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# Biological Science

Botany & Zoology

Future 'Wild X-Disease'

Reactions to the Vaccine Product

Highlights

Incidence of Serious AEFI

Spatial Distribution of Zooplankton

Discovering Thoughts, Inventing Future

VOLUME 21 ISSUE 5 VERSION 1.0

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# Incidence of Serious AEFI Linked to Reactions to the Vaccine Product in Weakly Immunized Health Areas, Case of the ZS of Kabinda, Province of Lomami, DRC, November 2019

By Kinuani Mbulu Léon, Nkodila Natuhoyila Aliocha, AbouBeckr Gaye, Yapi Moise, Badjiok Moise, Lina Piripiri, Ngoie Gullaume, Nzolo Didier & Muyembe Tamfum Jean-Jacques

*Introduction-* Vaccines are considered safe, effective in disease prevention and cost-effective [1, 2]. Reason for the need to expand and maintain high immunization coverage in order to maintain effective immunity [3-5]. But this vaccine leads to the likelihood of occurrence of adverse events following vaccination (AEFI), since vaccines are pharmacological products and are not exempt from causing adverse events in some people [1, 3-5].

AEFI consists of any undesirable effect following vaccination, which does not necessarily have a causal relationship with the use of a vaccine or other immunobiological preparation [1, 3, 4].

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*Strictly as per the compliance and regulations of:*

# Incidence of Serious AEFI Linked to Reactions to the Vaccine Product in Weakly Immunized Health Areas, Case of the ZS of Kabinda, Province of Lomami, DRC, November 2019

Kinuani Mbulu Léon [α], Nkodila Natuhoyila Aliocha [σ], AbouBeckr Gaye [ρ], Yapi Moise [ω], Badjiok Moise [¥], Lina Piripiri [§], Ngoie Gullaume [χ], Nzolo Didier [ν] & Muyembe Tamfum Jean-Jacques [Θ]



## I. Introduction

Vaccines are considered safe, effective in disease prevention and cost-effective [1, 2]. Reason for the need to expand and maintain high immunization coverage in order to maintain effective immunity [3-5]. But this vaccine leads to the likelihood of occurrence of adverse events following vaccination (AEFI), since vaccines are pharmacological products and are not exempt from causing adverse events in some people [1, 3-5].

AEFI consists of any undesirable effect following vaccination, which does not necessarily have a causal relationship with the use of a vaccine or other immunobiological preparation [1, 3, 4].

Five causes are inconvenient for the occurrence of AEFI, these are: 1) product-related reaction where the AEFI caused or precipitated by a vaccine emanates from one or more properties inherent in the vaccine product; 2) reaction related to a quality defect of the vaccine product where the AEFI caused or precipitated by a vaccine results from one or more quality defects of the vaccine product, including the administration device supplied by the manufacturer; 3) reaction related to a vaccination error where the AEFI caused is due to an error in handling, prescribing or administering the vaccine; 4) vaccine-related anxiety reaction where the AEFI caused resulting from anxiety about the vaccine and 5) a mere coincidence where the resulting AEFI is due to a factor other than the vaccine product, a vaccine error or anxiety associated with vaccination [6].

Most AEFIs are non-serious, local and systemic, therefore surveillance actions focus on moderate and severe events. These events are linked to several factors, such as the type of vaccine, the conditions of administration, the storage and the characteristics of the vaccinees. However, their intensity can vary from non-serious and expected effects such as local manifestation to moderate and severe events and rare cases, classified as unexpected [1, 3, 4].

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Given the characteristics of the vaccinated, children under one year of age represent the group most affected by AEFI. The highest concentration of vaccine offered and doses applied occur in this age group. Studies worldwide have shown that the distribution of AEFI in this age group is approximately 80% compared to other segments of the population [4, 7]. In this sense, it is important to carry out screening and surveillance after vaccination in order to identify AEFI and adopt timely intervention measures, allowing the maintenance of the quality, the safety of the vaccinees and the preservation of vaccine reliability. Immunization [1.7].

AEFI should be carefully investigated to avoid a cause-and-effect lag with vaccination, especially in cases with a transient association of the complication with vaccination. On the other hand, confirmed cases of AEFI should be disclosed in order to allow health professionals to become aware of them and therefore to adopt specific preventive measures, as well as to prescribe vaccinations with a higher level of safety. [1, 2, 3]. Considering the relevance of information on AEFI for public health, safe vaccination and sustaining advances in the control of immunopreventive diseases, the objective of the present study was to determine the incidence of AEFI in patients. children during the measles vaccination campaign in Lomami province.

## II. Patients and Methods

Cross-sectional descriptive study. The database included data collected during reporting of adverse events identified after mass measles vaccination campaign. The study sample included the total AEFI cases that occurred in children after this mass measles vaccination campaign between October 31 and November 3, 2019.

All vaccinated children with AEFI requiring hospitalization of less than 24 hours were included in this study. AEFI treated at home was not included in our study.

The data were collected by vaccination site health workers and confirmed by a team made up of

EPI, Pharmacy and Drug Management and WHO officers using an AEFI investigation form.

The adverse event following vaccination was chosen as the dependent variable, classified according to the options contained in the notification form. In this context, the most recurring events have been taken into account in this study.

The independent variables were those related to the vaccine (sex, age - depending on the interval, hereditary and personal children's history, batch number, vaccine expiration date, co-infection); time (interval between immunization and onset of adverse event - elapsed time); and the outcome of the case related to the intensity of the event, the course adopted and the progress of the case.

The variable intensity of AEFI was classified as A if the AEFI has a coherent causal link with vaccination in this case we can have class A1: reaction linked to the vaccine product (in accordance with the published literature); A2: reaction linked to a vaccine quality defect; A3: reaction linked to a vaccination error or A4: reaction linked to anxiety linked to vaccination. Or like B if the cause is undetermined. In this case, we can have class B1: proven temporal relationship, but insufficient evidence to implicate the vaccine in the event (it could be a new event associated with the vaccine) or B2: examination of the These factors show contradictory trends, whether or not in the direction of a causal relation with vaccination or even as C if the causal link is inconsistent with vaccination or is a simple coincidence. And finally, we can have unclassifiable MAPI.

*a) Statistical analyzes*

Statistical analyzes of the data were performed using SPSS for Windows version 22 software. Descriptive analyzes performed are the median and extremes for non-Gaussian distributed data and proportions for categorical data. Pearson's chi-square test or Fisher's exact test as appropriate was performed to compare the proportions. The p-value $<0.05$ was the threshold of statistical significance.

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## III. Results

A total of 24 children had presented serious AEFI during vaccination against VAR in the province of LOMAMI, in Kabinda. Their median age was 29.6 months with the extremes ranging from 9 to 51 months, 54.2% were girls, sex ratio 1H / 1F. 79.2% of these children received their 2nd dose. Two lots of vaccine were identified under number 0049F001 in 58.3% and 0049F047 (41.7%). The majority of these children had a history of AEFI related to this vaccine. The median time to investigation of AEFI and to hospitalization of children was 1 day, respectively.

*Table 1:* General characteristics of children

| Variables | Effectifs (n=24) | Pourcentage |
|---|---|---|
| Age | | |
| Médiane (extrêmes) (mois) | 29,6 (9-51) | - |
| <12 mois | 7 | 29,2 |
| 12-59 mois | 17 | 70,8 |
| Sexe | | |
| Garçon | 11 | 45,8 |
| Fille | 13 | 54,2 |
| Dose | | |
| 1ère | 5 | 20,8 |
| 2ème | 19 | 79,2 |
| Numéro de lot | | |
| 0049F001 | 14 | 58,3 |
| 0049F047 | 10 | 41,7 |
| Antécédents | | |
| MAPI vaccin | 6 | 25,0 |
| Allergie à un vaccin | 2 | 8,3 |
| Patient sous traitement | 9 | 37,5 |
| HF allergie | 1 | 4,2 |
| Delai d'investigation (jours) | 1 (1-20) | - |
| Délai d'hospitalisation (jours) | 1 (1-28) | - |

Type of AEFI investigated

Prolonged fever, convulsion, incessant crying, vomiting and generalized rash were the most common AEFI during the measles campaign in this Kabinda locality. The difference was not statistically significant between girls and boys in the occurrence of AEFI.

*Table II:* Distribution of serious AEFI observed

| MAPI | Tous (n=24) | Garçon (n=11) | Fille (n=13) | p |
|---|---|---|---|---|
| Fièvre | 21(87,5) | 10(90,9) | 11(84,6) | 0,565 |
| Convulsion | 17(70,8) | 8(72,7) | 9(69,2) | 0,605 |
| Pleurs incessants | 11(45,8) | 6(54,5) | 5(38,5) | 0,353 |
| Vomissement | 6(25,0) | 3(27,3) | 3(23,1) | 0,590 |
| Eruption cutanée | 4(16,7) | 1(9,1) | 3(23,1) | 0,363 |
| Diarrhée | 3(12,5) | 1(9,1) | 2(15,4) | 0,565 |
| Abcès | 3(12,5) | 1(9,1) | 2(15,4)) | 0,565 |
| Frisson | 3(12,5) | 2(18,2) | 1(7,7) | 0,435 |
| Anémie | 2(8,3) | 2(18,2) | 0(0,0) | - |

Comorbidity associated with AEFI and treatment initiated

Malaria was the most common comorbidity during the onset of AEFI (70.8%). Most of the treatment started was paracetamol (62.5%), artezunat (54.2%) and diazepam (29.2%).

