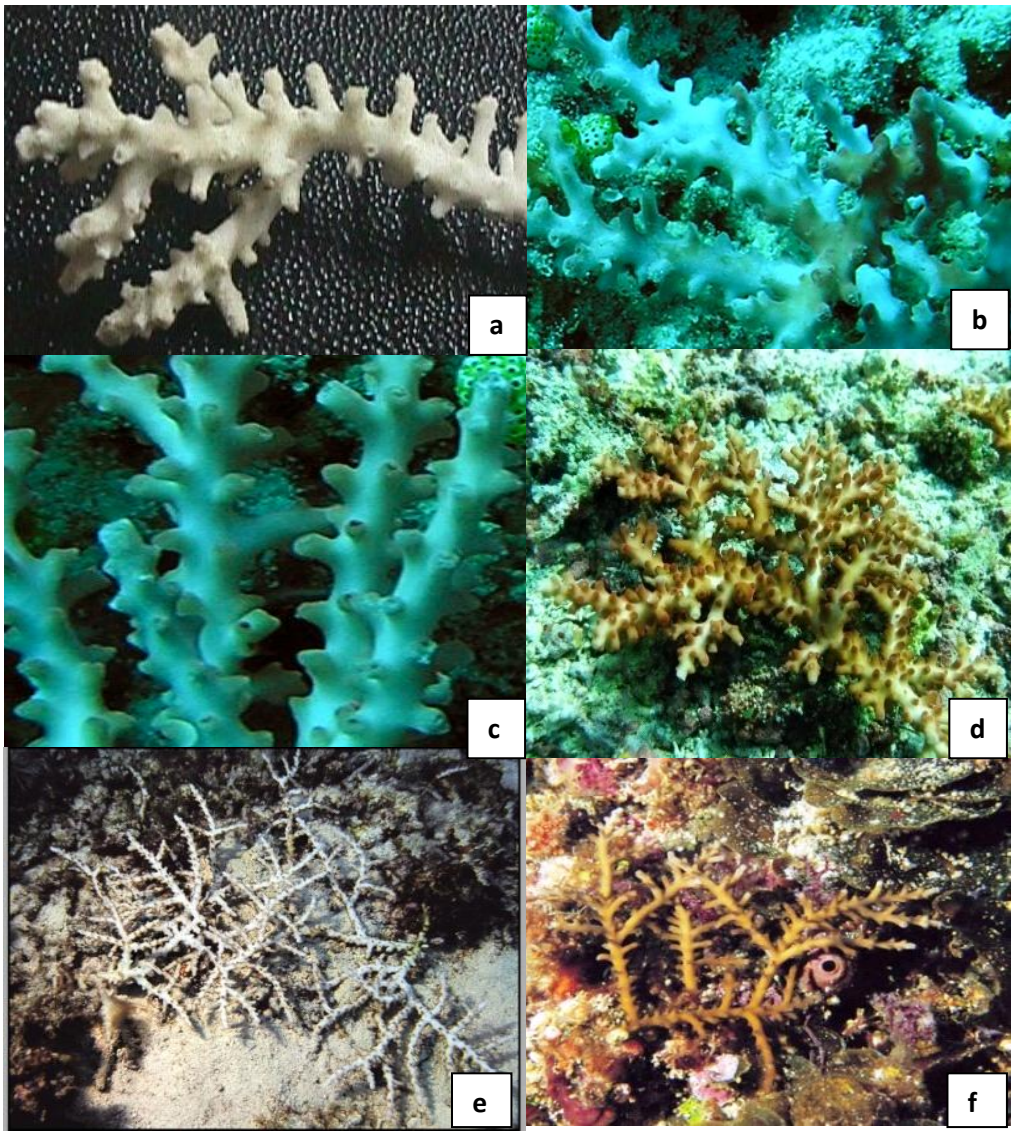

Figure 2. Specimens of *A. russelli* from several specific locations are : (a) Puludua Island Central Sulawesi, (b,c) Gili Meno Island Lombok Strait, (d) Lamalera Strait Flores, Indonesia, (e)Veron 2000, (f) Veron 2000 .