*Table III:* Comorbidity associated with AEFI and treatment initiated

| Variables | Effectifs (n=24) | Pourcentage |
|---|---|---|
| Comorbidités | | |
| Accès palustre | 17 | 70,8 |
| Méningite | 3 | 12,5 |
| Abcès hyatrogène | 1 | 4,2 |
| Traitement instauré | | |
| Paracétamol | 15 | 62,5 |
| Artésunat | 13 | 54,2 |
| Diazépam | 7 | 29,2 |
| cloxaciline | 5 | 20,8 |
| Acide folique | 2 | 8,3 |
| Pansement au dakin | 1 | 4,2 |

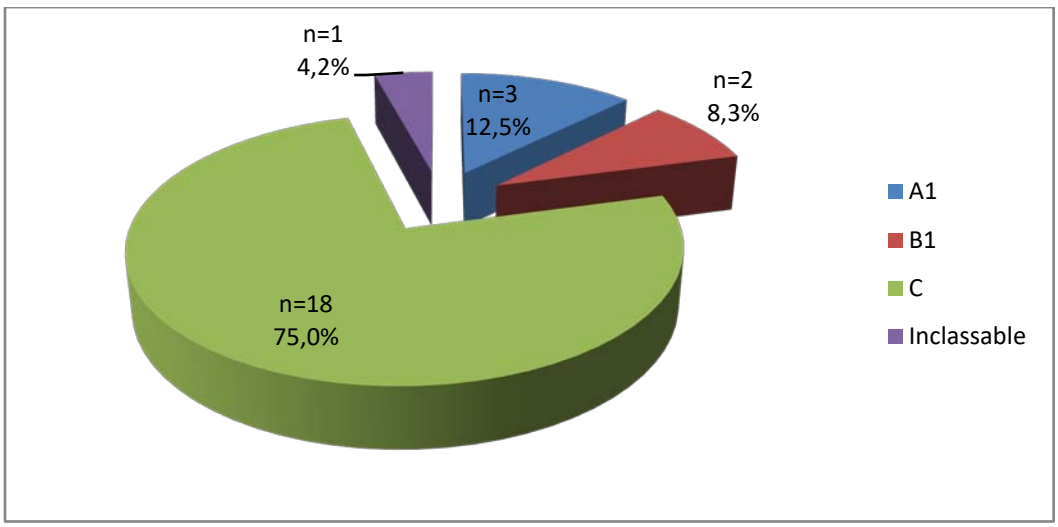


*Figure 1:* Classification of AEFI

A1: Reaction linked to the vaccine product (according to published literature)
B1: Proven temporal relationship, but insufficient evidence to implicate the vaccine in the event (it could be a new event associated with the vaccine)
C: Coincidentally, underlying or emerging condition (s), or condition (s) caused by exposure to anything other than the vaccine
The majority of AEFIs noted were coincidental (75%); 12.5% of AEFI were vaccine-related reactions and 8.3% were AEFI with a proven temporal relationship. One unclassifiable AEFI case was noted.

*Figure 2:* Illustration of AEFI

This figure shows the case of generalized skin rashes in a vaccinated child

## IV. Discussion

The discussion of the risks of vaccination should be balanced by recognition of the already well-established benefits in preventing disease and disability and death caused by infectious diseases. In this sense, the identification of AEFI helps improve the health care routine for children and contributes to interventions aimed at vaccine safety because passive surveillance of AEFI can be considered useful in monitoring related safety. to vaccines [1, 2, 4].

The nursing team plays a leading role as vaccinators and supervisors of immunization rooms, overseeing technical and operational aspects, and in screening and monitoring the immunization status of users, particularly in healthcare primary. Therefore, studies on AEFI can help identify opportunities to improve the actions developed in immunization rooms. In addition, they can help reduce wasted vaccination opportunities, as decisions about vaccination screening and post-vaccination follow-up will be made more safely [3, 8, 9].

Specific measures to prevent AEFI, including appropriate screening to check for possible contraindications or the need to postpone vaccines, continuing training of vaccinators and health education can contribute to the quality and safety of the vaccine. immunization, thus ensuring the verified progress in the eradication and control of vaccine-preventable diseases. It is important to mention that the evidence for the safety and efficacy of vaccines in routine immunization in children and adults is significantly favorable [1, 9, 10].

The high frequency of AEFI in children under one year of age found in this study has also been demonstrated in other studies [4, 5, 11]. This study highlights that in this age group, the concentration of vaccines is higher and the immune system is still immature, increasing the likelihood of infectious processes, allergies and clinical alterations that may be associated with vaccination [10, 12-14].

The present study demonstrated the predominance of AEFI in children aged 1 to 5 months. Cases of AEFI have also been reported in children aged 9 to 12 months, during which time there are no specifically recommended doses of the vaccine, suggesting immunization of children with a late vaccination schedule.

Despite the slight predominance of women, no statistically significant difference in AEFI was observed between the sexes. A CDC study [9] with children found the same proportion of notifications between the sexes. A study carried out in Uruguay [15] found a higher frequency for men aged 2 months to 5 years, and a study carried out in Brazil found a predominance of girls [11]. Information on vaccine safety, contraindications and possible cases of AEFI is needed to control immunopreventable diseases. Public ignorance can compromise product reliability and vaccine coverage, as was observed for the influenza vaccine in 2012 [15, 16].
In view of the above, the present study suggests the improvement of surveillance actions in relation to AEFI, the precision in the filling of the notification form, and the continuous training in the health services in order to update the professionals. working in vaccination rooms and guiding the population on the subject of increasing the reliability, quality and safety of vaccination [1, 17].

The present study has limitations that are certainly linked to the use of secondary data. There may be an underreporting of AEFI cases, as well as insufficient filling out of the investigation form, which leads to a bias in the information collected. Nevertheless, given the importance of notified cases, the results of the study provide important information.

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# Composition, Density and Spatial Distribution of Zooplankton in Inner Ambon Bay, Indonesia

By J. Latumeten, F S Pello & V D V Latumeten

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*Abstract-* Inner Ambon Bay is part of Ambon Bay; it is semi-closed area and a small pelagic fish fishing ground, especially anchovy. The anchovy is a zooplankton predator; therefore the existence of anchovy is affected by the abundance of zooplankton. The aims of the research are to obtain information on the composition, density, and spatial distribution of the zooplankton in these waters. Data of zooplankton composition were obtained from sampling by using plankton net at ten observation stations. Meanwhile, data of densities were collected using a scientific hydroacoustic system, BioSonic DTX supported with split-beam technology, on six parallel transect lines and one cross-parallel transect line. Geostatistical analyses technique was used to describe horizontal distributions of zooplankton, and vertical distributions pattern were plot in the graphs. The result shows that the zooplankton community is dominated by Copepod and meroplankton. The highest average density was found in August (9393 ind./$m^2$), while the lowest density was in June (903 ind./$m^2$).

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# Composition, Density and Spatial Distribution of Zooplankton in Inner Ambon Bay, Indonesia

J. Latumeten [α], F S Pello [σ] & V D V Latumeten [ρ]

*Abstract-* Inner Ambon Bay is part of Ambon Bay; it is semi-closed area and a small pelagic fish fishing ground, especially anchovy. The anchovy is a zooplankton predator; therefore the existence of anchovy is affected by the abundance of zooplankton. The aims of the research are to obtain information on the composition, density, and spatial distribution of the zooplankton in these waters. Data of zooplankton composition were obtained from sampling by using plankton net at ten observation stations. Meanwhile, data of densities were collected using a scientific hydroacoustic system, BioSonic DTX supported with split-beam technology, on six parallel transect lines and one cross-parallel transect line. Geostatistical analyses technique was used to describe horizontal distributions of zooplankton, and vertical distributions pattern were plot in the graphs. The result shows that the zooplankton community is dominated by Copepod and meroplankton. The highest average density was found in August (9393 ind./m$^2$), while the lowest density was in June (903 ind./m$^2$). Vertical distribution of zooplankton generally shows that the highest density was found near-surface and decrease to the deeper water column, except in June and July, where the highest density of zooplankton was found at a depth of 37m and 17m, respectively. On the horizontal distribution, lower densities (<500 ind./m$^2$) are distributed in a wide space; on the contrary, higher densities (>5000 ind./m$^2$) occupy smaller space.

## I. Introduction

Ambon Bay is located in Maluku Province, Indonesia. It is one of the potential fishing areas in Maluku, especially for small pelagic fish. The area used to be the main live bait (anchovy) fishing ground to support skipjack tuna fishery from early 1970 to mid-1980. Some of the pelagic fishes commonly caught are sardines (*Sardinella* sp.), mackerel (*Rastreliger* sp.), mackerel scads (*Decapterus* sp.), and bigeye scad (*Selar* sp.) (Syahailatua, 1999).Ambon Bay is divided into two parts, namely Outer Ambon Bay and Inner Ambon Bay. The area of Inner Ambon Bay is approximately 11.04 km$^2$. This bay is considered a semi-enclosed area with a shallow basin. Based on depth detection using a hydroacoustic device in 2010, it was known that the maximum depth of this area amount to 45m (Latumeten and Pello, 2019). This area is small pelagic fishing ground, in particular the anchovy. The anchovy fish commonly caught are *Stelophorus-heterolobus, S. indicus, and S. bucannieri* (Wouthuyzen *et al*, 1984). These species are predators of zooplankton and best live baits used in skipjack pole and line fishery in Ambon City. *Stolephorus* spp. is major omnivore group towards phytoplankton and zooplankton (Morintoh, 2001).The young *S. heterolobus* fish size 40 mm length eat tiny phytoplankton and zooplankton. In contrast, the adult one eat Calanoid, Leptochela, polychaete larvae, Lucifer, Brachyuran, and other large zooplankton includes their eggs (Huliselan *et al*, 2015).

Research on the zooplankton community in Ambon Bay had revealed as much as 53 genera of zooplankton dominated by the sub-class of Copepoda, namely Evadne, Calanus, Parucalonus. Psedocalarus, Centropages, Acartia, Oithona, Lucifer, Oikopleura, Sagitta, and fish egg. The copepod is the dominant zooplankton in Inner Ambon Bay (Tahapary, 2013). Estimation of abundance and biomass distribution of plankton using plankton net as a sampling method is considered difficult. This is due to the small sample size, highvariety, high cost, and enormous bias also inconvenient (Liao*et al*, 1999). With the invention of the hydroacoustic appliance, the in situ estimation of plankton abundance, distribution, plankton and nekton behavior, pelagic fish can be conducted (Aoki and Inagaki, 1992; Castillo et al, 1996; Fischer and Visbeck, 1993; Petitgas and Levenez, 1996, Simard et al, 1992). Hydroacoustic instrument in zooplankton research has been used by several authors (Kidwai and Amjad, 2001; Marchin *et al*, 1996; De Robertis et al, 2003 Liao*et al,* 1999; Chu and Wiebe, 2005; Forman and Warren, 2010).

## II. Materials and Method

### a) Materials

The research had been done in Inner Ambon Bay waters from December 2011 to August 2012. The research location, zooplankton sampling sites, and transect design for raw acoustic data showed in Figure 1. Materials used in this research covers: 1. One unit of a speed boat with the size of 11x1.8x0.8 m; 2. One unit of plankton net with mouth size of 45 cm and net mesh size of 33 mm; 3. One set of scientific hydroacoustic system BioSonic DTX with frequency operational of 206 kHz, and a beam angle of six degrees; 4. One global positioning system (GPS) receiver JRC (Japan Radio Cooperation) standard marine survey; 5. Visual Acquisition software to control all operational setting and echosounder and transducer functions which connected

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to the acoustic system during acoustic data collection (BioSonic, 2003); 6. Visual Analyzer software to estimate zooplankton abundance from echo integration result (BioSonic, 2004); 7. One unit of Panasonic Tough Book laptop to run the two software, saving acoustic data, and result fromanalysis.

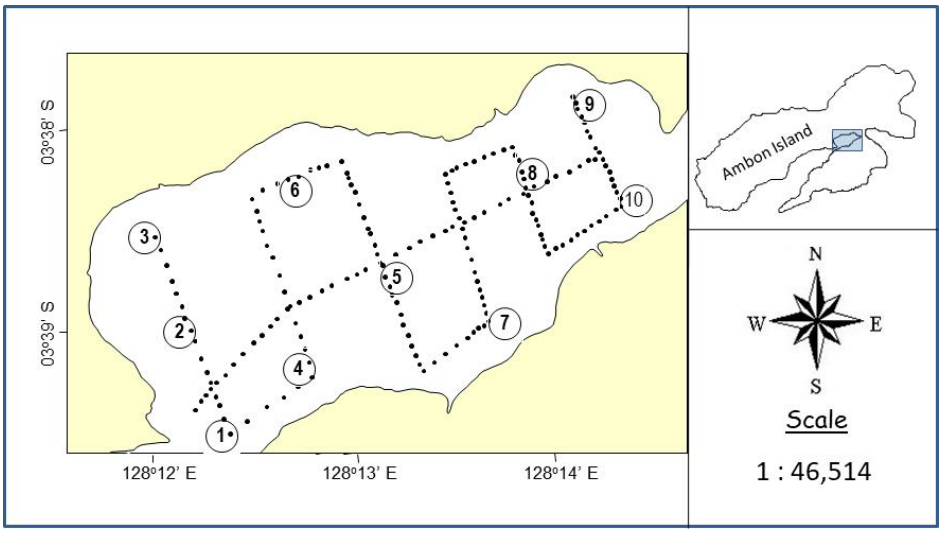


*Figure 1:* Map of survey location (Inner Ambon Bay). Black dots showing recording positions of zooplankton densities where the distance between the two black dots are the elementary sampling distance unit (ESDU) of echo integration. Numbers 1 to 10 in the circle are the sampling stations of zooplankton using a plankton net

*b) Data collection*

The zooplankton sample was collected vertically using plankton net from the depth with 1% light intensity to the seawater surface. The sampling had been done at all ten stations (Figure 1) on the same day. The plankton sampled was intended to verify plankton species detected during acoustic data collection. The filtrate water sample was poured into a sample bottle already filled with 4% formaldehyde. Before acoustic data collection, the hydroacoustic device was calibrated using a 31mm tungsten carbide sphere. The acoustic data collection using split-beam technique applied at six parallel transects and one transect which crossed the six parallel transects (Figure 1). During acoustic data collection, the transducer was laid at 1m depth at one side of the speed boat and pulled with approximately 5 knots along the transect line. The acoustic system parameter for zooplankton data collection set as follows; data threshold is -130 dB, transmitting rate is three pings per second, collection range is 50m from transducer face, and pulse width is 0.1millisecond. The length of the echo integration period was set to one minute with an elementary sampling distance unit (ESDU) at a speed boat speed of 5 knots at approximately 125 m length.

Positioning adjustment and speed boat course with the position and line transect direction assigned controlled using standard marine survey GPS JRC. Position and time of data collection at each ESDU were simultaneously and automatically recorded. All data is automatically saved on the computer hard disk. Zooplankton sampling and acoustic data collection were done concomitantly started from 08.00 am to 12.00pm at local time.

*c) Data analysis*

The zooplankton sampled was then identified according to (Newell and Newell, 1977; Yamaji,1984). Zooplankton density from vertical hydroacoustic sampling within each ESDU was estimated following BioSonic (2004) as follows:

$$ZPCM = \frac{S_v}{\bar{\sigma}_{BS}}$$

Where ZPCM is a zooplankton density per $m^3$,Sv is the volume of back-scattering strength, and $\sigma_{BS}$ is the mean back-scattering cross-section (cross-section of zooplankton size assessed acoustically) from detected zooplankton. The Sv value is calculated using the following formula:

$$S_v = 10 * log\left[\rho_c * \left(\frac{\Sigma P}{\Sigma samples}\right)\right]$$

where P is a gain of sound intensity samples corrected and $\rho_c$ is a System Scaling Constant is calculated from the following formula:

$$\rho_c = \frac{1}{\pi * pw * \left(10^{(SL/10)}\right)^2 * \left(10^{(RS/10)}\right)^2 * E\left[b^2\right]}$$

Where $\pi$ = 3.14159, PW = pulse width (second), c = sound speed (m/second), SL = source level (dB/µPa), RS = receiver sensitivity of transducer (dB), and E[$b^2$] beam pattern factor. Zooplankton density analysis was conducted at each one-meter water thickness from

transducer surface to bottom according to BioSonic (2004) with the following formula:

$$ZPUA = AD_i * (IT_i * \%_i/100)$$

Where ZPUA is the zooplankton density per $m^2$ (unit area) which is the sum of absolute vertical density, AD, and zooplankton per cubic meter (ZPCM). AD values are obtained by the formula (BioSonic, 1990):

$$AD = RD * C$$

Where RD is relative density and C is echo integrator scaling factor. In the processing acoustic raw data for zooplankton the filtered of echo srength is from -90 dB to -78 dB. The vertical zooplankton distribution data was plotted to observe a vertical distribution pattern using Microsoft Excel 2007 software. The horizontal distribution data were analyzed using the gridding method through 2-D (two dimensional) ordinary krigging (Deutsch and Journel, 1992) with the following formula:

$$D_i(x) = \sum_{\alpha=1}^{n} \lambda_\alpha D_i(x_\alpha)$$

$$\sum_{\beta=1}^{n} \lambda_{\beta\gamma}(x_\alpha, x_\beta) + \mu = \gamma(x_\alpha, x)$$

$$\beta = 1,\ \alpha = 1, \cdots n,\ \sum \lambda_\alpha = 1$$

where : x= site position estimated in two dimensional system
$x_\alpha$ = the position of a sample in two dimensional system
λ = kriging weight
n = number of nearest samples that used in kriging
γ = variogram of zooplankton density
μ = lag distance parameter

The variogramis obtained according to MacLennan and Simmonds (2005) with the following formula:

$$\gamma(h) = \{(F - F')^2/2\}$$

h = distance between the sample locations
F, F' = group of pair of samples for a particular distance

## III. Result and Discussion

*a) Composition*

The result shows that in general zooplankton community is obtained at ten sampling stations during the research is dominated by a group of copepod (42.85% in February to 85.15% in August), followed by the meroplankton (10.15% in August to 51.17% in February) and a group of others zooplankton in a small percentage (4.80 % in August to 14.77% in July). The copepod was dominated by Oithona, Acrocalanus, Eucalanus Macrosetella. Meroplankton consists of the larvae of Peneidae, Cirripedia, Stomatopoda, Brachyura, Echinodermata, Gastropoda, Bivalvia, Annelida, and fish egg. Group of other zooplankton in small percentage consists of Medusa, Siphonophora, Urochrodata, Chaethognata, Amphipoda, Sergestidae, Ostrachoda, Cladocera. Copepod and meroplankton found in each sampling period. Other groups of zooplankton were found in each sampling period were Siphonophora, Urochrodata, Chaethognata, and Sergestidae, meanwhile Amphipoda was found in January, April, and June, but Ostrachoda and Cladocera were not found in April. The percentage of zooplankton group in Inner Ambon Bay shown in Figure 2.

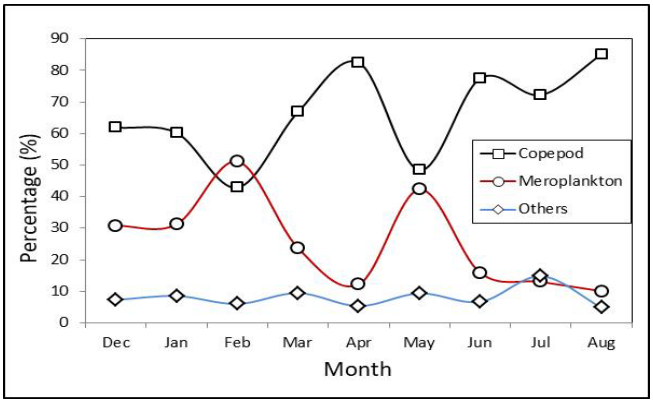


*Figure 2:* Variation of zooplankton percentage in Inner Ambon Bay

The high percentage of copepod is allegedly due to its ability to adapt to high dynamic of oceanographic conditions in coastal waters such as temperature and salinity compared with another group of zooplankton (Mulyadi and Wahab, 2015). This situation is, of course, also supported by the availability of phytoplankton as zooplankton's food (Huliselan *et al*. 2015; Pello *et al*. 2021; Latumeten *et al*. 2021). The presence of meroplankton (larval of various biota and fish egg) with a significant percentage such as a result of the research hint that the Inner Ambon Bay is a spawning ground, nursery ground, and feeding ground of finfish, crustacean, mollusk, shellfish, etc.

Variation of zooplankton percentage in Figure 2 is seen there is a relationship between meroplankton and copepod where the more meroplankton followed by a fewer copepod, the curve fit in Figure 3 explain it more clearly. In the marine food chain system, meroplanktonis in the first and second level consumers while copepods are in the first level consumers (Lalli and Parson, 1993). Meroplankton in the second level consumers will use copepods as one kind of food. Thus the presence of copepods in Inner Ambon Bay is controlled by meroplankton.