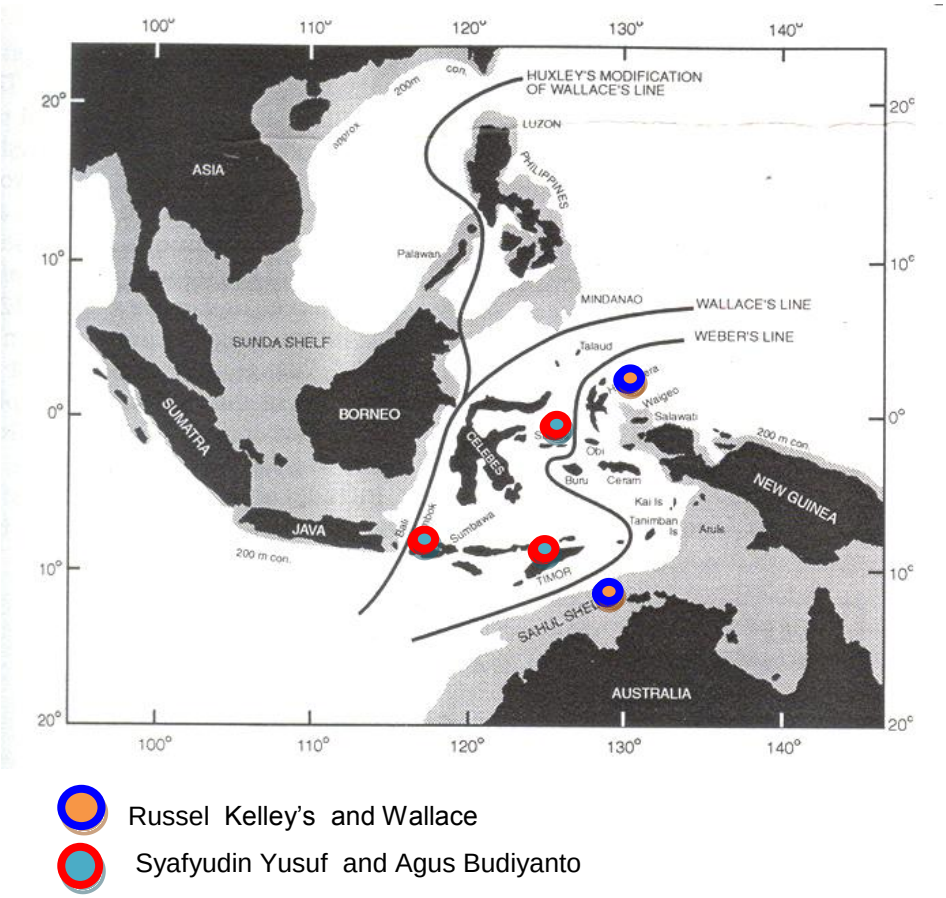

Figure 4. Location of the inventory of *Acropora russelli* in the Wallacea Line and Weber (Helfman et al., 1997).

Other World Record

Other collection sites were held by Emre Turak in Papua New Guinea (no GPS position) were stored in paratype G60745 to add a new record of *A. russelli* in the world. While in the Indian Ocean have been reported in Mauritius and Sri Lanka were collect in paratypes G59353 and G55765 (Wallace *et al*, 2012).

Discussion

The stafhorn corals, genus *Acropora* are by far the most diverse living reef building coral genus, with 114 species recognised worldwide (Wallace 1999). Distribution of this genus in Indonesian Archipelago show a duality reminiscent of the Wallace's Line pattern seen in

terrestrial animals and plants, rather than the concentric pattern predicted by 'the center of origin' model (Wallace 1997b). The duality is due to an overlap of Indian Ocean species distribution diminishing wesward within the Archipelago (Wallace 1997b). Additionally, a large number of species with broad Indo-Pacific Distribution.

Acropora as a major participants in coral mass spawning (Harrison, 2011). As coral reef studies intensified during the second half of the twentieth century, the dominance of the two genera on Indo-Pacific reefs saw them feature in various major enviromental and evolution discoveries. Based on taxonomically and the phylogeny application, a memoirs of the Queensland Musem book (nature 57) have describe the taxonomic position of *Acropora* and *Isopora*. Subgebus *Isopora* has considerably fewer species than *Acropora* and contrasting life history (Wallace, *et al* 2012).

Acropora russelli is very rare coral species on coral reef habitats. There are similarities habitats between the three site inventions, where both live in strong curent, good visibility, and located in narrow straits. In terms of ecology, these reefs do not attach themselves to the substrate with a relatively small colony size of about 10 -12 cm.

First discovering of *Acropora russelli* was in Australia Cartier Reef, northwestern Australia approximately position S 12^{o} 33', E 123° 34 at a depth of 18-25 m and was collected by Russell Kelley. Holotype collection number: G40795 and Paratipe collection: G40782, G40794, G40796. The discovery of the two on the island of Halmahera Loloda north, is the first discovery in the waters of Indonesia in 1997 with a collection of numbers: G51486-97. Further discovery of the three (this publication) in 1998 on the island of Sulawesi peninsula Puludua Middle east at Marine Conservation International Rapid Assessment Program Togian and Banggai in Central Sulawesi. According to it, It was the second finding after Russell Kelley who have seen in living specimen (Douglas Fenner : personal communication).

The fourth findings in the world or the third finding in Indonesia in the Straits of Lombok on the island of Gili Meno precisely in May 2004. *Acropora russelli* specimen was photographed on the island of Lombok is on the substrate (Figure 3). This specimen is in collection at the

RDC Macsi (Research and Development CenterMarine Sciences and Fisheries, University of Hasanuddin. According to Carden Wallace (musem Tropical Queensland Australia) outside Indonesia further discoveries around the waters of Sri Lanka. These *A. russelli* inventories were providing information on the new record sites *A. russelli* in the wallacea and weber line area. Another hand, this can adds a habitat references of these species, because of very limited distribution and less known of their habitats.

CONCLUSION

Acropora russelli (Wallace, 1994) is a rare new species of genus Acropora had been found around the Wallacea region of Indonesia in three sites, these are east peninsula of Central Sulawesi, second in Gili Meno Island Lombok Strait and third in Lembata Strait Flores. All of the colonies were free-living at clean hard substrate like base rock, dead coral, and rubble in clear waters and strong current a depth of 7-18 meters.

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