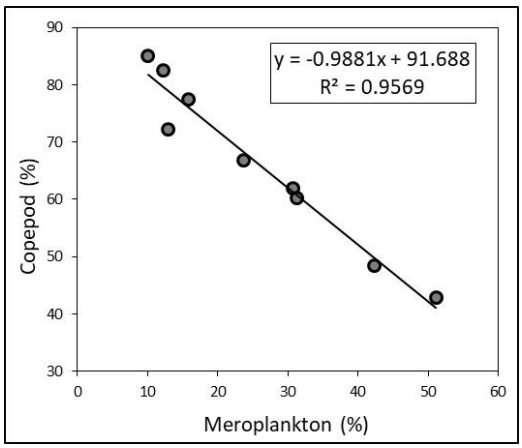


*Figure 3:* Relationship between meroplankton and copepod in Inner Ambon Bay

The equation in Figure 3 above explains that if there is an increase of one percent of meroplankton, it will reduce the copepod by 0.99 percent. From the value of the coefficient of determination ($R^2$), it is explain that the effect of the contribution of meroplankton to copepods is very high, which is equal to 95.69%.

*b) Density of Zooplankton*

Statistics of zooplankton density from hydroacoustic data during the research in Inner Ambon Bay are presented in Table 1.

*Table 1:* Statistical of zooplankton densities in Inner Ambon Bay

| Month | No. ESDU | Density (ind./m²) | | | |
|---|---|---|---|---|---|
| | | Minimum | Maximum | Average | Std. Deviation |
| December | 100 | 64 | 75,134 | 921 | 6,591 |
| January | 98 | 66 | 5,240 | 367 | 537 |
| February | 99 | 78 | 578,000 | 1,495 | 9,073 |
| March | 101 | 111 | 43,400 | 936 | 4,433 |
| April | 102 | 72 | 4,180 | 208 | 157 |
| May | 100 | 157 | 6,860 | 600 | 813 |
| June | 104 | 119 | 4,969 | 903 | 1,112 |
| July | 103 | 139 | 142,581 | 2,880 | 16,144 |
| August | 99 | 120 | 357,822 | 9,393 | 43,627 |

Table 1 shows that the zooplankton average density values vary from month to month during the research time. The lowest zooplankton density was found in April (208 ind./$m^2$), while the highest density was found in August (9,393 ind./$m^2$). The standard deviation value shows that the higher variation of zooplankton density between Elementary Sampling Distance Units (ESDU) occurred in August (43,627 ind./$m^2$), in July (16,144ind./$m^2$), and in February (9,073ind./$m^2$), while the lower variation was found in April (157ind./$m^2$), in January (537 ind./$m^2$) and in May (813 ind./$m^2$). The occurrence of high zooplankton density variations at different times in Inner Ambon Bay is due to the high variation in phytoplankton density(Huliselan *et al*. 2015).

*c) Vertical distribution*

The vertical distribution of zooplankton densities in Inner Ambon Bay is presented in Figure 4.It is showed that the depth of the swimming layer of zooplankton varied from month to month. The deepest swimming layer of zooplankton was found in June (44m), and the shallowest was in May (18m).

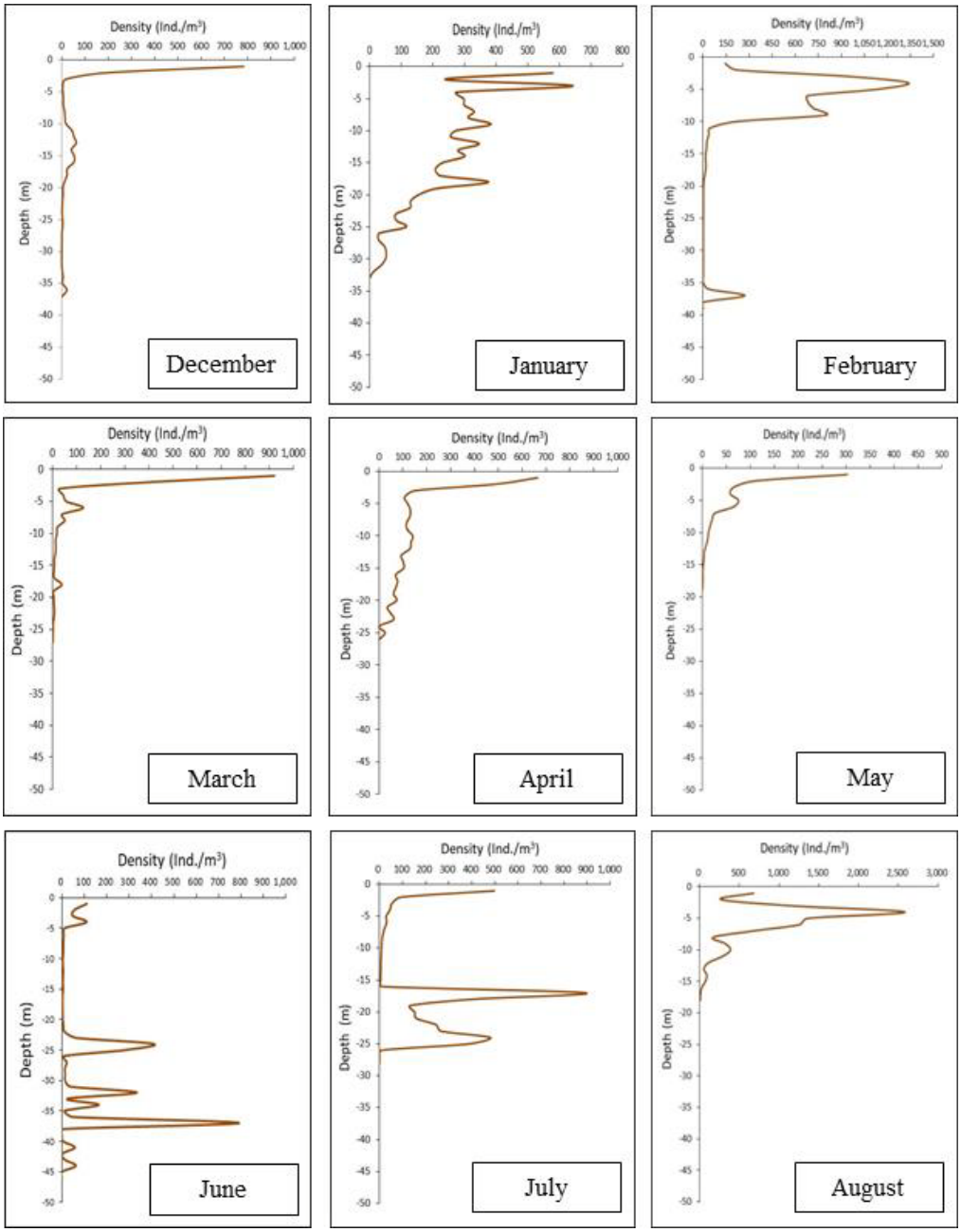


*Figure 4:* Vertical distribution of zooplankton densities in Inner Ambon Bay

Generally, a higher density of zooplankton was found near-surface layer and decreased down to deeper layers as appeared in December, January, February, May, and August. The situation is different in June, and July where higher density zooplankton was found far from the surface layer, i.e. at a depth of 37m and 17m, respectively. It is indicates there was a large migration of zooplankton from the surface to the deeper layers in both that months. This migration is the avoidance reaction of low salinity on the surface layer to a deeper water layer which is higher and stable salinity. The low salinity of the surface layer in June and July because in these months, the rainfall is usually higher than that of the other months. During this time, the input of freshwater from several rivers with large volumes into Inner Ambon Bay due to lower salinity in the surface layer (Table 3). In addition, especially in July, besides higher density of zooplankton distributed at a depth of 17m but there are a group of zooplankton with a fair density that have a tolerance to lower salinity near the surface. According to Pranoto (2005), the crustacean class, in general, is euryhaline or can withstand at extreme changes of salinity.

The vertical distribution pattern of zooplankton density in August was almost the same as the vertical distribution pattern of zooplankton density in the other monthsi.e higher zooplankton density was in the surface layer and decreased to the deeper water layers. The

high density of zooplankton near the surface layer in August is allegedly due to the lower rainfall that occurs it month, which causes the salinity of the surface layer to be higher than the salinity in June and July (Table 2).

*Tabel 2:* The range and average salinity (psu) in the surface layer of Inner Ambon Bay during the Wet and Dry Season (Pello, 2014)

| Value | Wet Season | | | Dry Season | | |
|---|---|---|---|---|---|---|
| | June | July | August | December | January | February |
| Minimum | 32.85 | 32.99 | 33.61 | 32.76 | 33.34 | 33.53 |
| Maximum | 20.21 | 25.95 | 28.63 | 30.46 | 31.77 | 32.42 |
| Average | 26.52 | 29.93 | 31.65 | 31.40 | 32.73 | 32.81 |
| Std. Deviation | 3.91 | 1.94 | 1.65 | 0,82 | 0.52 | 0.37 |

Besides the salinity effect, the high density of zooplankton in the surface layer is also related to the high intensity of sunlight which causes the high abundance of phytoplankton which is the food of zooplankton. The research result from Huliselan *et al.* (2015) in Ambon Bay indicated a high abundance of phytoplankton is followed by a high abundance of zooplankton, where Copepods always dominate the zooplankton community.

*d) Horizontal distribution*

The horizontal distribution of zooplankton density in Inner Ambon Bay is presented in Figure 5. It is shown that the horizontal distribution of zooplankton density in Inner Ambon Bay varies from month to month, thus making it difficult to predict. Low densities (<500 ind./$m^2$) are spread over a wider area of water. In contrast, high densities (>5000 ind./$m^2$) are spread over narrow water spaces, except in August, where high zooplankton densities are spread over a wider waters space compared to the high density found in other months.

High zooplankton densities are more often found near the inner-outer bay transition area except in January, April, and May, where high zooplankton densities are found in the south and east of these waters. Apart from near the transition areas of the inner-outer bay, high zooplankton densities were also found in the waters near the mangrove community, namely in the north in December, in the northeast and southeast in February and June, while in the east in July and August. The high density of zooplankton near the transition area of the inner-outer bay is thought related to the dynamics of mixing water masses from the Inner Ambon Bay and the water masses from the Ambon Outer Bay caused by tidal currents. These two water masses transport zooplankton which is a mixing near the transition area, which causes high-density zooplankton in this location. The mixing of two different water masses from inner bay and outter bay transport the zooplanktons. This mixing of water masses not only causes high density of zooplankt on but also high density of anchovies there(Latumeten and Latumeten, 2021[a]).Besides near the inner-outer bay transition area, a high density of zooplankton also found around the mangrove community; this is because mangroves are a nutrient supplier which causes the abundance of phytoplankton there, followed by zooplankton to eat the phytoplankton. From the horizontal distribution pattern of zooplankton density between locations and time in Ambon Bay, as shown in Figure 5, shows that the distribution pattern of zooplankton density in these waters is not random but clustered.

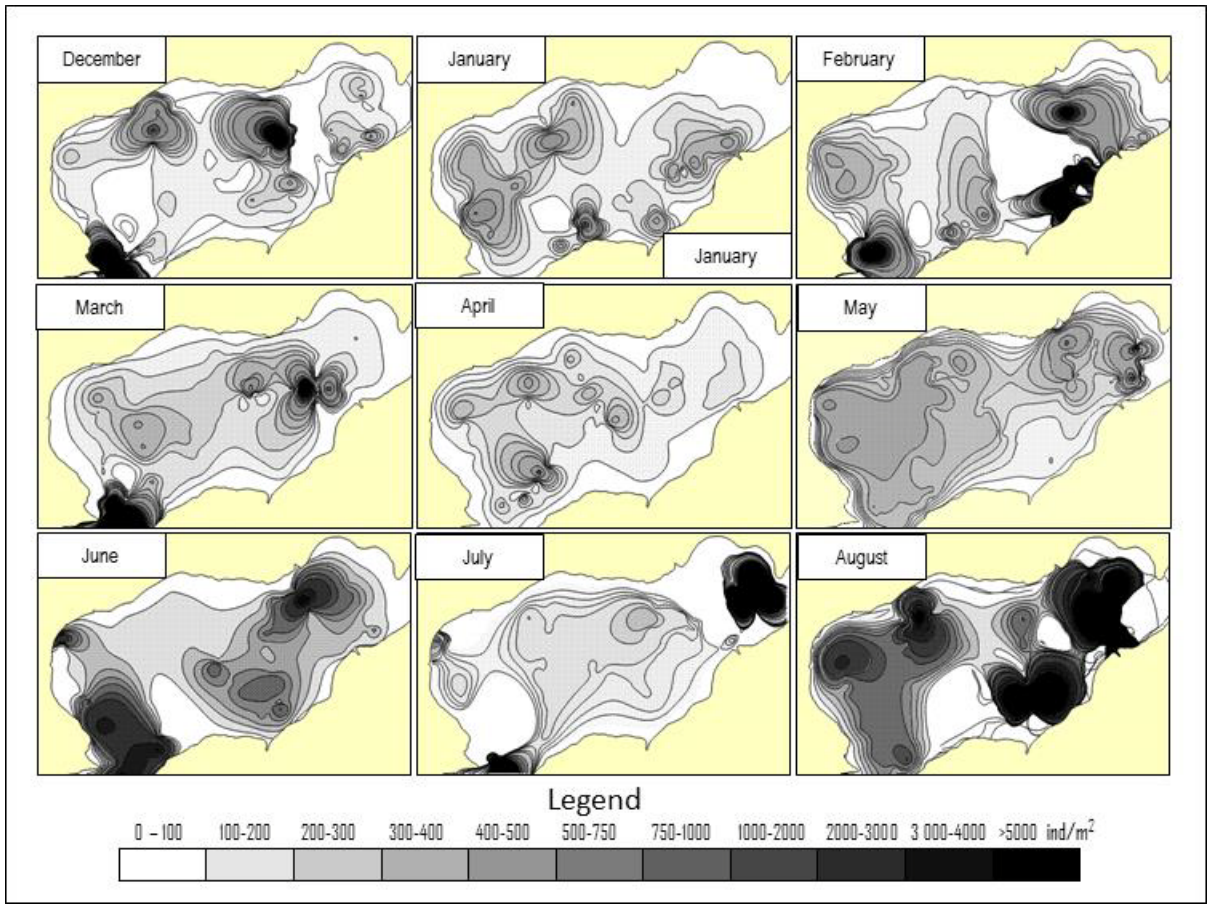


*Figure 5:* Horizontal distribution of zooplankton density in Inner Ambon Bay

According to Simard *et al.* (1992) that the distribution of animals in waters is not random but is well-organized by the physical, chemical, and biological factors that control their activities. These activities include: search for food, avoidance of predators, migration, reproduction, and habitat selection. However, in this study, no observations were made of these environmental factors. So, their contribution to the spatial distribution of zooplankton density in the waters of Inner Ambon Bay is uncertain.

## IV. Conclucion

Based on the results of this researchcan be concluded as follows:

(1) The composition of zooplankton in Inner Ambon Bay wasa group of copepod (42.85% in February to 85.15% in August), followed by the meroplankton (10.15% in August to 51.17% in February) and a group of others zooplankton in small percentage (4.80 % in August to 14.77% in July). The copepod was dominated by Oithona, Acrocalanus, Eucalanus Macrosetella. Meroplankton consists of the larvae of Peneidae, Cirripedia, Stomatopoda, Brachyura, Echinodermata, Gastropoda, Bivalvia, Annelida, and fish egg. Group of other zooplankton in small percentage consists of Medusa, Siphonophora, Urochrodata, Chaethognata, Amphipoda, Sergestidae, Ostracoda, Cladocera. Copepod and meroplankton were found in each sampling period. Other groups of zooplankton that were founded in each sampling period were Siphonophora, Urochrodata, Chaethognata, and Sergestidae, meanwhile Amphipoda was found in January, April, and June, but Ostrachoda and Cladocera were not found in April. The presence of meroplankton (larval of various biota and fish egg) with a significant percentage hints that the Inner Ambon Bay is a spawning ground, nursery ground, and feeding ground of finfish, crustacean, mollusk, shellfish, etc.

(2) The highest average density with highest variation of zooplankton was found in August, while the lowest density with lowest variation was in April.

(3) In the vertical distribution, the deepest swimming layer of zooplankton was 44m in June, and the shallowest was 18m in May. Generally, a higher density of zooplankton was found near-surface layer and decreased down to deeper layers, except in June and July, where a higher densities of zooplankton was found at both depths of 37m and 17m, respectively. This zooplankton behavior is a reaction to avoid low salinity on the surface layer

and then migrating to a deeper water layer which is higher and stable salinity.

(4) Low zooplankton density (<500 ind./$m^2$) spread over a wider area of water. In contrast, high density (>5000 ind./$m^2$) spread over a narrow water space, except in August where zooplankton density which are spread over a widerange of waters. High zooplankton densities are more often found near the inner-outer bay transition area and near mangrove communities. The distribution of zooplankton in Inner Ambon Bay is not random but clustered.

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# Owls and Bats Act as Future 'Wild X-Disease' Preventive COVID-19 Non-Medicated Vaccine: Improved Global-Health-Forestry-Agriculture -Environment-Science-Technology-Communication!

By Dr. Subhas Chandra Datta

*Visva Bharati University*

*Abstract-* The emergence of infectious pathogens with epidemic and pandemic potential like "Severe acute respiratory syndrome (SARS), middle east respiratory syndrome (MERS), influenza, Ebola, Marburg, Lassa, Nipah, and Zika for the last 30 years, and the current COVID-19 disease caused by coronavirus-2 (SARS-CoV-2), is highly infective, causing severe acute, long-term illness that affects the global public health and economic threats". Still, now no 'Buster-Dose-Vaccine' is discovered. On the other hand, food production forests, agriculture, and horticulture significantly reduce different pest attacks. So, to tackle and overcome both, the naturally growing "Wildlife-Conservation-Project of 'Wild Barn Owl and Bats' in the two Heritage-Schools" forming a 'Complex-Typical-Ecosystem' in the food-chain-relationships-landscaping, controlling the different pests in the forest, horticulture, agriculture, and pisciculture, etc.

*Keywords: owls-and-bats; future-wild x-disease; preventive-covid-19-non-medicated-vaccine; improved-global-health-forestry-agriculture-environment-science-technology-communication.*

*GJSFR-C Classification: FOR Code: 060899*


*Strictly as per the compliance and regulations of:*

# Owls and Bats Act as Future 'Wild X-Disease' Preventive COVID-19 Non-Medicated Vaccine: Improved Global-Health-Forestry-Agriculture-Environment-Science-Technology-Communication!

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*Keywords: owls-and-bats; future-wild x-disease; preventive-covid-19-non-medicated-vaccine; improved-global-health-forestry-agriculture-environment-science-technology-communication.*

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## I. Introduction

The last 30 years have faced various infectious diseases like severe acute respiratory syndrome (SARS), middle east respiratory syndrome (MERS), influenza, Ebola, Marburg, Lassa, Nipah, Zika, and now SARS coronavirus 2 (SARS-CoV-2), causing epidemic and pandemic, and impact on global public health and economy. The emergence of the future "X-Disease" depends on multiple forces like climate change, ecosystem changes, and increasing urbanization, and we have to be ready for future "X-Disease" [1]. Still now, in the New York Times, the first week of October 2021, Wolfe J. (Figure 1) reported that the U.S. is about to reach more than 700,000 deaths from Covid-19. The last more than 100,000 people to die passed away months after vaccines were American adults, and the majority of unvaccinated Americans in recent months, they also analyzed that the people who died in the last three and a half months for the spreading widely 'Delta mutant variant' in the South lagging in vaccinations. And, recently during the eve of 'Durga Puja' in Purba Bardhaman, West Bengal, India (Figure 1), on 12th-October 2021 showed that the total COVID-19 positive cases are 40157, the total number of discharge cases were 39340, the total number of COVID-19 death is 479, rate of recovery was 97.97% respectively, and rate of mortality was 1.19%. The distribution of COVID positive patient in Burdwan Municipality was 10. And the recent trend is slightly increasing COVID 19. So, it is an urgent need to find out policy-initiative, cheap, and non-pollutant strategies to develop future support and treatments of COVID-19.

## II. Materials and Methods

According to the Imperial Gazette of 1810, there were two English Medium Schools with Dispensary in Burdwan; Burdwan Raj Collegiate School (HS) and Kanchannagar D N Das High School (HS), Burdwan Municipality, Purba Bardhaman-713102, West Bengal, India, (Plate 1), the oldest area, where the temperature

was 22±5°C, relative humidity was 75±5%, is situated near the Damodar and Banka river, and is surrounded by forest, ponds, different old trees, park, garden, playground, storehouse, rice mill, markets, agriculture-horticulture land, brave-yard, wildlife sanctuary, masjids, temples, etc. forming the 'Location Wise an Ideal Place' for keeping and caring of 'Wildlife Conservation,' with the average rainfall was 150 millimeters. The school campus prevails the different old and tall trees, nutritional kitchen garden with a midday meal, exhibited an enriched faunal diversity comprising small mammals, mongoose, owls, bats, pigeons, different small birds, reptiles, toads, and insects, etc. and the two heritage oldest schools are the symbol of the 'Wildlife Conservation,' especially the wild owls, bats, and mongoose [1-7].

## III. Results and Discussions

The environment of the two schools depends on both plants and animals in the school compound in which keeping and caring of barn owls act as a keynote species in the food chain relationships. Rats that happen to spoil food items of mid-day meals, rooms, and documents are controlling by barn owl keeping in the school. Bats which inhabit the big building and different trees, making the school buildings dirty by their excreta, are also preventing by this owl species. Many pests found to significantly reduce food production in the kitchen garden in the school are also appreciably kept in control. Barn owl and bat breeding projects in the two school premises also help to escalate the vegetation profile of the school and the surrounding area and even keeps the pond ecosystem viable. It is worth mentioning that the barn owl in this school environment plays the role of a top carnivore, predating on mongoose juveniles and bats, which are mainly dependent on fishes and aquatic animals in the ponds. And, as such, an improved midday meal is possible conserving biodiversity. It observes, "Barn owl keeping helps improve the school environment, arouse the interest of students and communities on ecology and food chain relationships as well as biodiversity conservation issues." And, this ultimately contributes to sustainable pond and kitchen garden management, micro-and macro- climate issues, and also students' health and awareness development, including joyful learning experiences with "Wild Barn Owls and Bats Use as Social Vaccine Bio-Indicator Against COVID-19 Improving Science and Technology Communication Environments Socioeconomic Applications with Joyful Learning School Environment" [1-7].

Primarily it has also been observed, "The wild 'Owls' becomes the 'Social Guards, Bio-Indicator, and Social Vaccine' against COVID-19 by consuming especially Coronavirus-carrier wild bats and mongoose, enriching community health, health-risk-services, healthy-lifestyle, wildlife-conservation, agriculture, forestry, horticulture, science, technology, and communication-application-issues, socioeconomic, joyful learning environment, communities-and-health-ecology, food chain relationships issues, and contribute to sustainable pisciculture, and kitchen garden management, micro-and macro-climate issues, where it is mentioning that the wild bats secrets of immunity confirm the clues of treatment against various mutant-Coronavirus with developing the policy also, and arouse the interest of students about conservation of biodiversity" [1-6]. And recently in 'Science,' a cave in a mountain in Laos not far from the one shown here is home to bats infected with the closest coronavirus to SARS-CoV-2 yet, and the new viruses, the SARS-CoV-3, show for the first time that features of the pandemic virus exists in the wild, that viruses genetic sequence to SARS-CoV-2 up to 96.8% identical, using its surface protein, spike, angiotensin-converting enzyme 2(ACE2) for initiating an infection, and may cause 'Future Pandemic' due to evolution, several decades separate these bat viruses remain inactive [8].

Here, the bats not only control the different pests in forestry, horticulture, agriculture, and pisciculture, etc., increasing food production, but also plays a vital role in preventing the high rate of morbidity and mortality, showing the "Wild-Bat Act as a Natural-Booster-Community-Vaccine against COVID-19", and developing effective life-saving immunomodulatory therapies by improving natural-immunities, and provides-"Preventive-Community-Health-Clinical-Research-Education-and-Enriched-Wildlife-Biodiversity-Conservation-Agriculture-Forestry-Environments-Socio-economy-and-Science-Technology-Communication-Application-Issues with Joyful-Learning-Environment-with-Human-Health-Ecology, and Food-Chain-Relationships, and Community-Health" [1-9].

## IV. Future Research

Wild 'Owls and Bats' are also opening a path of more future research and communication, and we strive towards the betterment of societal conditions benefitting global humanity by advancing innovations in the fields of scientific research. The wild owls and bats may be "Potential Policy Developer Family-Based-Social-Natural-Booster-Community-Vaccine COVID 19 Epidemic-Models Against Future SARS-CoV-3 (Coronavirus-3) Crisis Achieved Sustainable Development Socio-Economic Welfare Science Technology Innovations Application Issues", focusing on methods of drug and clinical research, and technology development innovation for larger green-socio-economic-welfare supported the theme "Vision 2040" that might help policymakers, solving any future virus-induced crisis of epidemic or pandemic enriching natural resources with cost-effective treatment methods.

The world will remain in the old form, and the "Wild Owls and Bats Act as Future Wild X-Disease Preventive COVID-19 Non-Medicated Vaccine: Improved Global-Health Forestry-Agriculture-Environment Science-Technology-Communication", and worlds become retained in old form developing education and research in the new normal situation. It needs the "Wildlife Conservation Approach" [1-9].

## V. Conclusions

Here, the wild barn owls and bats not only control the different pests in forestry, horticulture, agriculture, and pisciculture, etc., increasing food production, but also plays a vital role in preventing the high rate of morbidity and mortality, showing the "Wild-Owls and Bats Act as a Natural-Booster-Community-Vaccine against COVID-19", and developing effective life-saving immune modulatory therapies by improving natural-immunities, and provides "Preventive-Community-Health-Clinical-Research-Education-and-Enriched-Wildlife-Biodiversity-Conservation-Agriculture-Forestry-Environments-Socioeconomy-and-Science-Technology-Communication-Application-Issues with Joyful-Learning-Environment-with-Human-Health-Ecology, and Food-Chain-Relationships, and Community-Health". So, wildlife conservation may be the "Future Preventive Epidemic COVID-19 Model" enriching "Forestry Horticulture Agriculture Environment Health Biodiversity Science Technology Communication Application Issues", and worlds become retained in old form developing education and research. It needs the "Wildlife Conservation Approach" and human, animal, and environmental interactions to prevent any kinds of "X-Disease."

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*Conflicts of Interest Statement*

The author declared that he has no conflict of interest regarding the research work.

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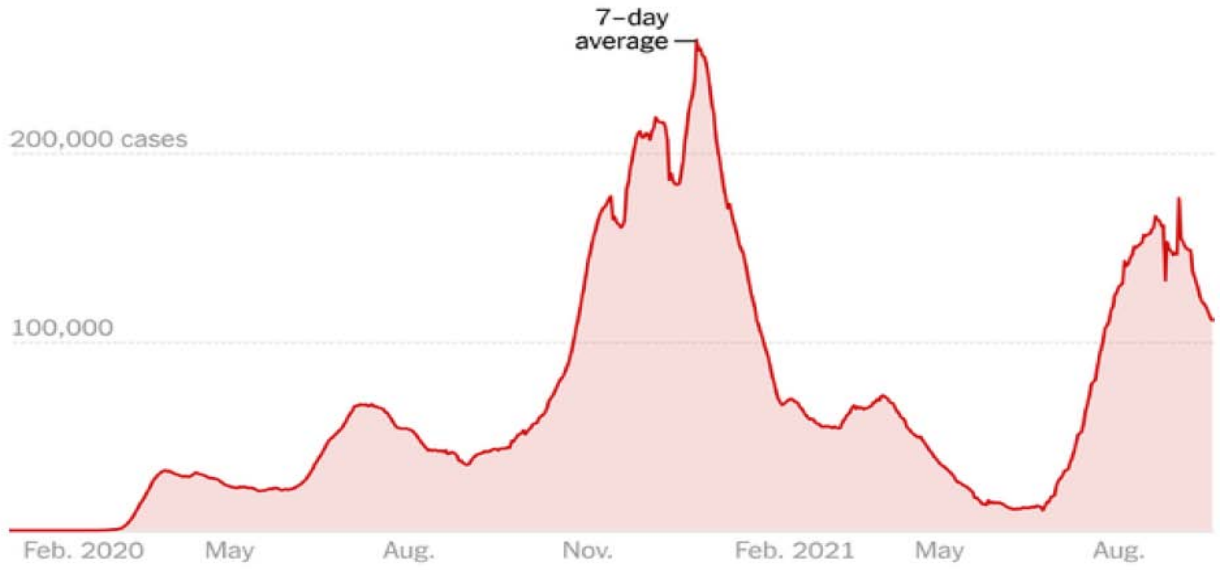


**Daily Press Briefing**
**Purba Bardhaman**
**Date: 12/10/2021 (Up to 5.00 P.M.)**
**(Report to be send by 7.00 P.M Daily)**

**Part – I: Related to COVID-19**

| | | | |
|---|---|---|---|
| i) | **Total No. of COVID Positive Patients found on the day of reporting *** | : | 28 |
| ii) | Total no of COVID positive patients** | : | 40157 |
| iii) | Total no of active patients as on today*** | : | 338 |
| iv) | Total no of discharged cases | : | 39340 |
| v) | Total no of COVID death recorded | : | 479 |
| vi) | Rate of Recovery# (Percentage) | | 97.97 |
| vii) | Rate of Mortality# (Percentage) | | 1.19 |
| viii) | Current Positivity Rate (last 7 days)# (Percentage) | | 1.95 |
| • | **Testing status : RTPCR + RAT** | | |
| xi) | Total no of Sample collected | : | 761182 |
| xii) | Total no of Sample tested | : | 760821 |
| xiii) | Total no of Positive cases | : | 34234 (+53 repeat +ve) |
| xiv) | Total no of negative Cases | : | 726534 |
| • | **Containment Zone status :** | | |
| xv) | Total no of Containment Zone as on today | : | |
| xvi) | Total no of containment withdrawn | : | |
| • | **Analysis of Positive Persons Details : On date – Positive-** | | |
| xvii) | Total No. of Migrant (Other State + Other Dist. of WB): | : | 00 |
| xviii) | No. of Persons in Safe House: | : | 00 |
| xix) | No. of Person in Covid Hospital: | : | 02 |
| xx) | No. of Persons in Home Isolations: | : | 26 |
| **Report on Sample Collection and Testing(On Date):** | | | |
| xxiii) | Antigen Test | : | 568 |
| xxiv) | RT-PCR Test | : | 315 |
| xiv) | Test Result within 24 Hrs. | : | 658 (RAT-568+ RTPCR-90) |

**Part- II:**

**Distribution of COVID Positive Cases found on 12/10/2021**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Aushgram-I | 0 | Galsi-II | 0 | Ketugram-I | 0 | Mongolkote | 0 | Burdwan Municipality | 10 |
| Aushgram-II | 0 | Jamalpur | 1 | Ketugram-II | 0 | Purbasthali-I | 1 | Dainhat Municipality | 1 |
| Bhatar | 1 | Kalna-I | 1 | Khandoghosh | 0 | Purbasthali-II | 0 | Guskara Municipality | 0 |
| Burdwan-I | 2 | Kalna-II | 0 | Manteswar | 0 | Raina-I | 0 | Kalna Municipality | 1 |
| Burdwan-II | 2 | Katwa-I | 0 | Memari-I | 2 | Raina-II | 0 | Katwa Municipality | 1 |
| Galsi-I | 0 | Katwa-II | 1 | Memari-II | 1 | Other District | 3 | Memari Municipality | 0 |

| Analysis on COVID +Ve Cases on 12/10/2021 | | *COVID Positive as on today | **Total Positive Cases |
|---|---|---|---|
| Type | Symptomatic | 02 | 4229 |
| | Asymptomatic | 26 | 35928 |
| Total | | 28 | 40157 |
| Contact Analysis | Primary Contact | 01 | 1592 |
| | Travel from High Burden Dist. of W.B. | 00 | 217 |
| | Travel from Other State | 00 | 435 |
| | No Travel History | 27 | 37913 |
| Total | | 28 | 40157 |

*Figure 1:* COVID-19 report of the United States, seven-day average in the 1st week of October 2021 in The New York Times, and of Purba Bardhaman District from 12th-October 2021

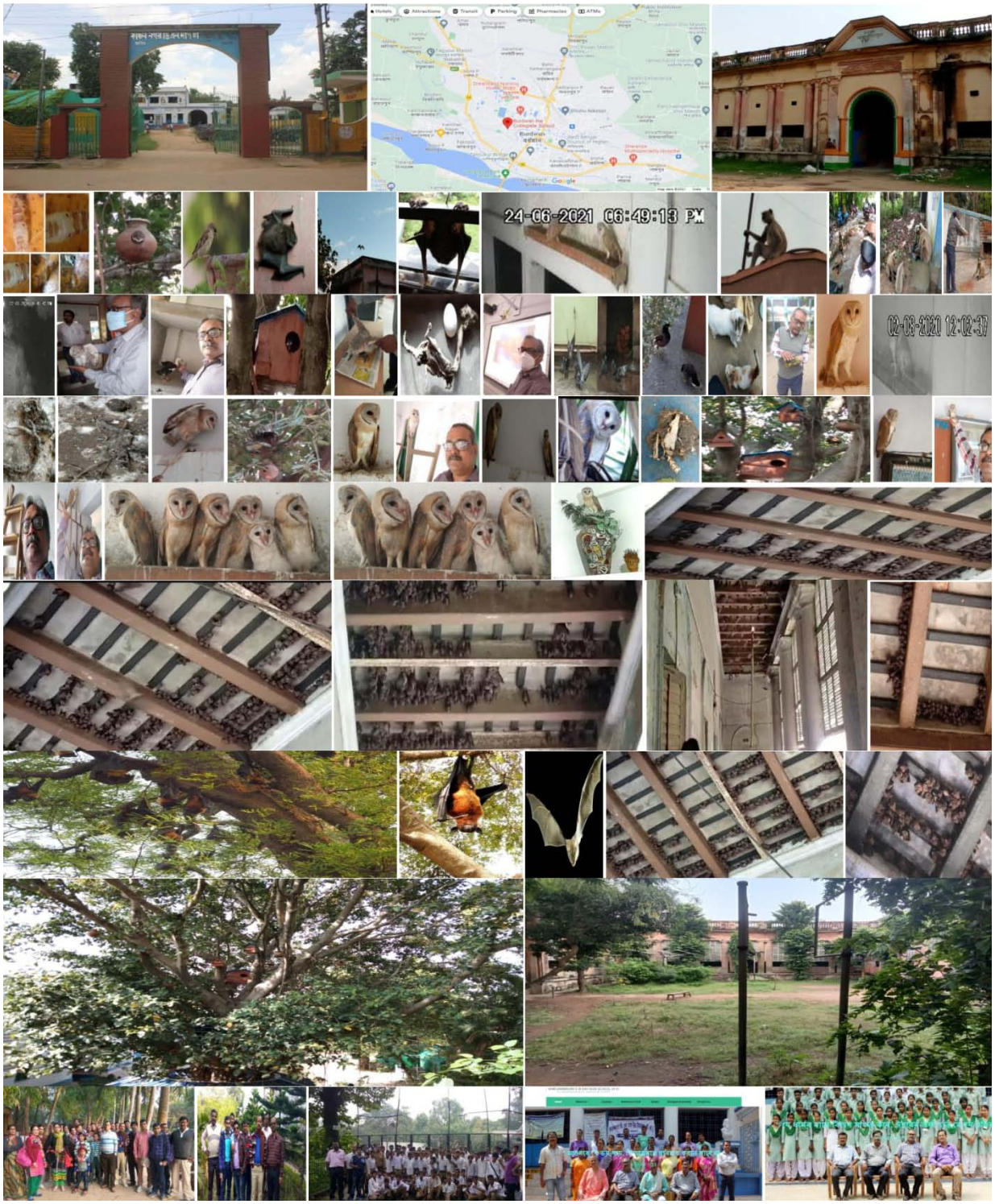


*Plate 1:* Activities of wild barn owls and bats in the two heritage schools Kanchannagar D. N. Das High School (HS) and Burdwan Raj Collegiate School (HS) during COVID-19 periods

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|---|---|---|---|
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- Author name in font size of 11 in one column.
- Abstract: font size 9 with the word "Abstract" in bold italics.
- Main text: font size 10 with two justified columns.
- Two columns with equal column width of 3.38 and spacing of 0.2.
- First character must be three lines drop-capped.
- The paragraph before spacing of 1 pt and after of 0 pt.
- Line spacing of 1 pt.
- Large images must be in one column.
- The names of first main headings (Heading 1) must be in Roman font, capital letters, and font size of 10.
- The names of second main headings (Heading 2) must not include numbers and must be in italics with a font size of 10.

***Structure and Format of Manuscript***

The recommended size of an original research paper is under 15,000 words and review papers under 7,000 words. Research articles should be less than 10,000 words. Research papers are usually longer than review papers. Review papers are reports of significant research (typically less than 7,000 words, including tables, figures, and references)

A research paper must include:

a) A title which should be relevant to the theme of the paper.
b) A summary, known as an abstract (less than 150 words), containing the major results and conclusions.
c) Up to 10 keywords that precisely identify the paper's subject, purpose, and focus.
d) An introduction, giving fundamental background objectives.
e) Resources and techniques with sufficient complete experimental details (wherever possible by reference) to permit repetition, sources of information must be given, and numerical methods must be specified by reference.
f) Results which should be presented concisely by well-designed tables and figures.
g) Suitable statistical data should also be given.
h) All data must have been gathered with attention to numerical detail in the planning stage.

Design has been recognized to be essential to experiments for a considerable time, and the editor has decided that any paper that appears not to have adequate numerical treatments of the data will be returned unrefereed.

i) Discussion should cover implications and consequences and not just recapitulate the results; conclusions should also be summarized.
j) There should be brief acknowledgments.
k) There ought to be references in the conventional format. Global Journals recommends APA format.

Authors should carefully consider the preparation of papers to ensure that they communicate effectively. Papers are much more likely to be accepted if they are carefully designed and laid out, contain few or no errors, are summarizing, and follow instructions. They will also be published with much fewer delays than those that require much technical and editorial correction.

The Editorial Board reserves the right to make literary corrections and suggestions to improve brevity.

## Format Structure

***It is necessary that authors take care in submitting a manuscript that is written in simple language and adheres to published guidelines.***

All manuscripts submitted to Global Journals should include:

**Title**

The title page must carry an informative title that reflects the content, a running title (less than 45 characters together with spaces), names of the authors and co-authors, and the place(s) where the work was carried out.

**Author details**

The full postal address of any related author(s) must be specified.

**Abstract**

The abstract is the foundation of the research paper. It should be clear and concise and must contain the objective of the paper and inferences drawn. It is advised to not include big mathematical equations or complicated jargon.

Many researchers searching for information online will use search engines such as Google, Yahoo or others. By optimizing your paper for search engines, you will amplify the chance of someone finding it. In turn, this will make it more likely to be viewed and cited in further works. Global Journals has compiled these guidelines to facilitate you to maximize the web-friendliness of the most public part of your paper.

**Keywords**

A major lynchpin of research work for the writing of research papers is the keyword search, which one will employ to find both library and internet resources. Up to eleven keywords or very brief phrases have to be given to help data retrieval, mining, and indexing.

One must be persistent and creative in using keywords. An effective keyword search requires a strategy: planning of a list of possible keywords and phrases to try.

Choice of the main keywords is the first tool of writing a research paper. Research paper writing is an art. Keyword search should be as strategic as possible.

One should start brainstorming lists of potential keywords before even beginning searching. Think about the most important concepts related to research work. Ask, “What words would a source have to include to be truly valuable in a research paper?” Then consider synonyms for the important words.

It may take the discovery of only one important paper to steer in the right keyword direction because, in most databases, the keywords under which a research paper is abstracted are listed with the paper.

**Numerical Methods**

Numerical methods used should be transparent and, where appropriate, supported by references.

**Abbreviations**

Authors must list all the abbreviations used in the paper at the end of the paper or in a separate table before using them.

**Formulas and equations**

Authors are advised to submit any mathematical equation using either MathJax, KaTeX, or LaTeX, or in a very high-quality image.

**Tables, Figures, and Figure Legends**

Tables: Tables should be cautiously designed, uncrowned, and include only essential data. Each must have an Arabic number, e.g., Table 4, a self-explanatory caption, and be on a separate sheet. Authors must submit tables in an editable format and not as images. References to these tables (if any) must be mentioned accurately.

**Figures**

Figures are supposed to be submitted as separate files. Always include a citation in the text for each figure using Arabic numbers, e.g., Fig. 4. Artwork must be submitted online in vector electronic form or by emailing it.

## Preparation of Eletronic Figures for Publication

Although low-quality images are sufficient for review purposes, print publication requires high-quality images to prevent the final product being blurred or fuzzy. Submit (possibly by e-mail) EPS (line art) or TIFF (halftone/ photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Avoid using pixel-oriented software. Scans (TIFF only) should have a resolution of at least 350 dpi (halftone) or 700 to 1100 dpi (line drawings). Please give the data for figures in black and white or submit a Color Work Agreement form. EPS files must be saved with fonts embedded (and with a TIFF preview, if possible).

For scanned images, the scanning resolution at final image size ought to be as follows to ensure good reproduction: line art: >650 dpi; halftones (including gel photographs): >350 dpi; figures containing both halftone and line images: >650 dpi.

Color charges: Authors are advised to pay the full cost for the reproduction of their color artwork. Hence, please note that if there is color artwork in your manuscript when it is accepted for publication, we would require you to complete and return a Color Work Agreement form before your paper can be published. Also, you can email your editor to remove the color fee after acceptance of the paper.

## Tips for Writing a Good Quality Science Frontier Research Paper

Techniques for writing a good quality Science Frontier Research paper:

***1. Choosing the topic:*** In most cases, the topic is selected by the interests of the author, but it can also be suggested by the guides. You can have several topics, and then judge which you are most comfortable with. This may be done by asking several questions of yourself, like "Will I be able to carry out a search in this area? Will I find all necessary resources to accomplish the search? Will I be able to find all information in this field area?" If the answer to this type of question is "yes," then you ought to choose that topic. In most cases, you may have to conduct surveys and visit several places. Also, you might have to do a lot of work to find all the rises and falls of the various data on that subject. Sometimes, detailed information plays a vital role, instead of short information. Evaluators are human: The first thing to remember is that evaluators are also human beings. They are not only meant for rejecting a paper. They are here to evaluate your paper. So present your best aspect.

***2. Think like evaluators:*** If you are in confusion or getting demotivated because your paper may not be accepted by the evaluators, then think, and try to evaluate your paper like an evaluator. Try to understand what an evaluator wants in your research paper, and you will automatically have your answer. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

***3. Ask your guides:*** If you are having any difficulty with your research, then do not hesitate to share your difficulty with your guide (if you have one). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work, then ask your supervisor to help you with an alternative. He or she might also provide you with a list of essential readings.

***4. Use of computer is recommended:*** As you are doing research in the field of science frontier then this point is quite obvious. Use right software: Always use good quality software packages. If you are not capable of judging good software, then you can lose the quality of your paper unknowingly. There are various programs available to help you which you can get through the internet.

***5. Use the internet for help:*** An excellent start for your paper is using Google. It is a wondrous search engine, where you can have your doubts resolved. You may also read some answers for the frequent question of how to write your research paper or find a model research paper. You can download books from the internet. If you have all the required books, place importance on reading, selecting, and analyzing the specified information. Then sketch out your research paper. Use big pictures: You may use encyclopedias like Wikipedia to get pictures with the best resolution. At Global Journals, you should strictly follow here.

***6. Bookmarks are useful:*** When you read any book or magazine, you generally use bookmarks, right? It is a good habit which helps to not lose your continuity. You should always use bookmarks while searching on the internet also, which will make your search easier.

***7. Revise what you wrote:*** When you write anything, always read it, summarize it, and then finalize it.

***8. Make every effort:*** Make every effort to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in the introduction—what is the need for a particular research paper. Polish your work with good writing skills and always give an evaluator what he wants. Make backups: When you are going to do any important thing like making a research paper, you should always have backup copies of it either on your computer or on paper. This protects you from losing any portion of your important data.

***9. Produce good diagrams of your own:*** Always try to include good charts or diagrams in your paper to improve quality. Using several unnecessary diagrams will degrade the quality of your paper by creating a hodgepodge. So always try to include diagrams which were made by you to improve the readability of your paper. Use of direct quotes: When you do research relevant to literature, history, or current affairs, then use of quotes becomes essential, but if the study is relevant to science, use of quotes is not preferable.

***10. Use proper verb tense:*** Use proper verb tenses in your paper. Use past tense to present those events that have happened. Use present tense to indicate events that are going on. Use future tense to indicate events that will happen in the future. Use of wrong tenses will confuse the evaluator. Avoid sentences that are incomplete.

***11. Pick a good study spot:*** Always try to pick a spot for your research which is quiet. Not every spot is good for studying.

***12. Know what you know:*** Always try to know what you know by making objectives, otherwise you will be confused and unable to achieve your target.

***13. Use good grammar:*** Always use good grammar and words that will have a positive impact on the evaluator; use of good vocabulary does not mean using tough words which the evaluator has to find in a dictionary. Do not fragment sentences. Eliminate one-word sentences. Do not ever use a big word when a smaller one would suffice.

Verbs have to be in agreement with their subjects. In a research paper, do not start sentences with conjunctions or finish them with prepositions. When writing formally, it is advisable to never split an infinitive because someone will (wrongly) complain. Avoid clichés like a disease. Always shun irritating alliteration. Use language which is simple and straightforward. Put together a neat summary.

***14. Arrangement of information:*** Each section of the main body should start with an opening sentence, and there should be a changeover at the end of the section. Give only valid and powerful arguments for your topic. You may also maintain your arguments with records.

***15. Never start at the last minute:*** Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

***16. Multitasking in research is not good:*** Doing several things at the same time is a bad habit in the case of research activity. Research is an area where everything has a particular time slot. Divide your research work into parts, and do a particular part in a particular time slot.

***17. Never copy others' work:*** Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

***18. Go to seminars:*** Attend seminars if the topic is relevant to your research area. Utilize all your resources.

***19. Refresh your mind after intervals:*** Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.

***20. Think technically:*** Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

***21. Adding unnecessary information:*** Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

***22. Report concluded results:*** Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

***23. Upon conclusion:*** Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

## Informal Guidelines of Research Paper Writing

***Key points to remember:***

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

**Final points:**

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

*The introduction:* This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

**The discussion section:**

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

**General style:**

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

**To make a paper clear:** Adhere to recommended page limits.

*Mistakes to avoid:*

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.
- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

**Title page:**

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

**Abstract:** This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

*Reason for writing the article—theory, overall issue, purpose.*

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

**Approach:**

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

**Introduction:**

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.

*The following approach can create a valuable beginning:*

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.

**Approach:**

Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

As always, give awareness to spelling, simplicity, and correctness of sentences and phrases.

**Procedures (methods and materials):**

This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

**Materials:**

*Materials may be reported in part of a section or else they may be recognized along with your measures.*

**Methods:**

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

**Approach:**

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

**What to keep away from:**

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.

**Results:**

The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

**Content:**

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

**What to stay away from:**

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

**Approach:**

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

**Figures and tables:**

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

**Discussion:**

The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an argument should be.

Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."

Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

**Approach:**

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

## The Administration Rules

Administration Rules to Be Strictly Followed before Submitting Your Research Paper to Global Journals Inc.

*Please read the following rules and regulations carefully before submitting your research paper to Global Journals Inc. to avoid rejection*.

*Segment draft and final research paper:* You have to strictly follow the template of a research paper, failing which your paper may get rejected. You are expected to write each part of the paper wholly on your own. The peer reviewers need to identify your own perspective of the concepts in your own terms. Please do not extract straight from any other source, and do not rephrase someone else's analysis. Do not allow anyone else to proofread your manuscript.

*Written material:* You may discuss this with your guides and key sources. Do not copy anyone else's paper, even if this is only imitation, otherwise it will be rejected on the grounds of plagiarism, which is illegal. Various methods to avoid plagiarism are strictly applied by us to every paper, and, if found guilty, you may be blacklisted, which could affect your career adversely. To guard yourself and others from possible illegal use, please do not permit anyone to use or even read your paper and file.

## Criterion for Grading a Research Paper (Compilation) by Global Journals

**Please note that following table is only a Grading of "Paper Compilation" and not on "Performed/Stated Research" whose grading solely depends on Individual Assigned Peer Reviewer and Editorial Board Member. These can be available only on request and after decision of Paper. This report will be the property of Global Journals.**

| Topics | Grades | | |
|---|---|---|---|
| | **A-B** | **C-D** | **E-F** |
| ***Abstract*** | Clear and concise with appropriate content, Correct format. 200 words or below | Unclear summary and no specific data, Incorrect form<br><br>Above 200 words | No specific data with ambiguous information<br><br>Above 250 words |
| ***Introduction*** | Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited | Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter | Out of place depth and content, hazy format |
| ***Methods and Procedures*** | Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads | Difficult to comprehend with embarrassed text, too much explanation but completed | Incorrect and unorganized structure with hazy meaning |
| ***Result*** | Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake | Complete and embarrassed text, difficult to comprehend | Irregular format with wrong facts and figures |
| ***Discussion*** | Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited | Wordy, unclear conclusion, spurious | Conclusion is not cited, unorganized, difficult to comprehend |
| ***References*** | Complete and correct format, well organized | Beside the point, Incomplete | Wrong format and structuring |

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